EGU2020-21208
https://doi.org/10.5194/egusphere-egu2020-21208
EGU General Assembly 2020


# Long-term trends in ocean chlorophyll: update from a Bayesian hierarchical space-time model

Claudie Beaulieu, **Matthew Hammond**, Stephanie Henson, and Sujit Sahu
University of California Santa Cruz, Ocean Sciences, USA (beaulieu@ucsc.edu)

Assessing ongoing changes in marine primary productivity is essential to determine the impacts of climate change on marine ecosystems and fisheries. Satellite ocean color sensors provide detailed coverage of ocean chlorophyll in space and time, now with a combined record length of just over 20 years. Detecting climate change impacts is hindered by the shortness of the record and the long timescale of memory within the ocean such that even the sign of change in ocean chlorophyll is still inconclusive from time-series analysis of satellite data. Here we use a Bayesian hierarchical space-time model to estimate long-term trends in ocean chlorophyll. The main advantage of this approach comes from the principle of ”borrowing strength” from neighboring grid cells in a given region to improve overall detection. We use coupled model simulations from the CMIP5 experiment to form priors to provide a “first guess” on observational trend estimates and their uncertainty that we then update using satellite observations. We compare the results with estimates obtained with the commonly used vague prior, reflecting the case where no independent knowledge is available. A global average net positive chlorophyll trend is found, with stronger regional trends that are typically positive in high and mid latitudes, and negative at low latitudes outside the Atlantic. The Bayesian hierarchical model used here provides a framework for integrating different sources of data for detecting trends and estimating their uncertainty in studies of global change.