

# The Greening of Greenland: modeling vegetation effects on ice sheet melt

## Summary

The Greenland Ice Sheet (GrIS) stores approximately the equivalent to 7 meters of Sea Level Equivalent (SLE), and is currently losing mass at rate of 0.7 mm SLE per year. Numerical simulations show that the ice sheet will completely deglaciate under sustained elevated greenhouse gas forcing. In this project, you will explore how much the climate and ice melt are affected by the establishment of vegetation over Greenland as the ice sheet retreats over multi-century time scales.

## Research questions

How do the future warm climate and the ice sheet retreat affect the vegetation growth in Greenland? How does the greening of Greenland affect the climate of Greenland and the melt of the remaining ice sheet?

## Method

You will use an Earth System Model with atmosphere, ocean, sea ice, land, and ice sheet components, the Community Earth System Model version 2 (CESM2). You will design, perform and/or analyze simulations. These will be done in supercomputing facilities in USA and/or The Netherlands (surfSARA). You will use the output of a biome model which simulates vegetation maps corresponding to climates simulated by CESM2. You will use the output of the model to prescribe the vegetation map over Greenland in CESM2 and will run/analyze simulations to investigate the vegetation-climate-icesheet interaction.

## Background/skills & technical details

You have a background on atmospheric physics, mathematics, hydrology, physics, informatics and/or earth system science. Strong programming skills are necessary. Previous knowledge of Python, Linux environments, and/or FORTRAN is a plus. Depending on your interest and skills, you may focus more on the technical aspects of the modelling or on the physical analysis of output. The model output format is netCDF.



The Greenland ice sheet

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