The MS deals with the PM2.5-fraction aerosol samples collected by a streaker in a roadside site and urban background site in Barcelona for 528 h. The samples were measured by PIXE analysis for concentrations of 17 elements with a time resolution of 1 h. Evaluation and statistical treatment of the analytical data were performed by descriptive statistics and positive matrix factorization (PMF).

The topic and objectives of the MS are definitely timely and are of interest for the international research community. The MS represents a useful contribution to the growing literature on the emission sources in large cities. The experimental and evaluation methods utilized were selected well for the purpose of the study. The work is part of a more comprehensive research program. Unfortunately, the MS is written and elaborated in a sloppy way which is not at all acceptable for a high quality journal. It should be improved substantially in many ways before it is considered for publication in the ACP. The present reviewer will focus less attention to the PMF results and their conclusions because 1) I am not a real expert in the field, and 2) it seems to me that they are presented in a loose and incomplete way which detracts from a deeper understanding.

Page 20137, line 11, and analogously lines 12 and 19
Abbreviation PM stands for particulate matter, which is a set of aerosol particles. Expression "PM_2.5 (PM<2.5 microm, fine)" has no sense, and it should be replaced by e.g. PM_2.5 (d<2.5 microm, fine particles).

Page 20137, lines 21 and 22
Expressions PM_0-1 and PM_0-2.5 are not acceptable because the diameter of the particles does not start at 0 microm but at 1-2 nm. They should be replaced by e.g. PM_1 and PM_2.5, respectively.

Page 20137, line 18
The formulation "the size cut at PM_2.5" should be replaced by "the size cut at 2.5 microm".

Page 20137, line 25 – page 20138, line 3
The authors may want to discuss briefly that the time resolution selected is also limited by the amount of aerosol particles to be obtained during the collection and which is necessary for the

subsequent chemical analysis, so with the air flow rate of the sampler and the determination/detection limit of the analytical method to be applied.

Page 20138, lines 13, 16, 19 and 21
Abbreviations SAPUSS, RS, UB, PMF, WMB are not at all explained or are not explained when they are used at first.

Page 20140, line 4
There is no “fine mode of an aerosol”, and the authors can use “fine size fraction of aerosol particles” instead.

Page 20140, section 2.2 Instrumentation
No mention was made on the off-line sampling and analytical methods although data from them are later included in the evaluations. Sentences from page 20142, lines 10-16 belong to section Instrumentation and should be shifted there.

Page 20141, line 2
There were 18 elements listed on page 20140 line 20 but 17 elements were used in the PMF calculations. Explain the difference.

Page 20142, lines 6-7
Give the standard deviation of the mean PM mass values. The authors show later that the distribution of the atmospheric concentrations is a lognormal function (page 20145, lines 10-16), and, therefore, the medians would represent the data sets better. Adopt the values in this sense.

Page 20143, section 3.1.2
One can only wonder how the diff RS-UB (%) was determined to be a number or a comment “not sign.” More information is required to evaluate its relevance.

Page 20143, line 10
Replace organic carbon with organic matter.

Page 20143, line 12 and 18

Adjective “fine” is redundant because the authors only measured fine size fraction. The concentration ratio Mg/Al probably concerns the mean ratio.

Page 20143, line 21
It is not clear which episode the authors refer to.

Page 20143, line 26
It is wondered if the authors really meant soil urban dust. More explanation is needed.

Page 20144-20145 (section 3.1.2) and/or 20158 (section 4.2.3)
The present reviewer misses a clear discussion that the non-exhaust vehicle emissions also include Sb (from break wear) and Zn (from tire wear) which are associated with the coarse mode (together with Cu, Ba and Fe). Major amounts of this mode do not belong to the PM2.5 size fraction investigated in the present MS but are linked to PM_2.5-10 (coarse) size fraction.

Page 20146, lines 8-9
Effects of the planetary boundary layer mixing height are missing from the discussion. They should be adopted.

Page 20148, lines 11-16
Explain briefly why Cu and Pb are associated with the biomass burning profile.

Page 20154, line 8
Change “inorganic elements” to “elements”.

Page 20156, line 9
There is no Fig. 8; correct the number.

Page 20156, line 29
It is unusual to write “rain concentration”. Replace with an appropriate expression.

Page 20157, line 12 and some other places in the text
Chloride is ion, while PIXE measures chlorine. Correct the expression.

Page 20158, line 23
The authors may want to replace “atmospheric pollutants” with “aerosol particles” because the former expression has too broad meaning here.

Page 20159, line 14
Replace South Europe with Southern Europe.

Page 20173, Fig. 1
The workdays and holidays should be indicated in the Figure, and this difference should be part of the interpretation as well.

Page 20174, Fig. 2 and page 20177 Fig. 5a
Square layout for correlation-type figures is strongly suggested.

Page 20175, Fig. 3
It is thought that the figures represent mean diurnal variations. Change the figure caption accordingly.

The MS is very difficult to read in detail. It should be shortened and clarified. Examples are: page 20139 lines 10-11, lines 19-23, page 20145, lines 10-16, and pages 20155 and 20156 which contain many redundant repetitions.

There are many grammatical and typing errors which should also be corrected. Some examples are:
page 20138, line 29: is given in describing,
page 20142, line 25- page 20143, line 1: filters based technique,
page 20144, lines 27-28: power plant generators in the Barcelona province are natural gas base.