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Coupling ocean colour remote sensing data into physical-ecosystem models: mapping uncertainty distributions from space.

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Ocean colour remote sensing (OCRS) has transformed our understanding of complex feedback processes linking physical forcing events to biogeochemical responses. With continuous daily global coverage extending beyond the last decade, OCRS has become established as an essential global climate variable with potential use as a sensitive indicator of regional and global response to changing climate. There is increasing focus on use of OCRS data for validation and assimilation into coupled physical-ecosystem models for both environmental and operational applications. It is therefore essential that OCRS data products are not only optimised for maximum accuracy, but are also provided to end users with appropriate uncertainties. A simple spectral deconvolution model will be presented along with a new bootstrap approach for estimating product uncertainties. This approach can be adapted for both remote sensing and in situ data, opening up the possibility of mapping uncertainty distributions in 3-D for the first time, and can be applied to other established OCRS data products, including the existent historic data set.

Ecosystem models seek to reproduce and predict ocean biogeochemical processes, where the models are constrained by physical parameters such as: wind, currents, density and light. The hydrographic aspects of marine ecosystems can generally be defined through ocean circulation models, which are largely independent of the ecosystem itself. The physical optics determining the light environment, on the other hand, are two-way coupled with ecosystem models since light interacts with seawater and suspended constituents. The Optical Physical and Ecosystem Regional Assessment (OPERA) model proposes a more comprehensive and challenging approach, where all optical interactions occurring within the volume of water are taken into account, thus providing a more accurate definition of light dependent processes.