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Mapping intertidal mudflat gross primary production (GPP) by hyperspectral imagery, coupling with atmospheric CO_2 fluxes at varied temporal and spatial scales: from the lab to the ecosystem level, through the seasons.

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Intertidal mudflats, present all over the world are excluded from global carbon budget calculation; while these ecosystems are increasingly recognized to be as productive as tropical forests. With an annual global productivity estimated to be in the order of 500 million tons of carbon, mudflats can therefore represent up to 20% of the global production of the oceans, whereas they occupy only 0.03% of their surface, with a total area estimated at 130,000 km^2. Despite their potentially high contribution to the overall carbon budget, their actual contribution remains unknown. Moreover, these ecosystems are currently under threat from global climate changes and increased human activities. In this context, estimating the actual carbon uptake by these ecosystems from the local to the global scale is a challenge that has to be tackled, which is the objective of this project.

The main innovation of our project resides in coupling hyperspectral remote sensing, with CO_2 fluxes measured at different spatial and temporal scales using benthic chambers and atmospheric eddy covariance. The first results shown the effect of seasons, tide, and habitats on CO_2 fluxes, making intertidal mudflats as a sink, rather than a source of CO_2. The final objective is to map the gross primary production (GPP) to estimate for the first time the contribution of these ecosystems at the global carbon cycle and more specifically, to the Blue Carbon. Such tools and results will help predicting what will happen to the tidal ecosystems due to changes linked to global climate changes and assist in developing mitigation and adaptation strategies to comply with the objectives of the Paris Agreement.