PYROPLANKTON: Impacts of PYROgenic aerosols on PLANKTON ecosystems

Description

Climate change is exerting an increasing pressure on land ecosystems in numerous parts of the planet. One of the most dramatic consequences of this enhanced stress are the exceptionally large wildfires that ravaged parts of Australia, the Arctic or California in recent years. While there exists an established research effort on how these fires are affecting land ecosystems, emerging research lines are just starting to show that wildfires might also perturb marine ecosystems.

Biomass burning injects massive amounts of aerosols into the atmosphere that are rich in organic matter and trace metals. Some of these compounds (e.g., phosphate, iron) are essential for living organisms but so scarce in parts of the global ocean that life can hardly be sustained. The case of iron is particularly relevant as it has been shown that burning biomass aerosols contain highly soluble forms of iron, which could potentially be deposited in the ocean and nourish phytoplankton. This hypothesis has recently been validated by the fellow's own research in the Pacific waters of the Southern Ocean: an extensive and anomalous phytoplankton bloom developed after a smoke and ash plume from 2019-20 Australian fires crossed the region, presumably depositing iron in bioavailable forms.

These observations suggest that an increase in fire activity, as projected by most Earth System models, might have immediate impacts on marine productivity andgeochemistry. The type, extension and consequences of these impacts are beyond our understanding as we have not yet defined which are the affected regions or which compounds are actually dissolved in seawater after the deposition of wildfire ash.The project presented here, called Impacts of PYROgenic aerosols on PLANKTON ecosystems (PYROPLANKTON), will analyse the problem from three different perspectives. First, the spatial and temporal variability of biomass burning aerosols deposition and its impact on surface phytoplankton will be evaluated from a synoptic perspective thanks to an original combination of ocean colour (OC-CCI) and fire-burned area (FireCCI) ESA s datasets, and ECMWF s atmospheric reanalysis (CAMS). Secondly, we will conduct ground-breaking experiments with ash from different source-regions across the world.

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