Appendix A. Air mass origins during MEGAPOLI

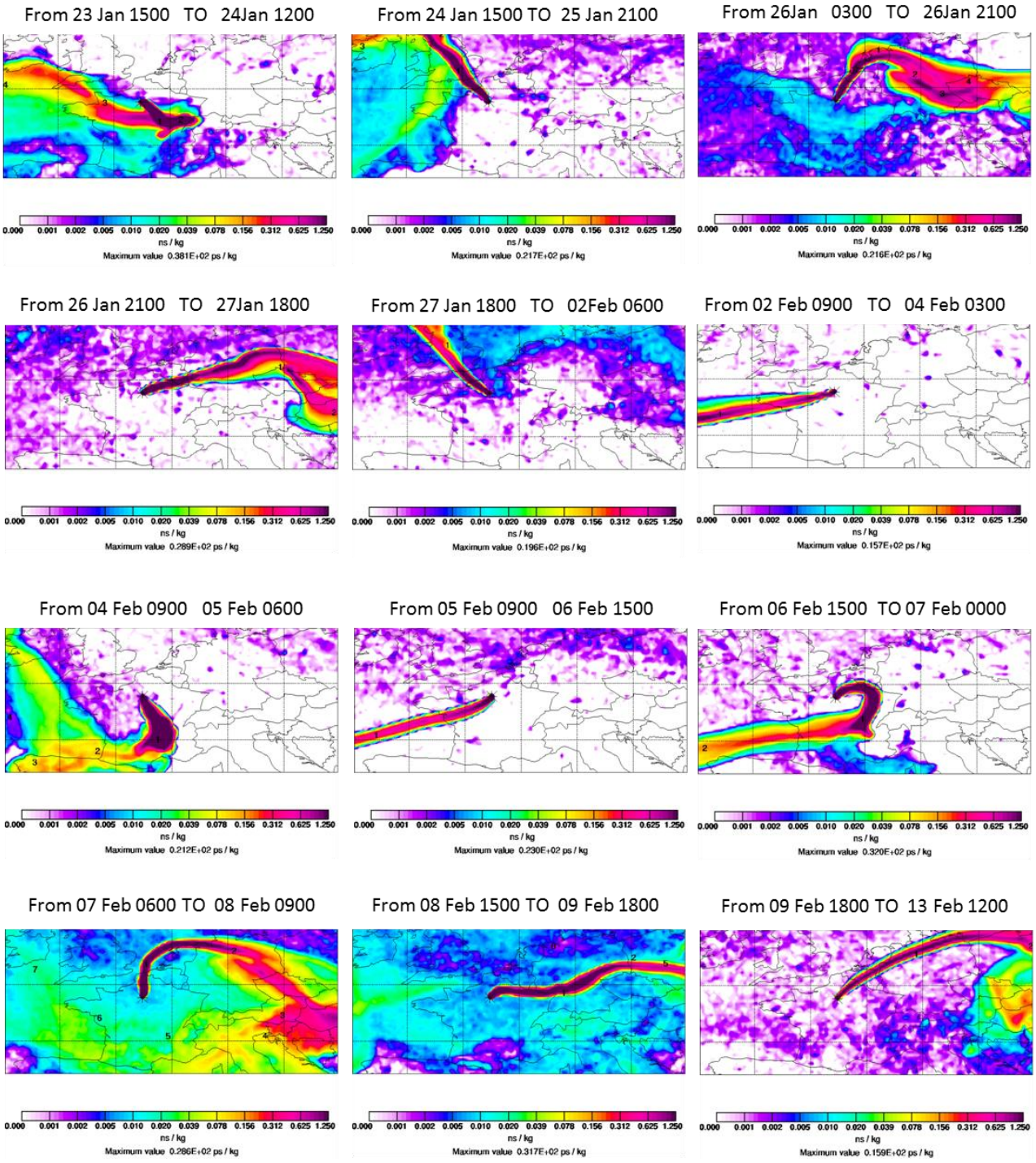

Figure A1: The 20 days backward trajectories of the air masses reaching Paris as calculated by Flexpart. The plots represent one example characterising the announced interval above each .

OH reactivity measurements were made from the 23rd of January until the 13th of February. During this time, a variety of air masses passed over Paris and its surroundings. Figure A1

synthesises all these air masses, their origins in the order in which they succeeded, as represented by the 20 days backtrajectories calculated with the FLEXPART model. Above each plot, the interval on which the air mass was observed is given. 12 different types of air masses have been observed, originating from different parts of the continent or the Atlantic Ocean. At the beginning of the campaign, from the 23rd of January and for one day, the air masses originated from the central and eastern part of France. The next day they came from the northwest side of France passing first over Great Britain. From the 26th until the 27th in the evening, the air masses arriving over Paris has crossed the northern part of the European continent, thereafter switching again for air masses passing over Great Britain. These later air masses persisted from the 27th of January until the 2nd of February. From this moment and for two days, fresh and clean air masses coming from over the Atlantic Ocean area were experienced in Paris. The same conditions have been noted again for one day, from the early morning on the 5th of February until 12:00 next day. Air masses coming from central France were also noted on two other occasions: from the 4th of February, 09:00, to the 5th of February, 06:00, and from the 6th (15:00) to the 7th of February (mid-night). Finally, air masses originating from the northern part of France that have previously passed over the northern or north-eastern part of the continent. These were observed from the 7th of February and until the end of the campaign, the 13th of February (see the last 3 plots of Fig. A1).

Appendix B. Diurnal variation of gaseous pollutants in Paris

Figure B1 presents the mean daily profiles of the selected gaseous pollutants (CO, NO, NO_2, O_3, the sum of NMHC and the sum of OVOCs) characterizing the Paris atmosphere during the whole campaign.

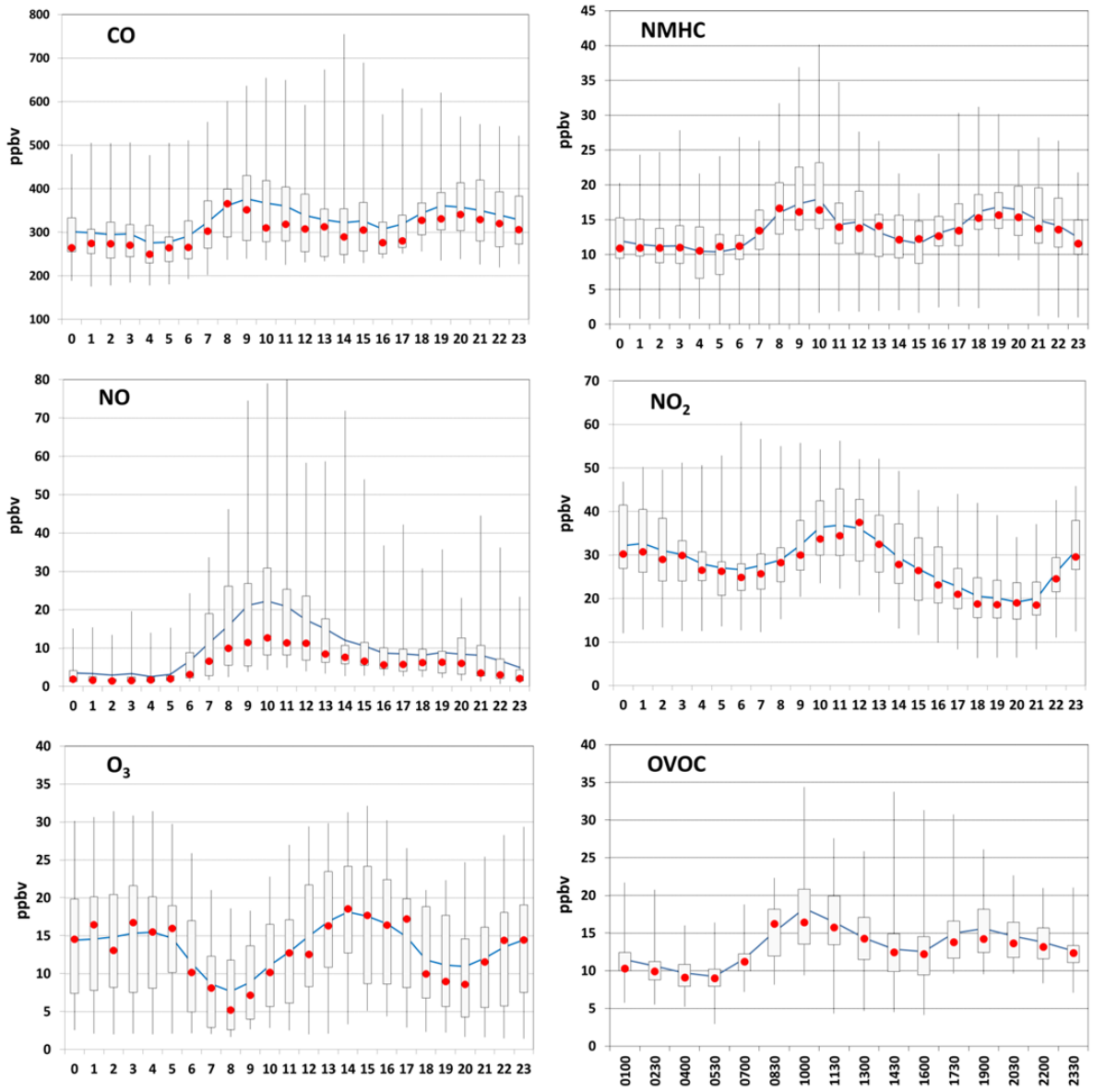

Figure B1. Hourly box plots for CO, O_3,NO, NO_2, NMHC and OVOC for the MEGAPOLI campaign. Red dots represent the median; the blue line represents the mean. The bottom and top of the box are the 25th (Q_1) and the 75th (Q_3) percentile and the ends of the whiskers represent the highest and the lowest data points.

Primary species (CO, NMHC and NO) show the same daily profile, related to their common source, the traffic related emissions (Vardulakis et al, 2002). They show a

minimum value during the night, a first peak in the early morning (~0700 hours), a slight decrease in the afternoon and a second peak starting to form in the late afternoon-early evening (16:00). The first peak corresponds to traffic emissions in a shallow boundary layer, while the second peak corresponds also to traffic emissions but this time in a well-developed boundary layer, so more diluted. The same profile of these primary pollutants was noticed in Paris during spring 2007 by Gros et al. (2011) and similar diurnal variations for primary hydrocarbons have also been reported for several sites inside the city boundaries (de Gouw et al., 2009; Velasco et al., 2007).

NO_2 is mainly of secondary origin and shows maxima in the morning, though slightly later than the primary species (about 10:00). The OVOCs, which have both primary and secondary sources, present the same diurnal cycle as the one of the primary sources. We can therefore conclude that in Paris, the oxygenated species are driven mainly by the primary emission sources.

Ozone was typically titrated by NO in the early morning. The first increase of ozone is observed at about 09:00 and it is due to mixing with free tropospheric air, when the boundary layer develops. It reaches its maximum in the afternoon, when the photochemical production is maximum. Still the maxima registered during MEGAPOLI is relatively low (only 17ppbv) compared to the ozone values registered in other cities around the world (see Table 1). The high volume mixing ratios of NOx, the smaller photochemical activity during the winter season and a high developed boundary layer during the day can explain this low value.

The analysis of the mean diurnal cycles confirms that the main primary emission source in Paris is represented by the traffic source.