Development of a coupled coral photosynthesis-respiration-calcification model

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Availability: by appointment

Thematics: climate, environment and oceanography

Description:

The World oceans' coral reefs are important carbon sinks in the ocean and they contribute to regulate atmospheric CO_2 levels on time scales of a few centuries to tens of millennia.

Here, I propose to develop a model of coupled carbon alkalinity and oxygen fluxes as a result of photosynthesis, respiration and calcification by the different components of a coral. We are at first basing our developments on previously published models, such as those of Hohn and Merico (2012, DOI:10.5194/bg-9-4441-2012) or Nakamura et al. (2013, DOI:10.1007/s00338-013-1032-2).

Requirements and prerequisites. This thesis project will obviously require programming skills. Once tested and validated, the model is meant to be included in ocean biogeochemical cycle models (multi-box models, EMICs or full 3D models). Accordingly, programming work would best to be done in Fortran 90 or better, as this is the source language of those models. I will provide introductory training in Fortran 90/95 if required. However, as early development stages of a new model generally require a lot of exploration tests, developments for this thesis can also be done in Python.

Furthermore, basic knowledge of biogeochemical cycles is recommended. Students must furthermore not be afraid of mathematics (differential equations, basic numerical methods, etc., at bachelors' level).

Infrastructure. Early stage developments can be done on the student's own computing devices (laptop, desktop PCs). For computationally intensive work, a dedicated computing server is available.

Stays abroad. It should normally be possible to carry out this work completely in Liège.

Special terms and conditions. This subject can be adapted for a 15- or a 27-credit thesis.