



Supplement of

Interdisciplinary strategy to assess the impact of meteorological variables on the biochemical composition of the rain and the dynamics of a small eutrophic lake under rain forcing

Fanny Noirmain et al.

Correspondence to: Fanny Noirmain (fanny.noirmain@gmail.com)

The copyright of individual parts of the supplement might differ from the article licence.

Supplementary material



Fig. S1 Illustration of the flow cytometry analysis performed to quantify the autofluorescence from specific pigment from photosynthetic cells in the rain samples. (a) Quantification of all aerosols, (b) total pigments population based on minimal chlorophyll fluorescence, (c) Phycoerythrin population, (d) Chlorophyll, and Phycocyanin populations present in a rain sample.

	Rain events	"High-Intensity- Short-Rain" (HIR)	"Continuous-Rain event 1" (CR1)	"Continuous- Rain event 2" (CR2)
Rain sensor data	Date	9/20/2020	9/27/2020	9/28/2020
	Duration (hour)	2,15	21,78	7,2
	Number of rain samples	1	6	2
<i>in situ</i> data	рН	5,79	5,59+-0,09	5,69±0,02
Long-range provenance (CAT model)	Primary sectors (%)	SWW (71,%)	NEE (31,7%)	NNE (44%)
		SSW 15,4%)	NNE (28,8%)	SEE (33,2%)
	Trajectory points located over land/sea below 2 km of altitude (%)	above 2 km over	below 2 km over	below 2 km over
		sea (37,6%)	land (40%)	land (48%)
		above 2 km over	below 2 km over	below 2 km over
		land (27%)	sea (24,3%)	sea (29,3%)
MRR data	Terminal Drop Velocity (m.s ⁻ ¹)	5,47±2,05	4,14±1,67	4,20±1,34
Parsivel data	Mean Drop diameter (mm)	0,57	0,35	0,36
	Peak intensity (5 min interval) (mm. h ⁻¹)	13.32±2.2	5.1±2.9	2.1±0.4
	Mean rain rate (mm. h ⁻¹)	2.5±3.15	1.26±0.9	0.8±0.5
Meteorological data from St- Genes	Mean Air Temp (°C)	16,63±1,42	4,8±0,9	6,45±0,36
	Mean Wind speed (m/s)	1,36±0,46	4,67±0,82	3,3±0,96
ново	Mean Lake temperature [0- 2,8 m] (°C)	19,46±0,06	14,58±0,3	13,97±0,06
	Mean water irradiance [0- 2,8 m] (Lux)	328,2±158	344,2±566,7	102,4±184

Table. S1: Mean characteristics of the "High-Intensity-Short-Rain" event (HIR) on September 20 from 14:00 to 16:15 UTC, the "Continuous-Rain event 1" (CR1) on September 27 at 03:50 to September 28 at 01:28, and finally the "Continuous-Rain event 2" (CR2) on September 28 at 01:50 to 09:00 UTC. Macro and microphysical data were recorded at the Aydat instrumental site using the Rain sensor, Parsivel, and MRR instruments. Meteorological data come from Saint-Genes Champanelle Météo-France weather station. Mean lake water temperature and light intensity during rain events were recorded from the HOBO data loggers.

	CR1's sub-events	CR1.a	CR1.b	CR1.c
Rain sensor data	Data time (UTC)	9/27/2020	9/27/2020	9/27/2020
	Date time (OTC)	03:50	10:30	20:35
	Number of CR1's infra-samples	2	3	1
	Duration (hour)	6,4	10,05	4,5
<i>in situ</i> data	рН	5,59±0,1	5,63±0,1	5,54
Long-range provenance (CAT model)	Primary soctors (%)	NNE (32.5 %)	NEE (33.7%)	NEE (32.5%)
	Primary sectors (%)	NEE (29.7%)	NNE (30.8%)	NWW(25.5%)
	Above or below 2 km over land or	below 2 km over land (34%)	below 2 km over land (50%)	below 2 km over land (39%)
	sea (%)	above 2 km	below 2 km	below 2 km
		over sea	over sea	over sea
		(26.2%)	(28.3%)	(28.3%)
MRR data	Terminal Drop Velocity (m s ⁻¹)	5±0,96	4,5±1,6	2,16±0,7
Parsivel data	Rain amount (mm)	8.74	15.28	3.27
	Peak intensity (5 min interval) (mm. h ⁻¹)	3.3±0.21	5.1±2.97	2±0.17
	Mean drop diameter (mm)	0.47	0.36	0.29
Meteorologial data from St- Genes	Mean Air Temp (°C)	5,31±-1,13	6,44±1,32	5,9±0,2
	Mean Wind speed (m s ⁻¹)	4,15±1,2	4,04±1,31	4,26±0,4
Lake data from HOBO	Mean water temperature [0-2.8 m] (°C)	14.92±0.1	14.55±0.18	14,16±0.05
	Mean water light irradiance [0-2.8 m] (Lux)	408.85±551	470±648	0.0±0.02

Table S2: Mean characteristics of CR1's infra-samples collected on September 27 at 03:50 UTC to September 28 at 01:28 UTC. Sub-divisions were according to the evolution of the reflectivity (Z) from Mira.



Fig. S2: 120-h backward trajectory plots at higher and lower cloud level, extracted from ERA5 data reanalysis, for the three rain events: (a-b) HIR, (c) CR1a, (d) CR1b, (e) CR1c, and (f) CR2. The initial cloud level was determined accordingly to the Cloud reflectivity from the Mira plots.



Fig. S3: Water temperature vertical profiles into the lake water column before and after rain events, recorded with the YSI ProDSS probe on September 18 (red line), 23 (green line), and 30 (blue line) 2020. The continuous lines correspond to the oxygen profiles (ODO) in mg L^{-1} and dotted lines correspond to the water temperature in Celsius degrees



b





с

Evolution of water temperature and water irradiance during CR2 event



Fig. S4: Lake water temperature and lake water irradiance at the surface and down to 2.8 m of depth recorded with the HOBO (5 min resolution) before, during, and after (a) HIR, (b) CR1 and (c) CR2.

а



Fig. S5: The mean (a) anion and (b) cation concentrations into lake samples collected at three depths into Lake Aydat before and after Rain Period 1 (RP1), where HIR event occurred, and before and after Rain Period 2 (RP2), where both CR1 and CR2 events occurred. The significance level was reported from the Dunn test to compare the ion concentrations between the dates of lake sampling, before and after RP1 and RP2.