Improvement of classifications European monitoring stations for AirBase

A quality control

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European Topic Centre
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Front page picture: Photo of the monitoring station “Amsterdam-Cabeliaustraat” of the Dutch National Air Quality Monitoring network made in March 2000. When established in 1976 the station has been classified as a *urban background station.* Over the years the fly-over has been built and the traffic intensities on the road increased strongly. The analyses presented in this report indicate that a classification as *traffic station* is more appropriate for more recent years. The station is not longer operational. (© RIVM, 2000).

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Minor thesis

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Summary

Classifications of monitoring stations are needed to give a representative picture of air quality in Europe. Not all European stations are assumed to be classified correctly.
This research can be seen as a quality control for the meta information of the monitoring stations. The ratio NO/NO_2 (R) was used to characterise three types of stations: rural background, urban background and traffic stations.
Dutch monitoring stations were supposed to be classified correctly and were therefore taken as reference stations to test two methods for separating monitoring stations into the three types of stations.
For classifying the types of stations cluster analysis on R-values and limit values for R were used. Data of three years (1999, 2001 and 2002) have been used, separating winter and summer data, based on their different behaviour. For these six periods hourly week concentrations were averaged, resulting in twenty-four concentration values for each period and each monitoring station.

Cluster analysis separates objects in a predefined number of clusters, based on their characteristics. Four clusters were chosen to separate rural background, urban background, traffic and high traffic stations. Using only peak values of R, i. e. during rush hours, gave the best results of cluster analysis. High traffic stations were separated from other traffic stations and urban and rural background stations were separated from all traffic stations. To separate urban and rural background stations was much more difficult. In the centre of the Netherlands and province Brabant rural and urban background stations had similar characteristics. Rural background stations situated in the North of the Netherlands and in province Zeeland could be separated from urban background stations and were clustered in a different cluster for each of the periods.
In total 7 of 45 stations were clustered in a different cluster than expected, based on the meta information of the stations, for more than 50% of the periods.

The second method also uses the ratio as a criterion for separating stations into three categories. This method is based on limit values of R for each op the station types. In France the R-value is used to test the representativeness of an urban background station. This same criterion for separating urban background stations and traffic stations, $R = 1.5$, could be applied to Dutch stations successfully. Dutch stations were used to find an R-value to separate urban background stations and rural background stations. A value of $R = 0.8$ gave the best results. Only morning peak concentrations (6:10 a.m.) were used in this method. For a station to be classified as traffic station, at least 2 hourly averaged values must exceed $R = 1.5$. For a station to be classified as rural background station, at least 3 hourly averaged values of R need to be less than 0.8. All other stations are classified as urban background station. Four stations were classified as a different type of station than could be expected from meta information of the stations.

The second method, using limit values for R, seemed the best method to classify Dutch monitoring stations, according to the axiom that all Dutch stations are classified correctly. Therefore, the second method was used to classify all European monitoring stations with available data. The preliminary results for European stations were not optimistic. Many countries had at least half of the station classified as a different type

of station than registered in AirBase. The limit values of *R* used for French and Dutch stations might not be used for other European countries, caused by their different background concentrations.

One Dutch station was classified as traffic station, instead of the registered urban background classification, by both methods. This station appeared to be situated in an area, which was subjected to many changes the last years. A wide road was built in the vicinity of the station, so this station could by all means be classified as traffic station. The hypothesis that all Dutch stations were classified correctly could hereby be rejected.

The rejection of cluster analysis as a method to classify European monitoring stations might not be correct, knowing that classifications of Dutch monitoring stations are not reliable. Cluster analysis is a method independent of precise criteria of characteristics for each type of station. This method could therefore be applied to each country separately, in case there is a sufficient number of stations, so the characteristics for each country are included.

Also other components, carbon monoxide for example, can be taken as a characteristic in further research. Data suppliers should be asked to report all measured concentrations. France for example did not report their measured NO or NO_x concentration, only NO_2 concentrations. The criterion used in France could therefore not be tested on French stations.

Preface

I would like to thank Frank de Leeuw for his co-ordination, Jordi Vila for his advise and co-ordination, Patrick van Hooijdonk for answering all my questions about AirBase, Ed Buijsman for giving me the opportunity to see more of the data process, Dick van Straalen for taking me with him on his trip to the monitoring stations in the Netherlands, Hans van Berkhout for showing validation of the data, Hans Visser for his help on the statistical aspects of my research, Jan van de Kassteele for help and discussion during my research, Jan and Remus for their presence in room 201 and all the people making me feel at home during my staying at RIVM.

Contents

1. Introduction

Air pollution continues to be an important public health concern. A number of air pollutants, emitted by a variety of industrial processes and traffic, have an enormous impact on the health of people and on ecosystems. Since air pollution is a European problem measures are taken at this level. The European Union established ambient air quality standards for protection of human health and ecosystems. The United Nations Economic Commission for Europe (UNECE) adopted the Convention on Long-Range Transboundary Air Pollution, the first international legally binding instrument to deal with problems of air pollution on a broad regional basis.

The European Environment Agency (EEA) focuses on assessing the current and future state of the environment across Europe and the pressures upon it. The EEA aims to support sustainable development and to help achieve significant and measurable improvement in Europe's environment through the provision of timely, targeted, relevant and reliable information to policy making agents and the public. The main information requirement of the EEA is to provide to the European Union and its Member States “objective, reliable and comparable information at a European level enabling the Member States to take the requisite measures to protect the environment, to assess the results of such measures and to ensure that the public is properly informed about the state of the environment” (EUROAIRNET, 1999).
EEA contracted European Topic Centres (ETCs), institutions in a few of the member countries of EEA, to execute tasks identified in the multi-annual work programme. EEA has five ETCs in total. One of the ETCs is specialised in Air and Climate Change (ACC). The National Institute of Public Health and the Environment (RIVM in Bilthoven) is the lead organisation of ETC/ACC.
One of the tasks of ETC/ACC is to develop and maintain a database for air quality data. This database, called AirBase, has been developed as a relational database within a multi-user environment. Countries of the European Union have a long tradition of exchanging air quality data. Data from over 30 European countries are obtained covering almost a hundred air quality parameters. Meta information, i.e. information of location, type of zone, characteristics of zone, type of station, measure techniques and number of inhabitants, is required for AirBase to give a representative picture of air quality in Europe.
The location of the station has influence on the height of the measured concentrations of air pollutants. Therefore meta information is an important tool for classifying stations with characteristic concentrations.

This research can be seen as a quality control for the meta information of the monitoring stations. The aim is to separate rural, urban and traffic stations using characteristics in concentrations and by comparing the results with the meta-information delivered by the member countries of the EEA.

Summarised the research questions for this research are:
- What are characteristics in concentration of air pollutants for different types of monitoring stations?
- Is it possible to use characteristics in concentrations to divide all monitoring stations in AirBase into three types of monitoring stations: rural stations, urban stations and traffic stations?

- Are the results of this classification comparable to the meta-information of monitoring the stations, given by their countries?
- What could be the advice to data suppliers of deviated monitoring stations?

For using characteristic concentrations, more information is needed of the measured components to find indicators for certain monitoring stations. Chapter 2 provides a deeper insight in the chemistry of the main pollutants and their sources, characteristic for types of stations. More information on the database for air quality data in Europe, AirBase, types of monitoring stations and data acquirement can be found in chapter 3. The method used to separate monitoring stations is discussed in chapter 4, followed by results and discussion in chapter 5. Chapter 6 summarises the main conclusions of the research and in chapter 7 recommendations for further research can be found.

2. Pollutants

Emissions of air pollutants can have many different sources. Each source has its own characteristic emissions. Insight in the chemistry of the emitted components could increase the knowledge of the effects they are causing; effects injuring human health, harming crops and ecosystems and damaging buildings and historical monuments.
Air pollutants will be used characterising and thus separating traffic stations from rural and urban stations. This chapter provides insight in the chemistry and the effects of components emitted mainly by traffic (primary gasses) or resulting from reactions with components emitted by traffic (secondary gasses).

2.1 Carbon monoxide (CO)

Carbon monoxide results from burning of fossil fuels with insufficient oxygen. In polluted regions such as urban centres, elevated CO concentrations can be dangerous to human health. High concentrations of CO, called CO poisoning, influence the oxygen absorption of blood. Five symptoms are widely regarded as common symptoms of CO poisoning: headaches, drowsiness, nausea, dizziness and vomiting. People having chronicle heart and vascular diseases are much more sensitive. These people will experience symptoms at lower concentrations of CO.
CO concentrations are lowest in rural areas and highest in urban and suburban areas. Traffic contributes for the main part to the total CO emission (58% in Europe; Taylor, 2004). Other sources of CO emissions include industrial processes, residential wood burning and forest fires. The highest concentration levels of CO typically occur during the colder months of the year when inversion conditions are more frequent; the air pollution becomes trapped near the ground beneath a layer of warm air. Winter also has higher emissions, caused by an increase of burning of fossil fuels.
For protection of the population the European Union established a limit value of 10.000 $\mu g\ m^{-3}$ for the 8 hourly-averaged concentration (EC, 2000).

2.2 Nitrogen oxides (NO_x)

The term NO_x, total oxides of nitrogen, is generally used to describe the sum of NO and NO_2 concentrations. NO_2 can be seen as a red brownish layer over many urban areas. Emission of NO_x into the surrounding air mainly takes place at combustion processes. These components are formed when fossil fuel is burned at high temperatures. The primary sources of NO_x are traffic, power plants and other sources that burn fossil fuels. The main part of the emission of traffic, caused by the high temperature combustion processes, consists of NO (90%), a much smaller part consists of NO_2 (10%). Emitted NO reacts with ozone yielding NO_2. Therefore with the availability of sufficient ozone high concentrations of NO_2 can be found at sites and times with high traffic intensity.
NO_x causes a wide variety of health and environmental impacts. Ground-level ozone (smog) is formed when NO_x and VOC (Volatile Organic Compounds) react in the presence of heat and sunlight. People with lung diseases such as asthma, and people who work or exercise outside, are susceptible to unfavourable effects such as damage to lung tissue and reduction in lung function.
NO_x may react with other substances in the air to form acids which fall to earth as rain, fog, snow or dry particles, damaging buildings and historical monuments and causing lakes and streams to become acidic. Increased nitrogen loading in water and

on land upsets the chemical balance of nutrients used in ecosystems. Additional nitrogen accelerates eutrophication.

To reduce the effects of NO_x the EU has established limit values for NO_2 and NO_x concentrations in the air. The hourly-averaged NO_2 concentrations may not exceed a value of 200 μg m^{-3} more than 18 times a year, meant as protection for the population. The limit value for long-term exposure is 40 μg NO_2 m^{-3} for the annual average concentration of NO_2. For vegetation the limit value is 30 μg NO_2 m^{-3} for annual average concentration of NO_x (EC, 2000).

2.3 Ozone (O_3)

Ozone is a gas composed of three oxygen atoms. It has the same chemical structure near the surface as in the stratosphere. Ozone can have a positive and a negative effect, depending on its location in the atmosphere. In the stratosphere ozone forms a layer that protects life on earth from the sun's harmful radiation, but in the lower atmosphere ozone is considered dangerous to human health.

Ozone is a secondary gas; it is not usually emitted directly into the air, but at ground level it is created by a chemical reaction between nitrous dioxide and VOC in the presence of heat and sunlight (equation 2.1). This reaction is in chemical equilibrium. Increasing NO concentrations yield a reaction to the left (equation 2.1d), resulting in lower ozone concentrations and higher NO_2 concentrations till a new equilibrium has been reached. Therefore, ozone concentrations will decrease at higher NO concentrations.

$$NO_2 + h\nu(\lambda \le 410nm) \xrightarrow{j} NO + O\cdot \qquad (2.1a)$$

$$O\cdot + O_2 + M \rightarrow O_3 + M \qquad (2.1b)$$

$$NO + O_3 \xrightarrow{k} NO_2 + O_2 \qquad (2.1c)$$

with j and k the rate constants for the NO_2 photolysis and O_3 removal reactions respectively, yielding a net reaction:

$$O_2 + NO_2 + h\nu \leftrightarrow O_3 + NO \qquad (2.1d)$$

When equilibrium is reached ozone formation equals ozone removal. This is called photostationary state, when ozone concentration is determined by j and k, and the ratio of NO_2/NO:

$$[O_3] = \frac{j[NO_2]}{k[NO]} \qquad (2.1e)$$

Net, according to equation (2.1d), there will be no forming of ozone. By the occurrence of photolysis (equation 2.2) and the resulting reaction with reactive hydrocarbon, NO will be subtracted, yielding higher ozone concentrations (Crutzen et al, 1993).

$$
\begin{aligned}
&O_3 + h\nu(\lambda \le 310nm) \rightarrow O\cdot + O_2 \\
&O\cdot + H_2O \rightarrow 2OH\cdot \\
&RH + OH\cdot \rightarrow R\cdot + H_2O \qquad (2.2)\\
&R\cdot + O_2 + M \rightarrow RO_2\cdot + M \\
&RO_2\cdot + NO \rightarrow NO_2 + RO\cdot
\end{aligned}
$$

where R is a hydrocarbon fragment.

NO concentrations are emitted by traffic, therefore ozone concentrations in these areas are lowest. Rural areas are subject to increased ozone levels, because wind carries ozone and pollutants that form it far away from their original sources. Sunlight and heat are needed for ozone to be formed. As a result ozone concentrations in winter are much lower than in summer.
Ozone can irritate lung airways and may cause coughing, breathing difficulties during outdoor activities. People with respiratory problems are most vulnerable, but even healthy people that are active outdoors can be affected when ozone levels are high. Repeated exposure to ozone pollution for several months may cause permanent lung damage. Plants and ecosystems could be more vulnerable to diseases, insects, and pests at high ground-level ozone concentrations (EPA, 1998).

To consider health of the population 8 hourly-averaged concentrations are important. The EU established a maximum number of days of 25 a year, on which the daily maximum 8 hourly-averaged concentration may exceed 120 μg m^{-3} (EC, 2000).

2.4 Sources of air pollution

Components can be emitted by many sources. An overview of the main sources of primary gasses can be found in Table 2.1. Secondary gasses result from reactions of primary gasses. Particulate matter is emitted directly into the atmosphere and may also be formed in the air from the chemical change of gases.

Table 2.1: Sources of the most important air pollutants.

Component	**Primary/secondary**	**Source**
O_3	secondary	Traffic petrochemical industry
PM_{10}	primary and secondary	Traffic mechanical activities industrial process transboundary pollution
CO	primary	Traffic fuel combustion Industry
NO/NO_2	primary/secondary	Traffic fuel combustion power plant chemical industry

3. Observations

The EEA needed an information system to provide objective, reliable and comparable information at European level. This system, AirBase, is managed and developed by ETC/ACC. All member countries of the EEA make their air quality data and additional meta-information available for AirBase, showing the relation between the type of zone the monitoring station is located in and the measured concentration of pollutants.
Monitoring stations can be located in different types of areas, measuring different heights of concentrations and showing different daily patterns in concentrations of pollutants. Locations of monitoring stations therefore are carefully chosen, answering the requirements of the EU. Data is acquired automatically and manually from the monitoring station to the institutes responsible for the data. Validation of the data is done by people of the institutes themselves.
This chapter contains a description of the AirBase system, different types of stations, measurement techniques for monitoring gas concentrations and validation of the data.

3.1 AirBase

The information system AirBase is a database for air quality data, data on air quality networks and stations in Europe. The system has been made consistent for use with the EU Exchange of Information system (EoI): 'establishing a reciprocal exchange of information and data from networks and individual stations measuring ambient air pollution within the member countries', including a list of pollutants covered, as well as information on measurement stations, measurement techniques and data quality (Buijsman et al, 2003). Efforts have been made to harmonise international air quality data collection.

AirBase has modules for data transfer and input, statistic calculations and presentations, and availability on the Internet by web-application AirView. Member countries of EEA deliver their data by means of a Data Exchange Module (DEM). The DEM also enables:

- to add, modify and delete meta information on air quality networks, stations and measurement configurations;
- to select station- component combinations for which air quality data is to be exchanged;
- to check imported files on outliners;
- visualisation of air quality data to support the import and maintenance of air quality data and meta data;
- to generate reports with overviews of information imported or contained in application.

The 1997 data reporting cycle was the first where DEM was used. Nowadays data of thirty-one countries is available, containing data of nearly a hundred components, precipitation amount, pH and conductivity.

3.2 Monitoring stations

Pollution effects are a function of exposure of people, objects and ecosystems to the air pollution. Meta information, as information of location, type of zone and number of inhabitants, is therefore used for classifying monitoring stations (Table 3.1).

Table 3.1: Characteristics for classifying monitoring stations

Type of zone	Type of station
urban	traffic
suburban	industrial
rural	background
unknown	unknown

The zone is called urban, when the station is located in a city. Residential areas outside a main city represent the suburban zone of a monitoring station. When a station is located outside a city, far from city sources of air pollution, the type of zone is called rural.
In these types of zone a distinction can be made regarding the location of the station. When a station is located such that its pollution level is determined predominantly by the emissions from nearby traffic, the type of station is called traffic station (street station is also used by member countries). Industrial stations are located such that its pollution level is determined predominantly by the emissions from nearby single industrial sources or industrial areas with many sources. When the pollution level is not determined significantly by any single source or street, but by the integrated contribution from all sources upwind of the station, the station is located on a background area. All of these types of stations can be located in urban, suburban as well as rural zones.
All these characteristics have their influence on the height of the measured concentrations of air pollutants. The net effect of the location for example can be found by comparing concentrations measured at different types of zones; rural stations will give lower carbon monoxide concentrations than urban stations.

Criteria have been framed which a station has to fulfil to have a certain classification. Still many stations have a different behaviour than would be expected from its classification. Information on both the type of zone as well as type of station is needed to understand the measured concentrations of pollutants of a monitoring station. For example two stations in Berlin, both characterised with a urban type of but measuring totally different concentration levels (Figure 3.1). The type of stations of the two locations is different, background and traffic. This example shows the meaning of reliable meta information: information on type of zone and type of station is needed for a correct interpretation of the data.

Stations need to be representative for the area it is situated in to give a good idea of the air quality for certain areas and to compare the air quality situation with other parts of Europe. Therefore a right classification is important. In this study the registered classifications are checked using the measured concentrations of pollutants. Three categories will be distinguished: rural background (R), urban background (U) and traffic (T) stations. Suburban background stations are included in urban background stations. Traffic stations include rural traffic and urban traffic stations. Industrial stations have different characteristics and therefore will not be included in this study.

In total more than two thousand European monitoring stations are operational. One of these stations can be seen in Figure 3.2, showing the area and instruments of a rural station in the Netherlands.

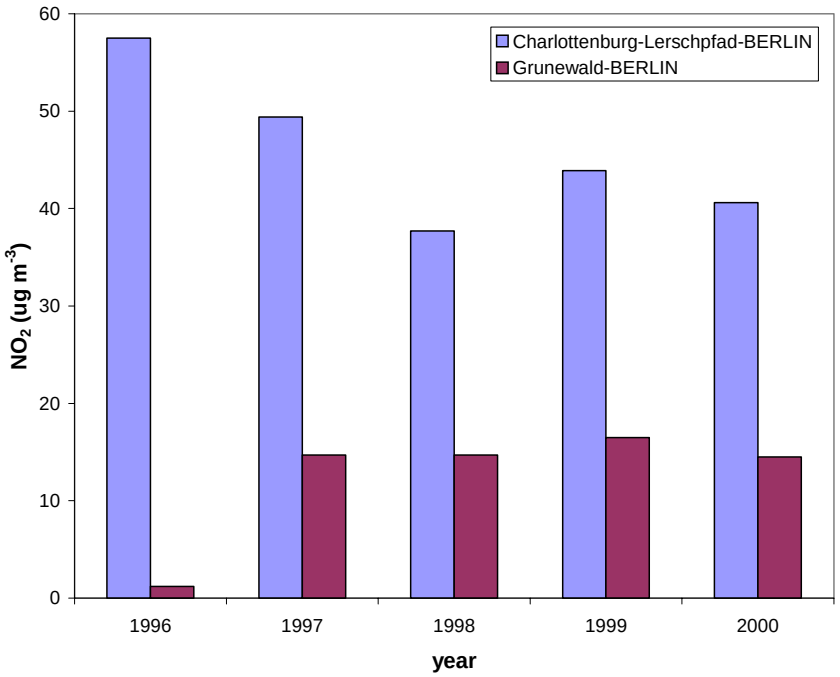


Figure 3.1: Average NO_2 concentrations of two stations in Berlin, a traffic station (Charlottenburg-Lerschpfad, DE0773A) and a background station (Grunewald, DE0754A) both situated in an urban zone, separated by a distance of 5 km. The concentrations measured by these stations indicate the importance of information of station type.

3.3 Data acquirement

Methods of measurement change as the scientific knowledge improves. All stations taking part in the air quality network are using similar techniques for measuring concentrations and calibrating the instrument. The techniques used for the main components of this study are described below. To assure that measurements meet the defined standards of quality, quality assurance and quality control (QA/QC) is needed. Quality assurance involves the management of the entire process. Quality control comprises the operational technique and activities that are undertaken to fulfil the requirements for quality.

3.3.1 Ozone

A dual cell ultraviolet photometric ozone analyser is being used.
The main difference between the calibrator and the analyser is the source of the reference gas used, zero air versus ambient air.

The principle of operation is based on absorption of light at a certain wavelength (254 nm) by ozone. The concentration of ozone is directly related to the magnitude of the attenuation of the light signal, using the Lambert-Beer Law.

$$I/I_0 = e^{-\kappa lc} \qquad (3.1)$$

where
κ = 308 cm^{-1} at 0 °C
l = length of the absorption cell in cm
c = concentration in ppm

Zero air, used at reference, passes into the absorption cell to establish a zero light intensity, I_0. After ten seconds the solenoid switches and the air sample passes through the absorption cell, yielding sample light intensity I. In order for the photometer to have a sensitivity of 1 ppb, a second detector is used to monitor the changes in zero light intensity and to correct for these changes.

3.3.2 NO_x, NO_2 and NO

A chemiluminescence NO_x, NO_2, NO analyser is being used.
The principle of operation is the gas-phase reaction of nitric oxide and ozone.

$$NO + O_3 \rightarrow NO_2 + O_2 + h\nu \qquad (3.2)$$

This reaction produces a characteristic luminescence.
First NO_2 must be converted into NO before it can be measured using the chemiluminescence reaction. To convert NO_2 into NO a NO_2 converter is used based on the reaction between molybdenum and NO_2:

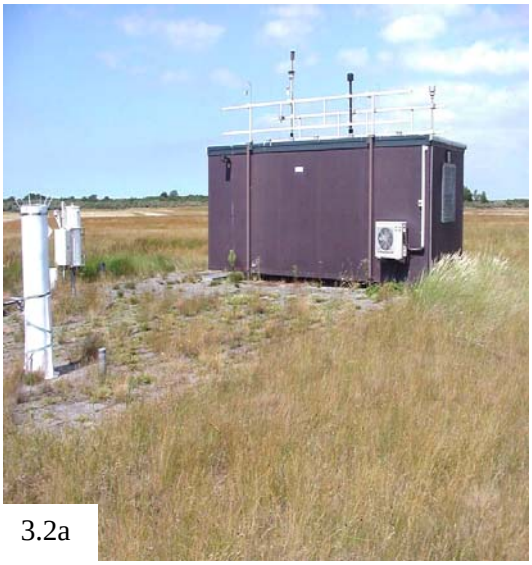
$$3\ NO_2 + Mo \rightarrow 3\ NO + MoO_3 \qquad (3.3)$$

Ambient air is directed to a solenoid valve, which leads the air sample through the NO_2 converter, is case of NO_x, or around the converter, in case of NO measurements. The difference between these two is used to generate a NO_2 signal.

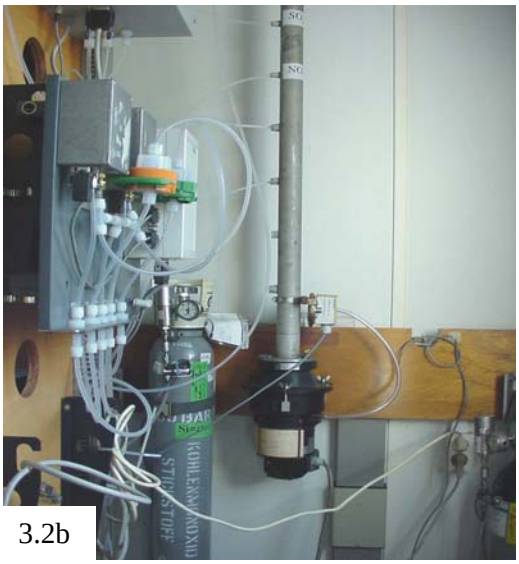
3.3.3 CO

A gas filter correlation spectrometer is being used.
The principle of operation is based upon comparison of the infrared (IR) absorption spectrum of CO to that of other gasses present in the air sample. Radiation from an IR source is passed through a gas filter alternating between CO and N_2 due to rotation of the filter. Radiation than passes through a narrow bandpass interference filter and enters a multiple optical pass cell where absorption by the sample gas occurs. The IR radiation then exits the sample cell and falls on an IR detector.

The CO filter is needed to produce a reference radiation, which cannot be further attenuated by CO in the sample cell. The N_2 side of the filter wheel is transparent to the IR radiation and therefore produces a measure radiation, which can be absorbed by CO in the cell.
Other gasses do not cause modulation of the detector signal, because they absorb the reference and measure radiation equally.



3.2a



3.2b

3.2c

3.2d

3.2e

Figure 3.2: Location and instruments of a Dutch rural background station (de Zilk), situated near dunes on an open area of heather (3.2a). Air is sucked in and concentrations of SO2, O3, NO, NO2 and NOx in the air are being measured each minute (3.2b). Concentrations are averaged each hour and converted to a voltage by monitors. Each hour the voltages representing the hourly-averaged concentrations are send to the observing institute using a modem (3.2c). Air is also sucked in for measuring black smoke. For twenty-four hours air is being lead through a filter. The amount of particles remaining in the filter is being examined in a laboratory on the amount of black smoke in the air that day (3.2d). Measuring small dust occur in a same manner as black smoke, although the amount of dust is measured directly using the reflection of light by the filter relative to the reflection of a clean (white) filter as an indication of the amount of dust (3.2e).

3.3.4 Quality assurance and quality control (QA/QC)

Quality assurance activities cover all the pre-measurement phases, as definition of data and site selection. Quality control covers activities connected to the measurements. Routine checks, calibration and data handling are all included in quality control.

Monitoring stations are under several organisational structures, yielding different QA/QC plans. These plans include rules of precision, accuracy, correctness, representativeness, data capture, time coverage and comparability (EUROAIRNET, 1999). Data must enable comparison of air quality data across Europe and must enable detection of a trend in air quality in Europe over a reasonable time period.
The QA/QC plan begins with quality assurance; procedures for site selection and air quality monitoring network design shall be described, instrumentation should be selected according to justifiable criteria and the central laboratory must have educated and trained personnel. Quality control includes site operation and equipment maintenance, which means frequent visits, calibration, data validation, reporting and documentation according to the AirBase requirements.

Data validation occurs directly; each time the data is sent to the institute or laboratory an automatic check is performed on the data, so that problems with instruments could be remedied immediately. Data validation occurs indirectly as well. Data for a certain period is checked, non-automatically, for deviated values. When these values are found for a certain time and station, data is being compared with nearby stations.

4. Methods

Data of a selection of monitoring stations were used to gain insight in the characteristics of different types of stations. Air pollutants mainly emitted by traffic (chapter 2) served as a starting point. Diurnal as well as weekly cycles of these air pollutants, showing the distance to their sources, were used to devide all monitoring stations into the three main categories: rural background, urban background and traffic stations.
Characteristics in these cycles were used as separation criteria. Separation criteria can be used in several ways, including statistics, to group stations with a similar characteristic.

4.1 Characteristics

Concentrations of pollutants emitted by traffic will show different diurnal and weekly cycles depending on the measured spots. This section shows these differences and the reasons for choosing one of these differences as the characteristic used as a basis for the research.

4.1.1 Ozone 'weekend-effect'

Ozone is being consumed by NO to form NO_2. These three components are in chemical equilibrium; with the availability of UV-radiation and temperature NO_2 forms NO and ozone (equation 2.1d). This reaction causes ozone concentrations to decrease during periods with high NO emissions. As a result, ozone concentrations during the week will be lower than during the weekend in areas with high NO emissions. The difference in ozone concentrations between working days (week) and weekend is called 'weekend effect' (Diem, 2000). This weekend effect can be noticed by monitoring stations nearby traffic. Urban stations are in the vicinity of the sources, so this weekend effect can also clearly be seen at urban stations. Rural stations will not show large differences in ozone concentration between week and weekend and could therefore be separated from the urban and traffic stations (Figure 4.1).

4.1.2 CO, NO and NO_2

Carbon monoxide, as well as nitrogen oxide has the opposite behaviour as ozone. During periods with high traffic intensity concentrations of CO and NO increase. These periods, occurring during the week in the morning and afternoon, are called rush hours. Rural stations are not in the vicinity of sources of CO and NO and will therefore not measure higher concentrations during rush hours.
Urban stations will measure lower concentrations, caused by the dispersion of CO and NO and the reaction of NO with ozone to form NO_2. For this conversion of NO to NO_2 ozone is needed. The ozone concentration decreases during rush hours in the morning and increases in the afternoon by the photochemical reaction (in summer). During afternoon rush hours, enough ozone is formed to consume all the emitted NO. For this reason and because the mixing height is still large during the evening rush hour, the NO concentration therefore will not have a second peak in summer (Figure 4.2a). For NO_2 there are two peaks in concentration, during both morning and afternoon rush hour, caused by the reaction of NO with ozone (Figure 4.2b).

The occurrence of high peaks in CO or NO concentration during the week can be taken as a criterion for traffic stations. Urban stations will have their peak

concentration at a later point of time and measure lower peak concentrations. Rural stations will not show peak concentrations at all.

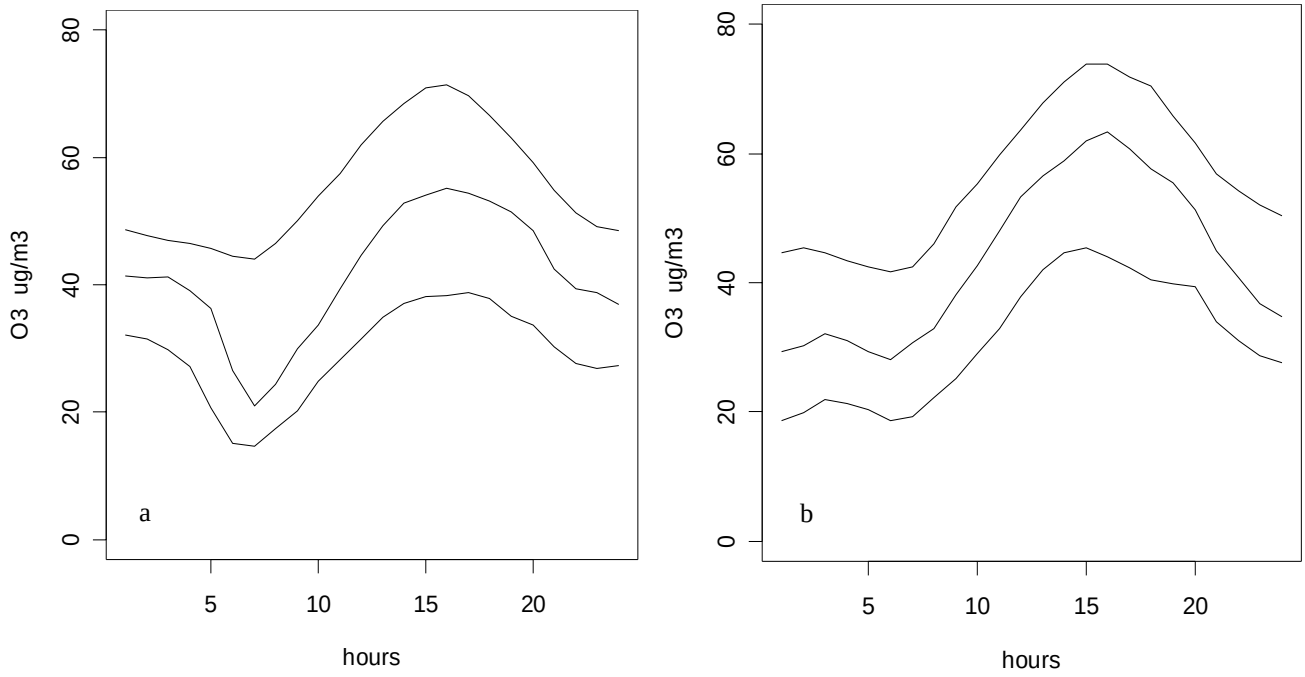


Figure 4.1: Mean concentration of ozone for a rural background (highest), urban background (middle) and traffic station (lowest) for year 2001, summer week (a) and summer weekend (b).

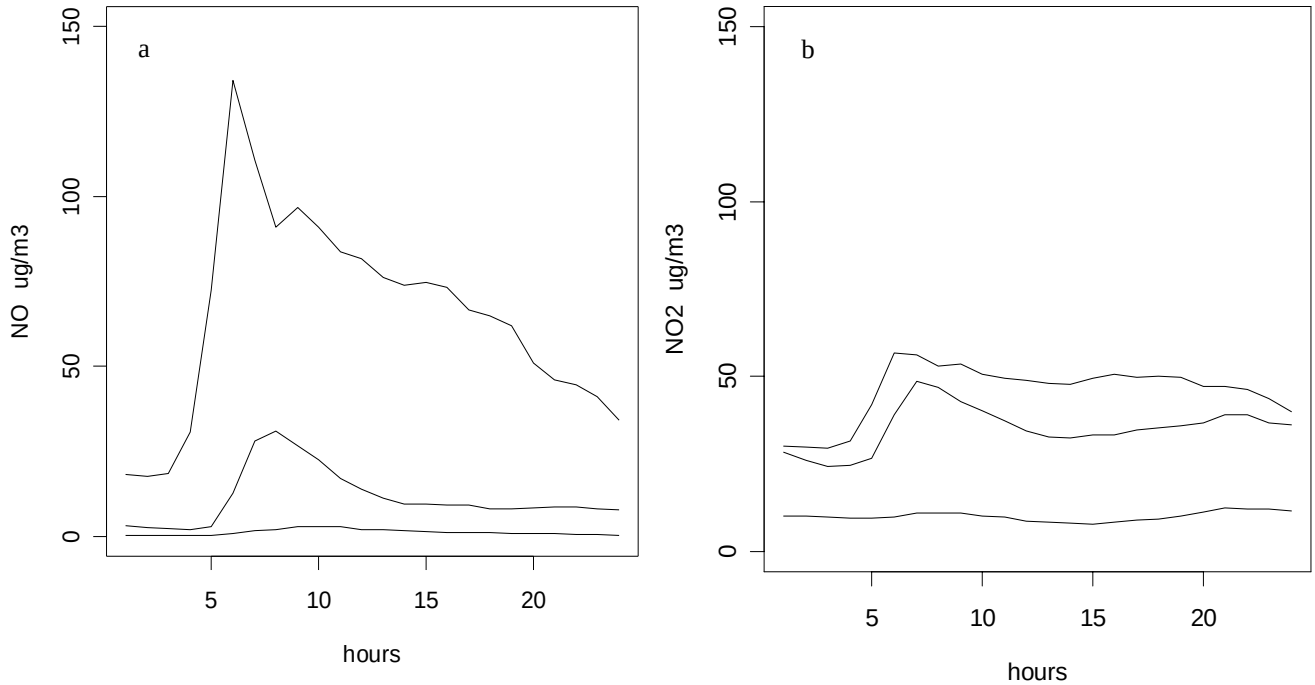


Figure 4.2: Mean concentration of NO (a) and NO_2 (b) for a rural background (lowest), urban background (middle) and traffic station (highest) for year 2002, summer week.

NO concentrations were initially chosen as characteristics for separating the three types of stations. Figure 4.2a shows that the differences between the types of stations in NO concentrations are obvious. Using NO concentrations gave difficulties with normalisation of the data (section 4.2.1) needed for the first method used, cluster analysis. When no normalisation is used, the spreading in NO concentrations of traffic stations makes it hard to use cluster analysis (section 4.2.2); first each cluster will be filled with a traffic station, so the last cluster contains all the remaining station.

4.1.3 Ratio NO/NO_2 (*R*)

To prevent these cluster-results as described in 4.1.2 the ratio NO/NO_2 (*R*) was used. Figure 4.3 shows that an increase in NO concentration causes a much smaller increase in ratio *R*. Therefore, the spreading in traffic stations decreases, while the spreading in urban and rural background stations remains, using *R* instead of NO concentrations.

The ratio *R* has been used as a criterion for background stations in France (Copalle et al, 2001). High values of *R* indicate the vicinity of traffic emissions. The concentration of NO is highest near traffic, where concentrations of NO_2 are much lower. While nitrogen monoxide diffuses from traffic hot spots to the surrounding area, nitrogen monoxide is converted to nitrogen dioxide. The ratio *R* is therefore much lower in these surrounding urban areas. The lowest values of *R* can be found in areas where the traffic intensity is lowest, that is in rural background areas. Supply of NO in these areas is low, yielding a low value of *R*.

Differences in *R* were taken as a criterion for separating stations for both methods.

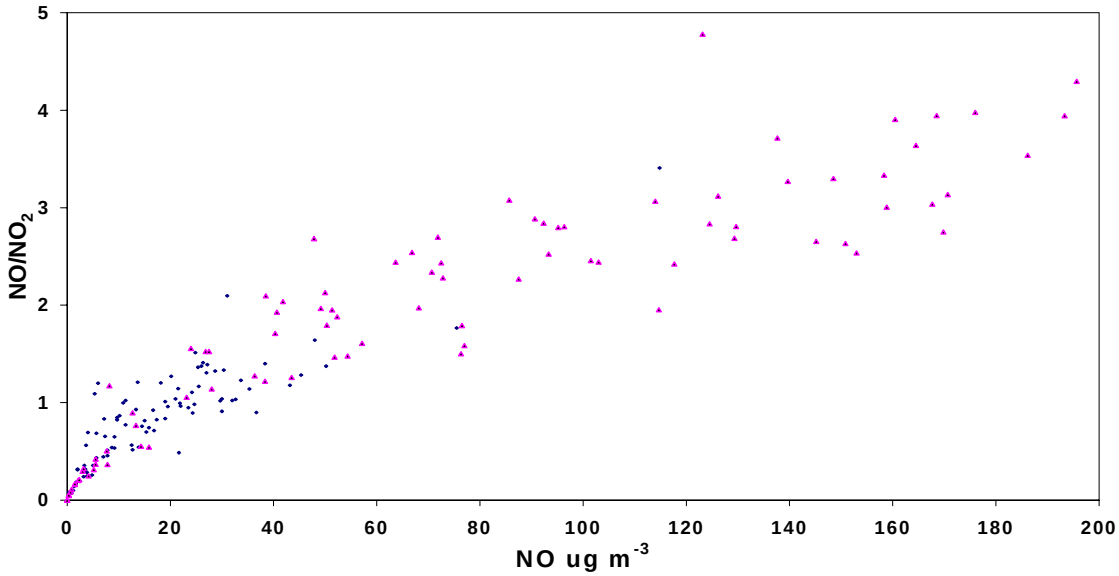


Figure 4.3: Daily averaged NO concentrations and NO/NO_2 ratios for 2 traffic stations. Data of summer 2001 was used. An increase in NO concentrations gives a much smaller increase in NO/NO_2.

4.2 Methods

There are several ways to separate types of stations. A statistical method based on the characteristic values and a method using limits for *R* were used in this study to separate rural background, urban background and traffic stations.

4.2.1 Normalisation data

To use methods for dividing stations into different groups of stations, based on a characteristic, concentrations need to be normalised. This prevents a station with high concentrations to be seen as a different group, while the station just had much higher concentrations than stations with a similar classification.

For normalisation the standard deviation is used:

$$x \rightarrow \frac{x - mean(x)}{\sigma} \qquad (4.1)$$

Normalisation of NO concentrations, using the standard deviation, causes even the NO concentrations of rural background stations to peak. Therefore normalisation makes it hard to even distinguish traffic stations from rural background stations. To prevent the need to normalise, the characteristic *R* can best be used.

4.2.2 Cluster analysis

K-means cluster analysis, which has never been used before to classify stations, is one of the methods used in this study. Cluster analysis is a multivariate analysis technique that seeks to organise information about variables so that relatively homogeneous groups, or "clusters," can be formed (Tryon and Bailey, 1970). Members of a cluster should be highly internally homogeneous and highly externally heterogeneous.

Using K-means clustering the number of clusters must be given. For example having a hundred points (objects) with two characteristics *x* and *y* (Figure 4.4). When defining 2 clusters before clustering, two centre point are calculated based on the Euclidean distance (equation 4.2) between the objects in the cluster and the centre point of the cluster. Defining three clusters, three centre points are calculated. The Euclidean distance between within a cluster must be as small as possible, while the Euclidean distance between the clusters must be as large as possible.

$$D(a,b) = \sqrt{\left(\Sigma_i \left(a_i - b_i\right)^2\right)} \qquad (4.2)$$

where *D(a,b)* is the Euclidean distance between objects *a* and *b* having both *i* characteristics.

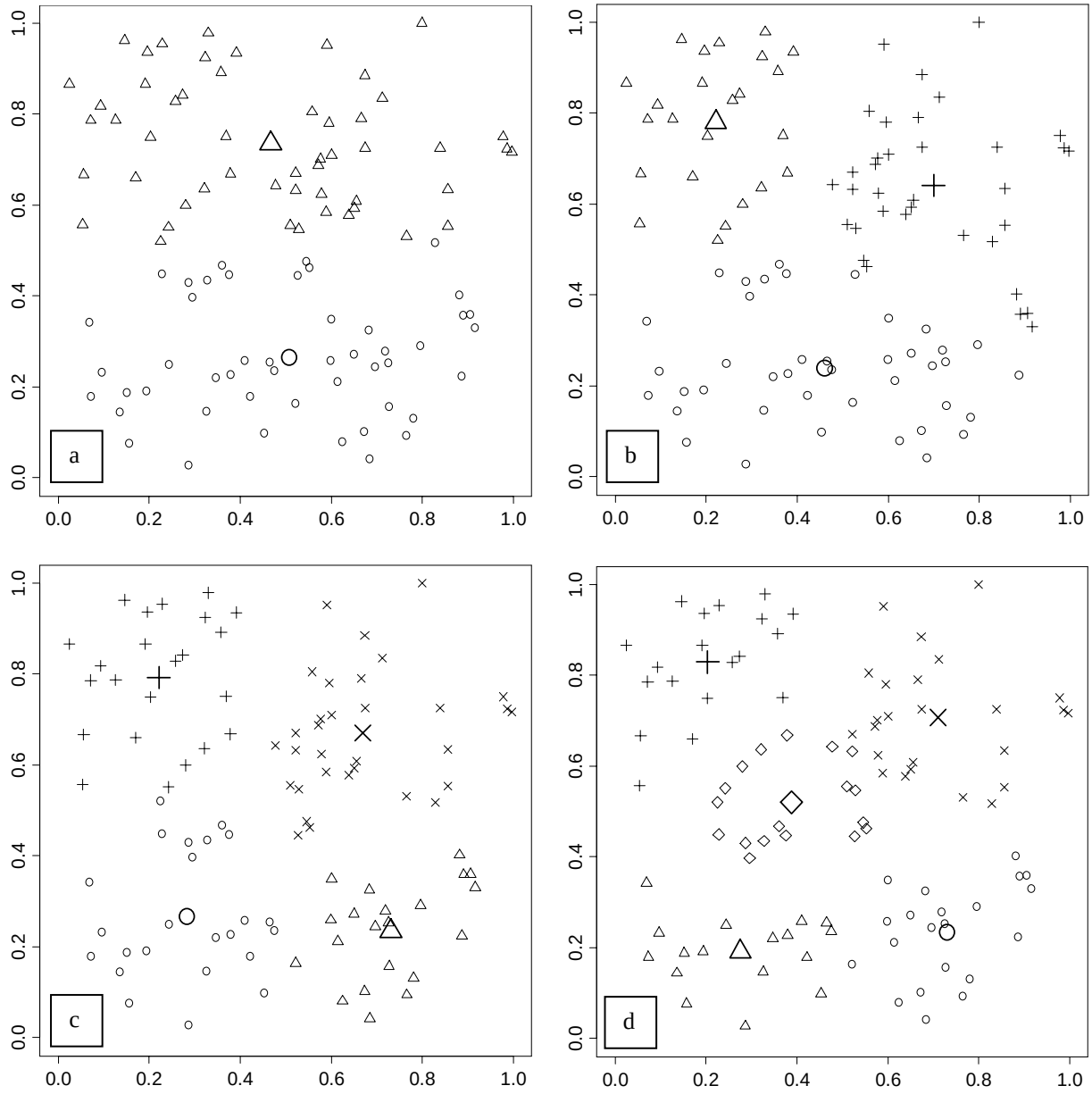


Figure 4.4: Clustering of 100 points, based on K-means, defining 2 (a), 3 (b), 4 (c) and 5 (d) clusters. Cluster centres are calculated and indicated by large signs. The smaller the distance between the objects, the better they are related. These related objects could then be part of a same cluster.

4.2.3 Limit values of *R*

The annual average value of the NO/NO_2 ratio *R*, must be less than 1.5 ppb/ppb for urban background stations, according to the criterion used in France to check the representativeness of an urban background station (Copalle et al, 2001). Equation (4.3) represents the annual average value of the NO/NO_2 ratio in ppb/ppb. The concentration NO therefore is multiplied by 46/30 (M_{NO_2}/M_{NO}).

$$R = \overline{\left[\frac{NO}{NO_2} \right]} \qquad (4.3)$$

Under meteorological conditions which are not favourable to pollutant dispersion, values of *R* may be greater than 1.5.

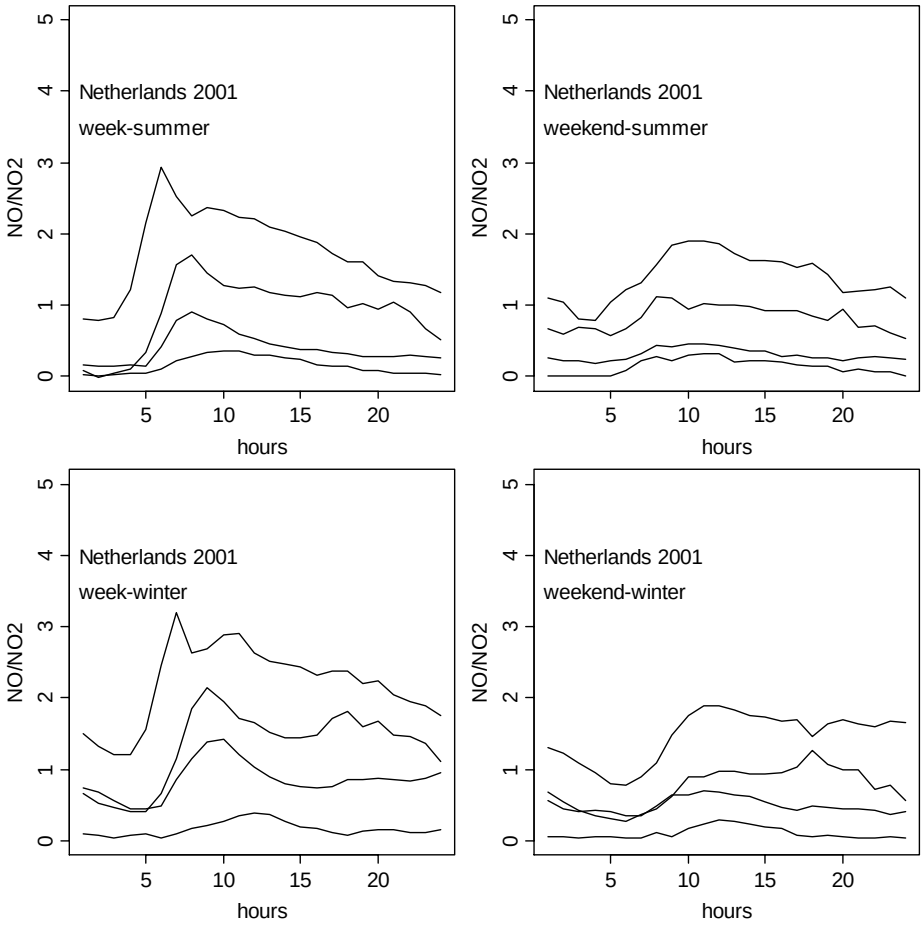


Figure 4.5: Diurnal variation in *R* for four Dutch stations for each of the periods of 2001 (section 4.2.4). The highest and second highest ratios were measured by traffic stations (Breukelen-Snelweg, NL0248A, Apeldoorn-Loolaan, NL0239A). The third by an urban station (Amsterdam-Florapark, NL0204A) and the lowest by a rural station (Balk-Trophornsterweg, NL0207A). The differences in ratio between the two traffic stations are high enough to divide them into different groups. The station measuring the highest ratio can be seen as a 'traffic plus station' (section 5.1.1).

4.2.4 Data

During the week peak concentrations in NO and NO_2 are measured, in the morning and afternoon, caused by rush hour. In weekends points of time of these higher concentrations are not well defined. In summer during weekdays the second peak in NO concentration does not occur.

For these reasons annual data is averaged for each hour for week-summer, weekend-summer, week-winter and weekend-winter (Figure 4.5). Weekend situations do not have clear characteristics to be used for separating stations. Therefore only week situations are used.

For winter-averaged concentrations, months November, December, January, February and March were used; for summer-averaged concentrations the months April, May, June, September and October. Including summer months July and August would disturb the height and points of time of peak concentration, because traffic intensity during summer holidays decreases enormously.

Data of three years were chosen for this study: 1999, 2001 and 2002. These years were chosen for their availability of data, constant number of days (365) and recent history. In total 6 periods are available for which cluster analysis and the French method can be executed (Table 4.1).

Table 4.1: 6 selected periods to check the classification of all stations of member countries

year	week-summer	week-winter
1999	A	B
2001	C	D
2002	E	F

All monitoring stations of member countries having NO (or NO_x) and NO_2 data for these years participate in the study (Appendix A).

For calculations of average values, the performance of K-means cluster analysis and using the limit values, the program R has been used. R is an environment in which statistical techniques are implemented. The script that has been used can be found in Appendix B.

5. Results and discussion

Both cluster analysis and the French criterion for urban background stations (section 4.2) were tested for Dutch monitoring stations, before using them for all European stations. More information is known about Dutch stations. The reason for stations not having the expected classification could easily be recognized by this information. For validation of the procedure it was initially assumed that all Dutch stations have been classified correctly.
The French method does not include a criterion for rural stations. This criterion for R resulted from testing Dutch monitoring stations and was used for stations of the member countries.

5.1 Verification on Dutch monitoring stations using K-means cluster analysis

Cluster analysis based on K-means was used for average values of *R* for all 24 hours in each of the 6 periods for Dutch monitoring stations. Cluster analysis in this case was based on these 24 characteristics. In total 44 Dutch stations for the years 1999 and 2001 and 45 stations for 2002 could participate in the cluster analysis (appendix A, Table A2).
According to the plots of average *R* (Figure 4.5) some traffic stations have a much higher ratio than other traffic stations. There are many differences between traffic stations in traffic intensity, distance to roadway, distance to traffic lights and road width. Four clusters were defined to prevent a clustering of traffic stations with higher *R* separately, causing traffic station with lower value of *R* and urban stations to be clustered in the same cluster.

After clustering with the defined number of clusters, a cluster was given a classification based on the most frequent type of station within the cluster. As expected certain traffic stations have a higher ratio, resulting in a separate cluster (Table 5.1). Urban stations and rural stations do not differ enough to be part of different clusters. Even when using more clusters urban stations could not be separated from rural stations. In most of the situations urban stations were clustered together. Rural stations were separated into two clusters: a cluster with rural and urban stations and a cluster with only rural station. These two categories clearly had different characteristics. The ones only clustered with rural stations had lower *R* values and were situated in the north of the Netherlands and Zeeland, and the ones which could hardly be separated from urban stations were situated in the center and south of the Netherlands.

Table 5.1: Dutch traffic stations with higher (plus) ratio NO/NO_2 than average traffic stations.

Traffic plus
NL, Breukelen-Snelweg (NL0248A)
NL, Utrecht-Wittevrouwenstraat (NL0236A)
NL, Eindhoven-Genovevalaan (NL0242A)
NL, Eindhoven-Piuslaan (NL0241A)

Table 5.2 summarizes the results of cluster analysis of Dutch monitoring stations, showing the stations most frequently making part of the wrong cluster. The registered classification shows the classification given in the meta-information; cluster classification shows the results of cluster analysis using 4 clusters.

Table 5.2: Dutch monitoring stations being frequently wrong clustered (50% or more of the periods).

Monitoring station (name and European station code)	**Registered station type**	**Classified station type using cluster analysis**
NL, Biest Houtakker-Biestsestraat (NL0223A)	R	U
NL, Schipluiden-Groeneveld (NL0200A)	R	U
NL, Budel-Toom (NL0196A)	R	U
NL, Westmaas-Groeneweg (NL0226A)	R	U
NL, Cabauw-Zijdeweg (NL0209A)	R	U
NL, Zegveld-Oude Meije (NL0229A)	R	U
NL, AMSTERDAM, Amsterdam-Cabeliaustraat (NL0208A)	U	T

Too many monitoring stations are clustered in a cluster with another classification than registered. Even using more than 4 clusters or taking rush hour as the characteristics instead of all hours did not improve the results. Urban stations were clustered in different rural clusters, instead of being clustered together. Traffic stations could be separated well enough by cluster analysis. Cluster analysis on all participating European stations seems not the right option for separating different types of stations, according to the axiom that Dutch stations are classified correct.

5.1.2 Verification on Dutch monitoring stations using a limit value NO/NO_2 (*R*)

Dutch monitoring stations were classified for 6 periods, using the average *R* for rush hours, to see what criterion best characterizes the types of stations. In summer only one peak in *R* can be expected, caused by the occurrence of one peak in NO (section 4.1.2). In winter both in the morning and afternoon rush hours and peaks in *R* occurred. The second peak is much lower and the second rush hour much more spread. Therefore in summer and winter only the first rush hour was used.

A limit value of *R* to characterize rural stations could not be found in literature. The analysis on Dutch monitoring stations was used to find this criterion. Averaged values of *R* of a period including rush hour, 6-10 a.m., was taken to test the French criterion. Of these five hours at least two hours must have a value of *R* higher than 1.5 to classify a station as traffic station. In all 6 periods, if available, this test was done, resulting in a percentage of the periods in which a station was classified as traffic station. For Dutch stations the criterion to separate traffic station was used successfully. All traffic stations were separated using a percentage of 50% or more of the periods in which a station is classified as traffic (Appendix C).
To separate rural and urban stations, a lower value of R had to be found. It was not easy to separate these types of stations, because of the relatively small distances between rural areas and urban areas in the center of the Netherlands. These small distances cause urban and rural stations to have nearly identical characteristics in measured concentrations. Based on the 6 periods for Dutch stations a value of 0.8 was found, for which urban and rural stations could best be separated. This value can also be found in a frequency plot of the maximum value of *R* for each station (Figure 5.1).

This figure shows the maximum values of R for period week-winter in 1999. For each period a similar frequency plot was found.

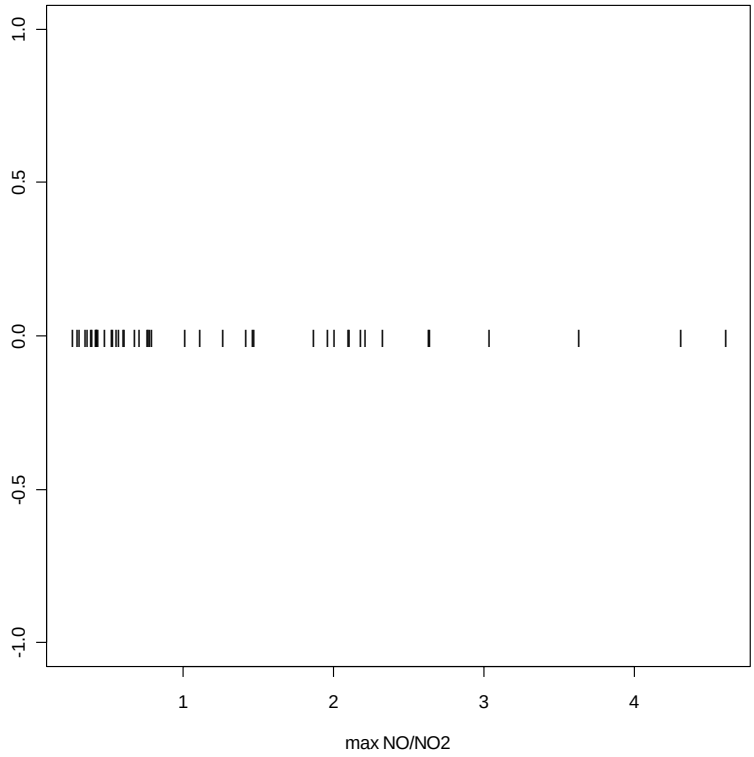


Figure 5.1: Frequency plot of maximum NO/NO_2 ratios for Dutch monitoring stations, week-winter 1999. Maximum values lower than 0.8 were maximum values of rural background stations. The highest values of maximum NO/NO_2 ratios were reached by traffic stations.

A station is given the label false in case in none of the situations the classification is equal to the registered classification. A station is given the label true in case in all situations the classification is equal to the registered classification. In case more than 50% of the situations gave a classification equal to the registered classification, a station is given the label almost frequently true. The remaining case, if in less than 50% of the situations the station is given the same classification as registered, a station is given the label frequently false (Appendix C).

No Dutch stations were given the label false. There were 4 frequently false stations. These stations are listed in Table 5.3, as well as the percentage of the situations given a classification equal to the registered classification. The rural stations that were given classification urban in some situations are also the stations given the classification urban using cluster analysis. Evidently these stations have the same characteristics as urban stations, located in the center and south of the Netherlands.

Urban station NL0208A was again classified as traffic station. Information was enquired about this station. The situation of the surrounding area appeared to have changed the last years: a road was build nearby the monitoring station, influencing the concentrations measured by the station (Figure 5.2). This change in the area surrounding the station changed the type of this station from urban to traffic.

Table 5.3: Dutch monitoring stations with label frequently false, using *R* as a criterion, based on 6 weekly periods.

Monitoring station (name and European station code)	**Registered station type**	**Classified station type (based on *R* value)**	**Classified as registered station type(%)**
NL, AMSTERDAM, Amsterdam-Cabeliaustraat (NL0208A)	U	T	17
NL, WAGENINGEN, Binnenhaven (NL0219A)	U	R	17
NL, UTRECHT, Utrecht-Universiteitsbibliotheek (NL0237A)	U	R	33
NL, Posterholt-Vlodropperweg (NL0202A)	U	R	33

Classifying monitoring stations using a limit value of *R* seemed more successfully for Dutch monitoring stations than using cluster analysis.

Summarised the criteria used for Dutch monitoring stations were:

R: $R < 0.8$ for 3 hourly averaged values during the week between 6:10 a.m.

T: $R > 1.5$ for 2 hourly averaged values during the week between 6:10 a.m.

U: remaining stations, thus stations with less than 2 hourly averaged values with $R > 1.5$ and less than 3 hourly averaged values with $R < 0.8$

The same criteria for classifying stations will be used for all European monitoring station with available data for *R*.

Figure 5.2: Station NL0208A, registered as urban background station. Cluster analysis and classification based on value *R* yielded classification traffic for this station. This figure shows the reliability of the classified station type using both methods.

5.2 Verification classification all European monitoring stations

Using limit values gave the best results for Dutch stations. Fewer stations were wrong classified using limit values than using cluster analysis. Therefore this method was applied to all European monitoring stations with available data. Taking the ratio *R* to test Dutch monitoring stations for their classifications pointed out that a value of $R < 0.8$ could best describe rural stations and a value of $R > 1.5$ could best describe traffic stations.

Many countries seemed to need other criteria to separate the three main types of stations. The criteria for Dutch stations could not, without any problem, be applied to other countries. This can be seen in Figure 5.3, where the percentage of stations classified as registered classification for each period, for more than 50% of the periods, for less than 50% of the periods and for none of the periods, for each country. Some countries only have a few stations participating this study. Norway for example, has only one station, yielding 100% respectively of the stations classified as registered (Appendix A). Appendix C summarises the results of the classifications using Dutch values for *R*. A division is made in the Appendix for stations labelled true (each period classified as registered), frequently true (more than 50% of the periods), frequently false (less than 50% of the periods) and false (none of the periods classified as registered).

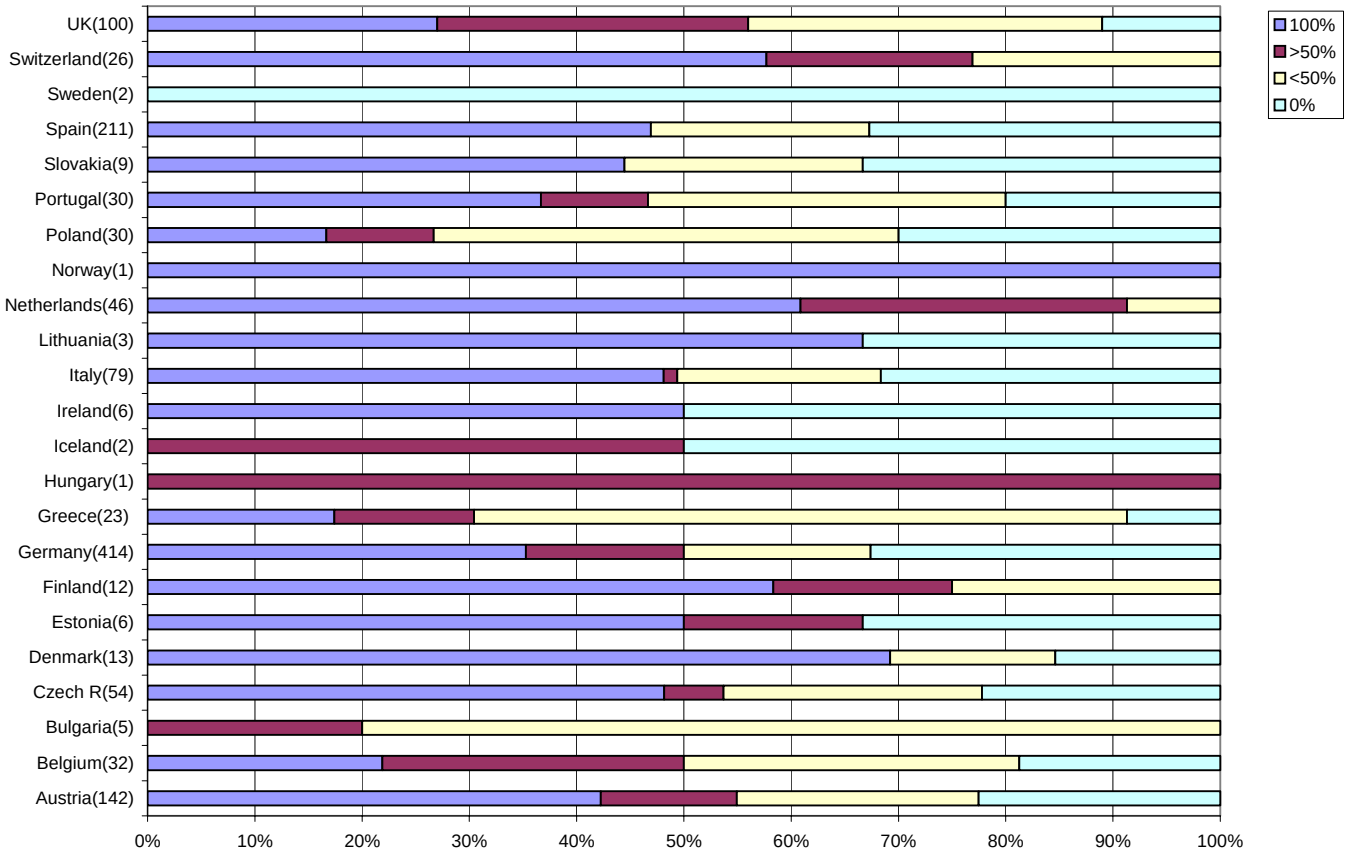


Figure 5.3: Percentage of monitoring stations in each category: blue bars representing the percentage classified as registered in AirBase for each period, red bars for more than 50% of the periods, yellow bars for less than 50% of the periods and the green bars for none of the periods. The number between brackets gives the number of stations participating the analysis.

6 Conclusions and recommendations

Averaged NO concentrations can not be used as characteristics for stations using cluster analysis, caused by the spreading in NO concentrations of traffic stations. The ratio NO/NO_2 seems more appropriate for cluster analysis. High traffic stations could be separated using this method, showing a lot of information about these stations. Other types of stations were clustered in different cluster most of the periods. Seven of 45 stations were given a classification other than the registered classification. Rural background stations were seen as urban background stations and an urban background station as traffic station.

Using the *R*-value the three types of stations could be separated for Dutch stations. Using these same values for other European monitoring stations did not give optimistic results. A lot of stations were given another classification than registered. The criterion used in France to separate traffic and urban background stations could be applied for Dutch stations. This is not the case for station of each country in Europe. For each country new *R*-values need to be found.

The axiom 'Dutch stations are classified correctly' has been rejected. For an urban background station the area could be seen in Figure 5.2, showing an area of a traffic station. Classifications of Dutch monitoring stations are not reliable.

The rejection of cluster analysis as a method to classify European monitoring stations might not be correct, knowing that classifications of Dutch monitoring stations are not reliable. Classifications given to each station need to be revised after a certain time. Cluster analysis is a method independent of precise criteria of characteristics for each type of station.

Cluster analysis could be applied to each country or region separately, in case there is a sufficient number of stations, so the characteristics for each country are included.
Also other components, carbon monoxide for example, can be taken as a characteristic in further research. CO is also a characteristic of traffic stations. Traffic stations could easily be recognised using cluster analysis. A component characterising a difference between rural and urban background areas, i.e. ozone, needs to be chosen to improve the separation of these two types of stations.

Data suppliers should be asked to report all measured concentrations. France for example did not report their measured NO or NO_x concentration, only NO_2 concentrations. The criterion used in France could therefore not be tested on French stations.

7. References

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Appendix A: Number of stations measuring NO_2 and NO/NO_x

Table A1: Number of stations measuring NO_2, NO and NO_x. Some member states (Bosnia-Herzegovina, France, Latvia, Luxembourg, Macedonia, former Yugoslavia, Malta, Romania, Slovakia and Slovenia) provided data of only one or none of the three components. These countries are not admitted in this table and could not participate in the research.

	1999			2001			2002		
Country	NO	NO_2	NO_x	NO	NO_2	NO_x	NO	NO_2	NO_x
Austria	150	150	-	145	147	-	138	143	-
Belgium	37	37	-	42	42	-	-	-	-
Bulgaria	6	48	-	3	45	-	-	-	-
Czech R	-	-	-	-	55	55	-	55	55
Denmark	8	9	-	10	10	-	11	12	-
Estonia	-	5	5	-	6	6	-	7	7
Finland	-	17	15	-	22	15	-	24	15
Germany	381	382	-	385	385	-	383	383	-
Greece	7	7	-	26	27	-	-	26	17
Hungary	1	1	-	1	1	-	1	1	-
Iceland	1	1	-	1	1	-	2	2	-
Ireland	-	-	-	-	6	2	-	6	5
Italy	82	127	-	60	168	-	-	-	-
Lithuania	3	3	-	-	-	-	-	-	-
Netherlands	44	45	-	44	44	-	45	45	-
Norway	-	-	-	-	1	1	-	1	1
Poland	-	20	18	-	30	29	-	28	29
Portugal	25	26	-	23	23	-	25	30	-
Slovakia	-	9	9	-	-	-	-	-	-
Spain	-	-	-	268	276	-	-	-	-
Sweden	-	2	1	-	2	1	-	2	1
Switzerland	27	32	-	26	30	-	27	30	-
UK	-	85	85	-	97	97	-	101	101

Table A2: Number of stations measuring both NO/NO_x and NO_2, making a selection criterion based on the ratio NO/NO_2 possible.

Country	1999	2001	2002
Austria	148	145	138
Belgium	37	42	0
Bulgaria	5	3	0
Czech R	0	55	55
Denmark	8	10	11
Estonia	5	6	7
Finland	15	15	15
Germany	380	385	181
Greece	7	26	17
Hungary	1	1	1
Iceland	1	1	1
Ireland	0	2	5
Italy	80	60	0
Lithuania	3	0	0
Netherlands	44	44	45
Norway	0	1	1
Poland	18	29	28
Portugal	25	23	25
Slovakia	9	0	0
Spain	0	268	0
Sweden	1	1	1
Switzerland	27	26	27
UK	85	97	101

Appendix B: Script of R

For calculating the average NO/NO_2 values for all periods

```
# load number of stations
n.stats.table<-read.delim("N:/data/R/number of stations.txt")
n.days<-365
countries<-as.character(n.stats.table$country)
years<-c(1999,2001,2002)
components<-c("NO","NO2","NOx")

# find names and numbers of stations
for (i in 1:length(countries)) {
    for (j in 1:length(years)) {
        name<-list(NULL,NULL,NULL)
        for (k in 1:length(components)) {
            if (!is.na(n.stats.table[i,3*j+k-2])) {
                filename<-paste("d:/airview/",countries[i],"/raw_data_",
                                components[k],"_",years[j],".txt", sep = "")
                name[[k]]<-character()
                for (l in 1:n.stats.table[i,3*j+k-2]) {
                    print(c(countries[i],years[j],components[k],l))
                    name[[k]]<-c(name[[k]], scan(file = filename, what = character(),
                                 skip =7+(n.days+7)*(l-1), n = 1, quiet = T))
                }
            }
        }
        statnrs<-list(NO.NO2 = (1:length(name[[1]]))[is.element(name[[1]],
                                intersect(name[[1]],name[[2]]))],
                      NO2.NO  = (1:length(name[[2]]))[is.element(name[[2]],
                                intersect(name[[2]],name[[1]]))],
                      NOx.NO2 = (1:length(name[[3]]))[is.element(name[[3]],
                                intersect(name[[3]],name[[2]]))],
                      NO2.NOx = (1:length(name[[2]]))[is.element(name[[2]],
                                intersect(name[[2]],name[[3]]))])
        statnames<-unique(c(name[[2]][statnrs$NO2.NO],name[[2]][statnrs$NO2.NOx]))
        save(statnrs, file = paste("d:/airview/",countries[i],"/statnrs_",years[j],
                                                              sep = ""))
       save(statnames, file = paste("d:/airview/",countries[i],"/statnames_",years[j],
                                                              sep = ""))
        }
}

calcmean<-function(x) {
# calculates averages
    y<-mean(x, na.rm = T)
    #y<-NA; if (sum(is.na(x))/length(x)<0.25) {y<-mean(x, na.rm = T)}
    return(y)
}
indexdates<-function(airview.data, year) {
    # build date and time matrix
    if (year==1999) {dows<-c(6,7,1,2,3,4,5)}
    if (year==2001) {dows<-c(2,3,4,5,6,7,1)}
    if (year==2002) {dows<-c(3,4,5,6,7,1,2)}
    dates<-data.frame(cbind(rep(dows, round(1+n.days/7), each = 24)[1:(n.days*24)],
    rep(as.numeric(substr(airview.data[1,],1,2)), each = 24),
    rep(as.numeric(substr(airview.data[1,],4,5)), each = 24),
    rep(as.numeric(substr(airview.data[1,],7,10)), each = 24),
    rep(1:24,n.days)))
    names(dates)<-c("weekday","day","month","year","hour")
    #find indices
    week<-dates$weekday==2 | dates$weekday==3 | dates$weekday==4 | dates$weekday==5 |
                                                              dates$weekday==6
    weekend<-!week
    summer<-dates$month==4 | dates$month==5 | dates$month==6 | dates$month==9 |
                                                              dates$month==10
    winter<-dates$month==11 |dates$month==12 | dates$month==1 | dates$month==2 |
                                                              dates$month==3
    weeksummer<- week & summer
    weekendsummer<- weekend & summer
    weekwinter<- week & winter
    weekendwinter<- weekend & winter
    dateshour<-NULL; for (m in 1:24) {dateshour<-cbind(dateshour, dates$hour==m)}
```

```
    return(list(weeksummer, weekendsummer, weekwinter, weekendwinter,dateshour))
}

# read raw data from airview files and average data
for (i in 1:length(countries)) {
    for (j in 1:length(years)) {
        load(paste("d:/airview/",countries[i],"/statnrs_",years[j], sep = ""))
        if (length(statnrs$NO.NO2)!=0) { # NO and NO2 data
            filename.NO<-paste("d:/airview/",countries[i],"/raw_data_NO_",years[j],
                                                        ".txt", sep = "")
            filename.NO2<-paste("d:/airview/",countries[i],"/raw_data_NO2_",years[j],
                                                        ".txt",sep= "")
            mean.K<-array(NA, dim = c(length(statnrs$NO.NO2), 4 , 24))
            for (l in 1:length(statnrs$NO.NO2)) {
                print(c(countries[i],years[j],l))
                airview.data.NO<-matrix(scan(file = filename.NO, what = character(),
                    skip = 12+(n.days+7)*(statnrs$NO.NO2[l]-1),
                    n = 25*n.days, sep = ",", na.strings = ".", quiet = T), ncol =
                                                                    n.days)
                airview.data.NO2<-matrix(scan(file = filename.NO2, what = character(),
                    skip = 12+(n.days+7)*(statnrs$NO2.NO[l]-1),
                        n = 25*n.days, sep = ",", na.strings = ".", quiet = T), ncol =
                                                                    n.days)
                conc.NO<-as.numeric(airview.data.NO[2:25,])
                conc.NO2<-as.numeric(airview.data.NO2[2:25,])
                K<-(46/30)*conc.NO/conc.NO2
                K[conc.NO2==0]<-NA
                if (l==1){
                    index.dates<-indexdates(airview.data.NO2, years[j])
                    weeksummer<-index.dates[[1]]
                    weekendsummer<-index.dates[[2]]
                    weekwinter<-index.dates[[3]]
                    weekendwinter<-index.dates[[4]]
                    dateshour<-index.dates[[5]]
                }
                for (m in 1:24) {
                    mean.K[l,1,m]<-calcmean(K[weeksummer & dateshour[,m]])
                    mean.K[l,2,m]<-calcmean(K[weekendsummer & dateshour[,m]])
                    mean.K[l,3,m]<-calcmean(K[weekwinter & dateshour[,m]])
                    mean.K[l,4,m]<-calcmean(K[weekendwinter & dateshour[,m]])
                }
            }
            save(mean.K, file = paste("d:/airview/",countries[i],"/mean.K_",years[j],
                                                                    sep = ""))
        }
        if (length(statnrs$NOx.NO2)!=0) { # NOx and NO2 data
            filename.NOx<-paste("d:/airview/",countries[i],"/raw_data_NOx_",years[j],
                                                                ".txt",sep= "")
            filename.NO2<-paste("d:/airview/",countries[i],"/raw_data_NO2_",years[j],
                                                                ".txt",sep= "")
            mean.K<-array(NA, dim = c(length(statnrs$NOx.NO2), 4 , 24))
            for (l in 1:length(statnrs$NOx.NO2)) {
                print(c(countries[i],years[j],l))
                airview.data.NOx<-matrix(scan(file = filename.NOx, what = character(),
                    skip = 12+(n.days+7)*(statnrs$NOx.NO2[l]-1), n = 25*n.days,
                    sep = ",", na.strings = ".", quiet = T), ncol = n.days)
                airview.data.NO2<-matrix(scan(file = filename.NO2, what = character(),
                    skip = 12+(n.days+7)*(statnrs$NO2.NOx[l]-1), n = 25*n.days,
                    sep = ",", na.strings = ".", quiet = T), ncol = n.days)
                conc.NOx<-as.numeric(airview.data.NOx[2:25,])
                conc.NO2<-as.numeric(airview.data.NO2[2:25,])
                K<-(conc.NOx-conc.NO2)/conc.NO2
                K[conc.NO2==0]<-NA
                if (l==1){
                    index.dates<-indexdates(airview.data.NO2, years[j])
                    weeksummer<-index.dates[[1]]
                    weekendsummer<-index.dates[[2]]
                    weekwinter<-index.dates[[3]]
                    weekendwinter<-index.dates[[4]]
                    dateshour<-index.dates[[5]]
                }
                for (m in 1:24) {
                    mean.K[l,1,m]<-calcmean(K[weeksummer & dateshour[,m]])
                    mean.K[l,2,m]<-calcmean(K[weekendsummer & dateshour[,m]])
                    mean.K[l,3,m]<-calcmean(K[weekwinter & dateshour[,m]])
```

```
                    mean.K[l,4,m]<-calcmean(K[weekendwinter & dateshour[,m]])
                }
            }
            save(mean.K, file = paste("d:/airview/",countries[i],"/mean.K_",years[j],
                                                                    sep = ""))
        }
    }
}
```

Script for using both cluster analysis and limit value method and making plots of average *R* for each station

```
library(mva)

# way of normalising
normalize<-function(x) {
    x<-x
}

# load saved files
country<-"Austria"; year<-1999
load(paste("d:/airview/",country,"/statnames_",year, sep = ""))
load(paste("d:/airview/",country,"/statnrs_",year, sep = ""))
load(paste("d:/airview/",country,"/mean.K_",year, sep = ""))

a<-numeric()
for (i in 1:length(statnrs$NO.NO2)) {
    a<-rbind(a,normalize(mean.K[i,3,c(6:9,16:19)]))
}

# clusteranalysis for rush hours (6:9, 16:19)
noNA<-!is.na(a[,c(6:9, 16:19)])
cl<-kmeans(a[noNA,], 5, iter.max = 50)
cbind(cl$cluster,statnames[noNA])

plot.new(); plot.window(xlim = c(1,24), ylim = c(0,6)); axis(1); axis(2); box())
for (i in 1:length(statnames)) { lines(normalize(mean.K[i,3,]))
}
# plot R
stats<-1:length(statnames)
par(mfrow = c(2,2), mar = c(4,4,1,1), mex = 0.7, cex = 0.7)
tit<-c("week-summer","weekend-summer","week-winter","weekend-winter")
for (i in 1:4) {
    for (j in 1:length(stats)) {
        if (j==1) {
            plot(normalize(mean.K[stats[j],i,]), type = "l", xlim =
                c(1,24), ylim = c(0,5), xlab = "hours", ylab = "NO/NO2")
        } else {
            lines(normalize(mean.K[stats[j],i,]))
        }
    }
    text(0,4, paste(country, year), pos = 4)
    text(0,3.5, tit[i], pos = 4)
}

# use limit values; year and country can be changed
year<-1999
country<-"Austria"
load(paste("d:/airview/",country,"/statnames_",year, sep = ""))
load(paste("d:/airview/",country,"/mean.K_",year, sep = ""))
stattype1<-rep("U", nrow(mean.K))
stattype1[apply(mean.K[, 1, 6:10]>1.5, 1, sum)>=2]<-"T"
stattype1[apply(mean.K[, 1, 6:10]<0.8, 1, sum)>=3]<-"R"
stattype1[is.na(apply(mean.K[, 1, 6:10]>1.5, 1, sum))]<-"X"
stattype3<-rep("U", nrow(mean.K))
stattype3[apply(mean.K[, 3, 6:10]>1.5, 1, sum)>=2]<-"T"
stattype3[apply(mean.K[, 3, 6:10]<0.8, 1, sum)>=3]<-"R"
stattype3[is.na(apply(mean.K[, 3, 6:10]>1.5, 1, sum))]<-"X"
cbind(paste(stattype1, stattype3, sep = ""), statnames)
```

Appendix C: Stations and their classifications

ESC	European station code	**CST**	Classified station type using NO/NO2 ratio
RST	Registered station type	**(%)**	Percentage classified as RST
LSC	Land station code	**Nearest CST**	Station type most frequently classified after

Appendix C1: Stations true classified (100%)

ESC	STATION_NAME	RST	LSC	CST	(%)
AT0002R	Illmitz	rural background	ILL1	R	100
AT0004R	St. Koloman	rural background	KOL1	R	100
AT0005R	Vorhegg bei Kötschach-Mauthen	rural background	VOR1	R	100
AT0011A	Linz Urfahr	urban traffic	S403	T	100
AT0018A	Wien Gaudenzdorf	urban background	GAUD	U	100
AT0024A	Hallein Hagerkreuzung	urban traffic	2000	T	100
AT0026A	Braunau Lach	rural traffic	S410	T	100
AT0030A	Linz 24er Turm	urban traffic	S415	T	100
AT0035A	Hall i.T. Münzergasse	urban traffic	2209	T	100
AT0036A	Wien Hietzinger Kai	urban traffic	MBA	T	100
AT0038A	Salzburg Rudolfsplatz	urban traffic	1000	T	100
AT0043A	Neusiedl im Tullnerfeld	rural background	1905	R	100
AT0044A	Streithofen	rural background	1904	R	100
AT0045A	Traismauer	rural background	1703	R	100
AT0046A	Trasdorf	rural background	1903	R	100
AT0047A	Tulbinger Kogel	rural background	1906	R	100
AT0049A	Zwentendorf	rural background	1902	R	100
AT0056A	Wien Stadlau	urban background	STAD	U	100
AT0064A	Innsbruck Nordkette	rural background	2123	R	100
AT0069A	Haunsberg	rural background	3055	R	100
AT0071A	Pöls Ost	rural background	127	R	100
AT0086A	Kollmitzberg	rural background	103	R	100
AT0088A	Wien Rinnböckstraße	urban traffic	RINN	T	100
AT0092A	Fischamend	rural background	602	R	100
AT0093A	Innsbruck Reichenau	urban traffic	2106	T	100
AT0096A	Forsthof am Schöpfl	rural background	202	R	100
AT0097A	Wien Floridsdorf Gerichtsgasse	urban background	FLO	U	100
AT0099A	Innsbruck Zentrum Fallmerayerstr.	urban traffic	2110	T	100
AT0101A	Heidenreichstein	rural background	502	R	100
AT0103A	Stixneusiedl	rural background	302	R	100
AT0104A	Sulzberg im Bregenzerwald	rural background	SUL1	R	100
AT0108A	Masenberg	rural background	156	R	100
AT0111A	Dunkelsteinerwald	rural background	1701	R	100
AT0117A	Großenzersdorf	rural background	406	R	100
AT0123A	Kufstein Zentrum Franz Josefs Platz	urban traffic	2539	T	100
AT0126A	Villach Tirolerbruecke	urban traffic	VI12	T	100
AT0131A	Wolfsberg Hauptschule	urban traffic	WO15	T	100
AT0133A	St. Veit a.d.Glan Oktoberplatz	urban traffic	SV14	T	100
AT0137A	Wald am Arlberg	rural traffic	2801	T	100
AT0138A	Hermagor Gailtalstrasse	rural traffic	HE19	T	100
AT0139A	Völkermarkt Umfahrungsstraße	rural traffic	VK16	T	100
AT0145A	Großgöttfritz	rural background	2201	R	100
AT0146A	Stolzalpe bei Murau	rural background	STO1	R	100
AT0149A	Pillersdorf bei Retz	rural background	PIL1	R	100
AT0159A	Langenzersdorf	rural background	903	R	100
AT0161A	Deutsch Wagram	rural background	402	R	100
AT0169A	Landeck Gerberbrücke	urban traffic	2617	T	100
AT0170A	Klagenfurt Völkermarkterstrasse	urban traffic	KA21	T	100
AT0176A	Zöbelboden -Reichr. Hintergeb.	rural background	ZOE1	R	100
AT0177A	Gärberbach - Brennerautobahn	rural traffic	2223	T	100
AT0182A	Vomp A12 Inntal-Highway	suburban traffic	2821	T	100

AT0183A	Linz Römerbergtunnel	urban traffic	S431	T	100
AT0184A	Lienz Amlacherkreuzung	urban traffic	2910	T	100
AT0185A	Feldkirch Bärenkreuzung	urban traffic	1919	T	100
AT0186A	Enzenkirchen im Sauwald	rural background	ENK1	R	100
AT0193A	St. Sigmund im Sellrain	rural background	SIG1	R	100
AT0204A	Bockberg	rural background	151	R	100
AT0205A	Graz Don Bosco	urban traffic	164	T	100
AT0209A	Zederhaus	rural traffic	5018	T	100
AT0211A	Vomp an der Leiten	rural traffic	2822	T	100
BE0032R	43N066 - EUPEN	rural background	43N066	R	100
BE0198A	44N029 - HOUTEM	rural background	44N029	R	100
BE0237A	45R512 - MARCHIENNE	urban background	45R512	U	100
BE0238A	43N121 - OFFAGNE	rural background	43N121	R	100
BE0292A	41R002 - IXELLES	suburban traffic	41R002	T	100
BE0304A	43N100 - DOURBES	rural background	43N100	R	100
BE0308A	41B003 - ARTS-LOI	urban traffic	41B003	T	100
CH0002A	Opfikon	suburban traffic	OPF	T	100
CH0003A	Birsfelden	suburban background	BIR	U	100
CH0003R	Tänikon	rural background	TAE	R	100
CH0004R	Chaumont/Jura	rural background	CHA	R	100
CH0005R	Rigi	rural background	RIG	R	100
CH0010A	Zürich	urban background	ZUE	U	100
CH0013A	Zürich Stampfenbachstrasse	urban traffic	ZSS	T	100
CH0018A	Volksbadstrasse	urban traffic	SGV	T	100
CH0019A	Stuelegg	rural background	SGS	R	100
CH0020A	Bern Zentrum	urban traffic	BRZ	T	100
CH0021A	Zürich Bahnhof Wiedikon	urban traffic	ZBW	T	100
CH0026A	Lugano Casa Serena	urban traffic	LCS	T	100
CH0028A	Lausanne	urban traffic	LAU	T	100
CH0029A	Basel Feldbergstrasse	urban traffic	BFB	T	100
CH0031A	Bern	urban traffic	BER	T	100
CZ0001R	Svratouch	rural background	1139	R	100
CZ0003R	Kosetice	rural background	1138	R	100
CZ0011A	Pha5-Mlynarka	urban traffic	775	T	100
CZ0014A	Pha4-Branik	urban traffic	773	T	100
CZ0017A	Bily Kriz	rural background	1214	R	100
CZ0021A	Pha6-Santinka	urban background	776	U	100
CZ0023A	Usti n.L.-mesto	urban background	1012	U	100
CZ0024A	Teplice	urban background	1008	U	100
CZ0026A	Decin	urban background	1014	U	100
CZ0028A	Vsechlapy	rural background	1009	R	100
CZ0030A	Sous	rural background	1022	R	100
CZ0033A	Blizevedly	rural background	1024	R	100
CZ0039A	Nadlesi	rural background	1031	R	100
CZ0041A	Ondrejov	rural background	1108	R	100
CZ0045A	Kostelni Myslova	rural background	1131	R	100
CZ0047A	Stitna n.Vlari	rural background	1134	R	100
CZ0049A	Churanov	rural background	1102	R	100
CZ0051A	Jesenik	rural background	1080	R	100
CZ0054A	Dublovice	rural background	1107	R	100
CZ0055A	Krkonose-Rychory	rural background	1110	R	100
CZ0057A	Hojna Voda	rural background	1103	R	100
CZ0058A	Serlich	rural background	1111	R	100
CZ0060A	Studenka	rural background	1074	R	100
CZ0061A	Vernovice	rural background	1072	R	100
CZ0062A	Rudolice v Horach	rural background	1317	R	100

CZ0065A	Pha5-Smichov	urban traffic	1459	T	100
DE	Raisting	rural background	DEUB041	R	100
DE	DEUB042:Baumerlenbach:Ohringen	rural background		R	100
DE0001R	DEUB001:Westerland	rural background	DEUB001	R	100
DE0002R	DEUB005:Waldhof	rural background	DEUB005	R	100
DE0003R	DEUB004:Schauinsland	rural background	DEUB004	R	100
DE0004R	DEUB002:Deuselbach	rural background	DEUB002	R	100
DE0005R	DEUB003:Brotjacklriegel	rural background	DEUB003	R	100
DE0007R	DEUB030:Neuglobsow	rural background	U19	R	100
DE0008R	DEUB029:Schmücke	rural background	U26	R	100
DE0009R	DEUB028:Zingst	rural background	U35	R	100
DE0012R	DEUB007:Bassum	rural background	DEUB007	R	100
DE0031R	DEUB021:Wiesenburg	rural background	U34	R	100
DE0033R	DEUB018:Herleshausen	rural background	U11	R	100
DE0035R	DEUB031:Lückendorf	rural background	U17	R	100
DE0038R	DEUB036:Murnauer Moos	rural background	DEUB036	R	100
DE0448A	DESN051:Radebeul-Wahnsdorf	rural background	DESN 051	R	100
DE0463A	DEBY063:Regensburg-Rathaus	urban traffic	L3.1	T	100
DE0466A	DEBY015:Erlangen-(Werner-von-Siemens-Str.)	urban traffic	L5.4	T	100
DE0468A	DEBY076:Würzburg (Kardinal-Faulhaber-Platz)	urban traffic	L6.4	T	100
DE0470A	DEBY006:Augsburg-Königsplatz	urban traffic	L7.1	T	100
DE0479A	DEBY061:Passau	urban traffic	L2.4	T	100
DE0480A	DEBW001:Karlsruhe-Mitte	urban traffic	4441	T	100
DE0481A	DEBW002:Karlsruhe-West	suburban traffic	4443	T	100
DE0492A	DEBY068:Schweinfurt	urban traffic	L6.3	T	100
DE0529A	DEBY035:Lindau	urban traffic	L7.4	T	100
DE0530A	DEBY052:Neu-Ulm	urban traffic	L7.5	T	100
DE0531A	DEBY037:München-Stachus	urban traffic	L8.1	T	100
DE0533A	DEBY040:München-Pasing	suburban traffic	L8.4	T	100
DE0534A	DEBY038:München-Effnerplatz	urban traffic	L8.2	T	100
DE0535A	DEBY045:München-Westendstraße	urban traffic	L8.9	T	100
DE0543A	DENI008:Braunschweig/Innenstadt Verkehr	urban traffic	BGVS	T	100
DE0548A	DERP009:Mainz-Zitadelle	urban traffic	DERP009	T	100
DE0556A	DESN052:Zinnwald	rural background	U36	R	100
DE0561A	DEBY059:Nürnberg-Langwasser	urban traffic	L5.11	T	100
DE0565A	DEBY078:Würzburg (Theodor-Heuss-Damm)	urban traffic	L6.8	T	100
DE0570A	DERP006:Ludwh.-Pfalzgrafenpl.	urban traffic	DERP006	T	100
DE0589A	DESH001:Altendeich	rural background	2	R	100
DE0597A	DEBY002:Arzberg	urban background	L4.5	U	100
DE0609A	DENW018:Herten	urban background	HERT	U	100
DE0628A	DENW022:Gelsenkirchen	urban traffic	GELS	T	100
DE0640A	DEBW026:Plochingen	urban traffic	4448	T	100
DE0649A	DEHE023:Grebenau	rural background	H16	R	100
DE0650A	DEHE025:Königstein	rural background	H21	R	100
DE0651A	DEHE024:Witzenhausen/Wald	rural background	H33	R	100
DE0652A	DESL012:Saarbrücken-City	urban traffic	SBCY	T	100
DE0653A	DESL010:Saarbrücken-Burbach	urban traffic	BURB	T	100
DE0673A	DENW048:Reisholz Düsseld.	suburban traffic	REIS	T	100
DE0679A	DEBY072:Tiefenbach	rural background	L3.6	R	100
DE0698A	DEHH007:Bahrenfeld	urban background	DEHH007	U	100
DE0699A	DEBW030:Welzheimer Wald	rural background	4459	R	100
DE0718A	DEHE027:Frankenberg	rural background	H12	R	100
DE0719A	DEHE026:Spessart	rural background	H28	R	100
DE0729A	DEBW081:Karlsruhe-Nordwest	urban background	4444	U	100
DE0732A	DENI019:Solling/Dassel	rural background	DLSW	R	100
DE0736A	DEBY033:Landshut-Podewilsstraße	urban traffic	L2.3	T	100
DE0739A	DEHE028:Fürth/Odenwald	rural background	H13	R	100
DE0746A	DEBW008:Weinheim	urban background	4454	U	100
DE0751A	DEBY053:Nürnberg-Willi-Brandt-Platz	urban traffic	L5.1	T	100
DE0758A	DESN020:Görlitz	suburban traffic	DESN 020	T	100

DE0771A	DENW030:Wesel	urban background	WESE	U	100
DE0773A	DEBE014:Charlottenburg-Lerschpfad	urban traffic	MC14	T	100
DE0782A	DEBW083:Freiburg-Nord	urban background	4464	U	100
DE0784A	DEBW036:Tübingen	unknown traffic	4472	T	100
DE0788A	DESL008:Nonnweiler	rural background	NONW	R	100
DE0789A	DEUB016:Gittrup	rural background	U9	R	100
DE0790A	DEUB017:Regnitzlosau	rural background	DEUB017	R	100
DE0800A	DEBY014:Coburg	urban traffic	L4.7	T	100
DE0817A	DEHE032:Bebra	urban background	H1	U	100
DE0836A	DENW072:Mörsenbroich Düsseld.-	urban traffic	VDDF	T	100
DE0844A	DESH008:Bornhöved	rural background	4	R	100
DE0845A	DENW043:Essen-Ost (Verkehr)	urban traffic	VESN	T	100
DE0859A	DENW058:Hürth	urban background	HUE2	U	100
DE0869A	DEHE035:Kassel-Süd	urban traffic	H20	T	100
DE0880A	DEBW033:Pforzheim-West	urban traffic	37459	T	100
DE0889A	DEBY001:Ansbach	urban traffic	L5.12	T	100
DE0906A	DERP025:Wörth Marktplatz	urban background	15-jan	U	100
DE0924A	DEBY034:Lauf-Albertistraße	urban traffic	L5.13	T	100
DE0926A	DESN014:Dresden-Mitte	urban background	DESN 014	U	100
DE0936A	DEBW054:Rottweil	urban background	42858	U	100
DE0937A	DEBW057:Sigmaringen	unknown traffic	42910	T	100
DE0943A	DEBW059:Tauberbischofsheim	urban background	42867	U	100
DE0944A	DEBW060:Tuttlingen	urban background	42859	U	100
DE0945A	DEBY056:Fürth-Theresienstraße	urban traffic	L5.5	T	100
DE0955A	DETH031:Suhl	unknown traffic	DETH031	T	100
DE0957A	DERP026:Frankenthal-Europaring	unknown traffic	35800	T	100
DE0958A	DEUB032:Leinefelde	rural background	U15	R	100
DE0960A	DEUB026:Ueckermünde	rural background	U30	R	100
DE0963A	DEHE037:Wiesbaden-Ringkirche	urban traffic	415	T	100
DE0980A	DEUB022:Angermünde	rural background	DEUB022	R	100
DE0996A	DENI051:Wurmberg/Braunlage	rural background	BRNN	R	100
DE1005A	DEBY085:München (Luise-Kiesselbach-Platz)	suburban traffic	L8.11	T	100
DE1013A	DEHH026:Straße3-Stresemannstr	urban traffic	DEHH026	T	100
DE1017A	DETH011:Altenburg Theaterplatz	urban background	DETH011	U	100
DE1019A	DEUB013:Ansbach	rural background	U2	R	100
DE1021A	DEMV003:Neubrandenburg	urban traffic	DEMV003	T	100
DE1034A	DEST078:Naumburg	urban background	NGOO	U	100
DE1036A	DEST063:Stendal	urban background	SLSO	U	100
DE1049A	DEHB006:Bremen Verkehr 1	urban traffic	DEHB006	T	100
DE1059A	DEBW072:Bruchsal	urban background	46271	U	100
DE1068A	DEUB033:Melpitz	rural background	U8	R	100
DE1073A	DEHE040:Darmstadt-Hügelstraße	urban traffic	115	T	100
DE1074A	DEHE041:Frankfurt-Friedb.Ldstr.	urban traffic	715	T	100
DE1080A	DEST075:Halle/Verkehr	urban traffic	HEVC	T	100
DE1082A	DEST070:Harzgerode	rural background	HZNN	R	100
DE1087A	DEST081:Weißenfels/Verkehr	urban traffic	WSVC	T	100
DE1088A	DEUB034:Helgoland	rural background	DEUB034	R	100
DE1089A	DEUB035:Lehnmühle	rural background	DEUB035	R	100
DE1101A	DEBB031:Königs Wusterhausen	urban background	107	U	100
DE1111A	DEBE064:Karl-Marx-Straße	urban traffic	220	T	100
DE1115A	DEBE065:Frankfurter Allee	urban traffic	174	T	100
DE1121A	DEBW097:Freiburg-Straße	urban traffic	53276	T	100
DE1123A	DERP029:Koblenz Zentralplatz	urban traffic	DERP029	T	10
DE1125A	DERP032:Neuwied Heddersdorfer Str.	urban traffic	DERP032	T	100
DE1130A	DEBW100:Stuttgart-Vaihingen-Straße	urban traffic	53278	T	100
DE1131A	DERP031:Pirmasens Park-Brauerei	urban traffic	DERP031	T	100
DE1134A	DEMV012:Löcknitz/Mewegen	rural background	DEMV012	R	100
DE1140A	DEBW087:Schwäbische Alb (Erpfingen)	rural background	47650	R	100
DE1142A	DETH039:Weimar Sophienstiftsplatz	unknown traffic	DETH039	T	100
DE1143A	DEHB007:Bremen Verkehr 2	urban traffic	DEHB007	T	100
DE1155A	DESN006:Borna	urban traffic	DESN 006	T	100
DE1157A	DESN012:Delitzsch	urban background	DESN 012	U	100

DE1158A	DESN061:Dresden-Nord	urban traffic	DESN 061	T	100
DE1164A	DESN057:Mittelndorf	rural background	DESN 057	R	100
DE1168A	DEBY081:GAP-Kreuzeckbahnstraße	rural background	L12.1	R	100
DE1169A	DEBE061:Steglitz Schildhornstr.	urban traffic	117	T	100
DE1171A	DEBW099:Stuttgart-Mitte-Straße	urban traffic	55006	T	100
DE1172A	DEHE042:Linden/Leihgestern	urban background		U	100
DE1180A	DETH042:Possen	rural background	DETH042	R	100
DE1183A	DEST039:Brocken	rural background	BROC	R	100
DE1188A	DEBE063:Silbersteinstraße	urban traffic	143	T	100
DE1190A	DETH043:Erfurt Bergstr.	unknown traffic	DETH046	T	100
DE1191A	DEBY092:Weilheim	rural background	L9.10	R	100
DE1194A	DENW077:Hagen	urban traffic	VHAG	T	100
DE1211A	DEBB051:Waldsieversdorf	urban background		U	100
DE1242A	DEBW103:Odenwald	rural background		R	100
DE1243A	DEBW104:Holzhausen BAB	unknown traffic		T	100
DE1244A	DEBW105:Kenzingen_BAB	unknown traffic		T	100
DE1256A	DEHE050:Zierenberg	rural background		R	100
DE1257A	DEHE051:Wasserkuppe	rural background		R	100
DE1291A	DEMV006:Stralsund	unknown traffic		T	100
DE1292A	DEMV017:Göhlen	rural background		R	100
DE1345A	DESN047:Zwickau	unknown traffic		T	100
DE1358A	DESN074:Schwartenberg	rural background		R	100
DE1359A	DESN075:Plauen-Süd	unknown traffic		T	100
DE1360A	DESN076:Collmberg	rural background		R	100
DE1387A	DEUB039:Falkenberg	rural background		R	100
DK0021A	Aalborg/8151	urban traffic	8151	T	100
DK0030A	Copenhagen/1257	urban traffic	1257	T	100
DK0031A	Odense/9155	urban traffic	9155	T	100
DK0034A	H.C.Andersens Boulevard - City	urban traffic	1103	T	100
DK0041A	Lille Valby/2090	rural background	2090	R	100
DK0048A	Keldsnor/9055	rural background	9055	R	100
DK0051A	Århus/6153	urban traffic	6153	T	100
EE0009R	Lahemaa	rural background	EE05	R	100
EE0011R	Vilsandi	rural background	EE04	R	100
EE0016A	Saarejärve	rural background	EE06	R	100
ES0008R	NIEMBRO	rural background	33036999	R	100
ES0010R	CABO CREUS	rural background	17032999	R	100
ES0011R	BARCARROTA	rural background	6016999	R	100
ES0012R	ZARRA	rural background	46263999	R	100
ES0013R	PEÑAUSENDE	rural background	49149999	R	100
ES0014R	ELS TORMS	rural background	25224999	R	100
ES0015R	RISCO LLANO	rural background	45153998	R	100
ES0016R	O SAVIÑAO	rural background	27058999	R	100
ES0059A	CURUXEIRAS (B-6)	rural background	27033004	R	100
ES0078A	TABOADA (F-4)	rural background	15050003	R	100
ES0110A	ERANDIO	urban traffic	48902006	T	100
ES0116A	MARAÑÓN	urban traffic	28079006	T	100
ES0123A	PLAZA DE CASTILLA	urban traffic	28079015	T	100
ES0125A	VILLAVERDE	suburban traffic	28079017	T	100
ES0193A	INGENIEROS	urban traffic	48020064	T	100
ES0297A	SUBESTACIÓN INCA	suburban background	7027001	U	100
ES0316A	MONAGREGA	rural background	44051002	R	100
ES0353A	PÁRAMO DEL SIL	rural background	24110001	R	100
ES0354A	PALACIOS DEL SIL	rural background	24109001	R	100
ES0355A	SUSAÑE DEL SIL	rural background	24110002	R	100
ES0584A	I6-MONTCADA	suburban traffic	8125002	T	100
ES0628A	(ER-3) BASTARRECHE	urban traffic	30016005	T	100
ES0691A	I2-POBLE NOU	urban traffic	8019004	T	100
ES0693A	I5-BADALONA	urban traffic	8015001	T	100
ES0752A	(ER-5) SAN GINÉS	urban traffic	30016004	T	100
ES0789A	LA UNION	suburban traffic	30016013	T	100

ES0805A	BASAURI	suburban traffic	48015002	T	100
ES0817A	LA RANILLA	suburban traffic	41091010	T	100
ES0827A	SAN JUÁN DEL PUERTO	suburban traffic	21064002	T	100
ES0917A	ENRAMADILLA	urban traffic	41091013	T	100
ES0958A	E5-SABADELL	urban traffic	8187010	T	100
ES0975A	AH-SARRIÁ DE TER	urban traffic	17186001	T	100
ES1016A	LA RUBIA	suburban traffic	47186016	T	100
ES1018A	E1-TERRASSA	urban traffic	8279011	T	100
ES1027A	E3-VIC	urban traffic	8298007	T	100
ES1037A	BARREDA	suburban traffic	39087004	T	100
ES1038A	ZAPATÓN	suburban background	39087003	U	100
ES1039A	ESCUELA DE MINAS	suburban traffic	39087005	T	100
ES1050A	ALCORCÓN	urban traffic	28007001	T	100
ES1054A	TORREJÓN DE ARDOZ	urban traffic	28148001	T	100
ES1084A	E2-MOLLET DEL VALLES	urban traffic	8124005	T	100
ES1093A	TORRE METEOROLÓGICA I	rural background	7003001	R	100
ES1119A	A6-TARRAGONA (NUCLI URBA)	urban traffic	43148002	T	100
ES1124A	A5-TARRAGONA (ST. SALVADOR)	urban traffic	43148001	T	100
ES1125A	A8-MANRESA	urban traffic	8113007	T	100
ES1126A	A9-MARTORELL	suburban traffic	8114006	T	100
ES1132A	LOS GLADIOLOS	urban traffic	38038011	T	100
ES1135A	AA-IGUALADA	urban traffic	8102005	T	100
ES1161A	BARRIO PINILLA	suburban traffic	24089006	T	100
ES1171A	ARAGÓN	urban traffic	46250033	T	100
ES1172A	LINARES	urban traffic	46250034	T	100
ES1183A	PATERNA	urban traffic	46190002	T	100
ES1184A	CASCO ANTIGUO	suburban traffic	46220002	T	100
ES1192A	ALCALÁ FINAL	suburban traffic	28079023	T	100
ES1195A	IE-SAGRERA	urban traffic	8019039	T	100
ES1208A	AF-REUS	urban traffic	43123005	T	100
ES1225A	AB-BISBE IRURITA	urban traffic	25120001	T	100
ES1231A	AT-SANT CUGAT DEL VALLES	urban traffic	8205002	T	100
ES1237A	TXURDINAGA	suburban traffic	48020058	T	100
ES1238A	PLAZA DE ESPAÑA	urban traffic	46250032	T	100
ES1240A	NUEVO CENTRO	urban traffic	46250031	T	100
ES1244A	MAZARREDO	urban traffic	48020062	T	100
ES1250A	HILERA	urban traffic	29067001	T	100
ES1251A	COLODRO	urban traffic	14021001	T	100
ES1262A	AD-SABADELL	urban traffic	8187012	T	100
ES1263A	AE-RUBI	suburban traffic	8184005	T	100
ES1268A	PLAZA DE TOROS	urban traffic	33044029	T	100
ES1277A	INSTITUTO Nº 3	suburban traffic	13071016	T	100
ES1285A	LOUSEIRAS (B-2)	rural background	27033001	R	100
ES1290A	HUERTAS DEL SACRAMENTO	urban traffic	24115014	T	100
ES1336A	PARQUE JOVELLANOS	urban traffic	33037009	T	100
ES1350A	ARETA	suburban traffic	1036005	T	100
ES1357A	BURGOS 2	urban background	9059004	U	100
ES1358A	AVENIDA DE CASTILLA	suburban traffic	33024027	T	100
ES1372A	ARANDA DE DUERO	urban background	9018001	U	100
ES1394A	CONSTITUCIÓN (P.F.)	urban traffic	18087005	T	100
ES1396A	ID-BARCELONA	urban traffic	8019042	T	100
ES1398A	E9-SANTA PERPETUA DE MOGODA	suburban traffic	8260009	T	100
ES1399A	E7-VILAFRANCA DEL PENEDES	urban traffic	8305005	T	100
ES1424A	PLAZA DE LA GUITARRA	urban traffic	33004049	T	100
ES1425A	PRINCIPE	urban traffic	41091016	T	100
ES1428A	ERMITA	rural traffic	12040009	T	100
ES1435A	VILAFRANCA	suburban background	12129001	U	100
ES1438A	IH-BARCELONA(Eixample)	urban traffic	8019043	T	100
ES1442A	ARRASATE	suburban traffic	20055001	T	100
ES1480A	IJ-GRACIA-SANT GERVASI	urban traffic	8019044	T	100
ES1482A	PASEO DE MARTIRICOS	urban traffic	29067004	T	100
ES1490A	DURANGO	rural traffic	48027001	T	100

ES1492A	TRES MARZO	urban traffic	1059009	T	100
ES1494A	ATEGORRIETA	urban traffic	20069002	T	100
ES1498A	TOLOSA	suburban traffic	20071001	T	100
ES1499A	BEASAIN	rural traffic	20019001	T	100
ES1501A	AZPEITIA	rural traffic	20018001	T	100
ES1518A	CAN LLOMPART	rural background	7003005	R	100
ES1519A	SAN JERÓNIMO	suburban traffic	41091017	T	100
ES1531A	LOS TOJOS	rural background	39086001	R	100
ES1544A	AGURAIN	urban traffic	1051001	T	100
ES1551A	B9-BARBERÁ DEL VALLÉS	urban traffic	8252006	T	100
ES1602A	LA CIGÜEÑA	urban traffic	26089001	T	100
FI0007R	Virolahti	rural background	351	R	100
FI0009R	Utö	rural background	349	R	100
FI0018A	Töölö	urban traffic	204	T	100
FI0022R	Oulanka	rural background	352	R	100
FI0032A	Luukki	rural background	208	R	100
FI0037R	Ähtäri 2	rural background	372	R	100
FI0106A	Tikkurila 3	suburban traffic	370	T	100
GB0037R	LADYBOWER	rural background	LB	R	100
GB0038R	LULLINGTON HEATH	rural background	LH	R	100
GB0045R	WICKEN FEN	rural background	WFEN	R	100
GB0608A	LONDON BEXLEY	suburban background	BEX	U	100
GB0617A	ROCHESTER	rural background	ROCH	R	100
GB0624A	TOWER HAMLETS ROADSIDE	urban traffic	TH2	T	100
GB0633A	OXFORD CENTRE	urban traffic	OX	T	100
GB0636A	CAMDEN KERBSIDE	urban traffic	CA1	T	100
GB0637A	HARINGEY ROADSIDE	urban traffic	HG1	T	100
GB0639A	BRISTOL OLD MARKET	urban traffic	BRS2	T	100
GB0647A	BATH ROADSIDE	urban traffic	BATH	T	100
GB0652A	BURY ROADSIDE	urban traffic	BURY	T	100
GB0655A	COVENTRY CENTRE	urban background	COV2	U	100
GB0657A	GLASGOW KERBSIDE	urban traffic	GLA4	T	100
GB0659A	LONDON A3 ROADSIDE	urban traffic	A3	T	100
GB0667A	SOUTHWARK ROADSIDE	urban traffic	SK2	T	100
GB0676A	LINCOLN ROADSIDE	urban traffic	LINC	T	100
GB0682A	LONDON MARYLEBONE ROAD	urban traffic	MY1	T	100
GB0685A	HOUNSLOW ROADSIDE	urban traffic	HS1	T	100
GB0693A	BRIGHTON ROADSIDE	urban traffic	BRIT	T	100
GB0695A	LONDON CROMWELL ROAD 2	urban traffic	CRD2	T	100
GB0726A	CAMBRIDGE ROADSIDE	urban traffic	CAM	T	100
GB0734A	STOCKTON-ON-TEES YARM	urban traffic	YARM	T	100
GB0740A	DUMFRIES	urban traffic	DUMF	T	100
GB	HULL FREETOWN	urban background	HUL2	U	100
GB	ST OSYTH	rural background	OSY	R	100
GB	STOCKPORT SHAW HEATH	urban background	STK4	U	100
GR0002A	ATHINAS	urban traffic	103	T	100
GR0003A	ARISTOTELOUS	urban traffic	109	T	100
GR0008A	PATRA - 1	urban traffic	301	T	100
GR0032A	Patission	urban traffic	101	T	100
IE0090A	Killkitt	rural background	Ozone1	R	100
IE0091A	Glashaboy	rural background	Ozone2	R	100
IE0105A	Coleraine Street	urban traffic	DC100	T	100
IT0467A	ZAVATTARI	urban traffic	301544	T	100
IT0470A	TO_1272_TO_REBAUDEN	urban traffic	100110	T	100
IT0477A	MARCHE	urban traffic	301526	T	100
IT0505A	Renon	rural background	402109	R	100
IT0741A	GAMBARA	rural background	301705	R	100
IT0771A	SCUOLA C.PLINIO	urban traffic	301311	T	100
IT0774A	VARENNA	rural background	301305	R	100
IT0777A	MERATE	urban traffic	301303	T	100
IT0781A	S.GIORGIO	urban traffic	301614	T	100

IT0825A	C.so Francia	urban traffic	3	T	100
IT0826A	P.ZZA E.FERMI	urban traffic	1205813	T	100
IT0827A	L .go Arenula	urban traffic	1	T	100
IT0828A	L.go Magna Grecia	urban traffic	5	T	100
IT0831A	TO_1272_TO_GAIDANO	urban traffic	100109	T	100
IT0850A	GIORDANI	urban traffic	803305	T	100
IT0851A	TO_001272_PRIVOLI	urban traffic	100111	T	100
IT0868A	LT-V.Romagnoli	urban traffic	19	T	100
IT0902A	ERBA	suburban background	301307	U	100
IT0909A	VIGEVANO	urban traffic	301809	T	100
IT0946A	L.go Montezemolo	urban traffic	7	T	100
IT0949A	CITTADELLA	urban traffic	302003	T	100
IT0952A	CASTEL DI GUIDO	rural background	1205803	R	100
IT0954A	V.Tiburtina	urban traffic	9	T	100
IT0956A	Cinecittà	urban traffic	8	T	100
IT0989A	LEONESSA	rural background	1205701	R	100
IT0992A	Fontechiari	rural background	36	R	100
IT1016A	SENATO MARINA	urban traffic	301537	T	100
IT1033A	OLGIATE COMASCO	urban traffic	301310	T	100
IT1120A	TO_1171_ORBASSANO	suburban traffic	100126	T	100
IT1121A	TO_1099_MANDRIA	rural background	100122	R	100
IT1130A	TO_001265_SETTSE	urban traffic	100129	T	100
IT1154A	VIA ROMA	urban traffic	904805	T	100
IT1176A	Largo Perestrello	urban traffic	2	T	100
IT1185A	Libia	urban traffic	6	T	100
IT1264A	VIA FIRENZE	urban traffic	1306805	T	100
IT1334A	BZ5	urban traffic	402114	T	100
IT1336A	Corso Milano	urban traffic	502304	T	100
IT1422A	CORSO VIT. EMANUELE	urban traffic	1306807	T	100
LT0027A	Vilnius 13A	urban traffic		T	100
LT0030A	Vilnius 9A	urban traffic		T	100
NL0007R	Eibergen-Lintveldseweg	rural background	722	R	100
NL0009R	Kollumerwaard-Hooge Zuidwal	rural background	934	R	100
NL0104A	Eindhoven-Noordbrabantlaan	urban traffic	237	T	100
NL0196A	Budel-Toom	rural background	227	R	100
NL0198A	Zierikzee-Lange Slikweg	rural background	301	R	100
NL0205A	Hellendoorn-Luttenbergerweg	rural background	807	R	100
NL0206A	Sappemeer-Borgercompagnie	rural background	913	R	100
NL0207A	Balk-Trophornsterweg	rural background	918	R	100
NL0213A	Witteveen-Talmaweg	rural background	928	R	100
NL0220A	Philippine-Stelleweg	rural background	318	R	100
NL0224A	Vlaardingen-Floreslaan	urban traffic	433	T	100
NL0227A	Wieringerwerf-Medemblikkerweg	rural background	538	R	100
NL0228A	Biddinghuizen-Hoekwantweg	rural background	631	R	100
NL0229A	Zegveld-Oude Meije	rural background	633	R	100
NL0231A	Barsbeek-De Veenen	rural background	818	R	100
NL0232A	Huijbergen-Vennekenstraat	rural background	235	R	100
NL0233A	Utrecht-Vleutenseweg	urban traffic	638	T	100
NL0234A	Utrecht-Erzeijstraat	urban traffic	639	T	100
NL0235A	Utrecht-de Jongweg	urban traffic	636	UT	100
NL0238A	Apeldoorn-Stationsstraat	urban traffic	728	T	100
NL0241A	Eindhoven-Piuslaan	urban traffic	238	T	100
NL0242A	Eindhoven-Genovevalaan	urban traffic	236	T	100
NL0244A	Haarlem-Amsterdamsevaart	urban traffic	537	T	100
NL0247A	Loenen-Eerbeeksedijk	rural background	733	R	100
NL0248A	Breukelen-Snelweg	rural traffic	641	T	100
NL0249A	Wekerom-Riemterdijk	rural background	738	R	100
NL0250A	De Zilk-Vogelaarsdreef	rural background	444	R	100

NL0252A	Valthermond-Noorderdiep	rural background	929	R	100
NO0011A	Kirkeveien	urban traffic	4	T	100
PL0014A	Belsk	rural background	Belsk	R	100
PL0028A	Czerniawa	rural background	Czerniawa	R	100
PL0026A	Jeleniow	rural background	Jeleniow	R	100
PL0012A	KrakKras	urban traffic	KrakKras	T	100
PL0011A	KrakProk	urban background	KrakProk	U	100
PT0096A	Vila Nova de Gaia	urban traffic	119	T	100
PT0104A	Paranhos	urban traffic	1020	T	100
PT0101A	Antas	urban traffic	1028	T	100
PT0102A	Espinho	urban traffic	1032	T	100
PT0085A	Coimbra/Avenida Fernão Magalhães	urban traffic	2005	T	100
PT0086A	Rua da Prata	urban traffic	3003	T	100
PT0088A	Entrecampos	urban traffic	3072	T	100
PT0092A	Avenida Casal Ribeiro	urban traffic	3073	T	100
PT0089A	Benfica	urban traffic	3074	T	100
PT0093A	Avenida da Liberdade	urban traffic	3075	T	100
PT0053A	Monte Velho	rural background	4002	R	100
SK0002A	Trnavske myto	urban traffic	112	T	100
SK0005A	Namestie Slobody	urban background	211	U	100
SK0012A	Prievidza	urban background	241	U	100
SK0019A	Velka Okruzna	urban traffic	251	T	100

Appendix C2:Stations frequently true classified (>50%)

ESC	STATION_NAME	RST	LSC	CST	(%)	Nearest CST
AT0019A	Wien Kendlerstraße	urban background	KEND	U	67	T
AT0021A	Wien Taborstrasse	urban traffic	TAB	T	83	U
AT0027A	Steyr	suburban background	S409	U	83	T
AT0052A	Piber	rural background	105	R	83	T
AT0068A	Krems	urban background	2501	U	50	R
AT0075A	Salzburg Lehen	urban background	1200	U	83	T
AT0081A	Wien Laaer Berg	suburban background	LAA	U	67	T
AT0084A	Bludenz Rathaus	urban background	2707	U	67	T
AT0094A	Hochgössnitz	rural background	137	R	83	U
AT0102A	Wolkersdorf	rural background	403	R	83	U
AT0114A	Amstetten	urban background	101	U	83	T
AT0127A	Klagenfurt Koschatstrasse	urban traffic	KA11	T	67	U
AT0128A	St. Georgen im Lavanttal - Herzogberg	rural background	WO35	R	83	T
AT0157A	Brunn am Gebirge	suburban background	1403	U	67	R
AT0158A	Himberg	rural background	603	R	75	U
AT0167A	Payerbach	rural background	1502	R	83	T
AT0188A	Pöchlarn	rural background	1204	R	67	U
AT0195A	Bruck an der Mur West	suburban traffic	192	T	83	U
BE0035R	43N073 - VEZIN	rural background	43N073	R	75	U
BE0202A	44R721 - WONDELGEM	suburban background	44R721	U	75	T
BE0212A	43R223 - JEMEPPE	urban background	43R223	U	50	R/T
BE0230A	42R832 - RUISBROEK	suburban traffic	42R832	T	75	U
BE0235A	45R501 - CHARLEROI	urban traffic	45R501	T	75	U
BE0245A	45R502 - LODELINSART	suburban background	45R502	U	75	T
BE0295A	42N016 - DESSEL	rural background	42N016	R	75	U
BE0309A	41B011 - BERCHEM S.A	suburban background	41B011	U	75	R
BE0371A	41MEU1 - MEUDON	suburban background	41MEU1	U	50	
BG0051A	Evmolpia-AMS	urban background	Pld2	U	75	R
CH0001A	Wallisellen	suburban background	WAL	U	67	R
CH0002R	Payerne	rural background	PAY	R	83	U
CH0017A	Basel St. Johannplatz	urban background	BSJ	U	67	T
CH0024A	Saxon	rural background	SAX	R	50	T
CH0040A	Luzern Museggstrasse	urban traffic		T	67	R
CZ0009A	Pha8-Kobylisy	suburban background	779	U	75	R
CZ0020A	Pha4-Libus	suburban background	774	U	75	R
CZ0040A	Brno-Kroftova	urban background	1129	U	75	R
DE0422A	DEHE043:Riedstadt	urban background	102	U	75	T
DE0461A	DEBW005:Mannheim-Nord	urban background	4474	U	75	T
DE0482A	DEBY012:Burghausen	urban traffic	L1.2	T	67	U
DE0483A	DEHE001:Darmstadt	urban background	H4	U	67	R
DE0526A	DEBY010:Bayreuth	urban traffic	L4.2	T	83	U
DE0532A	DEBY039:München-Lothstr.	urban traffic	L8.3	T	75	U
DE0544A	DERP001:Ludwh.-Oppau Horst-S.	urban background	DERP001	U	75	T
DE0547A	DERP008:Mainz-Goetheplatz	urban background	DERP008	U	50	R/T
DE0568A	DEBY043:München-Moosach	suburban traffic	L8.7	T	75	U
DE0580A	DENW034:Walsum Duisburg-	urban background	WALS	U	83	T
DE0581A	DENW036:Meerbeck	urban background	MEER	U	75	R
DE0583A	DENW038:Styrum	urban background	STYR	U	75	T
DE0584A	DENW039:Kaldenhausen Duisburg-	suburban background	KALD	U	83	T
DE0585A	DENW040:Buchholz Duisburg-	suburban background	BUCH	U	67	R/T
DE0590A	DEBW084:Freiburg-Mitte	urban background	4462	U	67	R
DE0594A	DEBY075:Weiden	urban traffic	L3.3	T	75	U
DE0595A	DEBY067:Schwandorf	urban traffic	L3.4	T	75	U
DE0606A	DENW006:Niederaden	urban traffic	NIED	T	75	U
DE0608A	DENW015:Sickingmühle	urban background	SICK	U	75	T

DE0614A	DENW060:Wesseling	urban traffic	WESS	T	75	U
DE0627A	DENW021:Bottrop	urban background	BOTT	U	67	R
DE0630A	DENW028:LIS-Essen (Bredeney) LUA Essen	urban background	LISE	U	83	R
DE0639A	DEBW022:Kehl-Hafen	urban background	4466	U	75	T
DE0641A	DEBW027:Reutlingen	urban background	4470	U	75	R
DE0643A	DEBW029:Aalen	urban background	4457	U	67	T
DE0644A	DEBW024:Ludwigsburg	urban background	4463	U	75	T
DE0655A	DESL003:Dillingen City	urban background	DESL003	U	67	R
DE0671A	DENW042:Krefeld	urban background	KREF	U	75	T
DE0672A	DENW071:Lörick Düsseld.-	urban background	LOER	U	67	R/T
DE0683A	DEBW009:Heidelberg	suburban traffic	4453	T	67	U
DE0715A	DEBE010:Wedding-Amrumer Straße	urban background	MC10	U	83	R
DE0742A	DEBE034:Neukölln-Nansenstraße	urban background	MC42	U	83	R
DE0754A	DEBE032:Grunewald (45m)	urban background	MC32	U	67	R
DE0760A	DENW010:Unna	urban background	UNNA	U	75	T
DE0764A	DENW047:Neuss	urban background	NEUS	U	75	T
DE0783A	DEBW038:Friedrichshafen	urban background	4471	U	75	R
DE0803A	DEBW039:Villingen Schwenningen	urban background	4468	U	75	T
DE0820A	DEHE030:Marburg	urban background	H24	U	75	T
DE0835A	DEBY032:Kulmbach	urban traffic	L4.8	T	75	U
DE0879A	DEBW021:Kehl-Süd	urban background	37458	U	75	T
DE0883A	DEHB003:Bremen-West	urban background	B3	U	67	T
DE0884A	DEHB005:Bremerhaven	urban background	B5	U	67	R
DE0887A	DEBY021:Ingolstadt-Rechbergstraße	urban traffic	L1.1	T	83	U
DE0920A	DESH010:Lübeck-Lindenplatz Verk.	unknown traffic	10	T	75	U
DE0932A	DEBW052:Konstanz	urban background	42818	U	75	R
DE0940A	DEBW048:Ehingen	urban background	42864	U	83	R
DE0953A	DESN011:Chemnitz-Mitte	urban background	DESN 011	U	83	T
DE0968A	DETH025:Meiningen	urban background	DETH025	U	75	R
DE0992A	DETH009:Gera Friedericistr.	urban background	DETH009	U	67	T
DE0999A	DETH026:Dreißigacker	rural background	DETH026	R	83	U
DE1032A	DEST057:Magdeburg/Südost	urban background	MGSO	U	75	R
DE1060A	DEBW073:Neuenburg	urban background	46268	U	75	T
DE1076A	DERP027:Neustadt Strohmarkt	urban traffic	DERP027	T	75	U
DE1099A	DEBW076:Baden-Baden	urban background	47648	U	67	R
DE1107A	DEBY089:München-Johanneskirchen	urban background	L8.12	U	75	R
DE1136A	DETH002:Gera Berliner Str.	unknown traffic	DETH002	T	83	U
DE1151A	DESN002:Aue	urban traffic	DESN 002	T	67	U
DE1153A	DESN004:Bautzen	urban background	DESN 004	U	83	T
DE1160A	DESN019:Glauchau	urban traffic	DESN 019	T	67	U
DE1197A	DEST089:Zartau/Waldstation	rural background	ZUWA	R	83	U
DE1303A	DENW081:Borken-Gemen	urban background		U	75	R
EE0013A	Viru	urban traffic	EE01	T	83	U
FI0092A	Leppävaara 2	suburban traffic	407	T	83	U
FI0123A	Mansikkala	suburban background	424	U	50	T
GB0036R	HARWELL	rural background	HAR	R	83	U
GB0043R	NARBERTH	rural background	PEMB	R	83	U
GB0420A	WEST LONDON	urban background	WL	U	83	T
GB0452A	GLASGOW CITY CHAMBERS	urban background	GLA	U	67	T
GB0567A	BELFAST CENTRE	urban background	BEL2	U	83	T
GB0568A	NEWCASTLE CENTRE	urban background	NEWC	U	83	T
GB0569A	BIRMINGHAM CENTRE	urban background	BIRM	U	67	R/T
GB0586A	LONDON ELTHAM	suburban background	LON6	U	67	R
GB0597A	LEICESTER CENTRE	urban background	LEIC	U	83	T
GB0609A	SWANSEA	urban background	SWAN	U	67	T
GB0614A	WOLVERHAMPTON CENTRE	urban background	WOLV	U	83	T
GB0616A	LONDON BRENT	urban background	BREN	U	83	R
GB0620A	LONDON N. KENSINGTON	urban background	KC1	U	67	R/T
GB0621A	LONDON SUTTON	suburban background	SUT3	U	67	R
GB0623A	SUTTON ROADSIDE	urban traffic	SUT1	T	83	U
GB0640A	EXETER ROADSIDE	urban traffic	EX	T	83	U

GB0645A	THURROCK	urban background	THUR	U	67	T
GB0646A	NOTTINGHAM CENTRE	urban background	NOTT	U	83	T
GB0654A	BOLTON	urban background	BOLT	U	67	R
GB0658A	STOKE-ON-TRENT CENTRE	urban background	STOK	U	83	T
GB0681A	BARNSLEY GAWBER	urban background	BAR3	U	83	R
GB0686A	HOVE ROADSIDE	urban traffic	HOVE	T	60	U
GB0697A	LONDON BROMLEY	urban traffic	BY2	T	67	U
GB0698A	SANDWELL WEST BROMWICH	urban background	WBRO	U	83	R
GB0729A	ABERDEEN	urban background	ABD	U	67	R
GB0731A	PRESTON	urban background	PRES	U	75	R
GB0736A	WIGAN LEIGH	urban background	WIG3	U	75	T
GB0737A	CANTERBURY	urban background	CANT	U	75	R
GB0742A	INVERNESS	urban traffic	INV2	T	75	U
GR0022A	MARUSSI	urban traffic	107	T	67	U
GR0030A	Pireaus - 1	urban traffic	102	T	83	U
GR0035A	LYKOVRISI	suburban traffic	112	T	50	U
HU0020A	Szeged	urban traffic	HU-KM-SE	T	83	U
IS0005A	Grensas	urban traffic	5	T	67	U
IT0869A	LT-V.Tasso	urban traffic	20	T	75	R
NL0010R	Vredepeel-Vredeweg	rural background	131	R	83	U
NL0199A	Den Haag-Rebecquestraat	urban background	404	U	67	R
NL0200A	Schipluiden-Groeneveld	rural background	411	R	50	U
NL0201A	Rotterdam-Schiedamsevest	urban background	418	U	83	R
NL0204A	Amsterdam-Florapark	urban background	520	U	83	R
NL0209A	Cabauw-Zijdeweg	rural background	620	R	83	U
NL0223A	Biest Houtakker-Biestsestraat	rural background	230	R	83	U
NL0225A	Wijnandsrade-Opfergeltstraat	suburban background	133	U	50	R
NL0226A	Westmaas-Groeneweg	rural background	437	R	83	B
NL0230A	Volkel-Heikantsepad	rural background	232	R	83	U
NL0236A	Utrecht-Wittevrouwenstraat	urban traffic	637	T	83	U
NL0239A	Apeldoorn-Loolaan	urban traffic	727	T	67	U
NL0240A	Apeldoorn-Arnhemseweg	urban traffic	729	T	83	U
NL0243A	Dordrecht-Frisostraat	urban background	441	U	50	R
PL0008A	KatowZal	urban background	KatowZal	U	50	R
PL0015A	KrakRyn	urban background	KrakRyn	U	67	R
PL0021A	Gliwice	urban background	Gliwice	U	67	R
PT0059A	Hospital Velho	urban traffic	3027	T	67	U
PT0087A	Olivais	urban background	3071	U	67	T
PT0099A	Ermesinde	suburban background	1023	U	75	T

Appendix C3:Stations frequently false classified (< 50% true)

ESC	STATION_NAME	RST	LSC	CST	(%)
AT0003A	Judenburg	urban background	118	R/T	33
AT0004A	Kapfenberg	urban background	145	T	17
AT0009A	Wien Stephansplatz	urban background	STEF	R	17
AT0012A	Wels Linzerstraße	urban background	S406	T	17
AT0013A	Wien Belgradplatz	urban traffic	BELG	U	17
AT0014A	Asten Kirchengasse	suburban background	S405	T	17
AT0015A	Linz Hauserhof	urban background	S401	R	50
AT0016A	Traun	suburban background	S404	T	17
AT0022A	Graz Nord	suburban background	138	T	50
AT0037A	Leoben Zentrum	urban background	143	T	17
AT0042A	Zeltweg	suburban background	114	T	17
AT0059A	Wiener Neustadt	suburban background	2401	R	17
AT0067A	Stockerau	suburban background	902	R	17
AT0073A	Grünbach bei Freistadt	rural background	S108	U	50
AT0080A	St. Valentin	rural background	102	U	17
AT0082A	Wien Währinger Gürtel	urban background	AKC	R	33
AT0100A	Deutschlandsberg	urban background	147	T	50
AT0112A	Graz Ost	suburban background	161	T	17
AT0122A	Kramsach Angerberg	rural background	2538	T	17
AT0140A	Vösendorf	suburban traffic	1402	R	17
AT0141A	Obervellach Schulzentrum	rural background	SP10	U	17
AT0142A	Spittal a.d.Drau Oktoberstrasse	urban background	SP18	T	17
AT0148A	Oberdrauburg Bundesstraße	rural traffic	SP20	U	50
AT0155A	Weiz	rural traffic	181	U	50
AT0163A	Eisenstadt - Laschoberstraße	urban traffic	1	U	17
AT0164A	Oberwart - Brunnenfeld	rural background	2	T	25
AT0168A	Salzburg Mirabellplatz	urban traffic	1066	U	33
AT0172A	Tamsweg - Untere Postgasse	suburban background	5032	T	50
AT0179A	Hartberg	suburban background	188	T	17
AT0190A	Waidhofen an der Ybbs	suburban background	2603	R	33
AT0191A	Braunau Zentrum	urban traffic	S156	R	17
AT0208A	Soboth	rural background	F101	U/T	0
BE0186A	41R012 - UCCLE	suburban background	41R012	R	25
BE0189A	42R020 - VILVOORDE	suburban traffic	42R020	U	50
BE0192A	42R010 - ST.STEVENSW	suburban background	42R010	R	50
BE0197A	44R701 - GENT	urban background	44R701	R	50
BE0213A	43R201 - LIEGE	urban traffic	43R201	U	17
BE0227A	42R821 - BEVEREN	suburban background	42R821	R	33
BE0228A	42R801 - BORGERHOUT	urban traffic	42R801	U	50
BE0229A	42N015 - SCHILDE	rural background	42N015	U	25
BE0353A	42R897 - ANTWERPEN	suburban traffic	42R897	U	50
BE0395A	41B004 - STE.CATHERI	urban background	41B004	T	50
BG0049A	Dimova mahala-Pernik	suburban background	Pe3	T	25
BG0050A	Krasno Selo	suburban background	Sf7	T	50
BG0051A	AMS Rakovsky-Dimitrovgrad	urban background	DmGr3	T	50
BG0052A	Drujba -Sofia	suburban background	Sf8	T	50
CH0005A	Dübendorf	suburban background	DUE	T	50
CH0008A	Basel-Binningen	suburban background	BAS	R	17
CH0011A	Lugano	urban background	LUG	T	33
CH0014A	Winterthur Obertor	urban background	WOT	T	50
CH0033A	Magadino	rural background	MAG	T	50
CH0042A	Rorschacherstr.	urban traffic	SGR	U	33
CZ0005A	Hr.Kral.-Sukovy sady	urban background	396	T	50
CZ0010A	Pha2-Riegrovy sady	urban background	772	R	50
CZ0013A	Pha10-Vrsovice	urban traffic	805	U	25

CZ0015A	Pha6-Veleslavin	suburban background	777	R	50
CZ0018A	Chomutov	urban background	1001	R	25
CZ0025A	Ostrava-Fifejdy	urban background	1061	R	25
CZ0029A	Most	urban background	1005	R	50
CZ0035A	Havirov	urban background	1068	R	25
CZ0038A	Ostrava-Zabreh	urban background	1064	R	25
CZ0043A	Prostejov	urban background	1133	R	50
CZ0052A	Prerov	urban background	1076	R	50
CZ0059A	Ceske Budejovice	urban background	1104	R	50
CZ0063A	Plzen-stred	urban background	1321	T	50
DE0256A	DEHB001:Bremen-Mitte	urban background	DEHB001	R	33
DE0437A	DESH007:Kiel-Schützenwall Verk.	suburban traffic		U	50
DE0460A	DEBW006:Mannheim-Mitte	urban traffic	4473	U	25
DE0462A	DEBW007:Mannheim-Süd	urban background	4475	T	25
DE0486A	DEHE019:Viernheim	urban background	H29	T	50
DE0493A	DEBY031:Kempten	urban traffic	L7.3	U	25
DE0503A	DEHE017:Offenbach	urban background	H26	T	50
DE0512A	DEBY017:Erlangen - Häusling	urban background	L5.7	T	50
DE0527A	DEBY009:Bamberg	urban traffic	L4.3	U	50
DE0528A	DERP007:Mainz-Mombach Dr.F.W.	urban background	DERP007	T	25
DE0563A	DEBY004:Kleinwallstadt (Aschaffenburg)	urban background	L6.7	R	50
DE0567A	DEBW019:Ulm	urban background	42859	T	25
DE0605A	DENW004:Ickern	urban background	ICKE	T	33
DE0607A	DENW012:Witten	urban traffic	WIT2	U	25
DE0610A	DENW050:Dormagen	urban background	DORM	T	50
DE0612A	DENW053:Chorweiler Köln-	urban background	CHOR	T	25
DE0629A	DENW023:Herne	urban traffic	HERN	U	17
DE0642A	DEBW023:Weil a. Rhein	urban background	4465	R	25
DE0657A	DESL013:Saarlouis-Fraulautern	urban traffic	DESL013	U	25
DE0680A	DENW063:Eggegebirge	rural background	EGGE	U	50
DE0684A	DEBW031:Schwarzwald Süd	rural background	4467	U	17
DE0694A	DEHH008:Sternschanze	urban background	DEHH008	R	50
DE0720A	DERP018:Speyer St. G. Stifts.	urban background	DERP018	T	25
DE0738A	DEBY047:Naila	urban background	L4.6	R	50
DE0747A	DEBW010:Wiesloch	urban background	12288	R	50
DE0748A	DEBW035:Böblingen	urban background	4450	T	33
DE0750A	DEBY007:Augsburg-Bourges-Platz	urban traffic	L7.6	U	33
DE0763A	DENW029:Hattingen	urban background	HATT	T	33
DE0772A	DENW062:Bonn	urban background	BONN	T	50
DE0781A	DEHB002:Bremen-Ost	urban background	B2	R	50
DE0807A	DEBE011:Wedding/Prenzl.B.-Beh	urban background	11	R	17
DE0823A	DENI020:Wolfsburg	urban background	WGCC	R	25
DE0827A	DEBY020:Hof (Berliner Platz)	urban traffic	L4.1	U	17
DE0833A	DENI038:Osnabrück	urban background	OKCC	R	25
DE0838A	DENW008:Dortmund2	urban traffic	DMD2	U	50
DE0856A	DENI054:Hannover/Linden	urban background	HRVS	R	17
DE0874A	DENW068:Soest	rural background	SOES	U	50
DE0882A	DEHB004:Bremen-Nord	urban background	DEHB004	R	50
DE0885A	DEBW041:Rheinfelden	urban background	37460	T	50
DE0888A	DENW067:Bielefeld	urban traffic	BIEL	U	33
DE0902A	DEST022:Halle/Zentrum	urban background	ECC	R	50
DE0903A	DEST005:Magdeburg/Zentrum	urban background	MGCC	R	50
DE0905A	DERP023:Worms Hagenstraße	urban background	36100	T	25
DE0931A	DEBW065:Ravensburg	urban background	42209	T	25
DE0938A	DEBW045:Balingen	urban background	42860	T	50
DE0939A	DEBW046:Biberach	urban background	42857	T	50
DE0942A	DEBW053:Künzelsau	urban background	42863	R	50
DE0946A	DEBE044:Mitte-Parochialstr.	urban background	MC71	T	33
DE0956A	DEBW056:Schwäbisch Hall	urban background	42911	T	25
DE0964A	DESN036:Pirna	urban background	DESN 036	R	50
DE0982A	DEBB021:Potsdam-Zentrum	urban background	102	R	25

DE0987A	DEBB003:Brandenburg a.d. Havel	urban background	114	R	50
DE0988A	DENI052:Walsrode	urban background	WASS	R	25
DE1026A	DEST029:Bernburg	urban background	BECO	T	17
DE1045A	DEMV001:Selmsdorf	rural background	DEMV001	U	50
DE1069A	DEBB001:Burg Bahnhofstr.	urban background		R	50
DE1077A	DEST014:Bitterfeld	urban background	BDCC	R	17
DE1091A	DEBE051:Buch	urban background	77	R	33
DE1102A	DEBB029:Schwedt/Oder	urban background	138	R	50
DE1129A	DEST071:Sangerhausen	suburban traffic	SANGEHAUSEN	U	50
DE1132A	DETH019:Erfurt Kartäuserstr.	urban background	DETH019	R	50
DE1152A	DESN048:Auerbach	urban background	DESN 048	T	50
DE1159A	DESN017:Freiberg	urban traffic	DESN 017	U	17
DE1162A	DESN024:Klingenthal	urban background	DESN 024	T	50
DE1165A	DESN034:Olbernhau	urban background	OLBERNHAU	T	50
DE1237A	DEBW094:Isny	urban background		T	25
DE1241A	DEBW102:Bad Waldsee	urban background		R	25
DE1250A	DEBY099:Augsburg LfU	urban background		R	50
DE1259A	DEHH033:HH Flughafen Nord	urban background		R	50
DE1302A	DENW080:Solingen-Wald	urban background		R	50
DE1306A	DENW094:Aachen-Burtscheid	rural background		U	50
DE1308A	DENW096:Mönchengladbach-Rheydt	urban background		T	50
DK0047A	Aalborg/8159	urban background	8159	R	17
DK0052A	Århus/6159	urban background	6159	R	25
ES0117A	MARQUÉS DE SALAMANCA	urban traffic	28079007	U	50
ES0324A	ESTANCA	rural traffic	44013002	U	50
ES0327A	CALANDA	suburban background	44051003	T	50
ES0330A	MAS DE LAS MATAS	rural background	44145001	U	50
ES0331A	ALCORISA	rural background	44014002	U	50
ES0692A	I3-L'HOSPITALET	urban traffic	8101001	U	50
ES0774A	LA GINEBROSA	rural background	44118001	U	50
ES0818A	MACARENA	urban traffic	41091008	U	50
ES1051A	COSLADA	suburban traffic	28049001	U	50
ES1086A	E6-GRANOLLERS	urban traffic	8096010	U	50
ES1095A	POZOS	suburban traffic	7032002	U	50
ES1121A	A2-POBLA DE MAFUMET	rural traffic	43109001	U	50
ES1131A	POLIDEPORTIVO MUNICIPAL	urban traffic	38038010	U	50
ES1162A	MEDINA DEL CAMPO	suburban background	47085003	T	50
ES1178A	ESTACIÓN RENFE	urban traffic	3014004	U	50
ES1180A	GOYA	urban background	46078002	T	50
ES1181A	QUART	suburban background	46102002	T	50
ES1182A	ESTACIÓN FERROCARRIL	urban background	46131002	R	50
ES1239A	PISTA DE SILLA	urban traffic	46250030	U	50
ES1246A	CAN MISSES	suburban background	7026001	T	50
ES1247A	DALT VILA	urban background	7026002	T	50
ES1254A	HOSPITAL CIUDAD JAÉN	urban traffic	23050001	U	50
ES1260A	PLAZA DE LA CONCORDIA	urban traffic	4013002	U	50
ES1278A	CALLE ANCHA	urban traffic	13071014	U	50
ES1281A	ESTACIÓN DE AUTOBUSES	suburban traffic	24115012	U	50
ES1320A	MATADERO	suburban traffic	33004048	U	50
ES1359A	MOURENCE (C-9)	rural background	27065004	U	50
ES1367A	REMOTA UTRILLAS	rural background	44238004	U	50
ES1404A	ELX	urban traffic	3065003	R	50
ES1420A	MONZÓN	suburban traffic	22158001	U	50
ES1426A	MORATALAZ	urban traffic	28079036	U	50
ES1439A	ESTACION 2 (OESTE)	suburban traffic	36057022	U	50
ES1449A	SAN JOSÉ	suburban background	37274009	T	50
ES1453A	II-TORREBALLDOVINA	urban traffic	8245012	U	50
ES1472A	ITURRAMA	suburban traffic	31201012	R	50
ES1481A	GRAN VÍA PARQUE	urban traffic	14021004	U	50
ES1488A	IZKI	rural background	1016001	U	50
ES1496A	RENTERIA	urban traffic	20067001	U	50

ES1497A	HERNANI	rural traffic	20040001	U	50
ES1502A	AVENIDA GASTEIZ	urban traffic	1059008	U	50
ES1529A	TETUÁN	suburban traffic	39075005	R	50
ES1579A	LOS CORRALES DE BUELNA	urban background	39025001	R	50
ES1600A	CASTELLÓ	urban traffic	12040011	U	50
FI0004A	Vallila 1	urban traffic	206	U	33
FI0105A	Lappeenrannan keskusta	urban traffic	377	U	50
FI0124A	Kallio 2	urban background	425	R	33
GB	WREXHAM	urban traffic	WREX	U	50
GB0453A	MANCHESTER TOWN HALL	urban background	MAN	R	33
GB0455A	WALSALL ALUMWELL	urban background	WAL	T	50
GB0566A	LONDON BLOOMSBURY	urban background	CLL2	T	33
GB0580A	CARDIFF CENTRE	urban background	CARD	R	50
GB0581A	EDINBURGH CENTRE	urban background	ED	T	33
GB0584A	LEEDS CENTRE	urban background	LEED	T	33
GB0585A	BRISTOL CENTRE	urban background	BRIS	T	33
GB0594A	LIVERPOOL CENTRE	urban background	LIVR	T	33
GB0595A	BIRMINGHAM EAST	urban background	BIR2	R	50
GB0596A	HULL CENTRE	urban background	HULL	T	50
GB0598A	SOUTHAMPTON CENTRE	urban background	SOUT	T	33
GB0613A	MANCHESTER PICCADILLY	urban background	MAN3	T	50
GB0615A	SHEFFIELD CENTRE	urban background	SHE2	T	17
GB0641A	GLASGOW CENTRE	urban background	GLA3	T	50
GB0643A	LEAMINGTON SPA	urban background	LEAM	R	17
GB0644A	LONDON TEDDINGTON	urban background	TED	R	33
GB0648A	STOCKPORT	urban background	STOC	R/T	33
GB0649A	MANCHESTER SOUTH	suburban background	MAN4	R	33
GB0650A	LONDON HACKNEY	urban background	HK4	T	50
GB0651A	PORT TALBOT	urban background	PT	R	50
GB0656A	LONDON SOUTHWARK	urban background	SK1	T	50
GB0674A	WALSALL WILLENHALL	suburban background	WAL2	R	17
GB0677A	ROTHERHAM CENTRE	urban background	ROTH	T	17
GB0678A	NORWICH ROADSIDE	urban traffic	NOR1	U	33
GB0683A	READING	urban background	READ	T	50
GB0684A	NORWICH CENTRE	urban background	NOR2	R	33
GB0687A	PLYMOUTH CENTRE	urban background	PLYM	R	50
GB0727A	BLACKPOOL	urban background	BLAC	R	25
GB0728A	SOUTHEND-ON-SEA	urban background	SEND	R	25
GB0733A	PORTSMOUTH	urban background	PMTH	R	25
GB0738A	NORTHAMPTON	urban background	NTON	R	50
GB0743A	LONDON WESTMINSTER	urban background	HORS	T	50
GR0018A	AGIA SOFIA	urban traffic	201	U	50
GR0019A	KALAMARIA	suburban traffic	204	U	50
GR0027A	LIOSSIA	suburban background	106	T	50
GR0028A	PERISTERI	urban background	108	T	50
GR0031A	Nea Smyrni	urban background	105	T	50
GR0037A	THRAKOMAKEDONES	suburban background	113	T	25
GR0040A	GOUDI	urban traffic	116	U	50
GR0041A	PIREAUS - II	urban background	117	R	50
GR0042A	GALATSI	urban background	118	R	25
GR0044A	UNIVERSITY	urban traffic	205	U	50
GR0045A	NEOCHOROUDA	suburban background	206	T	50
GR0047A	PANORAMA	suburban background	208	T	50
GR0048A	PATRA - 2	urban traffic	302	U	50
GR0110R	ALIARTOS	rural background	110	U	50
IT0187A	CORSO ISONZO	urban traffic	803803	U	50
IT0594A	BROLETTO	urban background	301702	R	25
IT0612A	SAN CUSMANO	suburban background	1908909	R	50
IT0705A	VERZIERE	urban traffic	301540	U	50
IT0778A	TREVIGLIO	urban traffic	301617	U	50

IT0785A	TO_001272_CRISTINA	urban traffic	100107	U	50
IT0839A	CREMA S.BERNARD.	suburban background	301905	T	50
IT0908A	BORMIO	rural background	301401	T/U	25
IT0963A	PARCO BISSUOLA STATION	urban background	502701	T	50
IT1034A	MEDA	urban background	301527	T	25
IT1087A	PUBBLICO PASSEGGIO	urban background	803312	T	50
IT1088A	GOISIS	suburban background	301609	R	25
IT1203A	ARCONATE	rural background	301504	U	50
IT1246A	BI_2046_COSSATO	urban background	109603	T	50
IT1343A	CASON	urban traffic	502305	U	50
NL0202A	Posterholt-Vlodropperweg	suburban background	107	R	33
NL0208A	Amsterdam-Cabeliaustraat	urban background	518	T	17
NL0219A	Wageningen-Binnenhaven	suburban background	724	R	17
NL0237A	Utrecht-Universiteitsbibliotheek	urban background	640	R	33
PL0010A	WarszIOS	urban background	WarszIOS	R	25
PL0017A	Kedzierz	suburban background	Kedzierz	R	17
PL0022A	KatowRac	urban background	KatowRac	R	50
PL0024A	Kuznia	rural background	Kuznia	U	50
PL0030A	Urad	rural background	Urad	U	25
PL0038A	KrakKrow	urban background	KrakKrow	T	17
PL0041A	Sosnowiec	urban traffic	Sosnowiec	U	50
PL0042A	PiekarySl	urban background	PiekarySl	R	33
PL0043A	Wojkowice	urban background	Wojkowice	R	50
PL0045A	GdanskPW1	urban background	AM-1	R	25
PL0046A	GdanskKa2	urban background	AM-2	R	35
PL0051A	TczewTa7	urban background	AM-7	R	25
PL0053A	GdyniaKo9	urban background	AM-9	R	25
PT0090A	Chelas	urban background	3010	R	33
PT0091A	Beato	urban background	3070	R	17
PT0094A	Rua dos Bragas	urban traffic	1017	U	50
PT0095A	Formosa	urban traffic	1018	R	17
PT0097A	Custóias	suburban background	1021	T	33
PT0100A	Vila Nova da Telha	suburban background	1031	R	33
PT0103A	Leça do Balio	suburban background	1034	T	25
PT0106A	Paio Pires aut.	urban background	3063	T	25
PT0109A	Alfragide/Amadora	urban background	3082	U	50
PT0111A	Reboleira	urban background	3084	R	25
SK0001A	Mamateyova	urban background	111	R	50
SK0015A	Strojarska	urban background	312	T	50

Appendix C4: Stations false classified (0% true)

ESC	STATION_NAME	RST	LSC	CST	(%)	
AT0001A	Wien Hohe Warte - Zentralanstalt für Meteor&Geodyn	suburban background	ZA	R	0	
AT0002A	Knittelfeld	urban background	115	T	0	
AT0008A	Wien Liesing	suburban background	LIES	T	0	
AT0020A	Wien Schafbergbad	suburban background	SCHA	R	0	
AT0031A	Linz Kleinmünchen	suburban background	S412	T	0	
AT0048A	Tulln	urban traffic	1901	U/R	0	**
AT0050A	Voitsberg Krems	suburban background	104	T	0	
AT0055A	Köflach	urban background	106	T	0	
AT0061A	Leoben Göß	urban background	141	T	0	
AT0065A	Mödling	urban background	1401	R	0	
AT0072A	Gänserndorf	urban background	401	R	0	
AT0074A	Wien Lobau - Grundwasserwerk	suburban background	LOB	R	0	
AT0076A	Hainburg	rural traffic	301	R	0	
AT0077A	Korneuburg	urban background	901	R	0	
AT0078A	Ternitz	urban background	1502	R	0	
AT0085A	Graz Süd	suburban background	140	T	0	
AT0087A	Graz West	suburban background	139	T	0	
AT0090A	Lustenau Wiesenrain	urban background	706	R	0	
AT0098A	Wien Hermannskogel	suburban background	JAEG	R	0	
AT0107A	Klosterneuburg	urban background	601	R	0	
AT0109A	Graz Mitte	urban background	160	T	0	
AT0113A	Graz Südwest	suburban background	162	T	0	
AT0125A	Dornbirn Stadtstraße	urban background	807	T	0	
AT0135A	Bad Ischl	suburban background	S125	R	0	
AT0143A	Bleiburg Koschatstrasse	rural background	VK26	T	0	
AT0144A	Ferlach	rural background	KL17	T	0	
AT0152A	Bad Vöslau - Gainfarn	suburban background	201	R	0	
AT0162A	Liezen	rural background	182	T	0	
AT0187A	Kittsee	suburban background	3	R	0	
AT0192A	Voitsberg Mühlgasse	suburban background	107	T	0	
AT0194A	Biedermannsdorf	rural background	1406	T	0	
AT0203A	Linz Freinberg	suburban background	s425	R	0	
BE0033R	44N012 - MOERKERKE	suburban background	44N012	R	0	
BE0034R	44N050 - ST.DENIJS	suburban background	44N050	R	0	
BE0184A	41R001 - MOLENBEEK	urban background	41R001	T	0	
BE0185A	41N043 - HAREN	suburban background	41N043	T	0	
BE0302A	43N132 - HABAY-LA-N.	suburban background	43N132	R	0	
BE0372A	41WOL1 - WOL.ST.L.	suburban traffic	41WOL1	U	0	
CZ0008A	Pha1-nam. Republiky	urban traffic	771	U	0	
CZ0012A	Pha10-Pocernicka	urban traffic	804	U	0	
CZ0022A	Usti n.L.-Kockov	suburban background	1011	R	0	
CZ0034A	Sokolov	suburban background	1032	R	0	
CZ0036A	Karvina	urban background	1069	R	0	
CZ0037A	Ostrava-Radvanice	suburban background	1063	R	0	
CZ0042A	Brno-Turany	suburban background	1130	R	0	
CZ0044A	Frydek-Mistek	urban background	1067	R	0	
CZ0046A	Trinec-Kosmos	urban background	1188	R	0	
CZ0048A	Plzen-Doubravka	suburban background	1105	R	0	
CZ0050A	Opava-Katerinky	suburban background	1186	R	0	
CZ0053A	Olomouc	urban background	1075	R	0	
DE0016R	DERP022:Bad Kreuznach	urban background	14-jan	T	0	
DE0208A	DEHE033:Borken	urban background	1302	R	0	
DE0359A	DERP011:Mainz-Rheinallee	Unknown		T	0	*

DE0467A	DEBY003:Aschaffenburg-Krankenhaus	urban unknown	L6.1	T/U	0	**
DE0484A	DEHE011:Hanau	urban background	H17	T	0	
DE0485A	DEHE018:Raunheim	urban background	H27	T	0	
DE0487A	DEHE022:Wiesbaden-Süd	urban background	H32	T	0	
DE0502A	DEBW004:Eggenstein	urban background	4445	T	0	
DE0510A	DEBY049:Neustadt a.d.Donau-Eining	urban background	L2.6	R	0	
DE0524A	DENI011:Braunschweig/Broitzem	urban background	BGSW	R	0	
DE0525A	DENI036:Nordenham	urban background	NMCC	R	0	
DE0545A	DERP002:Ludwh.-Mitte Neuer M.	urban unknown	DERP002	T	0	*
DE0546A	DERP003:Ludwh.-Mundenheim Gui.	urban background	DERP003	T	0	
DE0562A	DEBY005:Aschaffenburg-Bussardweg	urban background	L6.6	T	0	
DE0571A	DERP010:Mainz-Parcusstraße	Unknown	35830	T	0	*
DE0572A	DEHE005:Frankfurt-Höchst	urban background	606	T	0	
DE0573A	DEHE010:Gießen	urban background	H15	T	0	
DE0574A	DEHE014:Kassel-Nord	urban background	H19	T	0	
DE0575A	DEHE020:Wetzlar	urban background	1001	T	0	
DE0592A	DEBW015:Heilbronn	urban background	4461	T	0	
DE0596A	DEBY069:Selb	suburban background	L4.4	R/T	0	**
DE0600A	DENI016:Oker-Mitte Bei der Eiche	urban background	OGCC	R	0	
DE0611A	DENW051:Langenfeld	rural background	LANG	U/T	0	
DE0613A	DENW059:Rodenkirchen Köln-	urban background	RODE	T	0	
DE0621A	DEBW013:Stuttgart Bad Cannstatt	urban background	4452	T	0	
DE0622A	DEBW014:Stuttgart-Hafen	urban background	4451	T	0	
DE0623A	DEBW012:Stuttgart-Mitte	urban background	4447	T	0	
DE0624A	DEBW011:Stuttgart-Zuffenhausen	urban background	4449	T	0	
DE0637A	DEBW025:Esslingen	urban background	4446	T	0	
DE0638A	DEBW028:Göppingen	urban background	4455	T	0	
DE0645A	DEBW020:Rastatt	urban background	4456	T	0	
DE0654A	DESL015:Völklingen-Heidstock	urban traffic	HDST	U/R	0	
DE0659A	DESL011:Saarbrücken-Eschberg	urban background	S01	R	0	
DE0669A	DESH005:Lübeck-Schönböcken	urban background	6	R	0	
DE0674A	DENW064:Eifel	rural background	EIFE	U	0	
DE0682A	DESH006:Schleswig	urban background	SCHLESWIG	R	0	
DE0689A	DEHE008:Frankfurt-Ost	urban background	H10	T	0	
DE0690A	DEBY082:GAP-Wankgipfel	rural background	L12.2	U	0	
DE0692A	DENI031:Wilhelmshaven/Voslapp	urban background	WNCC	R	0	
DE0705A	DEHH015:Veddel	urban unknown	20VE	T	0	*
DE0706A	DEHH020:Kirchdorf	urban traffic	26KI	U	0	
DE0709A	DEHH014:Steinwerder	urban unknown	19SW	U	0	*
DE0716A	DEHH016:Billbrook	urban unknown	21BI	U	0	*
DE0717A	DEHH021:Tatenberg	urban background	27TA	R	0	
DE0735A	DENW065:Rothaargebirge	rural background	ROTH	U	0	
DE0740A	DERP019:Kaiserslautern Rathausplatz	urban background	DERP019	T	0	
DE0741A	DERP020:Trier Ostallee	urban background	DERP020	T	0	
DE0745A	DEBW032:Pforzheim-Mitte	urban background	4458	T	0	
DE0749A	DEBW034:Waiblingen	urban background	4442	T	0	
DE0755A	DENI028:Duderstadt	urban background	DUCC	R	0	
DE0756A	DENW001:Werne	urban unknown	WERN	U/T	0	*
DE0762A	DENW013:Schwerte	urban background	SCHW	T	0	
DE0765A	DEBE018:Schöneberg-Belziger Straße	Unknown	MC18	U/R	0	*
DE0770A	DENW002:Datteln	urban traffic	DATT	U	0	
DE0799A	DEBW037:Freudenstadt	urban background	4460	R	0	
DE0801A	DEBE005:Tegel-Buddestraße	Unknown	MC5	U/R	0	*
DE0810A	DENI042:Göttingen	urban background	GNCC	R	0	
DE0814A	DENW066:Nettetal	rural background	NETT	U/T	0	
DE0816A	DERP021:Neuwied Hafenstraße	urban background	36130	T	0	
DE0818A	DEHE029:Dillenburg	urban background	H5	T	0	
DE0819A	DEHE031:Fulda	urban background	H14	T	0	
DE0821A	DESL004:Diefflen(bach)	unknown urban	DIEF	U/R	0	*
DE0832A	DENI041:Rinteln	urban background	RNCC	R	0	
DE0834A	DENI043:Lingen	urban background	LNCC	R	0	
DE0857A	DERP012:Mainz-Stadthausstraße	Unknown	35832	T	0	*

DE0872A	DEBE026:Lichterfelde-Wupperstr.	Unknown	MC26	R/U	0	*
DE0878A	DEBE027:Marienfelde-Schichauweg	urban background	27	R	0	
DE0890A	DENI048:Hannover/Linden Verkehr	unknown	DE226	T	0	*
DE0894A	DEBE015:Tiergarten-Bachstraße	Unknown	MC15	U/T	0	*
DE0895A	DEBW016:Neckarsulm	urban background	39255	T	0	
DE0899A	DEBW040:Waldshut	urban background	39254	T	0	
DE0900A	DEBW042:Bernhausen	urban background	39253	T	0	
DE0904A	DESN028:Leipzig-Süd	urban background	LECC	R	0	
DE0907A	DEHE034:Nidda	urban background	H25	R	0	
DE0910A	DEST015:Greppin	suburban traffic	GRNN	R	0	
DE0923A	DEBW044:Mosbach	urban background	42210	T	0	
DE0930A	DEBW049:Emmendingen	urban background	42208	T	0	
DE0941A	DEBW050:Heidenheim	urban background	42866	T	0	
DE0952A	DEBW047:Calw	urban background	42861	T	0	
DE0961A	DEBE045:Pankow-Blankenfelder	Unknown	MC72	T	0	*
DE0962A	DEHE036:Frankfurt-Höhenstraße	Unknown		T	0	*
DE0965A	DEST028:Zeitz	urban traffic	ZZCC	R	0	
DE0967A	DETH024:Ilmenau	unknown traffic	DETH024	U/R	0	**
DE0969A	DETH029:Sonneberg	Unknown	DETH029	U	0	*
DE0989A	DENI053:Cloppenburg	urban background	CGCC	R	0	
DE0990A	DEBB026:Spremberg-Süd	urban background	217	T/R	0	
DE0991A	DETH020:Erfurt Krämpferstr.	unknown traffic	DETH020	U	0	
DE1007A	DETH018:Nordhausen	unknown traffic	DETH018	U	0	
DE1022A	DEMV002:Rostock-Holbeinpl.	urban traffic	DEMV002	U	0	
DE1024A	DERP024:Koblenz F.-Ebert-Ring	urban background	DERP024	T	0	
DE1025A	DEST031:Bad Dürrenberg	suburban traffic	DGCW	R	0	
DE1027A	DEST030:Dessau	suburban traffic	DECN	R	0	
DE1028A	DEST032:Genthin	urban background	GNCC	R	0	
DE1033A	DEST025:Merseburg	urban background		R	0	
DE1047A	DEBY079:Bad Reichenhall - Nonn	urban background	L12.5	R	0	
DE1048A	DEBY088:Trostberg	urban background	L1.14	T	0	
DE1055A	DEBB010:Guben	urban background	210	R	0	
DE1062A	DEBB006:Cottbus-Süd	urban background		R	0	
DE1079A	DEST074:Halle/Südwest	urban background	HESW	R	0	
DE1081A	DEST072:Halle/Ost	suburban traffic	HEOO	R	0	
DE1084A	DEST076:Magdeburg/Verkehr	urban background	MGVC	T	0	
DE1085A	DEST068:Pouch	suburban traffic	PHNN	R	0	
DE1090A	DEBB028:Wittenberge	urban background	134	R	0	
DE1097A	DEBB030:Premnitz	urban background	124	R	0	
DE1110A	DETH030:Zella-Mehlis	Unknown	DETH030	U	0	*
DE1127A	DEST073:Dessau/Verkehr	urban background	DEVC	T	0	
DE1128A	DEST069:Salzwedel	suburban traffic	SWOO	R	0	
DE1137A	DEBW080:Karlsruhe Straße	unknown		T	100	*
DE1141A	DEBW098:Mannheim-Straße	urban background	55007	T	0	
DE1150A	DESN001:Annaberg-Buchholz	urban background	DESN 001	T	0	
DE1154A	DESN005:Böhlen	urban background	DESN 005	R	0	
DE1161A	DESN050:Hoyerswerda	urban background	DESN 050	R	0	
DE1203A	DEBB043:Luckau	urban background		R	0	
DE1205A	DEBB045:Frankfurt (Oder), Leipziger Str.	Unknown		T	0	*
DE1209A	DEBB049:Brandenburg, Neuendorfer Str.	unknown		T	0	*
DE1226A	DEBE062:B Frohnau, Funkturm (3.5 m)	urban background		R	0	
DE1227A	DEBE066:B Karlshorst-Rheingoldstr./Königswinterstr.	Unknown		U/R	0	*
DE1239A	DEBW096:Ulm-Straße	Unknown		T	0	*
DE1245A	DEBW106:Leonberg-BAB	Unknown		T	0	*
DE1252A	DEHE045:Michelstadt	urban background		T	0	
DE1254A	DEHE048:Lamperthein	rural background		U/T	0	
DE1255A	DEHE049:Kassel-Fünffenster-Str.	Unknown		T	0	*
DE1294A	DENI058:Norderney	urban background		R	0	
DE1300A	DENW078:Ratingen-Tiefenbroich	Unknown		U/T	0	*
DE1309A	DENW097:Wuppertal Fr.-E.-Allee	Unknown		T	0	*

DE1311A	DERP035:Kaiserslautern-Marienplatz	Unknown		T	0	*
DE1312A	DERP036:Trier Kaiserstraße	Unknown		T	0	*
DE1368A	DETH007:Rudolstadt	Unknown		T	0	*
DE1370A	DETH017:Apolda Busbahnhof	Unknown		U/R	0	**
DE1384A	DETH060:Zella-Mehlis	urban background		T	0	
DE	Lubeck-ST.Jurgen	urban background	DESH023	R	0	
DE	Zarrenttin	rural background	DEMV018	U	0	
DE	DERP042:Pirmasens Schaferstr.	unknown		U/T	0	*
DE	DEBB053: Hasenholz	urban background		R	0	
DE	DEST091: Dessau Albrechtsplatz	urban background		T	0	
DK	Husdyragardurinn	urban background		R	0	
DK0045A	Copenhagen/1259	urban background	1259	R	0	
DK0046A	Odense/9159	urban background	9159	R	0	
EE0014A	Majaka	urban background		R	0	
EE0018A	Õismäe	urban background	EE03	R	0	
ES0007R	VIZNAR	unknown background	18189999	R	0	
ES0009R	CAMPISÁBALOS	unknown background	19061999	R	0	
ES0296A	SA POBLA	rural background	7044001	T	0	
ES0329A	FOZ CALANDA	rural background	44107001	T	0	
ES0356A	HOSPITAL	rural traffic	24110003	R	0	
ES0812A	TORREVELILLA	rural background	44230001	U/T	0	
ES0813A	LA CEROLLERA	rural background	44077001	U	0	
ES0822A	LA ORDEN	urban traffic	21041008	U	0	
ES0905A	GETXO	suburban traffic	48044003	U	0	
ES0918A	HOSPITAL MANUEL LOIS	urban traffic	21041013	R	0	
ES0957A	Q3-SANT JORDI	rural traffic	8268004	U/R	0	
ES1019A	E4-MATARO	urban traffic	8121007	U	0	
ES1033A	SÁSTAGO	rural background	50240001	T	0	
ES1034A	NUCLEAR	rural background	50101002	T	0	
ES1071A	ALGECIRAS	urban traffic	11004003	R/U	0	
ES1094A	SAN LUIS	suburban traffic	7032001	R/U	0	
ES1120A	A7-BONAVISTA	urban traffic	43148003	R/U	0	
ES1129A	CHIPRANA	rural background	50092001	U/T	0	
ES1130A	ESCATRÓN	unknown background	50101001	T	0	
ES1164A	VENTA DE BAÑOS	rural traffic	34023002	U	0	
ES1176A	ROSALEDA	urban traffic	3009002	U	0	
ES1177A	OLIVER	suburban traffic	3009003	U	0	
ES1276A	LINARES	urban traffic	23055001	U	0	
ES1279A	CAMPO DE FÚTBOL	suburban background	13071015	R/T	0	
ES1280A	CAMPO DE LA JUVENTUD	suburban traffic	34120007	U	0	
ES1286A	JARDINES EDUARDO BARRÓN	urban traffic	49275001	U	0	
ES1296A	ESTACIÓN DE AUTOBUSES DE ÁVILA	urban traffic	5019001	U/R	0	
ES1297A	LAS HERAS	rural background	24134006	U	0	
ES1339A	AW-VILANOVA I LA GELTRÚ	urban traffic	8307012	U	0	
ES1340A	POZO DULCE	suburban traffic	21041016	R/U	0	
ES1353A	SAMA I	urban background	33031032	T	0	
ES1368A	REMOTA 1	rural background	44176002	U	0	
ES1369A	REMOTA 2	rural background	44155003	T	0	
ES1370A	MOTRIL	urban traffic	18140001	R/U	0	
ES1371A	MIRANDA DE EBRO 3	suburban traffic	9219003	R/U	0	
ES1386A	PENYETA	suburban traffic	12040008	R	0	
ES1387A	ONDA	suburban background	12084003	T	0	
ES1400A	BUJARALOZ	rural background	50059001	U	0	
ES1405A	VALLIBONA	rural background	12127002	U	0	
ES1419A	CAMARENA	rural background	44054001	U/T	0	
ES1433A	BLIMEA	suburban traffic	33060003	U	0	
ES1437A	CORATXAR	rural background	12093004	U	0	
ES1441A	MORELLA	rural background	12080007	U	0	
ES1445A	GRAU	rural background	12040010	U/T	0	
ES1451A	NÉSTOR ÁLAMO	suburban traffic	35016011	U	0	
ES1489A	VALDEREJO	rural background	1055001	T	0	

ES1530A	REINOSA	suburban background	39059001	R	0	
ES1535A	ALBACETE	suburban background	2003001	T	0	
ES1537A	GUADALAJARA	urban background	19130001	T	0	
ES1542A	SANT JORDI	rural background	12099001	U	0	
ES1543A	ZORITA	rural background	12141002	U	0	
ES1560A	GRANADA - NORTE	Unknown	18087007	T	0	*
ES1563A	ALCALÁ DE HENARES	Unknown	28005002	T	0	*
ES1564A	ALCOBENDAS	Unknown	28006004	U/T	0	*
ES1565A	FUENLABRADA	Unknown	28058004	U/T	0	*
ES1566A	GETAFE	Unknown	28065012	T	0	*
ES1567A	LEGANÉS	Unknown	28074007	T	0	*
ES1568A	MÓSTOLES	Unknown	28092005	U/T	0	*
ES1573A	MERCADO CENTRAL	Unknown	35016012	U	0	*
ES1578A	CASTRO URDALES	urban traffic	39020001	R	0	
ES1584A	NAZARET	Unknown	46250038	T	0	*
ES1593A	SAN FERNANDO	Unknown	11031001	U/T	0	*
ES1594A	LANTARÓN	Unknown	1902001	T	0	*
ES1595A	SANGRONIZ	Unknown	48904002	U	0	*
ES1598A	ZALLA	Unknown	48096001	R/T	0	*
ES1599A	PAGOETA	Unknown	20016001	R	0	*
ES1604A	CASTILLO DE BELLVER	Unknown	7040003	R	0	*
ES1609A	ELX-2	Unknown	3065005	U/T	0	*
ES1617A	ALZIRA	Unknown	46017002	R	0	*
GB0030A	Bridge Place	Unknown	BRI	U	0	*
GB0622A	LONDON WANDSWORTH	urban background	WA2	T	0	
GB0642A	LONDON HILLINGDON	suburban background	HIL	T	0	
GB0672A	LONDON LEWISHAM	urban background	LW1	T	0	
GB0673A	DERRY	urban background	DERY	R	0	
GB0679A	REDCAR	suburban background	REDC	R	0	
GB0689A	BRADFORD CENTRE	urban background	BRAD	T	0	
GB0730A	WIRRAL TRANMERE	urban background	TRAN	R	0	
GB0739A	COVENTRY MEMORIAL PARK	urban background	COV3	R	0	
GB0741A	BOURNEMOUTH	urban background	BORN	R	0	
GB0744A	CWMBRAN	urban background	CWMB	R	0	
GR0039A	Agia PARASKEVI	suburban background	115	R	0	
GR0043A	ZOGRAFOU	suburban background	119	R	0	
IE0028A	Rathmines	urban traffic	DC15	R	0	
IE0098A	Wood Quay	urban traffic	DC21	U	0	
IE0107A	Anglesea Street	urban traffic		U	0	
IT0448A	VENEZIA SACCA FISOLA	urban background	502717	T	0	
IT0466A	JUVARA	urban background	301518	T	0	
IT0476A	LEGNANO S.MAGNO	urban background	301520	T	0	
IT0506A	VIPITENO	suburban background	402111	T	0	
IT0554A	TO_1272_TO_LINGOTTO	urban background	100106	T	0	
IT0620A	SCALA GRECA	urban traffic	1908910	R	0	
IT0732A	VIA VIDOLETTI	suburban background	301213	R	0	
IT0842A	CORTE DEI CORTESI	rural background	301903	U/T	0	
IT0905A	CHIAVENNA	rural background	301402	U/T	0	**
IT0952A	Castel di Guido	rural background	40	U	0	
IT0953A	Villa Ada	urban background	39	T	0	
IT0957A	Tenuta del Cavaliere	rural background	41	T	0	
IT0957A	TENUTA DEL CAVALIERE	rural background	1205817	T	0	
IT0990A	Segni	suburban background	38	T	0	
IT1017A	P.CO LAMBRO	suburban background	301530	T	0	
IT1122A	TO_1120_GRUGLIASCO	urban background	100123	T	0	
IT1174A	MOTTA VISCONTI	rural background	301529	U/T	0	**
IT1179A	GHERARDI	rural background	803805	U	0	

IT1184A	Latina Scalo	suburban unknown	51	T	0
IT1188A	BOSCO FONTANA	rural background	302001	U/T	0
IT1247A	BI_2012_BIELLA1	urban background	109602	R	0
IT1292A	LACCHIARELLA	rural background	301545	U/T	0
IT1381A	CENSS6	urban traffic	2009019	R	0
IT1440A	BELVEDERE	urban traffic	1908902	R	0
LT0029A	Vilnius 21A	urban background		T	0
PL0029A	Ustron	urban background	Ustron	T	0
PL0031A	KoninPL	suburban background	KoninPL	R	0
PL0040A	Chorzow	urban background	Chorzow	R	0
PL0047A	GdanskWy3	urban background	AM-3	R	0
PL0048A	GdyniaPo4	urban background	AM-4	R	0
PL0049A	GdanskOs5	urban background	AM-5	R	0
PL0050A	SopotBP6	urban background	AM-6	R	0
PL0052A	GdanskLe8	urban background	AM-8	R	0
PT0031A	Estarreja/Avanca	rural background	2002	T	0
PT0098A	Baguim	suburban background	1022	T	0
PT0105A	Vermoim	urban background	1024	T	0
PT0108A	Câmara Municipal	urban traffic	3028	R	0
PT0110A	Laranjeiro	urban traffic	3083	U/R	0
PT0112A	Loures	urban background	3085	T	0
SE0001A	Rådhuset-MAL	urban background		R	0
SE0004A	Femman - GBG	urban background		R	0
SK0004A	Kamenne Namestie	urban background	114	R	0
SK0014A	Sturova	urban traffic	311	U	0
SK0016A	Podhradova	suburban background	313	T/R	0

* Stations with unknown classification were automatically labelled false

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AT0048A	U 83% and R 17%
DE0467A	T 83% and U 17%
DE0596A	R 75% and T 25%
DE1370A	U 75% and R 25%
DE0975A	U 75% and R 25%
IT0905A	U 75% and T 25%
IT1174A	T 75% and U 25%