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Ocean Acidification from space: recent advances

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The phenomenon referred to as Ocean Acidification (OA) is gathering increasing attention as one of the major foci of climate-related research, for its profound impact at scientific and socio-economic level. To date, the majority of the scientific studies into the potential impacts of OA have focused on in-situ measurements, laboratory-controlled experiments and models simulations. Satellite remote sensing technology have yet to be fully exploited, despite it has been stressed it could play a significant role by providing synoptic and frequent measurements for investigating globally OA processes, also extending in-situ carbonate chemistry measurements on different spatial/temporal scales [1,2].
Within this context, the purpose of the recently completed ESA “Pathfinders - Ocean Acidification” project was to quantitatively and routinely estimate OA-related parameters by means of a blending of satellite observations and model outputs in five case-study regions (global ocean, Amazon plume, Barents sea, Greater Caribbean and Bay of Bengal).
Satellite Ocean Colour, Sea Surface Temperature (SST) and Sea Surface Salinity (SSS) have been exploited, with an emphasis on the latter being the latest addition to the portfolio of satellite measured parameters. A proper merging of these different satellites products allows computing at least two independent proxies among the seawater carbonate system parameters: the partial pressure of CO_2 in surface seawater (pCO_2); the total Dissolved Inorganic Carbon (DIC), the total alkalinity (TA) and the surface ocean pH.
In the project, efforts have been devoted to a systematic characterization of TA and DIC from space in the mentioned case-study regions; in this paper, also through the knowledge of these parameters, the objective is to come up with the currently best educated guess of the surface ocean pH [3] and Aragonite saturation state. This will also include an estimation of the achievable accuracy by propagating the errors in the satellite data sources.
The overarching long-term objectives are to develop new algorithms and data processing strategies to overcome the relative immaturity of OA satellite products currently available, and to produce a global, temporally evolving, quasi-operational suite of OA satellite-derived data.

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