**Numerical model laboratory for exploring uncertainty in satellite derived chlorophyll-a**

**Stephanie Dutkiewicz1,2, Anna Hickman3, Oliver Jahn1, Michelle Gierach4**

1. Department of Earth, Atmospheric and Planetary Sciences, Massachusetts Institute of Technology, Cambridge, MA, USA

2. Center for Climate Change Science, Massachusetts Institute of Technology, Cambridge, MA, USA

3. University of Southampton, Southampton, UK

4. NASA Jet Propulsion Laboratory, Pasadena, CA USA

Presenting author: stephd@mit.edu

Satellite ocean colour observations have provided the biogeochemical modelling community an unprecedented evaluation product on global scale and at regular and frequent intervals: satellite derived ocean surface chlorophyll-a (chl-a). However the uncertainties of the satellite derived chl-a are not well documented. Here we present a global three-dimensional biogeochemical, ecosystem, and radiative transfer numerical model that acts as a virtual laboratory to explore some of the uncertainties. The model resolves sufficient details of the marine ecosystem, water optical constituents as well as explicit upwelling irradiance. We can therefore calculate a "satellite-like" derived chl-a from the model reflectance output and compare this to the model "actual" chl-a. We find that the satellite-like product has substantial low biases at high latitudes and also estimates spring blooms as much as two months too early relative to model "actual" chl-a in those regions. These uncertainties should be kept in mind when using satellite derived chl-a as an evaluation product for biogeochemical models. We show how our model can also be used to explore uncertainties that result from the scarcity of observations used to calculate the chl-a/reflectance ratio algorithms, as well as the role that CDOM, non-algal particles, and differences in phytoplankton optical properties play into the inherent uncertainties.