Groundwater discharge into a coastal freshwater pond impacts an aquatic ecosystem

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Aquatic ecosystems are essential components of the environment which contribute to biodiversity and provide various ecological services. In particular, wetlands are typical hotspots defined by the close interaction between different water sources (surface and ground water) controlling both ecosystem structure and processes. Therefore, quantifying water and element fluxes, the mixing of different water bodies and the impact of ecological processes is essential to understand the ecosystem dynamics and resilience.

Here, we show how high spatial resolution of dissolved gas data can decipher the spatial heterogeneity of water sources and biogeochemical processes. Such datasets were acquired using a MIMS (Chatton et al, 2017) designed and adapted to the field within the CRITEX project (Innovative equipment for the Critical Zone) and implemented on a classified coastal wetland (Lannenec pond) downstream a hydrogeological observatory (H+ Ploemeur).

These innovative experiments (figure 1) allowed to localise and quantify groundwater discharges (oversaturation of He and CO_2), and biogeochemical reactivity hotspots (oversaturation of O_2 and undersaturation of CO_2) associated with a deep concentration of cyanobacteria. A surface bloom of *Dolichospermum sp* was indeed observed with a high spatial variability of the biomass coinciding with the horizontal temperature gradient.

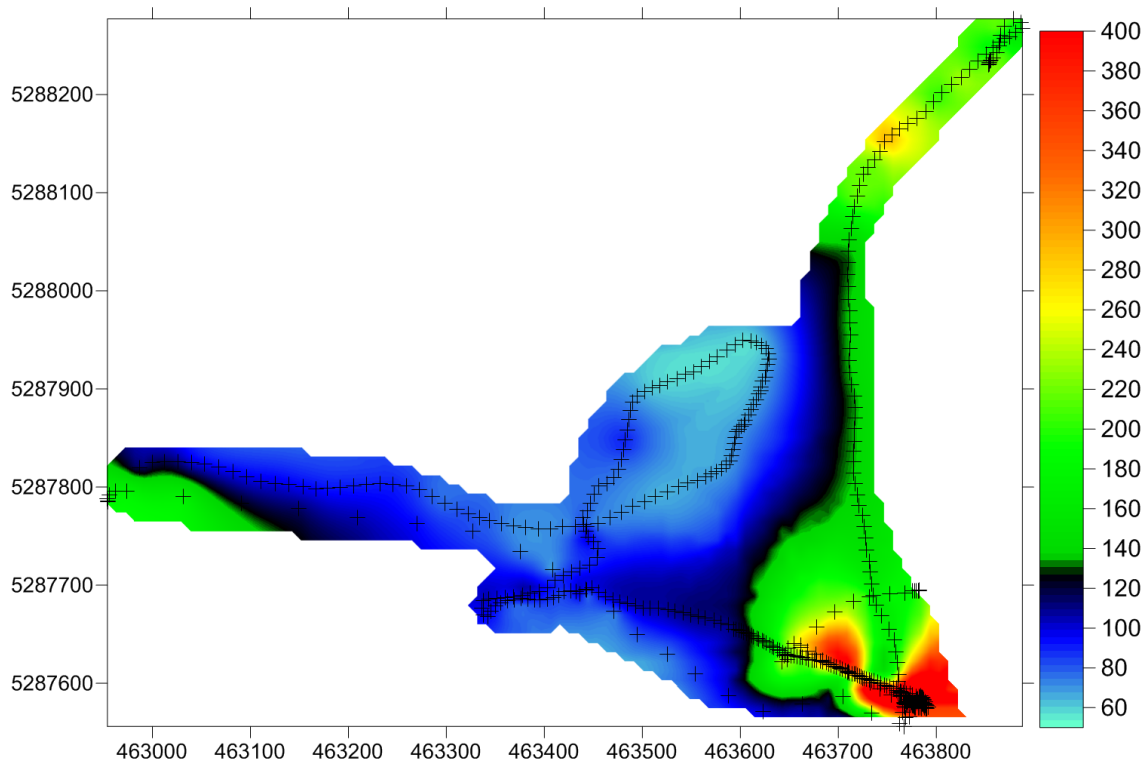

Figure 1: Spatial distribution of CO_2 saturation in Lannénec pond. Oversaturation (>100%) results from subsurface groundwater discharge and undersaturation (<100%) results from biogeochemical reactions depleting carbon dioxide (photosynthesis).

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