

Supplement of Atmos. Chem. Phys., 18, 3335–3362, 2018  
<https://doi.org/10.5194/acp-18-3335-2018-supplement>  
© Author(s) 2018. This work is distributed under  
the Creative Commons Attribution 3.0 License.



*Supplement of*

## **Diurnal, synoptic and seasonal variability of atmospheric CO<sub>2</sub> in the Paris megacity area**

**Irène Xueref-Remy et al.**

*Correspondence to:* Irène Xueref-Remy ([irene.remy-xueref@univ-amu.fr](mailto:irene.remy-xueref@univ-amu.fr))

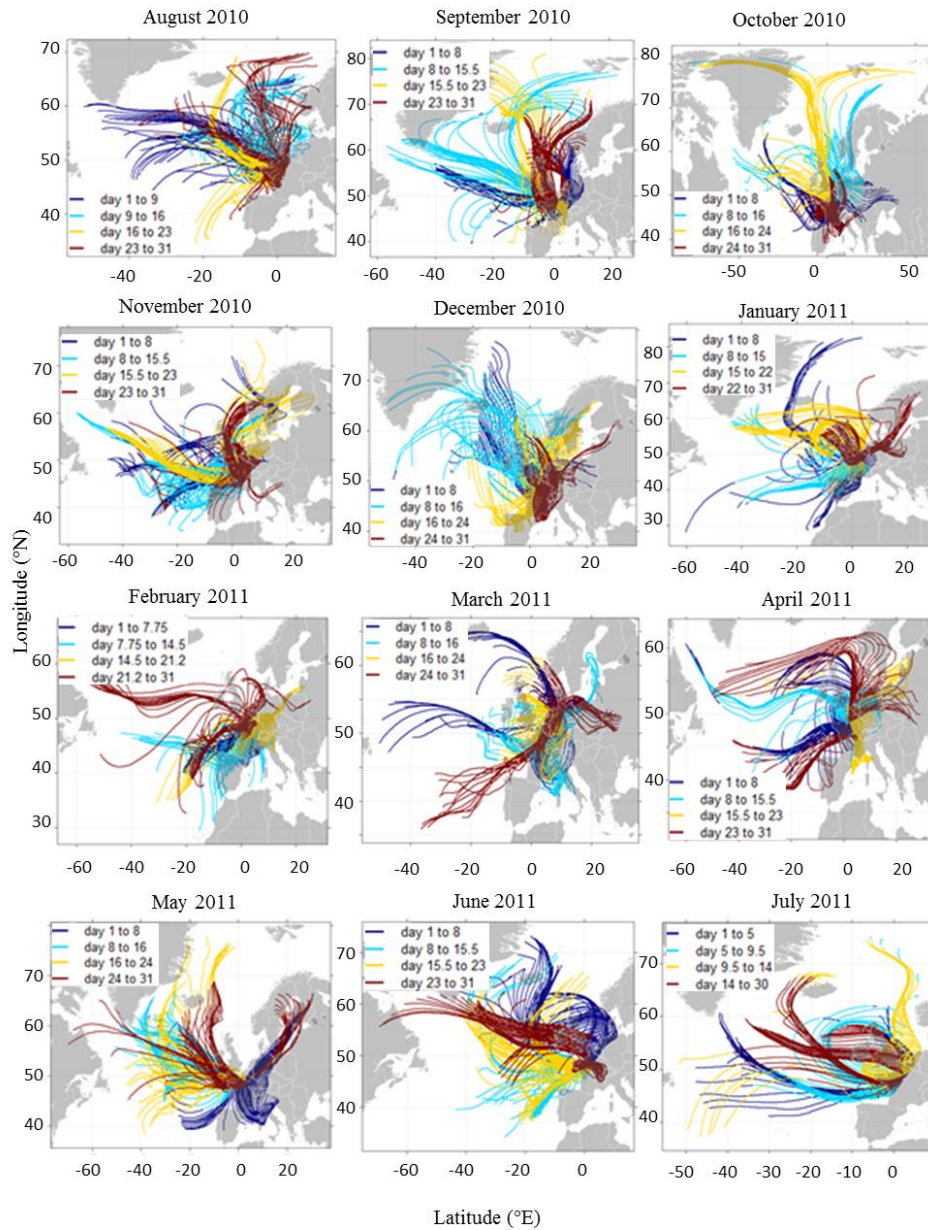
The copyright of individual parts of the supplement might differ from the CC BY 3.0 License.

## **S1 Back trajectories**

- 5 Back trajectories from the HYSPLIT model were calculated for the Paris city using wind fields from the NOAA-NCEP/NCAR reanalysis data archives at a  $2.5^\circ \times 2.5^\circ$  and 6 h resolution (<http://rda.ucar.edu/datasets/ds090.0/>). They were run for 72 h backwards and started at 10 m AGL. They were then plotted and colored by clusters of several days using the OPENAIR (<http://www.openair-project.org/>) backtrajectory plotting functions. These clusters are shown on Fig. S1 for each month of the period of study (8 August 2010 – 13 July 2011).

10

5

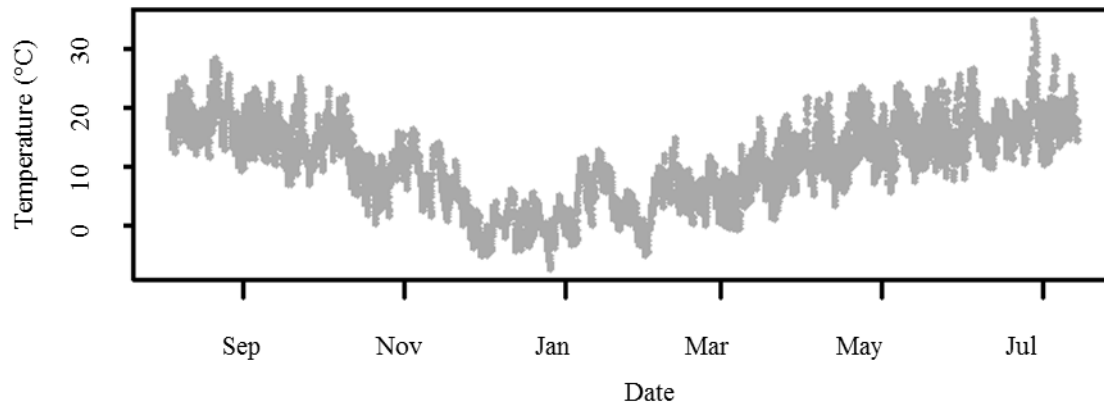


15

Figure S1. Clusters of back trajectories calculated for Paris with the HYSPLIT model for each month of the period of study (8 August 2010–13 July 2011). See text above for technical details.

20

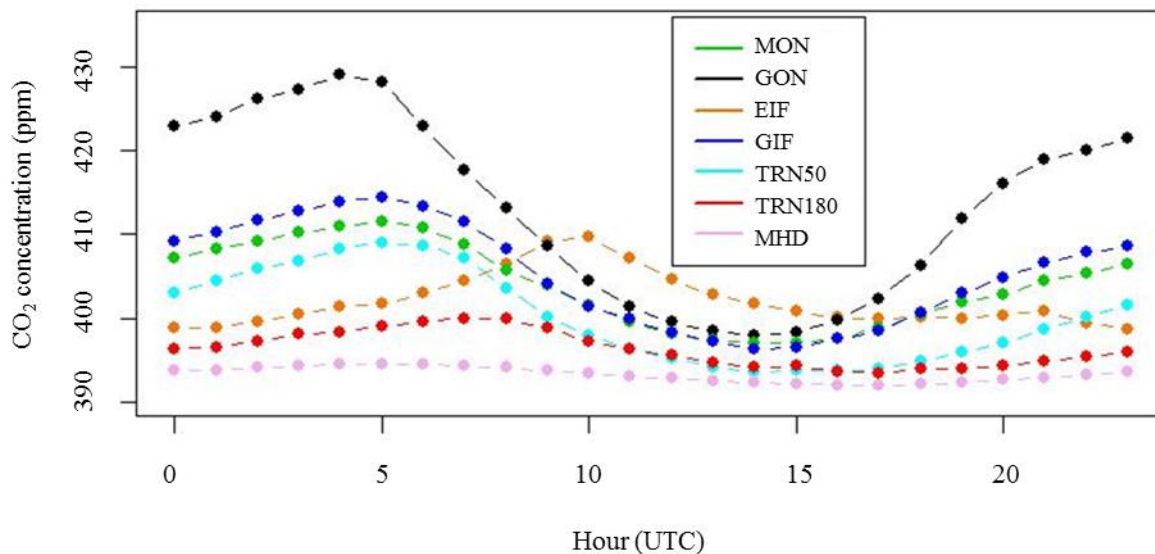
## S2 Temperature



5

Figure S2. Seasonal variation of the temperature at SAC (100 m AGL) close to the GIF SW peri-urban station (hourly averages) on the period of study (8 August 2010 –13 July 2011).

### S3 Mean CO<sub>2</sub> diurnal cycles



5

Figure S3. Mean CO<sub>2</sub> diurnal cycles at the different sites of the Paris regional network and of the remote site of MHD averaged on the whole period of study (8 August 2010–13 July 2011) and computed from hourly CO<sub>2</sub> concentrations. We recall the stations inlet heights (in m AGL) and the site types : MON = 9 m (NE rural site), GON = 4 m (NE peri-urban site), EIF = 317 m (urban site), GIF = 7 m (SW peri-urban site), TRN50 = 50 m (SW rural site), TRN180 = 180 m (SW rural site), MHD = 15 m (remote site).

15

## S4 CO<sub>2</sub> diurnal cycles data

Table S4. Amplitude, variation of the amplitude, minimum and maximum of the CO<sub>2</sub> diurnal cycle over the year and by season at the different sites. All values are given in ppm of CO<sub>2</sub>. The variation of the amplitude is calculated as the mean of the standard deviation on the minimum and maximum concentrations of the corresponding cycle.

	MON	GON	EIF	GIF	TRN50	TRN180	MHD
Annual							
Amplitude	14.9	30.6	11.2	18.2	15.5	6.5	2.6
Variation	12.8	23.4	16.3	12.9	11.1	10.0	6.6
Min	396.6	398.2	398.6	396.3	393.5	393.4	392.0
Max	411.4	428.7	409.8	414.5	409.0	400.0	394.6
Spring							
Amplitude	20.1	43.1	18.9	27.5	20.7	10.3	3.8
Variation	10.1	20.2	15.9	12.2	10.1	8.9	4.0
Min	393.3	395.7	398.5	395.0	392.8	393.0	395.9
Max	413.5	438.8	417.4	422.5	413.5	403.2	399.7
Summer							
Amplitude	21.5	38.0	9.5	24.7	22.8	8.2	3.7
Variation	8.7	21.1	7.1	9.7	9.7	6.0	7.5

Min	385.7	386.0	388.2	386.6	385.2	385.9	387.0
Max	407.3	424.0	397.7	411.2	408.0	394.1	390.6

Autumn

Amplitude	15.3	32.6	13.4	19.2	18.5	8.3	2.8
Variation	10.9	22.5	15.2	11.2	11.2	9.0	6.4
Min	394.8	395.9	396.3	392.9	389.0	388.7	388.2
Max	410.1	428.6	409.7	412.1	407.5	397.0	391.0

Winter

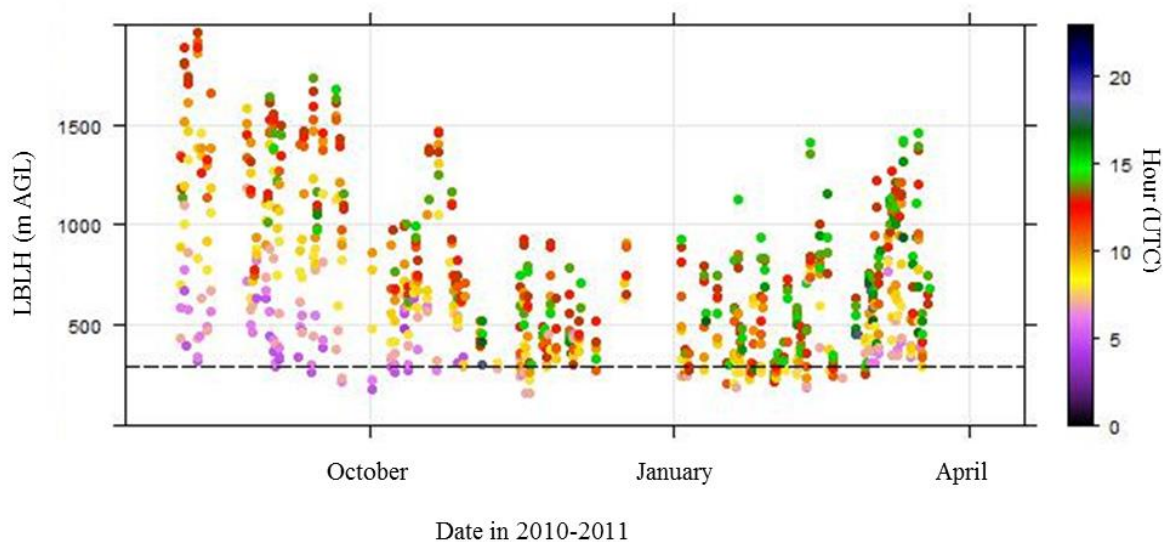
Amplitude	5.7	13.9	8.3	5.9	5.1	2.7	1.4
Variation	12.4	17.0	16.3	12.2	9.4	9.1	3.0
Min	409.5	412.7	407.4	408.5	403.7	402.9	395.7
Max	415.1	426.7	415.7	414.4	408.8	405.6	397.1

---

## S5 Boundary layer observations from August 2010 to March 2011 in Jussieu

Boundary layer height was monitored from August 2010 to March 2011 on the QUALAIR platform in Jussieu. In the cold months, this parameter is often below the Eiffel tower station (EIF) in the early to mid-morning as shown in Fig. S5.

5



10

Figure S5. Hourly means of the lowest estimate of the boundary layer height LBLH (base of the entrainment zone, in m AGL) observed at the QUALAIR station in the center of Paris from 4 August 2010 to 31 March 2011. The color scale indicates the hour of the day, in UTC. Measurements were done only during daytime, between 5 h and 18 h UTC. The dashed line indicates the height of the EIF station (317 m AGL).



## S6 CO<sub>2</sub> wind roses

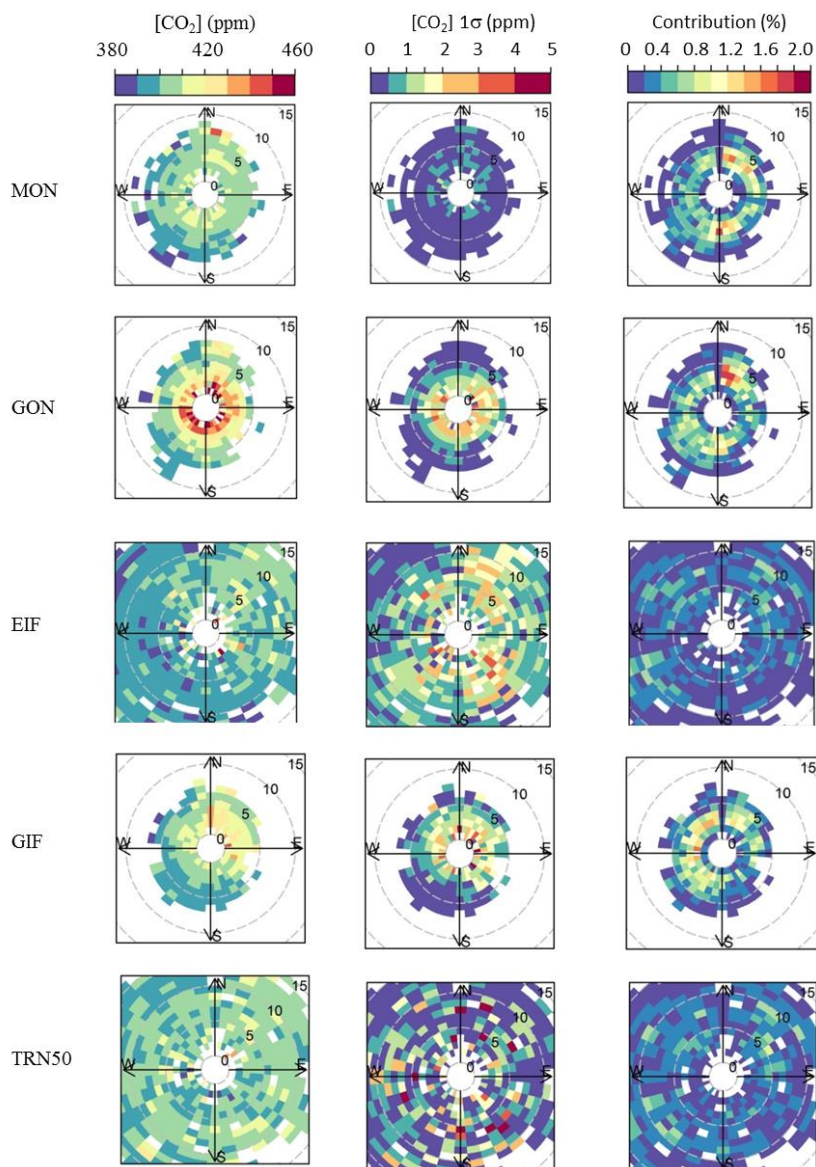
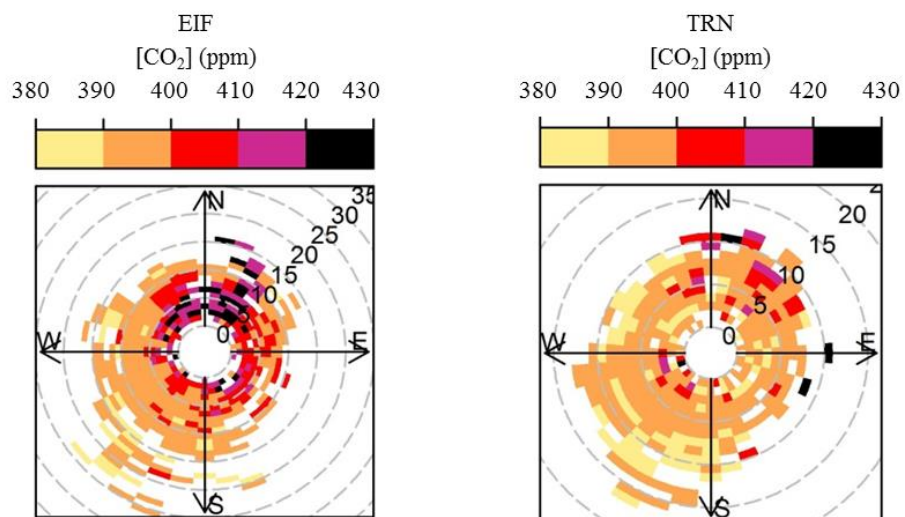
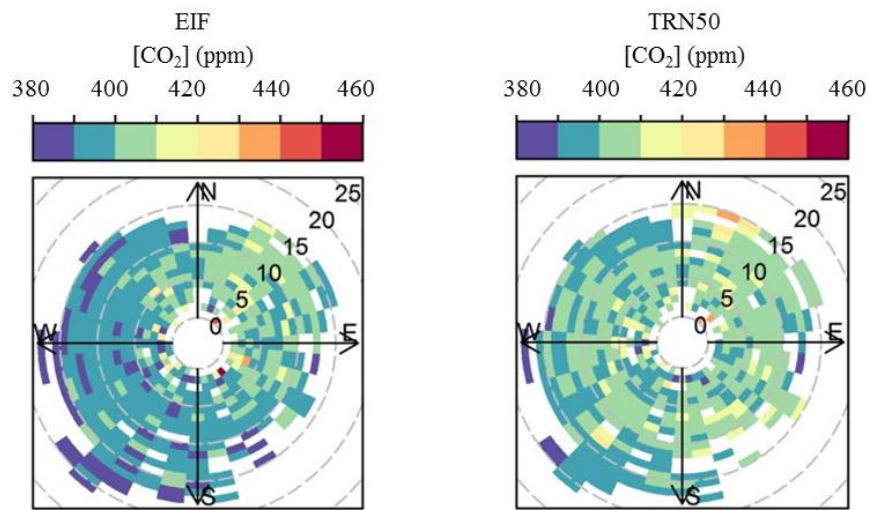


Figure S6.1. CO<sub>2</sub> wind roses during nighttime (22-2h UTC) at the five Paris regional stations on the period of study (8 August 2010-13 July 2011). Here, wind speed is shown only up to 15 m s<sup>-1</sup> on this figure, as on Fig.11. The data have been seasonally adjusted.



5 Figure S6.2. CO<sub>2</sub> wind roses at EIF and TRN50 during daytime on the full range of wind speed encountered at these stations on the period of study (8 August 2010-13 July 2011). The data have been seasonally adjusted.



5

Figure S6.3. CO<sub>2</sub> wind roses at EIF and TRN50 during nighttime on the full range of wind speed encountered at these stations on the period of study (8 August 2010-13 July 2011). The data have been seasonally adjusted.

10