Theme: Earth System Modelling

Modelling future change in the Greenland ice sheet with a coupled ice sheet and Earth System Model

Introduction

The Greenland ice sheet (GrIS) is becoming a major contributor to sea level rise (~0.7 mm yr^{-1} in the last decade). Most of current projections of GrIS evolution are made with ice sheet models forced (offline) with output from climate models. Here, **we will do this with an advanced newly coupled Earth System and ice sheet model that includes an advanced snow/ice melt calculation** (CESM2-CISM2). With such a tool, interactions (e.g., albedo, elevation feedbacks) between climate and ice sheet can be modelled.

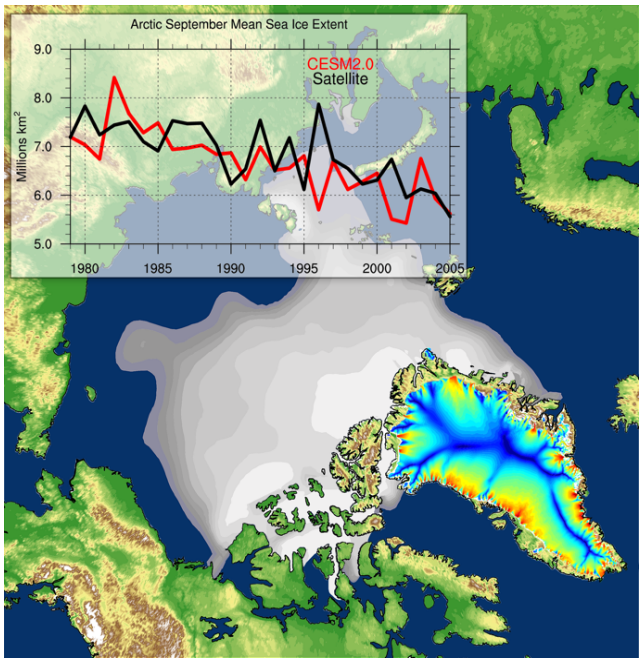
Description

You can choose between a variety of topics involving model development, running simulations in supercomputers with Unix environment and/or analysis of model output. There are options to work mainly with the ice sheet model, mainly with the climate model and melt calculation, or with both equally. Some examples of topics are:

- Topic 1: Simulating total loss of the GrIS – how fast, irreversibility, key processes
- Topic 2: Improving initialization, and including ocean forcing to the outlet glaciers
- Topic 3: Testing a lower resolution CESM2.1-CISM2.1 for long simulations
- Topic 4: Using artificial neural networks to calculate future GrIS melt

Additional info

Simulations with the coupled model*: Muntjewerf et al, GRL, 2020; Muntjewerf et al, JAMES, 2020*
SMB evaluation: *van Kampenhout et al. JGR, 2020*



Simulation of Arctic sea ice and Greenland ice sheet surface velocities (blue-low; red-high) in the new coupled model CISM2-CESM2 http://www.cesm.ucar.edu/models/cesm2/

Requirements

Strong programming skills and analytical thinking. You will be using python and visualization software to set simulations and/or analyse netCDF-format files. The model is written in FORTRAN, a carbon-friendly programming language ☺

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