



Supplement of

Measurement report: Chemical characterization of cloud water at Monte Cimone (Italy) – impact of air mass origin and assessment of atmospheric processes

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Materials and Methods

Supplementary S1: Physicochemical analysis

Ion chromatography: Ion content was measured by ion chromatography (IC) analysis, using a Thermo ICS5000+ equipped with an IonPac AG18 (guard-column 4×50 mm) and an IonPac AS18 (analytical column 5×250 mm) for anions (formate, acetate, Cl^- , NO_3^- , SO_4^{2-} , PO_4^{3-} , oxalate) and an IonPac CG16 (guard-column 4×50 mm) and an IonPac CS16 (analytical column 5×250 mm) for cations (Na^+ , NH_4^+ , K^+ , Ca^{2+} , Mg^{2+}).

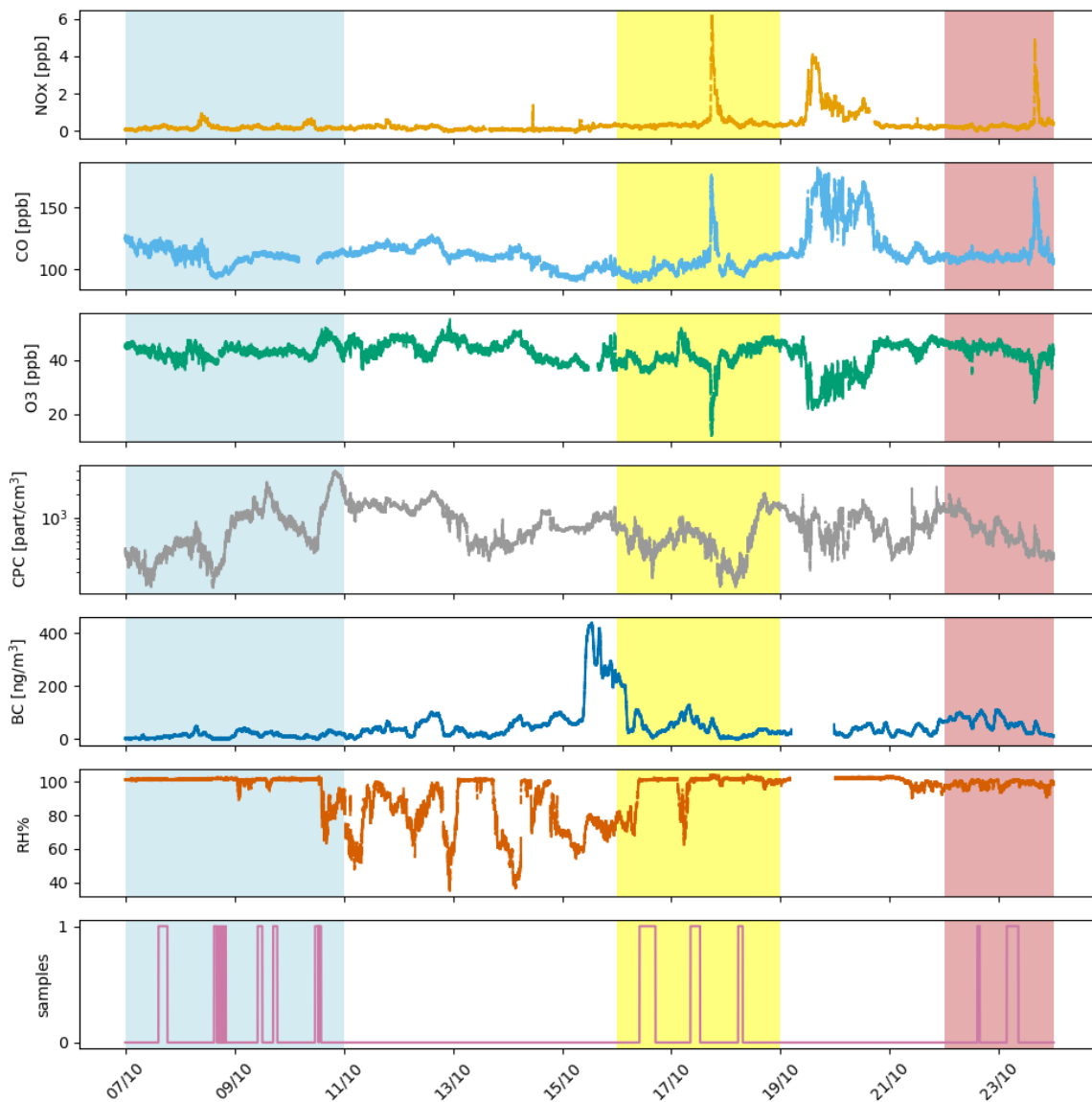
Hydrogen Peroxide: The spectrofluorimetric method based on the reactivity of p-hydroxyphenilacetic acid (purity > 98%) with horseradish peroxidase (solid containing 150-200 units per mg) and developed by Wirgot et al. was used to measure the concentration of hydrogen peroxide in cloud water.

Dissolved Organic Carbon: TC and IC are measured with a Shimadzu TOC-L analyser. TOC quantification is then obtained by the difference between the measured TC and IC.

Carboxylic acids: Short-chain carboxylic acids were analyzed using Ion Chromatography coupled with Mass Spectrometry (IC-MS, Thermo Scientific), utilizing a Dionex ICS-6000 platform, a single quadrupole mass detector, and a Dionex IonPac AS11-HC-4 μm analytical column (2×250 mm). The gradient elution was performed with KOH solution of varying concentrations at a constant flow rate of 0.36 mL min^{-1} . The column temperature was maintained at $40 \text{ }^\circ\text{C}$, and the injection volume of sample was $40 \mu\text{L}$.

Aldehydes and ketones: Carbonyl compounds in cloud water samples were derivatized with DNPH solution *in situ* right after sampling and stored at $4 \text{ }^\circ\text{C}$. The DNPH solution was freshly prepared by mixing 20 mg of DNPH with 1.25 mL of 35 % HCl, 0.625 mL of acetonitrile (ACN), and 3.12 mL of MilliQ water well in order. $20 \mu\text{L}$ of DNPH solution was added to 1.2 mL of sample, which was analyzed by high-performance liquid chromatography coupled with diode-array detection (HPLC-DAD, 1260 Infinity II, Agilent), equipped with an eclipse XDB-C18 column (4.6×150 mm, $5 \mu\text{m}$, Agilent). The elution was as follows: a linear gradient with 50% ACN and 50% MilliQ water to 60% ACN within 10 min, maintained for 4.5 min, and a linear gradient to 75% ACN within 10.5 min, then with a linear gradient back to 50% ACN within 0.5 min, maintained for 5 min. The flow rate was 1 mL min^{-1} . The injection volume was $5 \mu\text{L}$. The column temperature was at $30 \text{ }^\circ\text{C}$. The detection wavelength was 365 nm.

ICP-MS: Aliquots of 3 mL of cloud water samples are directly transferred in 6 mL ICP-MS polystyrene vials previously conditioned by immersion for 24 h in diluted nitric acid followed by repeatedly washes with ultrapure (MilliQ) water. Samples are diluted with 3 mL of distilled HNO_3 1 M in MilliQ water. Trace elements abundances are determined by ICP-MS (Agilent 7500). Sample solutions are aspirated at a rate of $400 \mu\text{L min}^{-1}$ using a peristaltic pump and introduced into the plasma using a quartz introduction system (Micromist Nebulizer and a Scott-type spray chamber). The signal is calibrated externally with multi-element standards (1 and 10 ng g^{-1}), which are prepared by gravimetric dilution of $10 \mu\text{g mL}^{-1}$ certified solutions traceable to NIST (National Institute of Standards and Technology) (Inorganic Ventures).



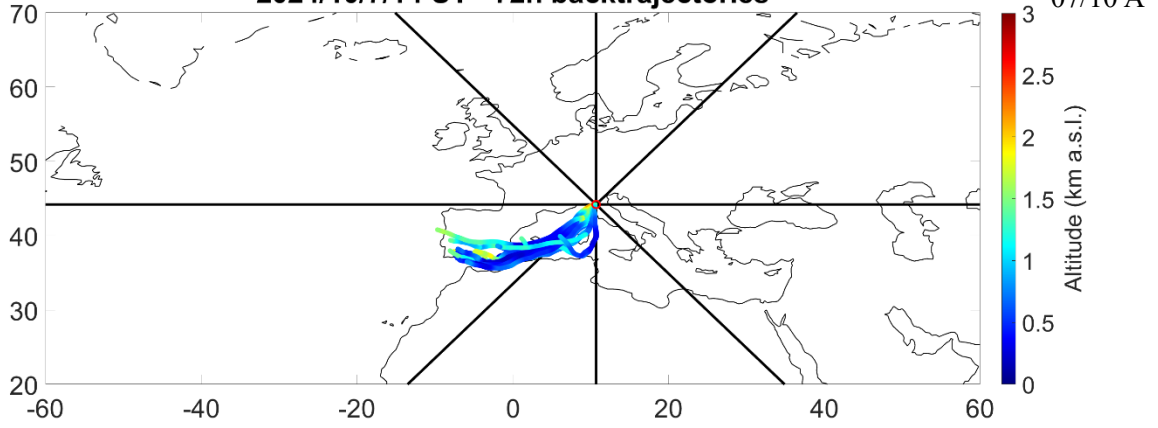
80

Fig. S1. Temporal evolution of meteorological parameters during the campaign. The three periods are shown in blue (period 1), yellow (period 2) and red (period 3). The variable “samples” equals 1 for each cloud water sampling and 0 when no sample was collected.

Period 1

(a)

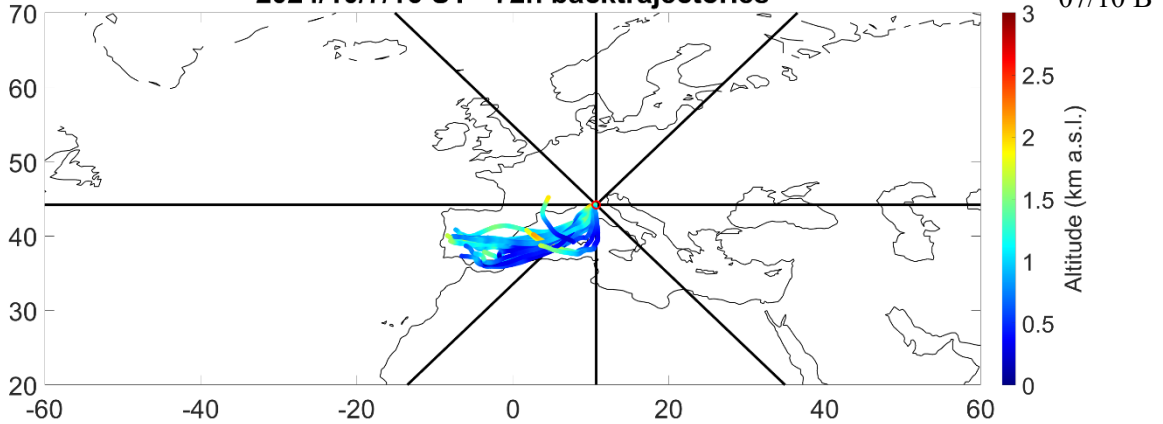
2024/10/7/14 UT - 72h backtrajectories



Nb trajectory points over Land (<1km a.g.l.) =1110 (~16%)	NNW sector =0 (~0%)	NEAR sector =66 (~1%)	NNE sector =0 (~0%)
Nb trajectory points over Land (>1km a.g.l.) =364 (~5%)	NWW sector =0 (~0%)		NEE sector =0 (~0%)
Nb trajectory points over Sea (<1km a.g.l.) =4644 (~67%)	SWW sector =4923 (~71%)		SEE sector =0 (~0%)
Nb trajectory points over Sea (>1km a.g.l.) =818 (~12%)	SSW sector =1924 (~28%)	nb total points =6936	SSE sector =23 (~0%)

(b)

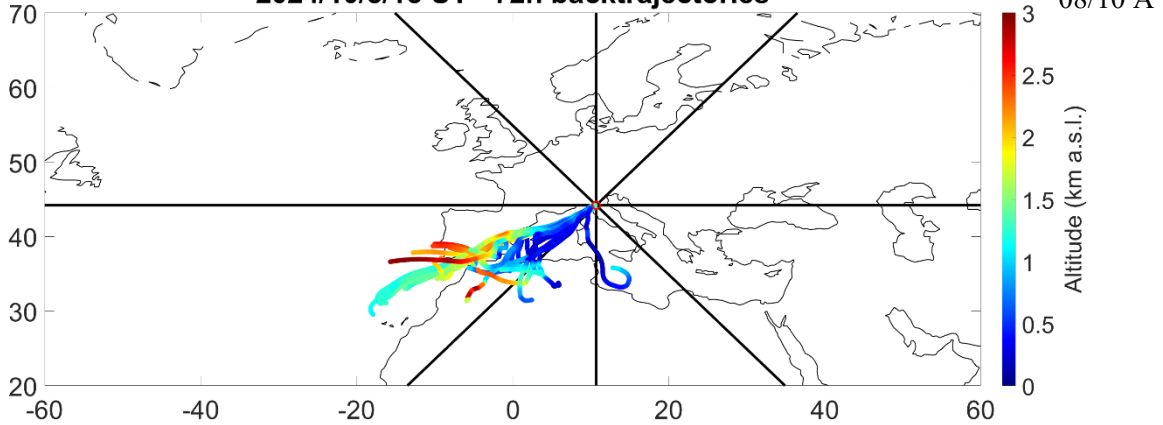
2024/10/7/16 UT - 72h backtrajectories



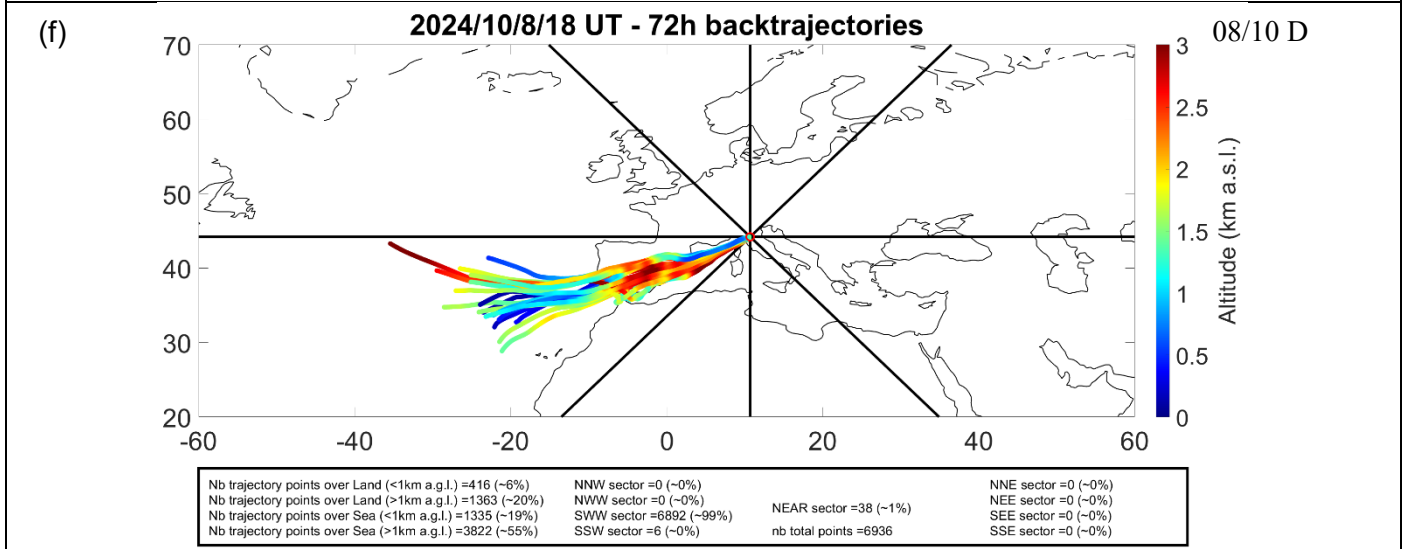
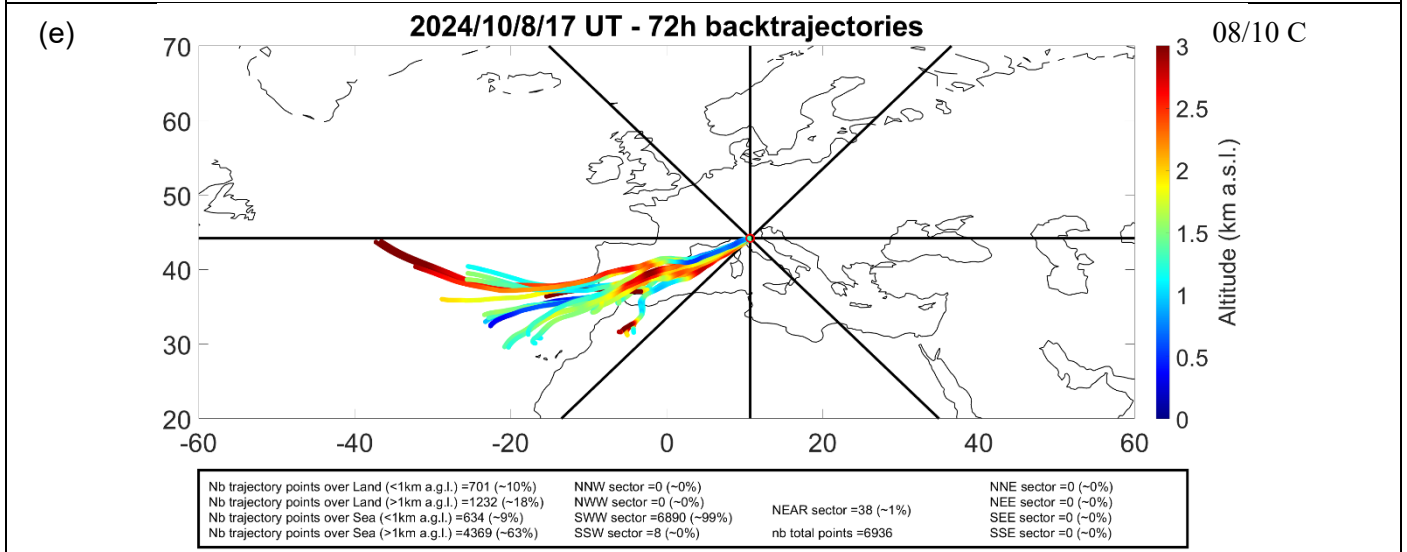
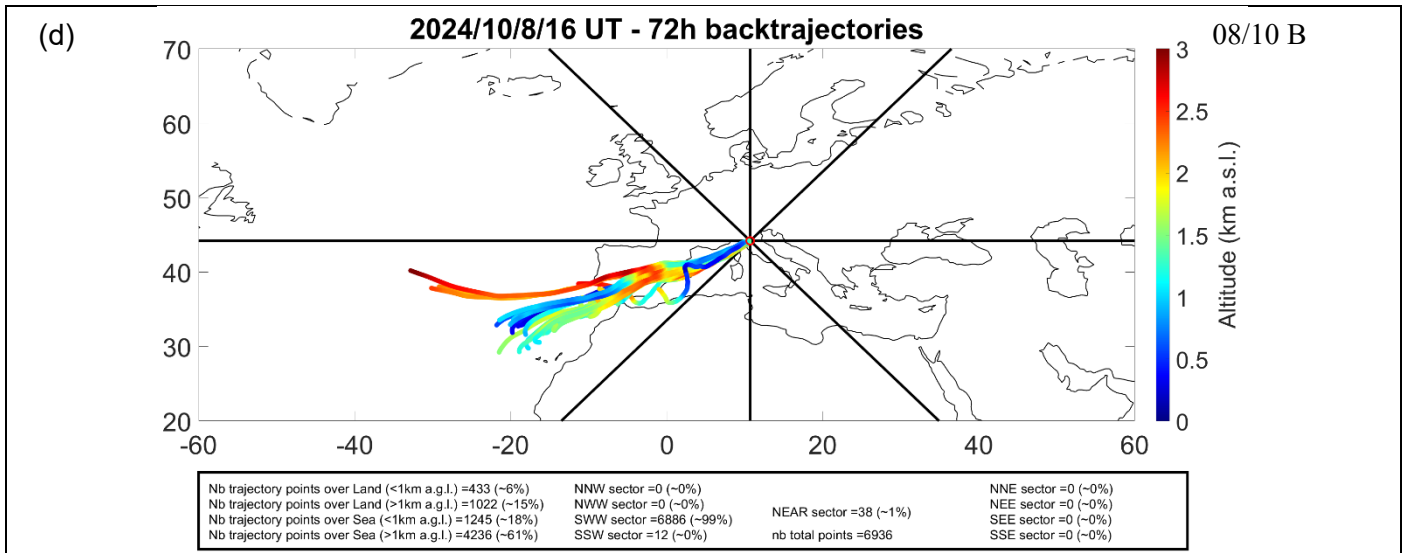
Nb trajectory points over Land (<1km a.g.l.) =2109 (~30%)	NNW sector =0 (~0%)	NEAR sector =66 (~1%)	NNE sector =0 (~0%)
Nb trajectory points over Land (>1km a.g.l.) =284 (~4%)	NWW sector =9 (~0%)		NEE sector =0 (~0%)
Nb trajectory points over Sea (<1km a.g.l.) =3233 (~47%)	SWW sector =4725 (~68%)		SEE sector =0 (~0%)
Nb trajectory points over Sea (>1km a.g.l.) =1310 (~19%)	SSW sector =2029 (~29%)	nb total points =6936	SSE sector =107 (~2%)

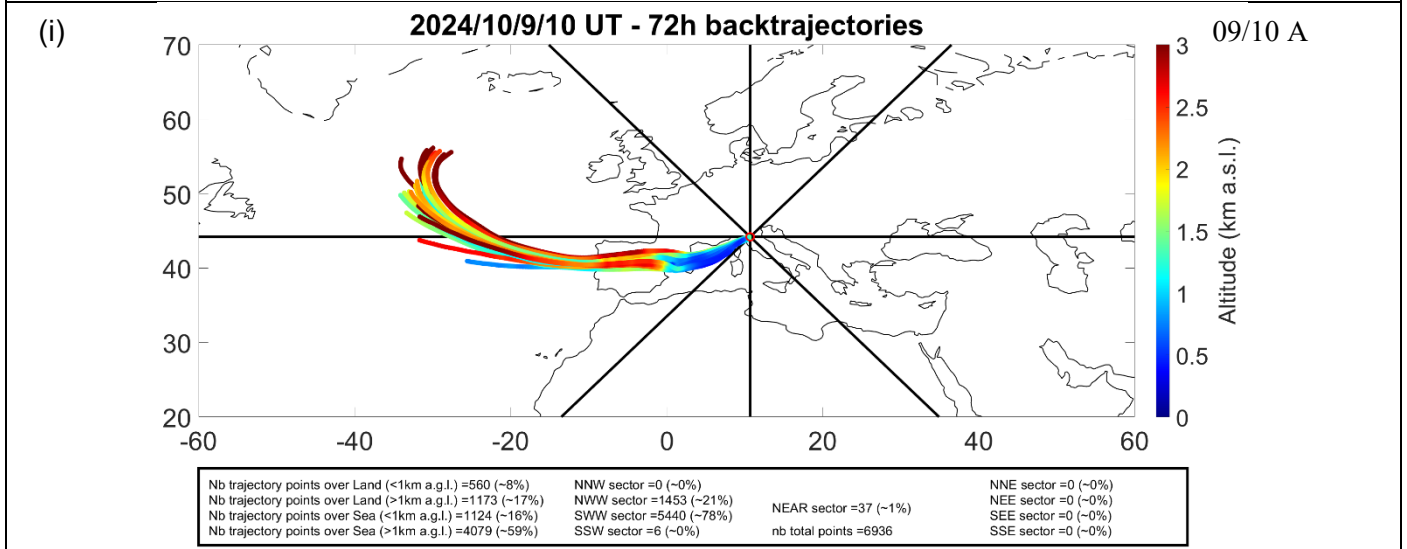
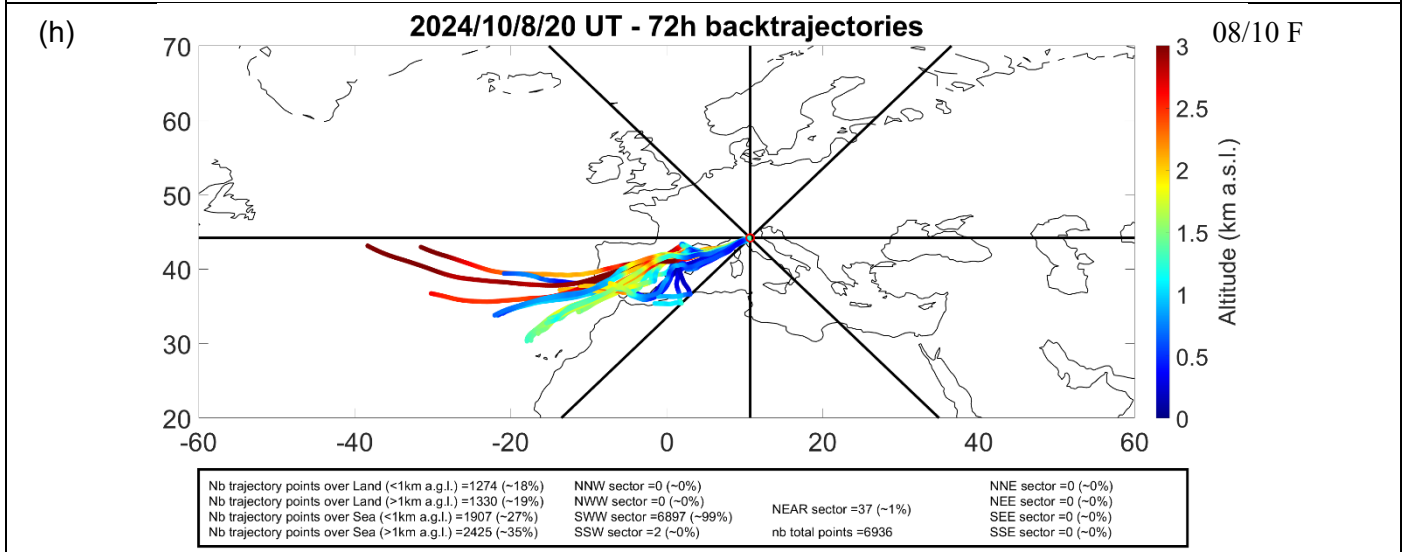
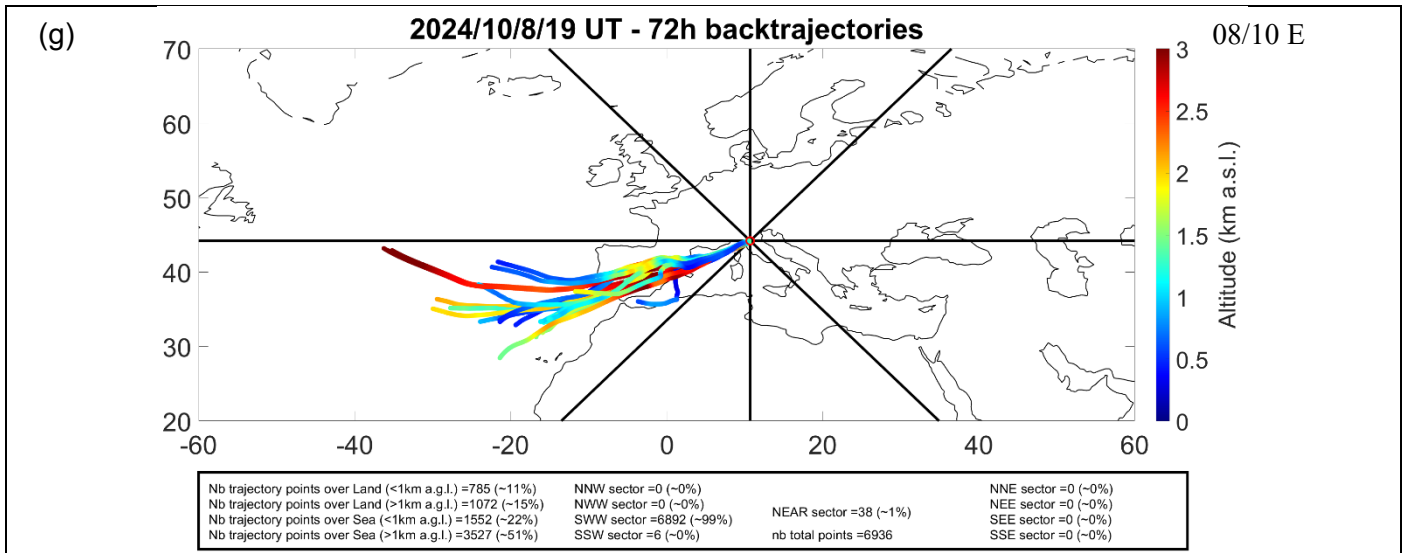
(c)

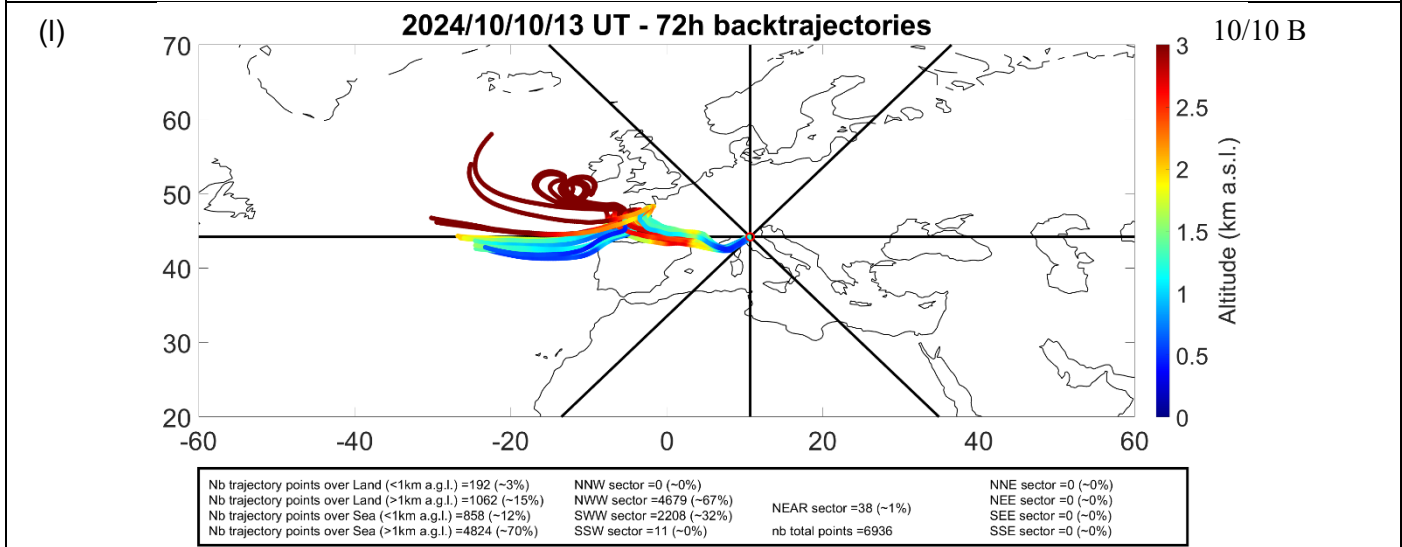
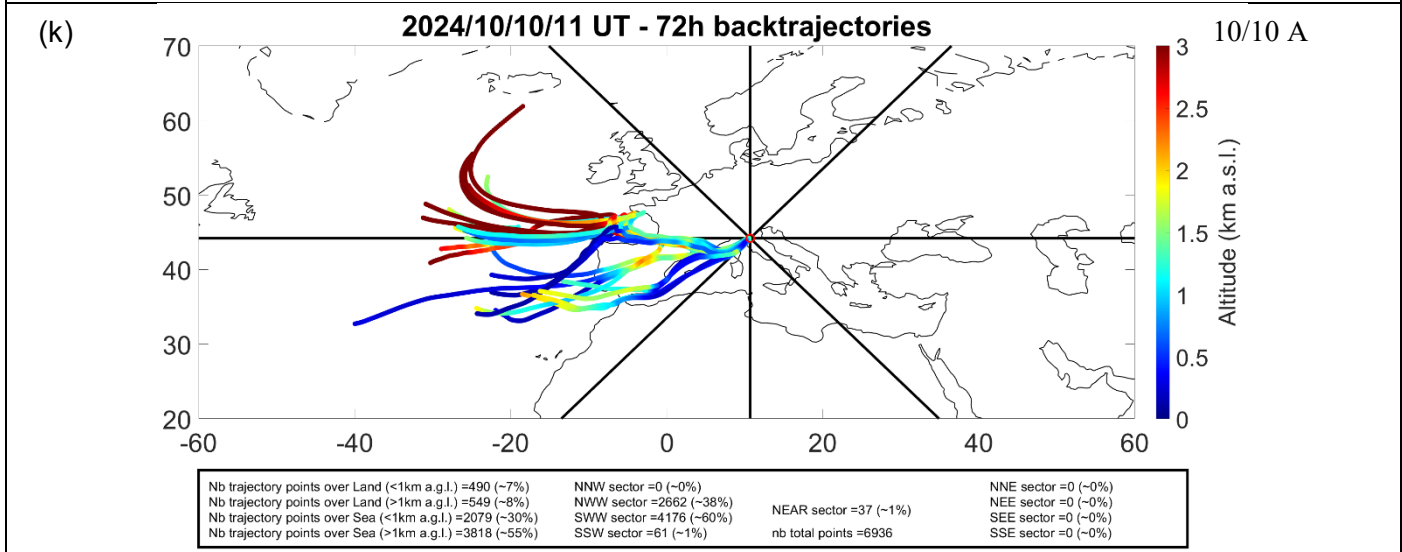
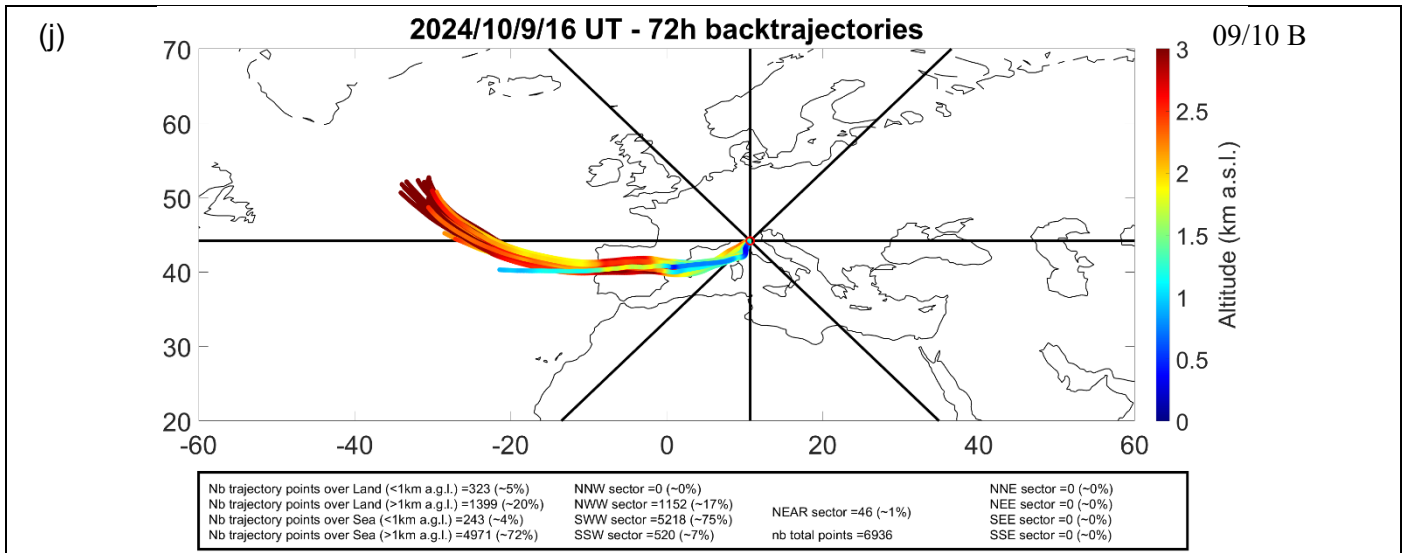
2024/10/8/15 UT - 72h backtrajectories



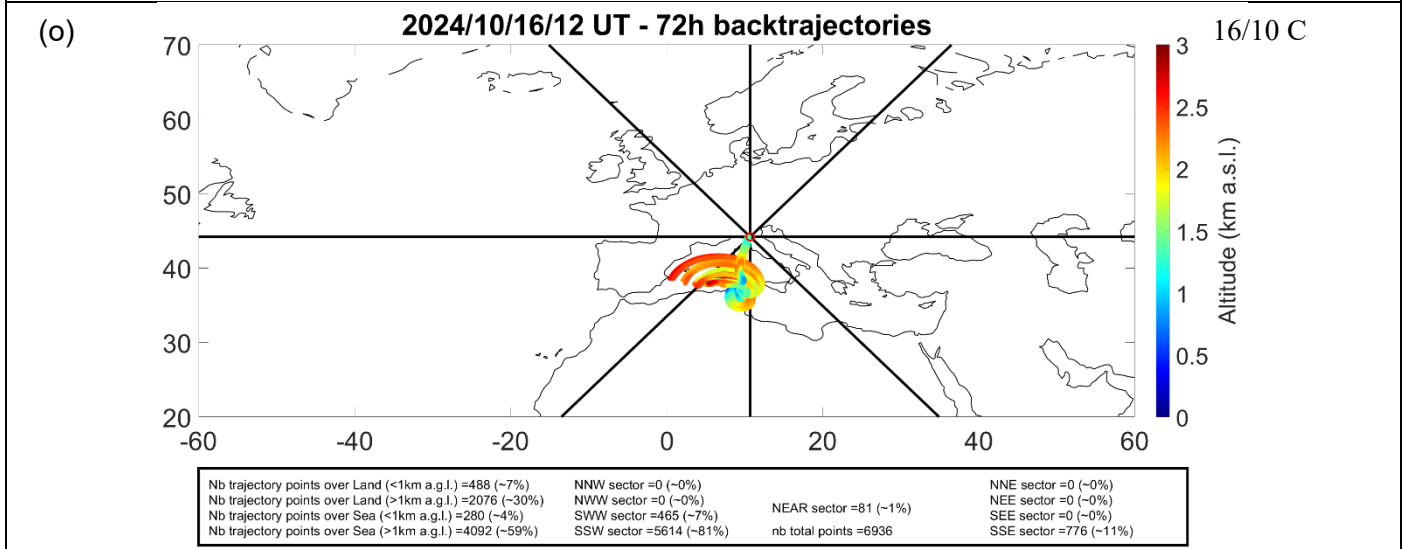
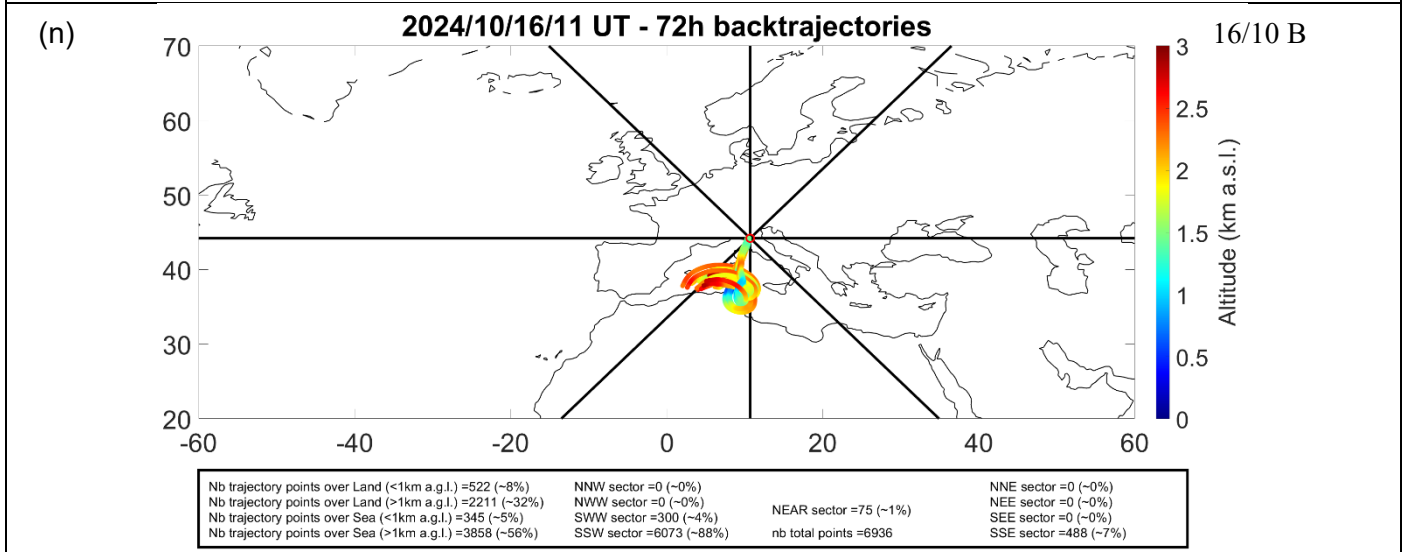
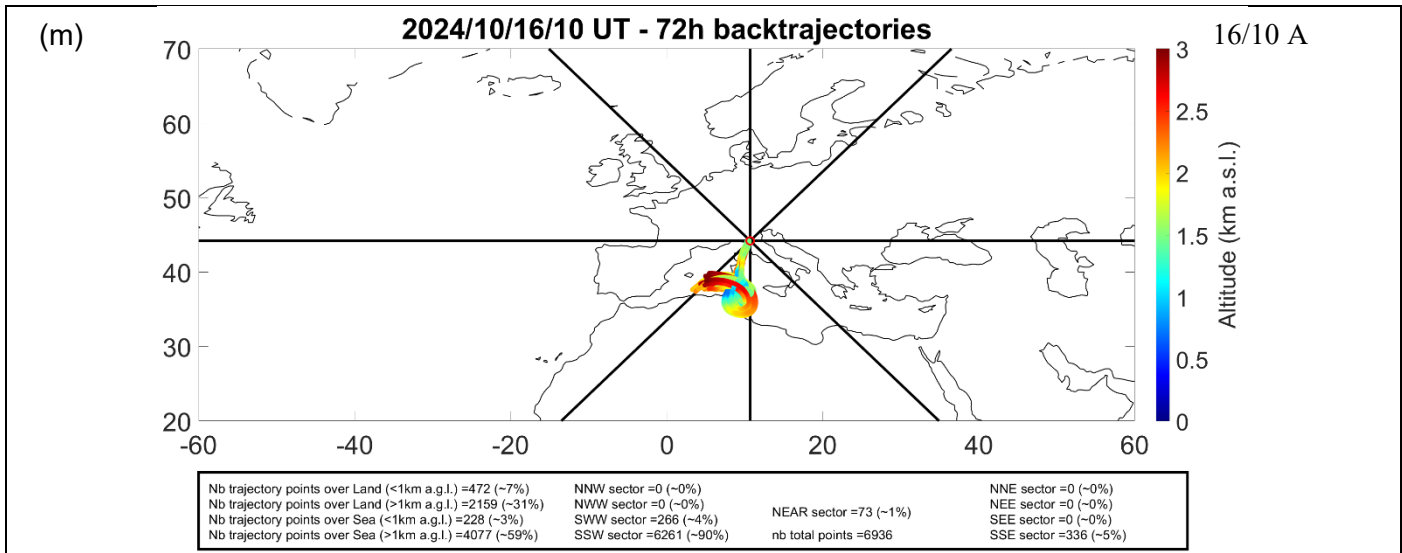
Nb trajectory points over Land (<1km a.g.l.) =1612 (~23%)	NNW sector =0 (~0%)	NEAR sector =38 (~1%)	NNE sector =0 (~0%)
Nb trajectory points over Land (>1km a.g.l.) =881 (~13%)	NWW sector =0 (~0%)		NEE sector =0 (~0%)
Nb trajectory points over Sea (<1km a.g.l.) =1644 (~24%)	SWW sector =8008 (~87%)		SEE sector =0 (~0%)
Nb trajectory points over Sea (>1km a.g.l.) =2799 (~40%)	SSW sector =683 (~10%)	nb total points =6936	SSE sector =207 (~3%)

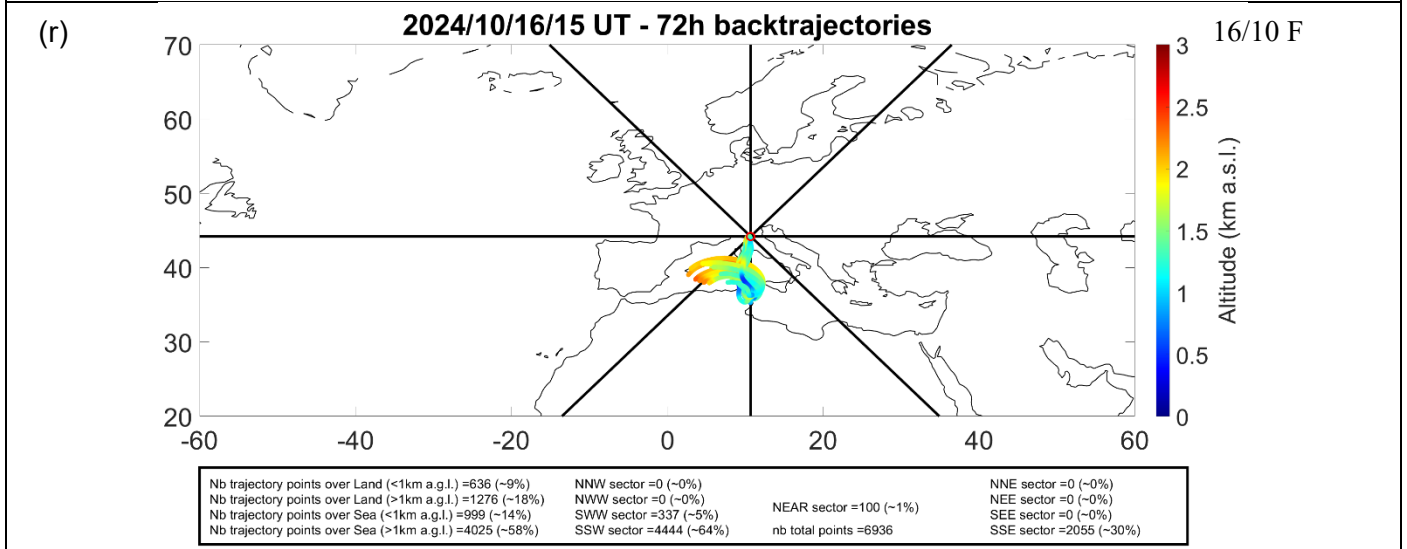
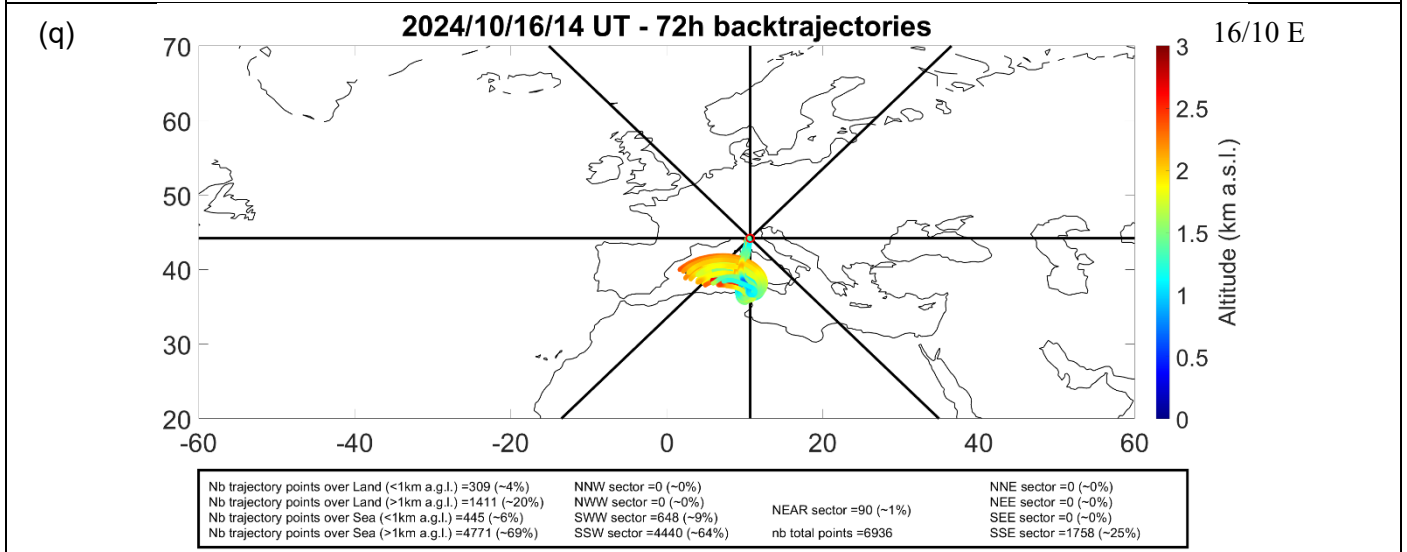
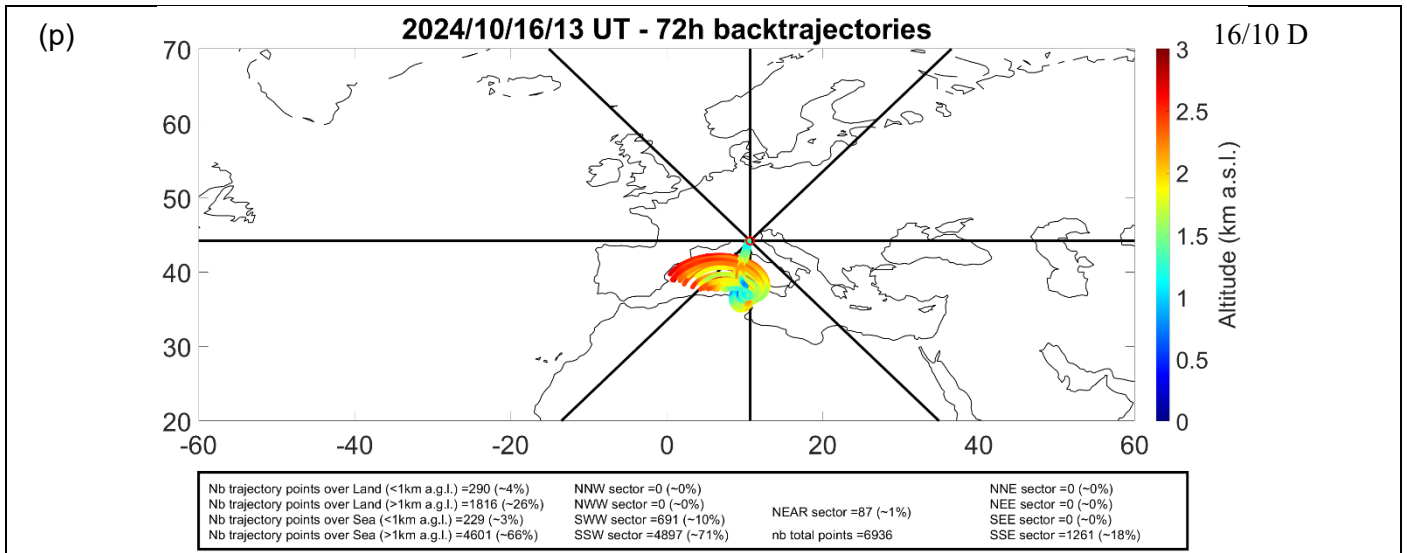


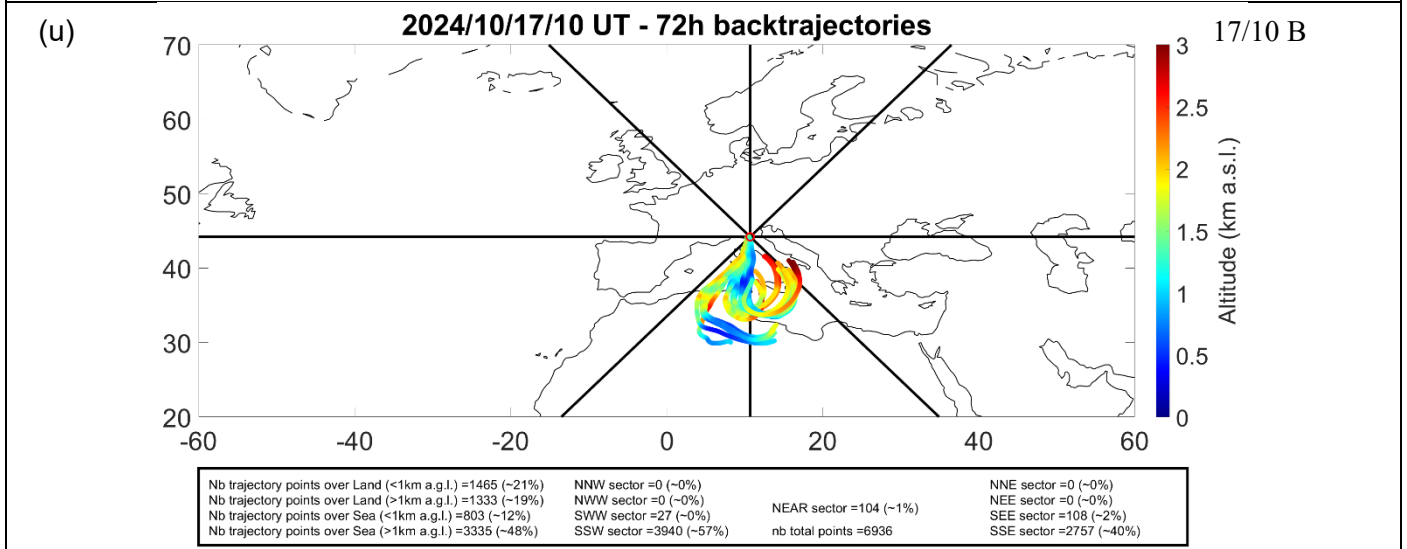
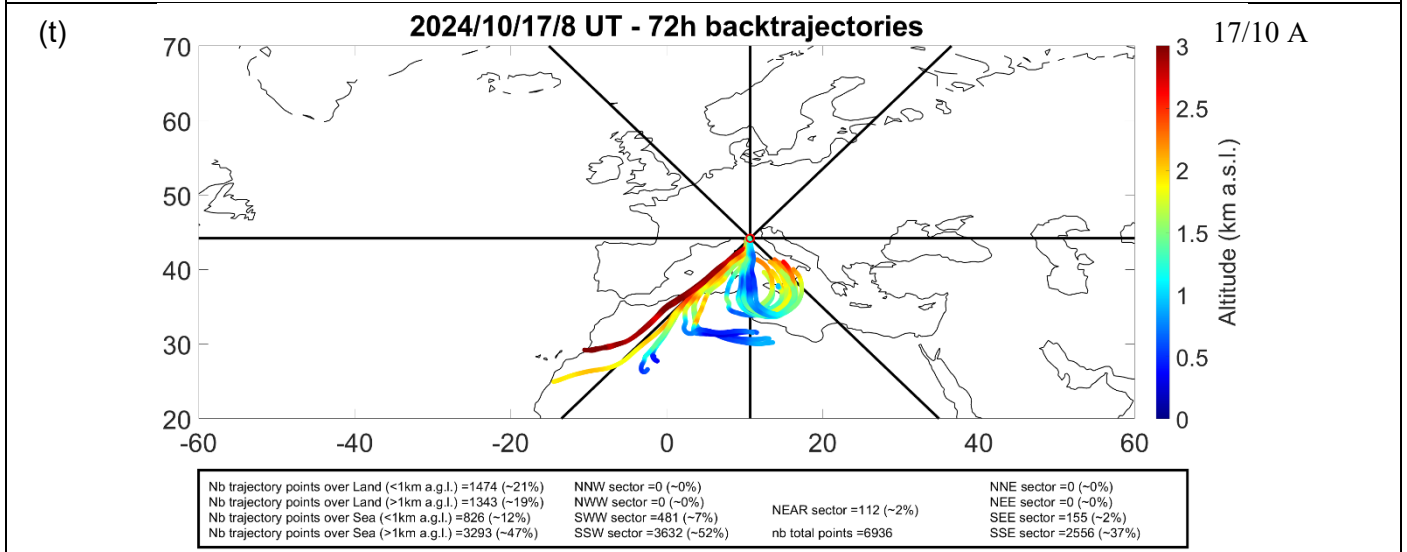
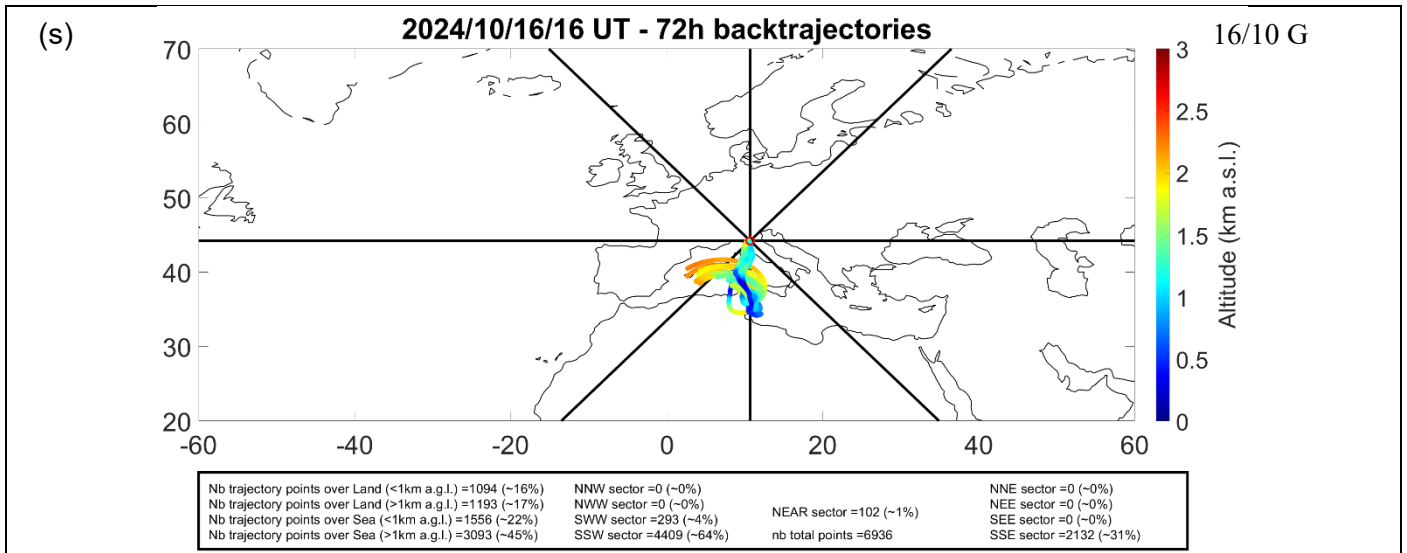




Period 2



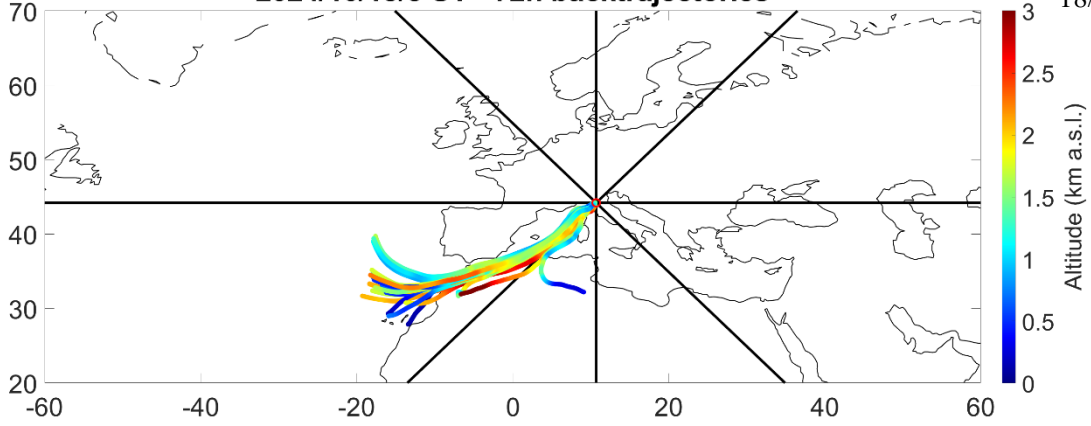




(v)

2024/10/18/5 UT - 72h backtrajectories

18/10 A

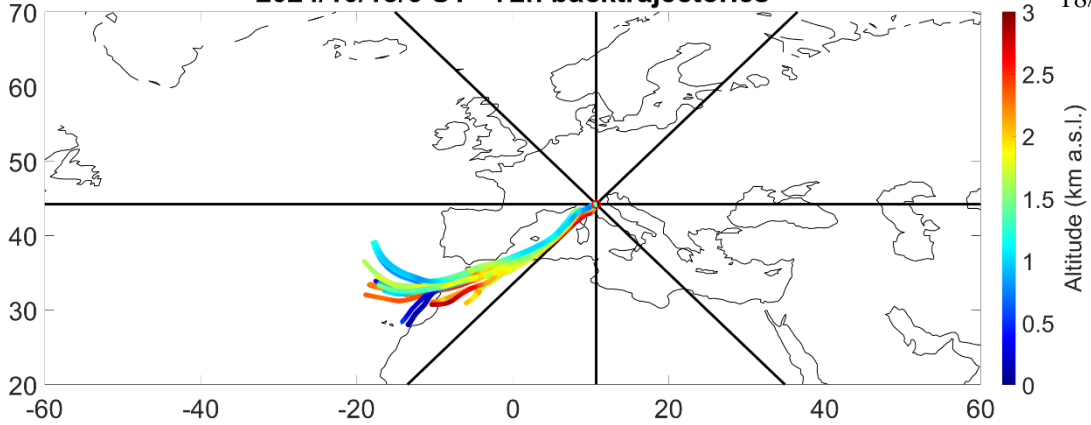


Nb trajectory points over Land (<1km a.g.l.) =435 (-6%)	NNW sector =0 (-0%)	NEAR sector =84 (-1%)	NNE sector =0 (-0%)
Nb trajectory points over Land (>1km a.g.l.) =1361 (-20%)	NWW sector =0 (-0%)		NEE sector =0 (-0%)
Nb trajectory points over Sea (<1km a.g.l.) =850 (-12%)	SWW sector =6006 (-87%)	nb total points =6936	SEE sector =0 (-0%)
Nb trajectory points over Sea (>1km a.g.l.) =4290 (-62%)	SSW sector =846 (-12%)		SSE sector =0 (-0%)

(w)

2024/10/18/6 UT - 72h backtrajectories

18/10 B



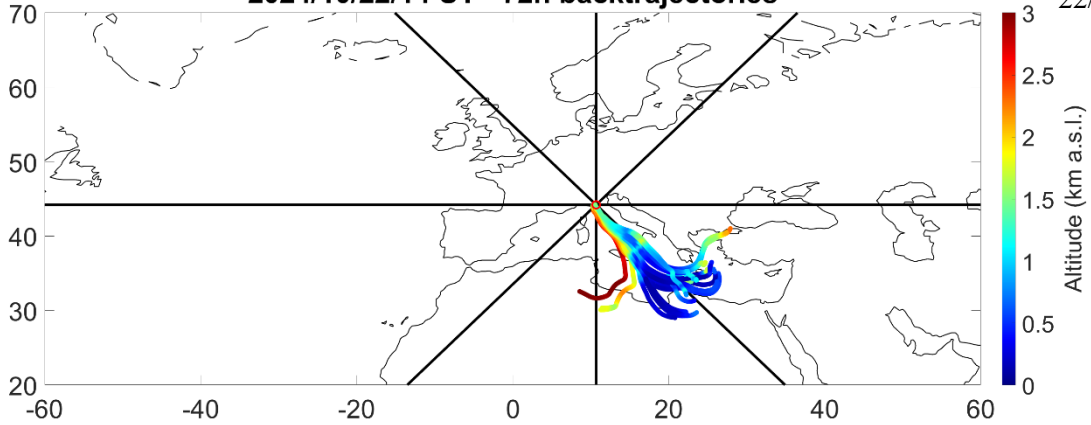
Nb trajectory points over Land (<1km a.g.l.) =640 (-9%)	NNW sector =0 (-0%)	NEAR sector =81 (-1%)	NNE sector =0 (-0%)
Nb trajectory points over Land (>1km a.g.l.) =1194 (-17%)	NWW sector =0 (-0%)		NEE sector =0 (-0%)
Nb trajectory points over Sea (<1km a.g.l.) =924 (-13%)	SWW sector =6716 (-97%)	nb total points =6936	SEE sector =0 (-0%)
Nb trajectory points over Sea (>1km a.g.l.) =4178 (-60%)	SSW sector =139 (-2%)		SSE sector =0 (-0%)

Period 3

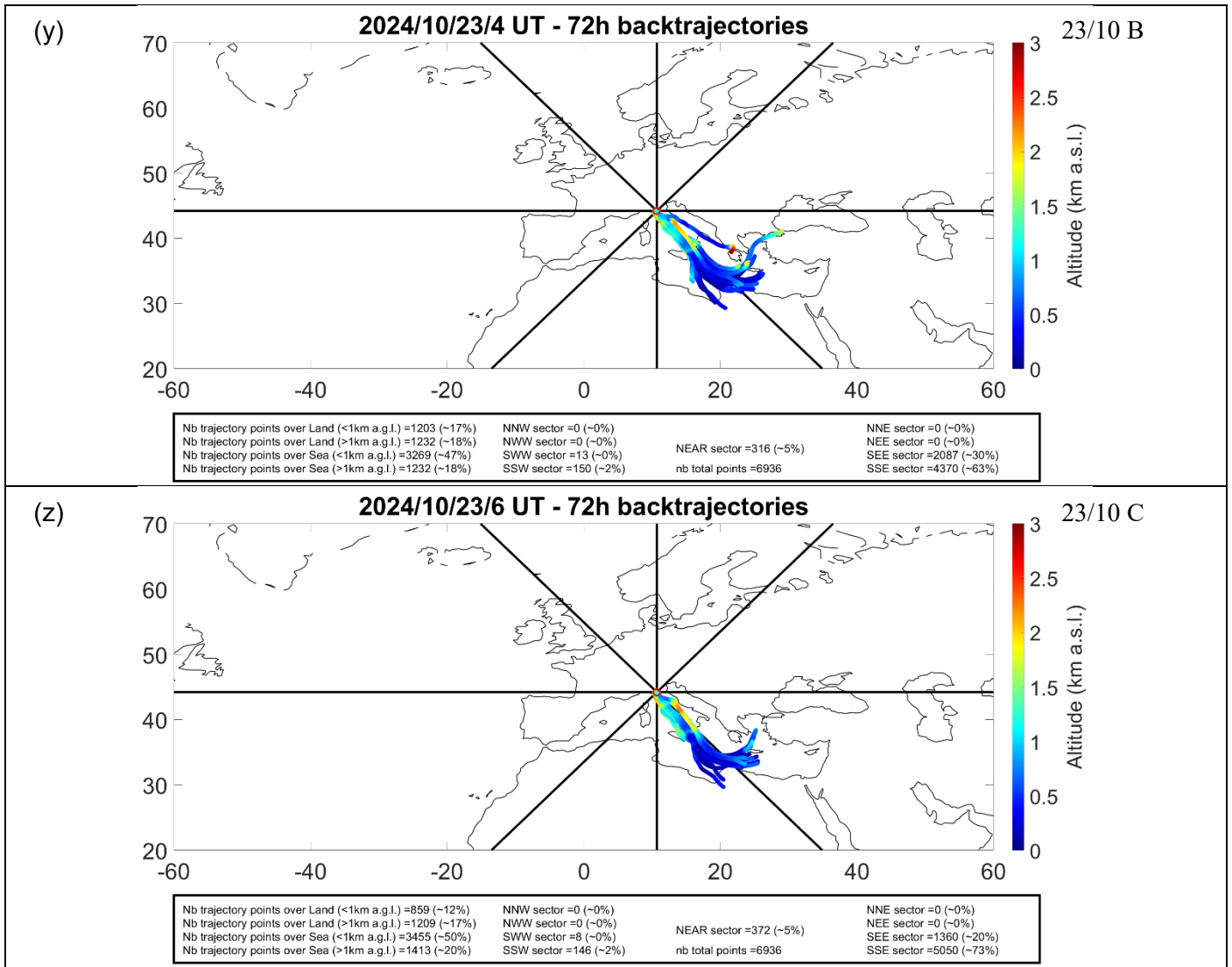
(x)

2024/10/22/14 UT - 72h backtrajectories

22/10 A



Nb trajectory points over Land (<1km a.g.l.) =719 (-10%)	NNW sector =0 (-0%)	NEAR sector =242 (-3%)	NNE sector =0 (-0%)
Nb trajectory points over Land (>1km a.g.l.) =1672 (-24%)	NWW sector =0 (-0%)		NEE sector =0 (-0%)
Nb trajectory points over Sea (<1km a.g.l.) =2401 (-35%)	SWW sector =27 (-0%)	nb total points =6936	SEE sector =2309 (-33%)
Nb trajectory points over Sea (>1km a.g.l.) =2144 (-31%)	SSW sector =269 (-4%)		SSE sector =4089 (-59%)



85 **Fig. S2 a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z.** Clusters of 72h-back-trajectory plots of air masses reaching CMN during cloud sampling from October 7th to October 23rd. The upper panels show the trajectories projected on a horizontal map, and the lower panels show the percentage number of trajectory point traveling over land or sea.

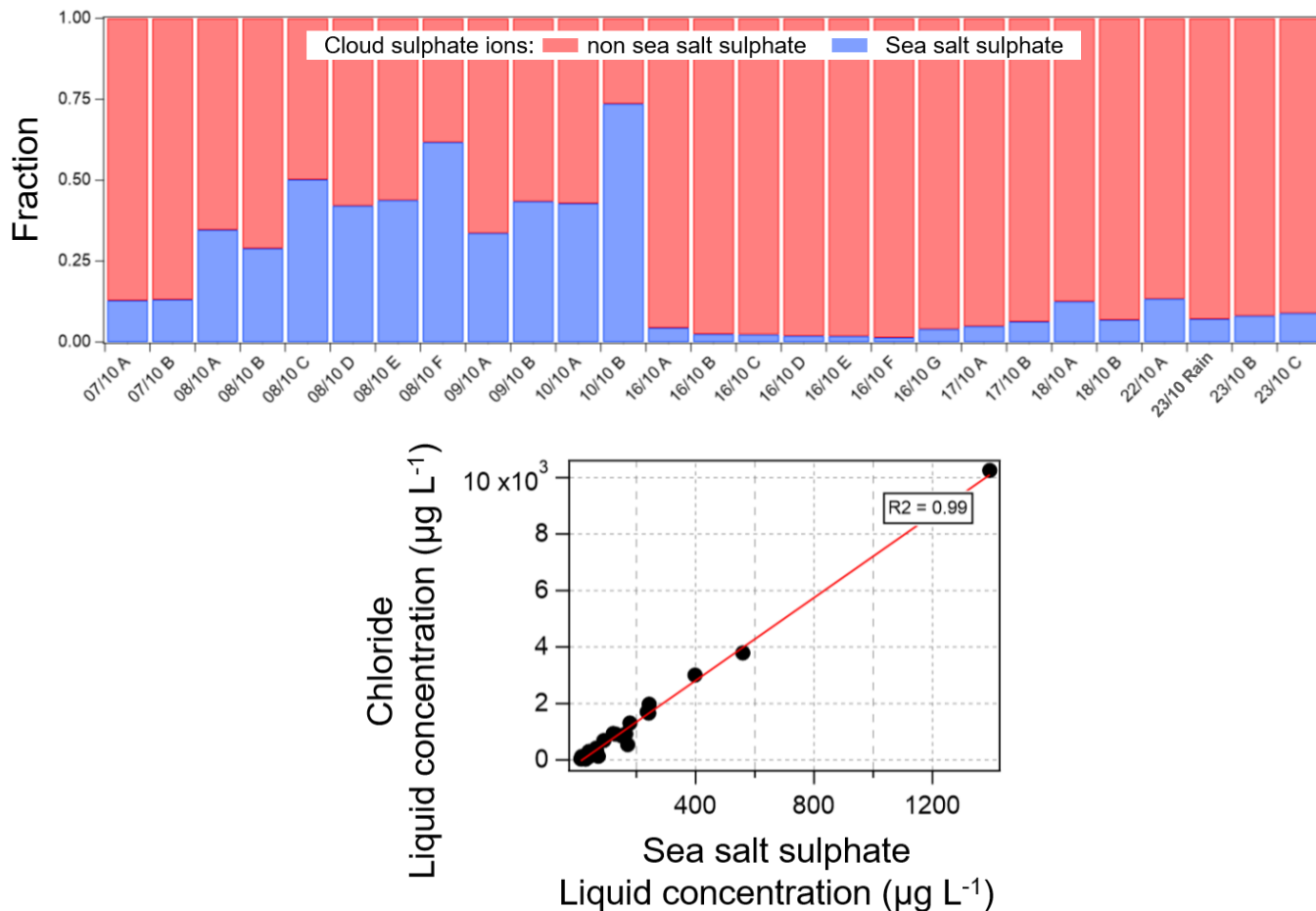


Fig. S3. Upper panel: fraction of non-sea salt sulphate, in red, and sea salt sulphate, in blue, in cloud water samples. Lower panel: correlation between chloride and sea sulphate in cloud samples.

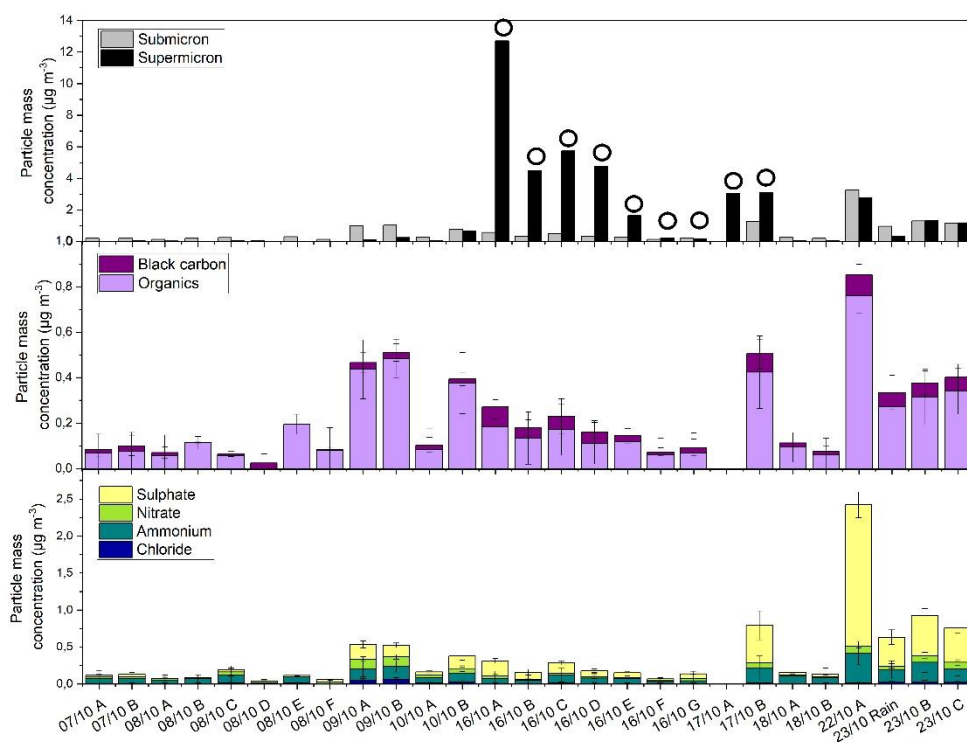


Fig. S4. Upper panel: particle mass concentration of submicron and supermicron aerosol. Saharan dust events are highlighted with a circle. Middle panel: particle mass concentration of organics and black carbon in aerosol. Lower panel: particle mass concentration of main inorganic ions in aerosol.

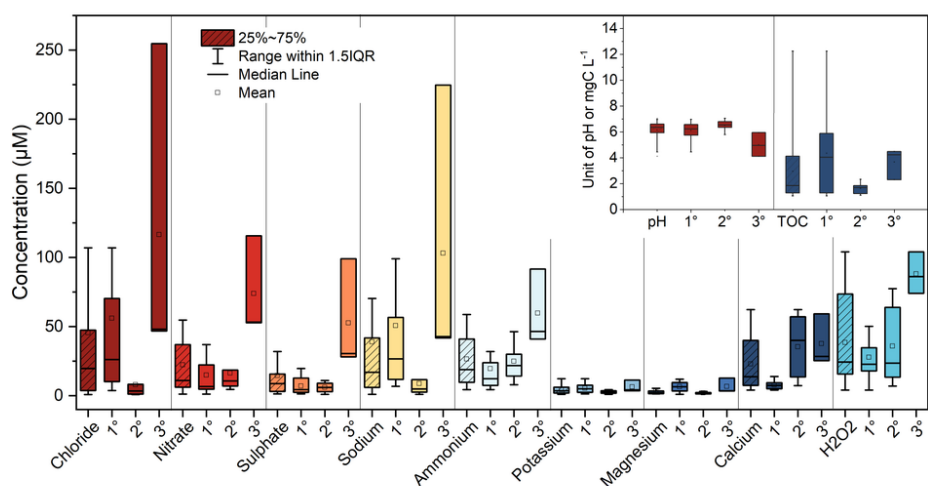


Fig. S5 Boxplot of anions, cations and hydrogen peroxide concentration in cloud samples for the whole campaign (dashed box) and for *Period 1* (1°), *Period 2* (2°), and *Period 3* (3°) (plain boxes). Boxes represent the interquartile range (25th–75th percentiles), the horizontal line shows the median and whiskers indicate the minimum and maximum values. The insert reports the average values of pH and DOC for all samples (“pH”, “DOC”) and for each periods.

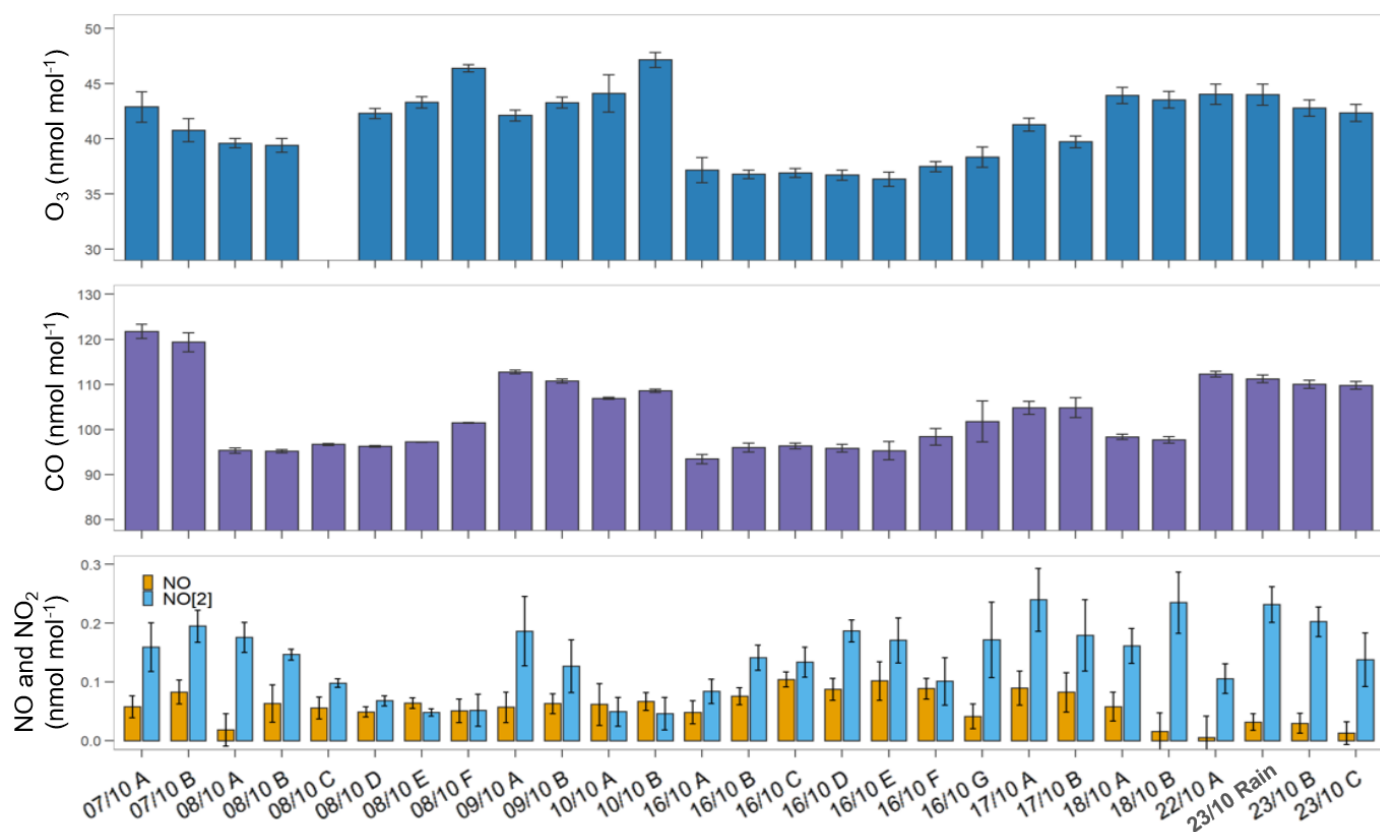
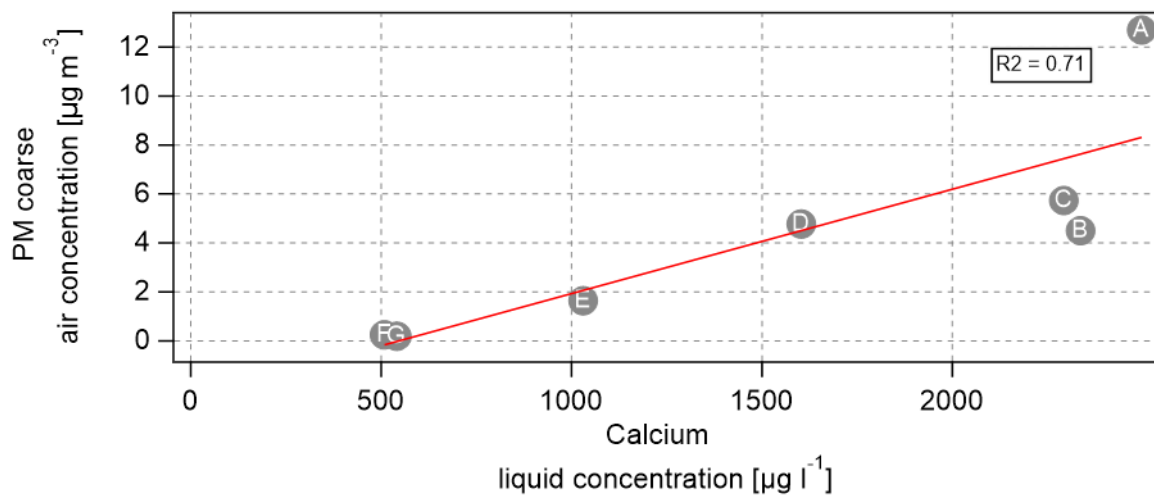
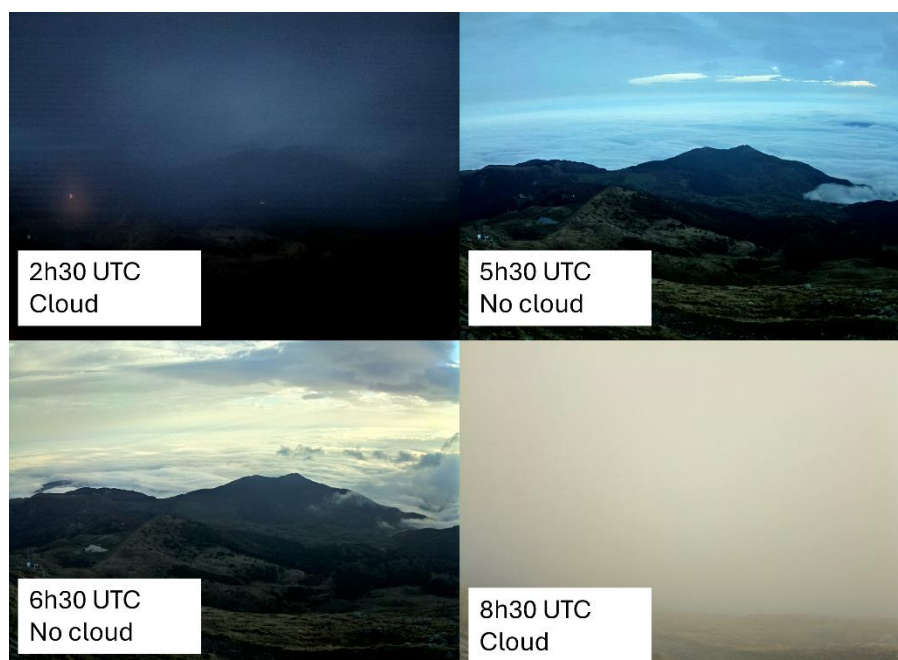


Fig. S6. Upper panel: atmospheric ozone mole fraction. Middle panel: atmospheric carbon monoxide mole fraction. Lower panel: atmospheric nitrogen oxide and nitrogen dioxide mole fraction.



120

Fig. S7. Evolution of the coarse particle mass concentration vs calcium concentration for samples 16/10 A to 16/10 G.



125

Fig. S8 Webcam images from the top of CMN on 17 October between 2.30 a.m. and 8.30 a.m.

Sample Id	Date	Start (local)	Stop (local)	Start (UTC)	Stop (UTC)		Collector	Sterile/Not sterile	Volume collected
	dd/mm/yyyy	hh:mm	hh:mm	hh:mm	hh:mm		#		mL
07/10 A	07/10/2024	16:34	18:39	14:34:00	16:39:00	day	3	Sterile	725
		16:34	18:39	14:34:00	16:39:00		4	Sterile	736
07/10 B	07/10/2024	18:39	20:30	16:39:00	18:30:00	night	3	Sterile	710
		18:39	20:30	16:39:00	18:30:00		4	Sterile	750
08/10 A	08/10/2024	17:00	18:00	15:00:00	16:00:00	day	3	Not sterile	571
		17:00	21:20	15:00:00	19:20:00		4	Sterile	367
08/10 B	08/10/2024	18:00	18:10	16:00:00	16:10:00	day	3	Not sterile	20
08/10 C	08/10/2024	19:00	19:10	17:00:00	17:10:00	night	3	Not sterile	20
08/10 D	08/10/2024	20:00	20:10	18:00:00	18:10:00	night	3	Not sterile	20
08/10 E	08/10/2024	21:00	21:10	19:00:00	19:10:00	night	3	Not sterile	20
08/10 F	08/10/2024	22:00	22:10	20:00:00	20:10:00	night	3	Not sterile	20
09/10 A	09/10/2024	12:11	14:11	10:11:00	12:11:00	day	3	Not sterile	368
09/10 B	09/10/2024	18:58	20:45	16:58:00	18:45:00	night	3	Not sterile	158
		18:58	20:45	16:58:00	18:45:00		4	Sterile	144
10/10 A	10/10/2024	13:25	14:55	11:25:00	12:55:00	day	3	Not sterile	535
		13:25	16:00	11:25:00	14:00:00		4	Sterile	348
10/10 B	10/10/2024	15:00	16:00	13:00:00	14:00:00	day	3	Not sterile	36
15/10 Blank	15/10/2024	Blank					3	Not sterile	
16/10 A	16/10/2024	12:00	13:00	10:00:00	11:00:00	day	3	Not sterile	454
		12:00	14:00	10:00:00	12:00:00		4	Sterile	338
16/10 B	16/10/2024	13:00	14:00	11:00:00	12:00:00	day	3	Not sterile	443
16/10 C	16/10/2024	14:00	15:00	12:00:00	13:00:00	day	3	Not sterile	408
		14:00	16:00	12:00:00	14:00:00		4	Sterile	400
16/10 D	16/10/2024	15:00	16:00	13:00:00	14:00:00	day	3	Not sterile	502
16/10 E	16/10/2024	16:00	17:00	14:00:00	15:00:00	day	3	Not sterile	453
16/10 F	16/10/2024	17:00	18:00	15:00:00	16:00:00	day	3	Not sterile	731
16/10 G	16/10/2024	18:00	19:00	16:00:00	17:00:00	day-night	3	Not sterile	529
17/10 A	17/10/2024	10:23	12:36	08:23:00	10:36:00	day	3	Not sterile	255
		10:23	13:07	08:23:00	11:07:00		4	Sterile	283
17/10 B	17/10/2024	12:36	14:36	10:36:00	12:36:00	day	3	Not sterile	559
		13:07	14:45	11:07:00	12:45:00		4	Sterile	307
18/10 A	18/10/2024	07:20	08:20	05:20:00	06:20:00	day	3	Not sterile	261
18/10 B	18/10/2024	08:20	09:20	06:20:00	07:20:00	day	3	Not sterile	203
22/10 A	22/10/2024	16:30	17:30	14:30:00	15:30:00	day	3	Not sterile	48
		16:30	17:30	14:30:00	15:30:00		4	Sterile	38
23/10 Rain	23/10/2024	05:25	06:34	03:25:00	04:34:00	night	3	Not sterile	281
23/10 B	23/10/2024	06:34	08:30	04:34:00	06:30:00	night-day	3	Not sterile	221
		06:34	08:30	04:34:00	06:30:00		4	Sterile	172
23/10 C	23/10/2024	08:30	10:30	06:30:00	08:30:00	day	3	Not sterile	310
		08:30	10:30	06:30:00	08:30:00		4	Sterile	242

Table. S1. Sampling conditions (day/night; sterile/not sterile) and parameters (date, start/stop time, and collected volume) for each sample.

	pH	Cl ⁻	NO ₃ ⁻	SO ₄ ²⁻	Acetic	Formic	Oxalic	Na ⁺	NH ₄ ⁺	K ⁺	Mg ²⁺	Ca ²⁺	Formaldehyde	Acetaldehyde	Acetone	Acrolein	H ₂ O ₂	CCT/TC (mgC/L)	CCT/TOC (mgC/L)
07/10 A	6.1	15.2	11.1	13.8	22.3	10.4	6.9	30.2	15.7	12.3	4.1	13.9	2.7	1.7	1.9	0.2	25.5	4.5	4.0
07/10 B	5.9	3.8	6.6	5.6	6.7	7.0	6.8	12.5	13.4	4.1	1.8	7.4	2.7	1.9	2.3	0.2	24.8	1.7	1.3
08/10 A	6.4	11.9	3.7	1.9	17.4	2.2	6.5	11.2	7.3	7.4	1.5	7.6	2.7	1.6	1.8	0.2	8.8	2.3	1.8
08/10 B	6.5	8.6	1.1	1.4	20.6	0.1	5.0	6.9	4.4	7.3	1.3	5.1	2.2	1.6	2	0.2	4.0	<DL	<DL
08/10 C	6.7	6.7	1.8	1.3	<DL	1.6	4.1	11.1	7.5	2.5	1.5	4.8	2.7	1.6	1.8	0.2	14.5	<DL	<DL
08/10 D	6.3	26.5	6.8	3.0	<DL	5.1	4.2	21.5	11.2	2.0	1.9	4.9	3.3	1.8	2.2	0.3	23.8	<DL	<DL
08/10 E	6.8	25.9	6.1	3.1	0.3	4.9	3.5	23.1	9.8	2.5	2.0	5.0	3.1	1.7	2	0.2	21.9	<DL	<DL
08/10 F	7.0	37.0	5.7	3.0	<DL	2.5	2.7	31.5	6.9	1.3	2.3	4.1	3	1.7	2.2	0.2	21.5	<DL	<DL
09/10 A	6.1	84.8	37.0	12.3	14.2	13.3	2.8	70.4	54.5	8.4	3.9	8.7	5.4	1.9	1.6	0.2	43.9	4.6	4.1
09/10 B	4.5	107.0	54.8	13.4	11.5	18.0	2.9	99.1	58.8	6.1	5.4	10.0	4.2	2.2	1.3	0.2	73.7	12.7	12.2
10/10 A	5.5	55.8	13.0	5.9	3.4	9.9	2.0	43.0	14.1	2.9	2.7	8.3	2.9	1.2	1.1	0.1	21.3	1.5	1.0
10/10 B	5.6	289.2	31.6	19.7	3.9	12.8	2.1	246.9	31.9	7.8	12.2	13.9	4.5	1.8	1.2	0.2	50.3	6.4	5.9
16/10 A	6.5	8.3	16.6	15.6	3.4	2.4	1.9	11.6	18.0	4.4	2.4	62.3	1.9	0.7	0.8	0.2	15.7	3.4	1.9
16/10 B	6.6	2.9	17.0	15.7	5.3	2.3	1.9	6.5	26.4	3.5	2.2	58.3	2.5	1.4	1.6	0.2	<DL	<DL	<DL
16/10 C	7.0	3.4	18.6	15.6	11.1	2.0	2.0	6.1	30.1	3.1	2.1	57.2	2.5	1.5	1.8	0.2	53.2	3.3	1.7
16/10 D	6.4	1.0	10.8	9.2	4.3	1.1	1.0	2.9	21.8	2.0	1.7	40.0	2.2	1.4	1.6	0.2	<DL	<DL	<DL
16/10 E	<DL	3.6	9.7	8.4	3.0	0.7	1.4	2.6	23.4	1.8	1.5	25.7	2.4	1.3	2.1	0.2	24.4	2.3	1.2
16/10 F	7.1	<DL	4.5	4.2	<DL	<DL	0.2	1.0	14.2	0.9	1.3	12.7	2.7	1.6	1.9	0.3	<DL	2.3	1.3
16/10 G	6.6	<DL	4.8	4.4	2.4	1.6	0.2	3.0	19.9	2.0	1.3	13.5	3.1	1.3	1.8	0.2	22.8	2.0	1.1
17/10 A	6.5	24.2	43.0	32.0	14.5	8.9	1.4	26.4	57.3	4.3	3.0	53.0	4	0.8	0.8	0.1	74.6	3.5	2.3
17/10 B	6.8	26.1	38.5	27.1	12.0	3.8	1.4	28.9	46.3	3.5	2.8	45.2	3.7	1.8	2.1	0.3	77.5	2.0	1.2
18/10 A	6.1	0.9	9.4	2.3	6.3	9.7	<DL	4.9	8.5	2.6	1.6	13.9	2.3	1.5	2.1	0.3	7.0	2.8	2.2
18/10 B	5.8	1.2	7.1	1.8	<DL	<DL	<DL	2.1	7.9	1.5	1.3	7.4	2.6	1.8	2.5	0.3	11.0	2.4	1.7
22/10 A	4.1	254.7	115.7	99.1	9.9	16.5	2.9	224.7	91.6	11.3	12.8	59.2	4	1.9	2.2	0.3	104.1	4.9	4.2
23/10 Rain	5.1	19.4	20.4	13.0	4.8	4.6	0.5	15.8	19.9	4.3	1.9	10.1	2.5	1.1	1.7	0.2	21.8	4.2	3.6
23/10 B	5.0	48.1	53.3	30.5	5.5	12.3	0.5	41.8	46.5	3.6	3.5	25.4	4.2	1.1	1.5	0.2	86.1	5.1	4.5
23/10 C	6.0	46.8	52.8	28.2	3.7	13.7	0.9	42.8	41.1	4.2	3.6	28.4	4	1.3	1.8	0.2	74.1	2.9	2.3
15/10 Blank	6.4	0.8	1.4	2.0	<DL	<DL	0.7	2.4	0.7	0.4	2.4	6.6	0.5	0.7	1	0.1	<DL	<DL	<DL
Median	6.4	17.3	10.9	8.8	5.9	4.9	2.0	14.2	18.9	3.5	2.1	13.1	2.7	1.6	1.8	0.2	24.1	3.1	2.0
Average	6.1	42.8	21.5	14.0	8.5	6.7	2.6	36.8	25.3	4.2	3.1	21.9	3.1	1.5	1.8	0.2	37.8	3.7	3.0

Table S2. Concentration in $\mu\text{mol L}^{-1}$ of main organic, inorganic anions and cations, carboxylic acid, H_2O_2 , TC, TOC and pH of the cloud water samples studied in this work. “<DL” is reported for values below the detection limit

Samples	Chloride	Nitrate	Sulphate	Sodium	Ammonium	Magnesium	Calcium
07/10 A	15.2	11.1	13.8	30.2	15.7	4.1	13.9
07/10 B	3.8	6.6	5.6	12.5	13.4	1.8	7.4
08/10 A	11.9	3.7	1.9	11.2	7.3	1.5	7.6
08/10 B	8.6	1.1	1.4	6.9	4.4	1.3	5.1
08/10 C	6.7	1.8	1.3	11.1	7.5	1.5	4.8
08/10 D	26.5	6.8	3.0	21.5	11.2	1.9	4.9
08/10 E	25.9	6.1	3.1	23.1	9.8	2.0	5.0
08/10 F	37.0	5.7	3.0	31.5	6.9	2.3	4.1
09/10 A	84.8	37.0	12.3	70.4	54.5	3.9	8.7
09/10 B	107.0	54.8	13.4	99.1	58.8	5.4	10.0
10/10 A	55.8	13.0	5.9	43.0	14.1	2.7	8.3
10/10 B	289.2	31.6	19.7	246.9	31.9	12.2	13.9
15/10 Blank	0.8	1.4	2.0	2.4	0.7	2.4	6.6
16/10 A	8.3	16.6	15.6	11.6	18.0	2.4	62.3
16/10 B	2.9	17.0	15.7	6.5	26.4	2.2	58.3
16/10 C	3.4	18.6	15.6	6.1	30.1	2.1	57.2
16/10 D	1.0	10.8	9.2	2.9	21.8	1.7	40.0
16/10 E	3.6	9.7	8.4	2.6	23.4	1.5	25.7
16/10 F	0.0	4.5	4.2	1.0	14.2	1.3	12.7
16/10 G	0.0	4.8	4.4	3.0	19.9	1.3	13.5
17/10 A	24.2	43.0	32.0	26.4	57.3	3.0	53.0
17/10 B	26.1	38.5	27.1	28.9	46.3	2.8	45.2
18/10 A	0.9	9.4	2.3	4.9	8.5	1.6	13.9
18/10 B	1.2	7.1	1.8	2.1	7.9	1.3	7.4
22/10 A	254.7	115.7	99.1	224.7	91.6	12.8	59.2
23/10 Rain	19.4	20.4	13.0	15.8	19.9	1.9	10.1
23/10 B	48.1	53.3	30.5	41.8	46.5	3.5	25.4
23/10 C	46.8	52.8	28.2	42.8	41.1	3.6	28.4

Table S3.

Matrix used for the PCA based on ion concentrations dissimilarities (concentrations in $\mu\text{mol L}^{-1}$). The matrix was not normalised prior to analysis as the predefined function on R was used.

Elements	As	Cd	Co	Cr	Cu	Fe	Mg	Mn	Mo	Ni	Pb	Pd	Rb	Sb	Sn	Sr	Tl	V	W	Zn
15/10 Blank	<LQ	0.2	0.5	<LQ	160.9	<LQ	4432.5	123.4	0.1	9.0	0.3	<LQ	0.4	0.2	0.2	13.0	<LQ	0.5	0.4	246.2
07/10 A	0.3	0.7	4.9	4.1	122.4	36.4	8342.8	407.2	3.4	176.7	1.5	0.0	5.8	0.9	1.1	27.7	0.0	3.4	1.2	2489.8
07/10 B	<LQ	0.4	2.6	<LQ	65.3	29.6	2562.1	112.9	1.0	48.0	1.3	<LQ	2.4	0.6	0.5	15.7	0.0	3.6	1.3	1781.0
08/10 A	<LQ	0.7	1.3	<LQ	87.7	27.7	1655.1	46.0	0.5	39.1	1.1	0.0	3.3	0.6	0.6	13.5	0.0	1.2	1.9	1599.9
09/10 A	0.7	0.2	0.9	2.2	66.6	29.5	8579.4	39.5	1.6	25.2	1.9	0.0	4.1	0.4	0.4	20.7	0.0	6.0	2.3	809.0
09/10 B	0.7	0.3	0.8	2.1	112.9	54.4	11581.8	49.9	0.5	26.7	2.5	0.0	2.3	0.4	0.4	25.4	0.0	7.4	1.2	541.6
10/10 A	<LQ	0.4	1.2	<LQ	60.6	17.3	5887.2	44.0	1.7	34.5	2.7	0.0	2.4	0.5	0.4	17.8	0.0	2.6	1.2	1548.0
10/10 B	0.7	0.4	1.0	2.1	88.4	30.5	27403.5	58.2	2.0	26.3	2.4	0.0	2.7	0.4	0.2	50.9	0.0	4.8	1.7	1220.4
16/10 A	0.4	0.1	2.0	1.8	25.3	89.3	3836.3	231.0	2.3	25.6	0.1	0.1	2.6	0.6	0.3	92.2	<LQ	3.7	3.4	351.7
17/10 A	1.3	0.3	2.2	2.2	35.2	44.9	5555.8	199.5	0.7	17.2	0.2	0.1	3.0	1.1	0.3	93.9	0.1	19.0	5.0	231.6
18/10 A	<LQ	0.3	1.3	2.5	32.2	24.2	1757.9	45.1	6.0	35.8	0.4	<LQ	1.5	0.6	0.5	23.9	<LQ	1.5	1.3	3386.6
22/10 A	7.7	1.3	2.7	4.4	596.0	283.0	28024.7	176.4	0.8	26.7	42.1	0.1	6.0	1.6	1.0	137.8	0.5	17.8	1.5	1189.6
23/10 Rain	0.6	0.8	1.0	<LQ	80.8	20.1	2461.5	57.7	0.2	24.9	1.9	<LQ	2.2	0.7	0.3	19.5	0.0	2.9	1.0	1844.4
23/10 B	2.1	0.5	1.4	2.9	150.4	64.5	6665.8	105.0	0.6	21.7	4.0	0.1	2.2	0.9	0.6	61.8	0.1	7.2	1.5	893.3
23/10 C	1.9	0.6	4.9	5.5	109.9	75.0	8166.8	113.2	1.1	38.9	2.2	0.1	2.7	1.1	0.7	69.0	0.1	6.5	0.9	1561.9

Table. S4. Concentration of the main metals in nmol L⁻¹ detected in the samples. “LQ” is reported for values below the quantification limit.

	Mycelium forming unit	Bacteria-like CFU	# replicates
	mL⁻¹	mL⁻¹	
10/07/2024 A	70	420	1
10/08/2024 A	225 ± 78	175 ± 7	2
10/09/2024 B	380 ± 35	183 ± 23	3
10/10/2024 A	245 ± 49	235 ± 106	2
10/16/2024 A	137 ± 61	333 ± 65	3
10/17/2024 A	426 ± 45	20 ± 10	3
10/17/2024 B	163 ± 47	63 ± 21	3

Table. S5. Concentration of culturable fungi and bacteria-like CFUs for the different samples after 3 or 4 days of incubation at 17°C (mean ± SD). Replicates varied because of fungi invasion in Petri dishes.

Samples	Concentration (cell mL⁻¹)
07/10/24 A	(4.0 ± 0.5) 10 ⁴
08/10/24 A	(2.8 ± 0.4) 10 ⁴
09/10/24 B	(1.5 ± 0.1) 10 ⁴
10/10/24 A	(8.0 ± 0.3) 10 ³
16/10/24 A	(1.0 ± 0.3) 10 ⁶
17/10/24 A	(2.4 ± 0.5) 10 ⁵
17/10/24 B	(2.9 ± 1.0) 10 ⁵
22/10/24 A	(3.1 ± 0.2) 10 ⁴
23/10/24 B	(1.4 ± 0.1) 10 ⁵

Table. S6. Total cell concentration from flow cytometry (mean ± SD).