Supplement of Biogeosciences, 13, 3573–3584, 2016
http://www.biogeosciences.net/13/3573/2016/
doi:10.5194/bg-13-3573-2016-supplement


Biogeosciences
Open Access

*Supplement of*

# Are flood-driven turbidity currents hot spots for priming effect in lakes?

**Damien Bouffard and Marie-Elodie Perga**

*Correspondence to:* Marie-Elodie Perga (marie-elodie.perga@thonon.inra.fr)

# Supplement

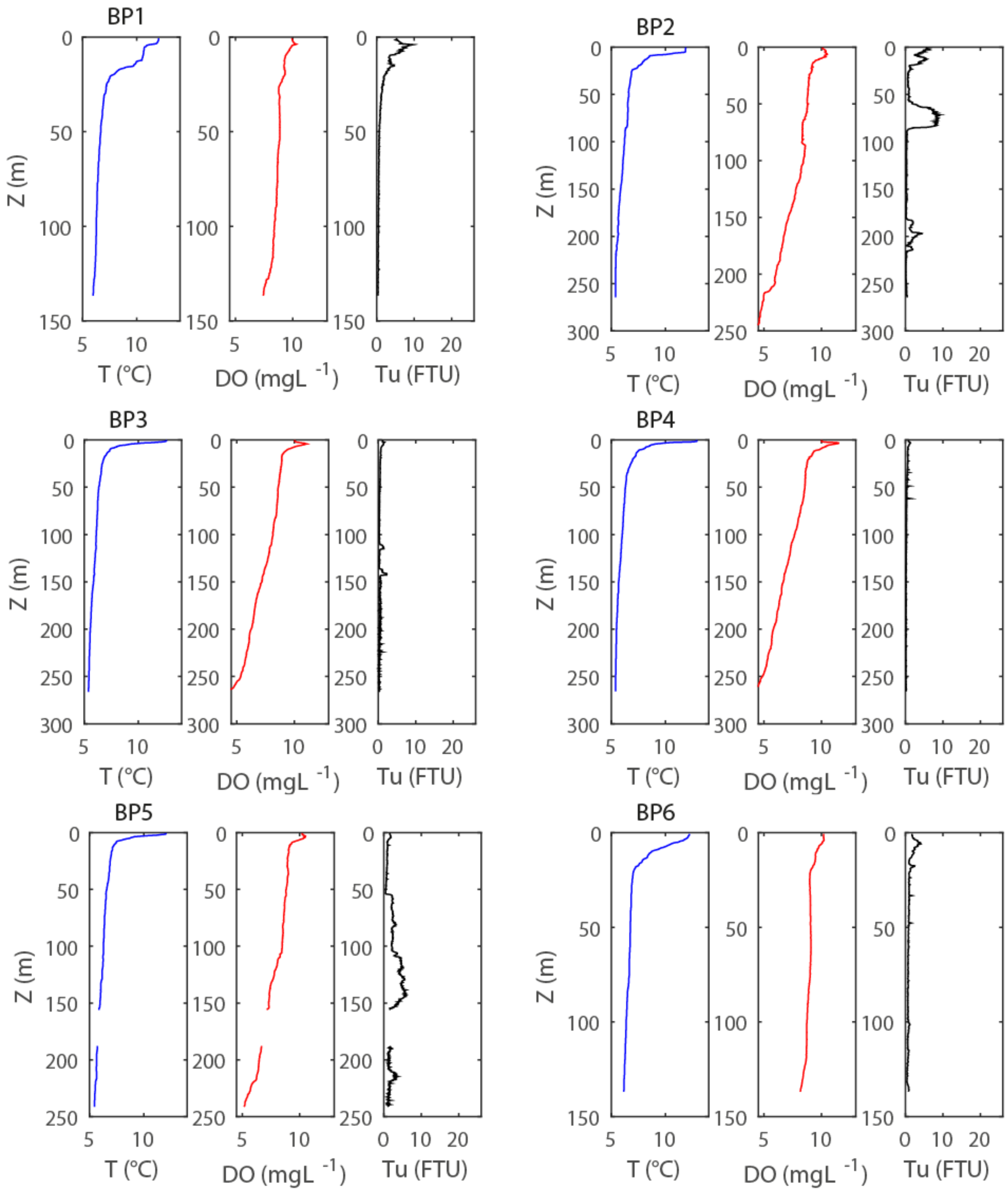
S1. The thickness of the intrusion provides information on the dilution of the riverine water by lake water. We assume first that horizontal dispersion, $K_H$, is of same order as vertical dispersion, Kz (e.g. conservative case as typically, $K_H > K_z$). The rate of dilution, $\Gamma_\delta$, can be defined by $\Gamma_\delta = \delta i / \delta j$, with $\delta$ the thickness of the intrusion at the location defined by indices i and j. Taking i = BP22 or entrance of the river Dranse, respectively and j = BP18, gives $\Gamma_\delta$ = 46 % (i= BP22) and $\Gamma_\delta$ = 0.9 % (i = entrance of river Dranse).

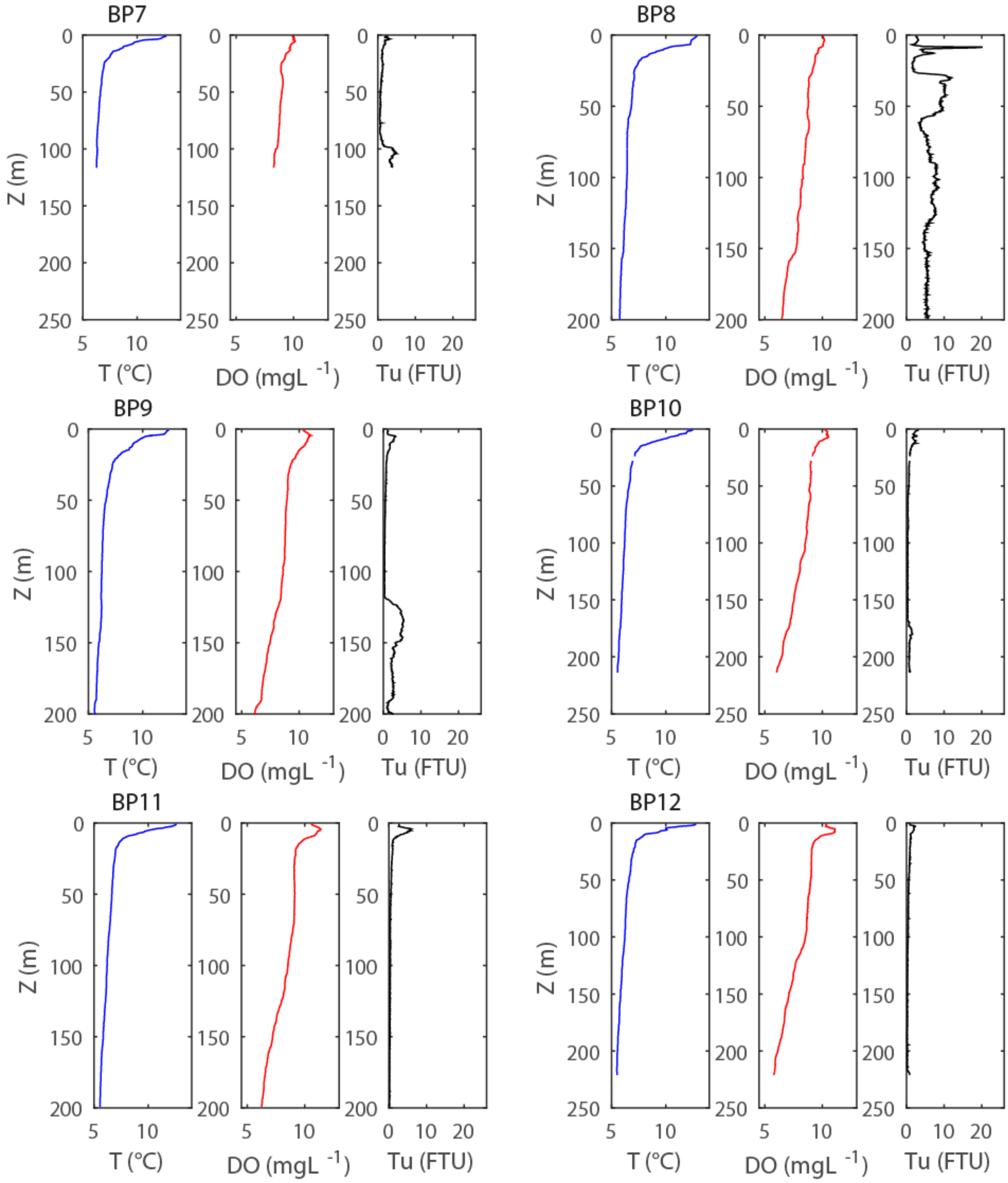
The rate of dilution within the intrusion can also be estimated, assuming negligible particle settling away from the plunging point, by comparing the averaged temperature anomaly in 2 profiles (e.g. BP22 and BP18). The intrusion density, $\rho_I$, is a function of temperature $\rho_T$, and particle concentration $\rho_C$ with $\rho_I = \rho_T + \rho_C$ (Figure 2). $\rho_I$ is calculated from the linearly interpolated temperature profile in the absence of intrusion. In so doing, we estimate $\Gamma_\rho = \rho_{C,\,BP18} / \rho_{C,\,BP22}$ = 29 % over the 4 km distance between BP22 and BP18. To have $\Gamma_\delta = \Gamma_\rho$, implies to have an horizontal dispersion 1.5 times larger than the vertical dispersion and will lead to a Dranse river fraction at BP18 of 0.4%. These bulk estimates suggest that the river water is first efficiently mixed in the underflow stage (e.g. most of the dilution is done before the intrusion reaches BP22), then, the dilution rate becomes smaller allowing the intrusion to propagate over a long distance.

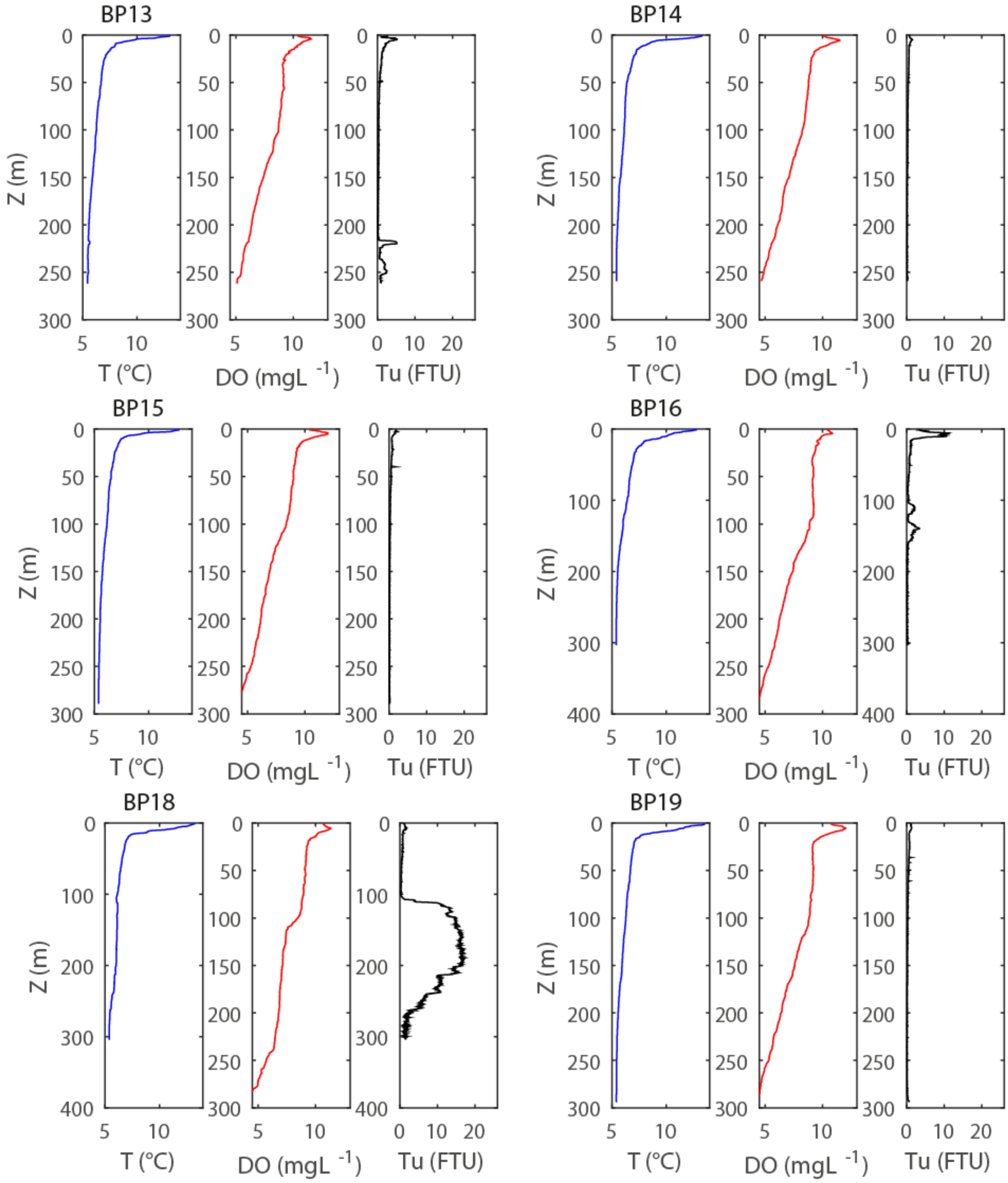
For SHL2 (BP18), the riverine fraction is about O(1%) and, as shown above, river contribution increases as stations are closer to the river mouths. The 50% dilution treatment was therefore quite out of the range of possible dilution, we then focussed more attention on the functional consequences of river contribution at low fractions.

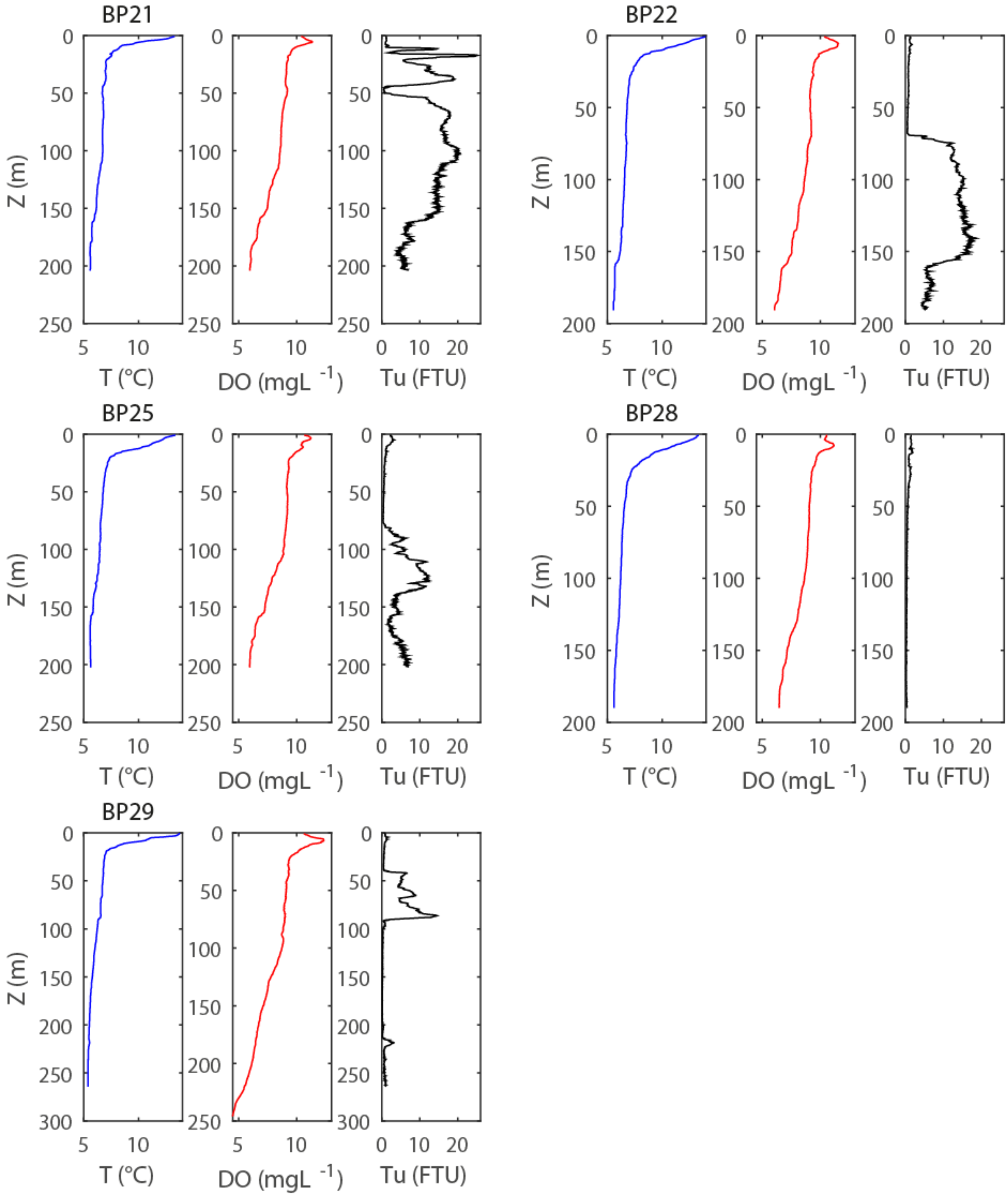
S2.

CTD vertical profiles (Temperature, dissolved oxygen concentrations and turbidity) at each sampled station.

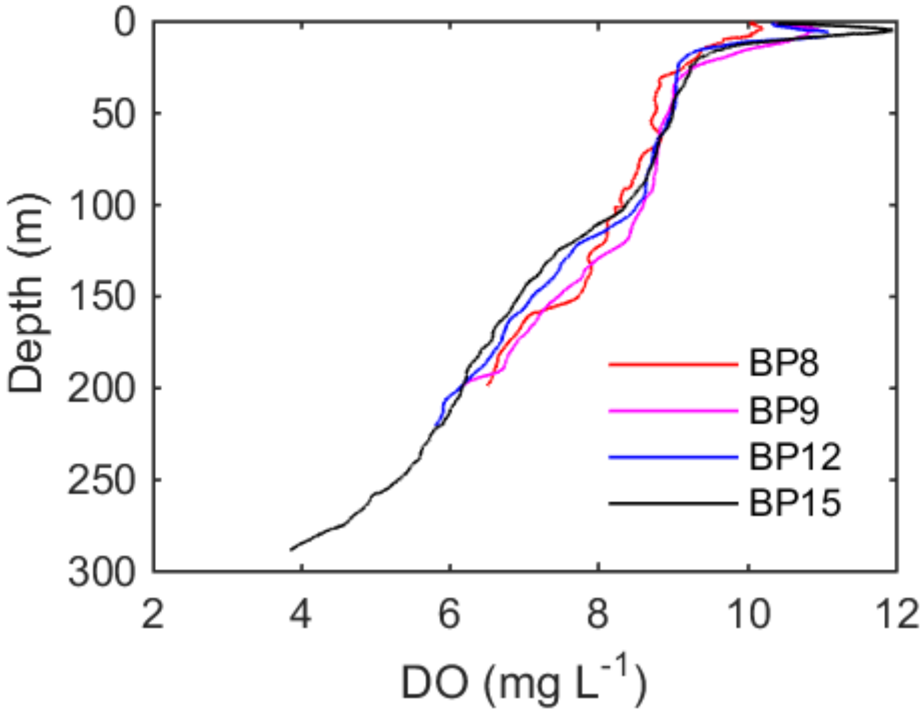



BP7
BP8
BP9
BP10
BP11
BP12
Z (m)
T (°C)
DO (mgL -1)
Tu (FTU)
0
50
100
150
200
250
5
10
20

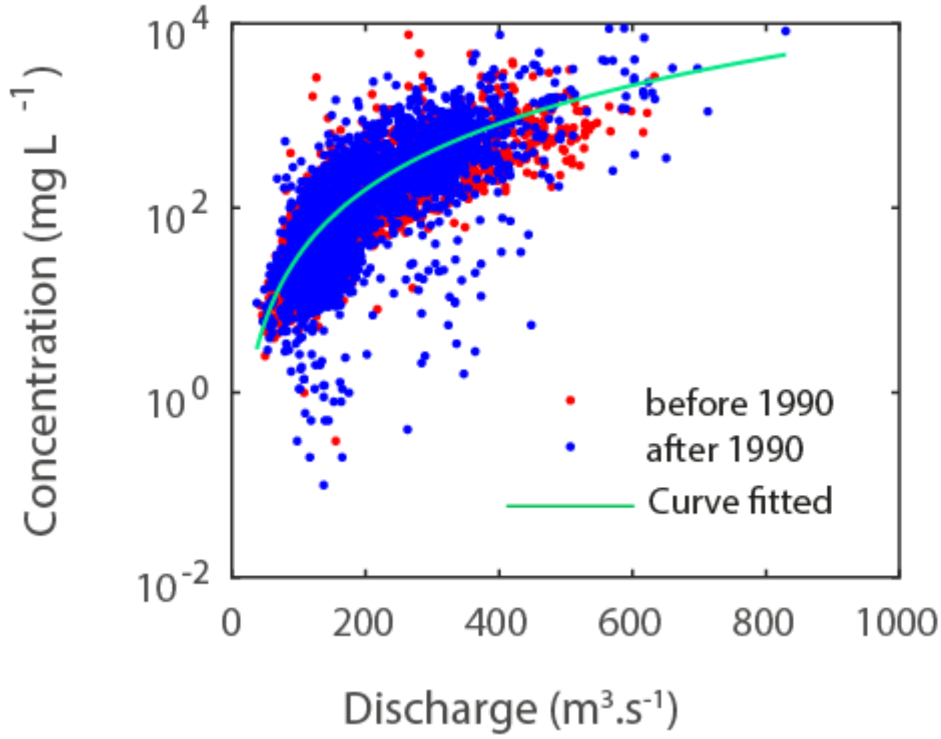

BP13
BP14
BP15
BP16
BP18
BP19
Z (m)
T (°C)
DO (mgL -1)
Tu (FTU)


BP21
BP22
BP25
BP28
BP29
Z (m)
T (°C)
DO (mgL -1)
Tu (FTU)

S3. Detailed oxygen vertical profiles at the sampling sites closer to the Dranse River mouth.



S4. Fitted relationship between the Rhône River sediment load (concentration) and discharge.



S5. GPS locations of the CTD profiles.

| | | |
|---|---|---|
| BP1 | 6.65535 | 46.48196 |
| BP2 | 6.74681 | 46.47204 |
| BP3 | 6.73746 | 46.45538 |
| BP4 | 6.72681 | 46.44335 |
| BP5 | 6.76507 | 46.43823 |
| BP6 | 6.82108 | 46.42729 |
| BP7 | 6.79751 | 46.42411 |
| BP8 | 6.81049 | 46.40934 |
| BP9 | 6.78839 | 46.41372 |
| BP10 | 4.77548 | 46.40600 |
| BP11 | 6.75064 | 46.41646 |
| BP12 | 6.75885 | 46.42551 |
| BP13 | 6.72372 | 46.41630 |
| BP14 | 6.73042 | 46.43069 |
| BP15 | 6.69043 | 46.43947 |
| BP16 | 6.64098 | 46.45186 |
| BP18 | 6.58872 | 46.45270 |
| BP19 | 6.54273 | 46.43007 |
| BP21 | 6.53978 | 46.41241 |
| BP22 | 6.52600 | 46.41216 |
| BP25 | 6.51537 | 46.41379 |
| BP28 | 6.47253 | 46.45149 |
| BP29 | 6.55481 | 46.46611 |
| BP30 | 6.60594 | 46.49139 |