

## **Sampling sites during the MissRhodia 2 cruises (May-June 2018)**

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The Rhône River (RR; Fig. 1) is the largest river in the Mediterranean Sea in terms of solid loads, nutrients and freshwater fluxes, since the construction of Aswan dam and reduction of Nile riverine flows (Antonelli et al. 2008; Ludwig et al. 2009). The RR is 832 km long, characterized by a catchment area of 97800 km<sup>2</sup> originating in the Alps and ending in a delta of 1455 km<sup>2</sup> (Pont et al. 2002; Antonelli et al. 2004). Fifty kilometers up from the River mouth, the Rhône River splits into two unequal branches : the eastern channel (Grand Rhône, 50 km long, also called Rhône), which discharges 80-90% of the freshwater in the Gulf of Lions, while the western channel (Petit Rhône, 70 km long) carries 10-20% of total discharge (Ibañez et al. 1997; Sabatier et al. 2006; Provansal et al. 2012).

During the flood events, 80% to 90% of particulate loads are driven to the Rhône River mouth, from the catchment area (Arnau et al., 2004; Eyrolle et al., 2012; Ollivier et al., 2010). Overall, the mean liquid discharge at the River mouth is 1700 m<sup>3</sup> s<sup>-1</sup>, with a peak discharge of 13000 m<sup>3</sup> s<sup>-1</sup> in December 2003 (Arnau et al., 2004; Ibañez et al., 1997; Locht and Leveau, 1990; Pont et al., 2002).

Generally, the Rhône River's plume extends towards the southwestward (SW), as it is oriented by winds regimes close to the River mouth and by the River flow (Estournel et al. 1997; Naudin et al. 1997; Gatti et al. 2006). Consequently, the delivered loads of particulate material to the delta are mostly transported in the SW direction and some are ultimately driven to the adjacent continental shelf. The largest share of the riverine inputs is deposited at the seafloor near the river mouth, leading to the formation of a deposition fan (Lansard et al. 2007). Consequently, the water depth increases from 10 m at the river mouth to 75-90 m on the continental shelf.

The decrease of transported loads with distance is accompanied by a progressive aging of organic particles (Cathalot et al. 2013). The decreasing sediment deposition offshore gives rise to a large biogeochemical gradient from the River mouth to the continental shelf (Cathalot et

al. 2010; Pastor, et al. 2011; Rassmann et al. 2016). Concerning the DIP from the Rhône River, Ludwig et al. (2009) showed an increase of DIP loads from 1970 to around 1985, followed by a decrease that may be related to the mitigation of pollution (i. e., the ban of P detergents and/or the upgrading of the WWTP).

The Rhône delta (called also a prodelta because of its prograding properties) is characterized by two regions: the proximal zone located near the River mouth at the water depth of around 20 meters with a sedimentation rate of 20-35 cm yr<sup>-1</sup>, whereas the prodelta zone is located further at 30-65 meters depth and displays sedimentation rates of 1-2 cm yr<sup>-1</sup>. The continental shelf extends further away from the prodelta and has sedimentation rates of less than 0.1 cm yr<sup>-1</sup> (Charmasson et al. 1998; Radakovitch et al. 1999; Miralles et al. 2005).

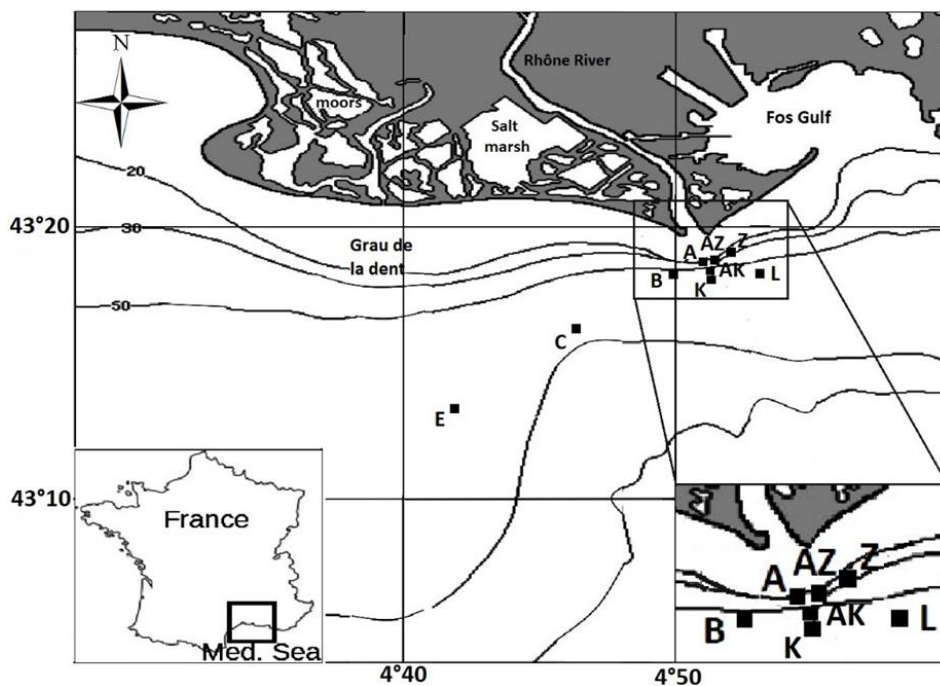


Fig. 1 Location of sampled stations in proximal, prodelta and distal domains of the Rhône River delta



The sampling cruise MissRhoDia was carried out aboard the RV Tethys II in May 2018. Nine stations were sampled between 2 and 18 km from the Rhône river mouth, in the proximal (stations A, Z and AZ), prodelta (stations AK, K, B and L) and distal (stations C and E) domains over a southwest transect, corresponding to the direction of the river plume. The locations of sampling stations are shown in table 1.

Table 1. Sampling site locations and environmental parameters (bottom water temperature T<sub>bw</sub> and salinity S) for each station during the benthic sampling

Site	Lat. (°N)	Long. (°E)	Dist. (km)	Depth (m)	T <sub>bw</sub> (°C)	S
Z	43°19.062	4°52.034	1.8	20.2	15.7	38
A	43°18.680	4°51.038	1.9	21	15.6	37.8
AZ	43°18.742	4°51.400	2.3	20	20	37.8
AK	43°18.426	4°51.300	2.7	43.7	15.6	37.9
B	43°18.262	4°49.938	3	48.5	15.8	37.9
K	43°18.111	4°51.361	3.3	57.3	15.7	38.5
L	43°18.270	4°53.106	4	60.8	15.1	38.1
C	43°16.237	4°46.379	8.6	72.5	14.7	38.2
E	43°13.333	4°41.897	16.6	72	14.8	38.3

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