



The impact of coastal upwellings on air-sea exchange of climatically important gases

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UK SOLAS (Surface Ocean - Lower Atmosphere Study) aims to *advance understanding of environmentally significant interactions between the atmosphere and ocean, focusing on material exchanges that involve ocean productivity, atmospheric composition and climate*. Coastal upwelling regions are characterised by large chemical and particle fluxes which significantly influence atmospheric chemistry and oceanic biogeochemistry. We therefore aim to determine the hydrodynamics of an upwelling plume off the NW African coast, in order to characterise its impact upon the physical, photochemical and microbiological processes contributing to ocean-atmosphere exchange of biogenic gases.

This project will undertake the first unequivocal Lagrangian study of the interaction between hydrodynamics, biogeochemistry, photochemistry and ecology in an upwelling system. The framework of this unique experiment will be a time-series Lagrangian study using the tracer sulphur hexafluoride (SF_6) as a label for the upwelling water. We will directly measure ocean-atmosphere exchange of trace gases during two 7 day time series studies of upwelled water. We will concurrently determine the roles of photochemistry and microbial (virus-bacteria-phytoplankton- μ zooplankton) interactions which contribute to the production, transformation, release and destruction of gases such as N_2O , CH_4 , pCO_2 , iodocarbons and DMS. In addition, we will determine the hydrodynamics of the upwelling water in order to constrain the transport of nutrients and carbon from the coastal upwelling to the offshore oligotrophic region. Improved understanding of marine biogeochemical processes will only be achieved through interaction between experimental and modelling approaches and this project

will provide a comprehensive high frequency data set linking physics, ecosystem and gas dynamics with great utility to parameterise / validate process models.