

Article

Emission Characteristics and Potential Exposure Assessment of Aerosols and Ultrafine Particles at Two French Airports

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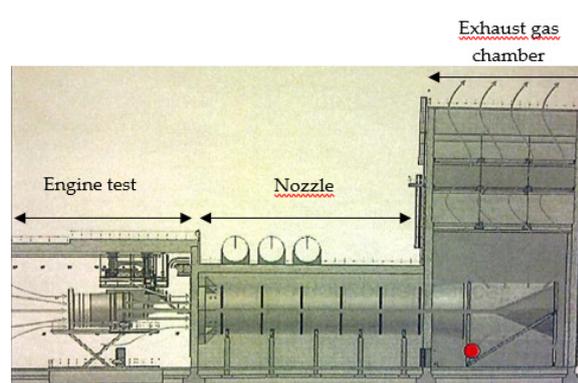
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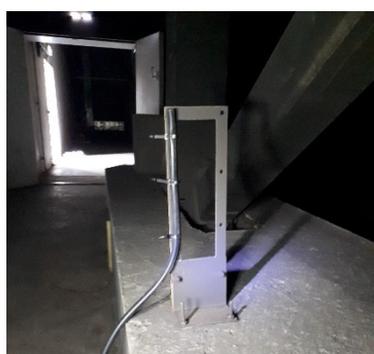
Supplementary Material



(a)



(b)



(c)



(d)

Figure S1. Aircraft engine sampling location with: (a) the engine test area, (b) the schematic view of the Zephyr Air-France test bench with the location of the aerosol sampling point in red, (c) the aerosol sampling probe inside the exhaust chamber and finally (d) the trolley mounted with the aerosol devices.

Table S1. Basic meteorological data, temperature (°C), pressure (hPA), humidity (%), rain (mm en 1 hour), wind speed (10m meters high) and wind direction (on 360°) – recorded at the Roissy meteorological station, from <https://meteo.data.gouv.fr>, (accessed on 19 February 2024, Latitude: 49°00'55" Nord, Longitude: 2°32'04" Est), during the characterisation of the exhaust engines (GE90, CFM56-5B, Pushback tractor 256, Generator set, Gasoline car, Diesel van) and at the Medium-haul aircraft area.

Sources of emission	Temperature (°C)	Pressure (hPA)	Humidity (%)	rain (mm en 1 hour)	wind speed, 10m meters high (m/s)	wind direction (on 360°)
Aircraft engine GE90 (long haul)	9	1008	71	0	NA*	NA*
Aircraft engine CFM56-5B (medium-haul)	17	1005	73	0	NA*	NA*
Pushback tractor 256 (Old generation)	22	1000	56	0	NA*	NA*
Pushback tractor 270 (New generation)						
Generator set	24	997	45	0	NA*	NA*
Gasoline car	24	998	46	0	NA*	NA*
Diesel van						
Medium-haul aircraft area	24	996	49	0	7	170

* The wind data is not applicable as the measurement was taken in the exhaust cone of the engine.



Figure S2. Measurement location at the medium-haul area.

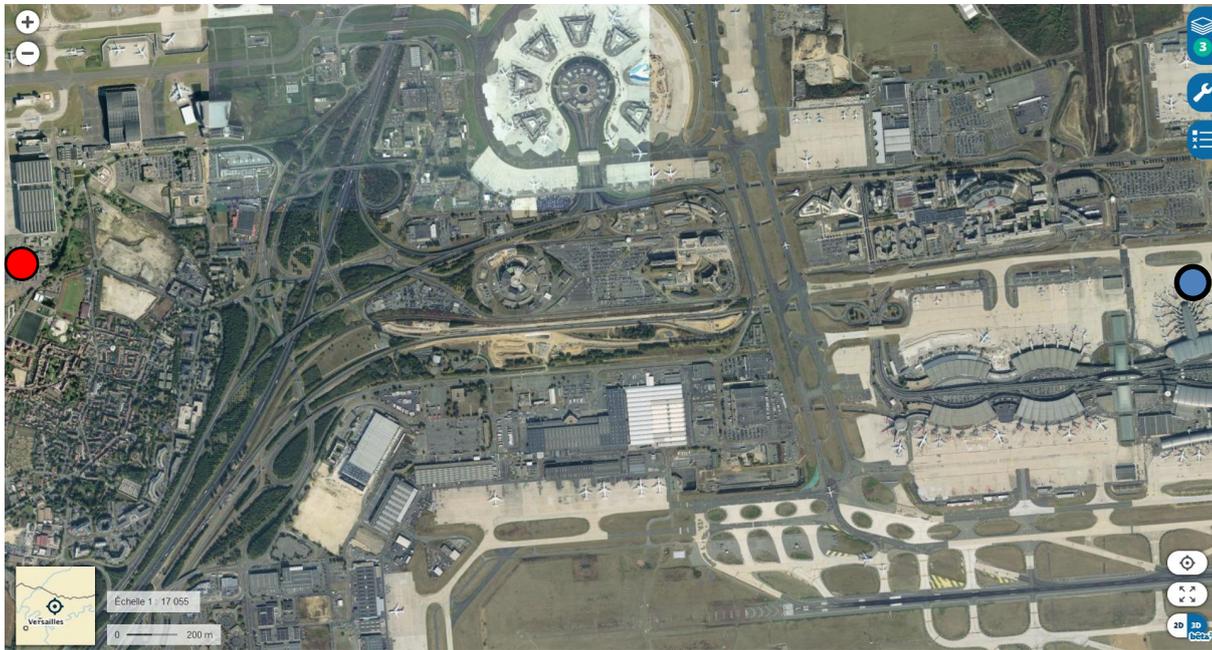


Figure S3. Positioning of ambient measurements (red circle) and measurements at the medium haul area (blue circle) at Paris Charles de Gaulle airports.

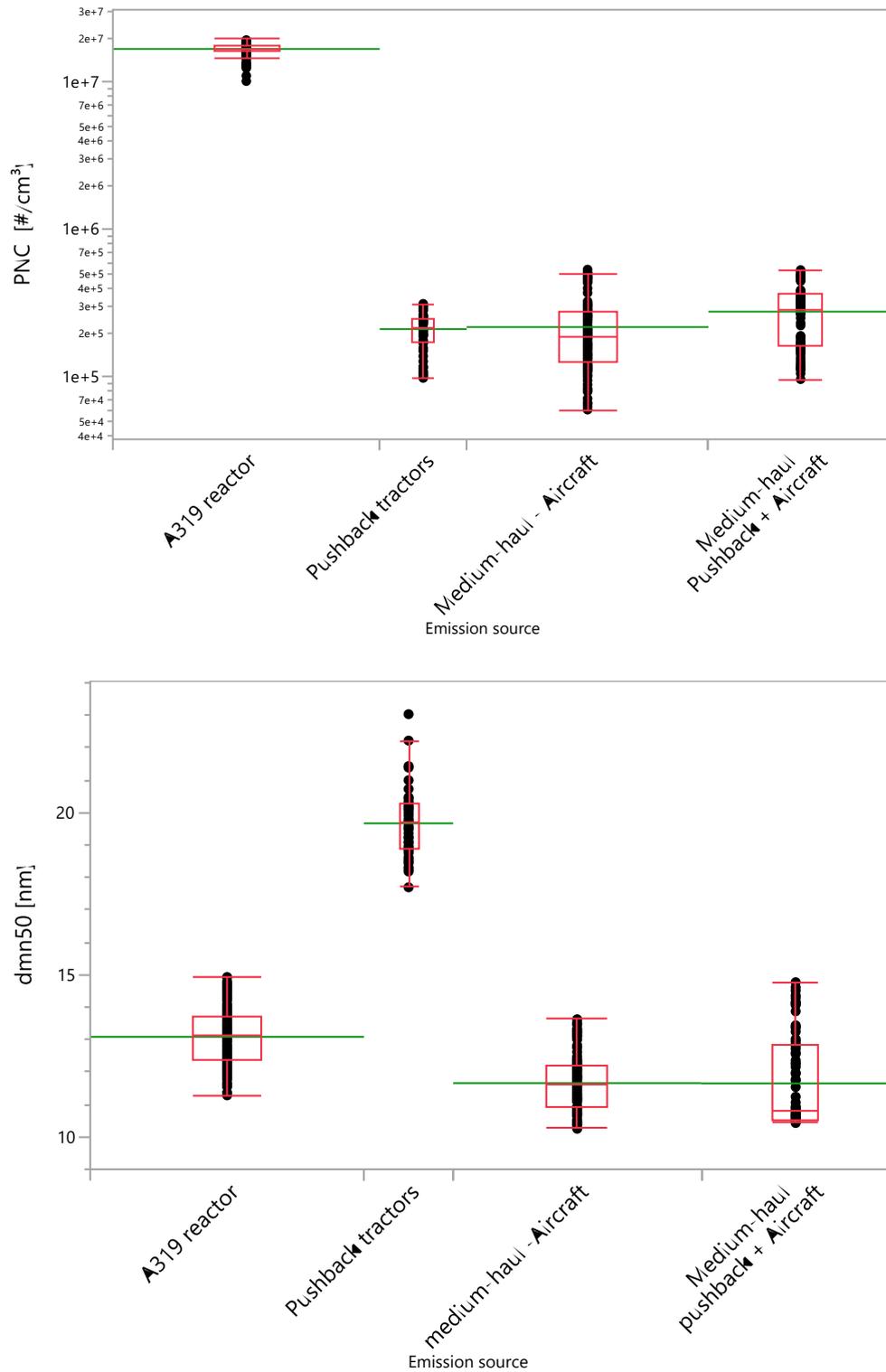
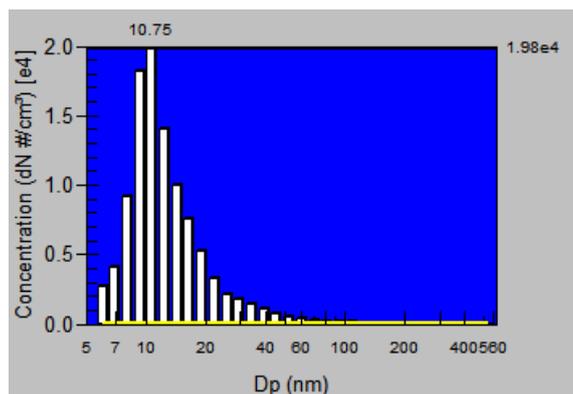
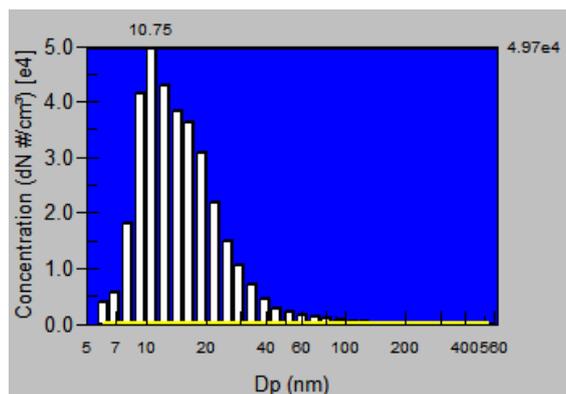


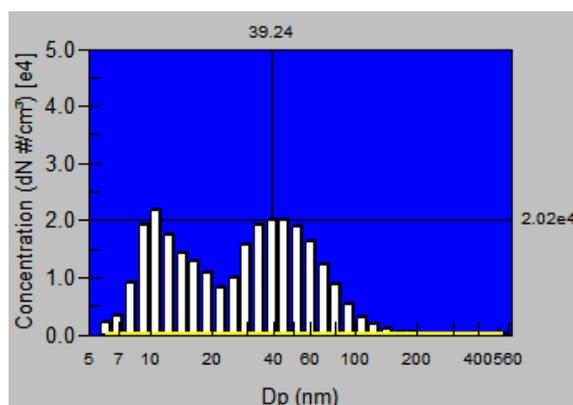
Figure S4. Box plots of particle number concentration (PNC) and the median particle size (dmn50) for the motor exhausts studied in 2012 at Paris-CDG and Marseille airport.



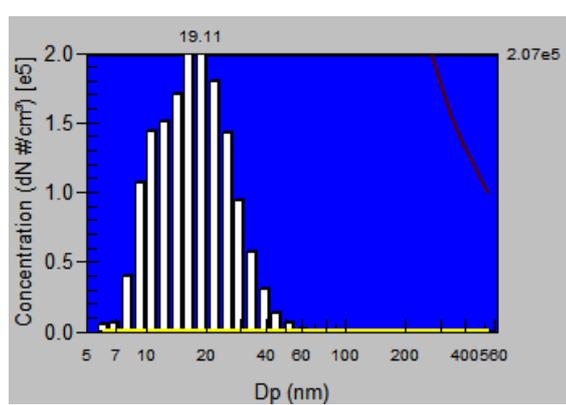
(a) 11 h 29 min ambient on apron



(b) 11 h 10 min airplane taxi



(c) 11 h 13 min vehicle



(d) 12 h 03 min reactor emission at start up

Figure S5. Discrimination of type of emission based on PSDs recorded by FMPS with (a) PSD on the apron, (b) for air plane taxiing, (c) vehicle passing and (d) when reactor start up

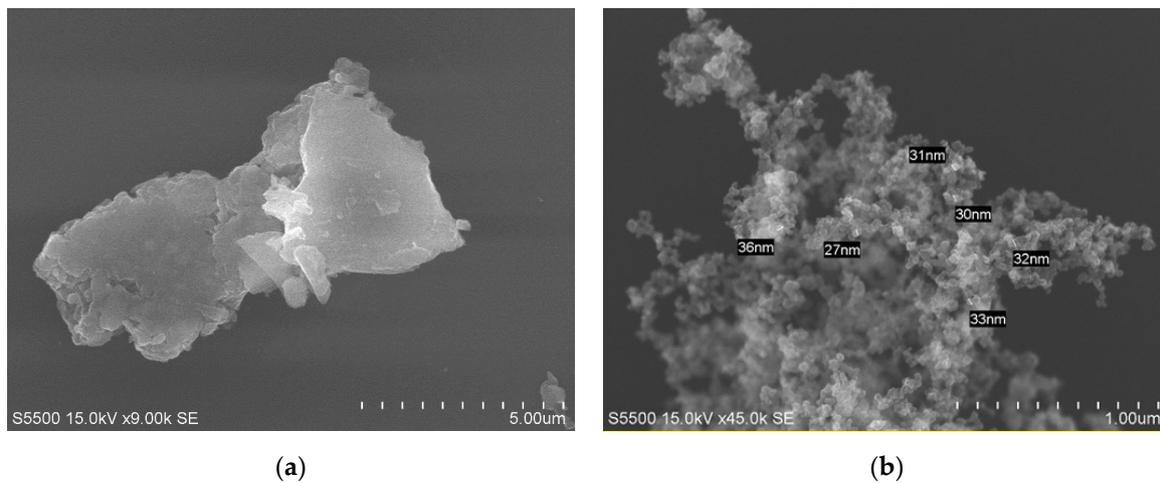


Figure S6. SEM pictures of atmospheric particles collected by Sioutas® on the apron at medium-haul area: (a) micrometric particles observed at a magnification of 9k, and (b) aggregate of nanoparticles observed at a magnification of 45k.