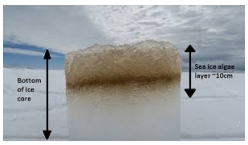
University of Stuttgart
Germany

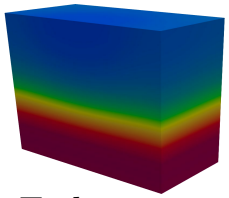
Institute of Mechanics, Structural Analysis
and Dynamics of Aerospace Structures
Head of Institute: Prof. Dr.-Ing. Tim Ricken

Announcement – HiWi/ Master's Thesis

Mathematical modeling and parametric studies of a coupled equation system to simulate algal growth in Antarctic sea ice

Motivation:





Antarctic sea ice formation and its mutual effects on ocean biology and chemistry is very sensitive to climate change. The formation of 'pancake' ice floes and the coupled physical-biogeochemical (P-BGC) processes can be modeled by using the continuum-mechanical multi-phase description of the extended Theory of Porous Media (eTPM), and simulated with the Finite Element Method (FEM). Various biological communities live within and under the ice floes. These ice algae are important for the ocean ecosystem as they serve as primary producers in the food chain.

Tasks:

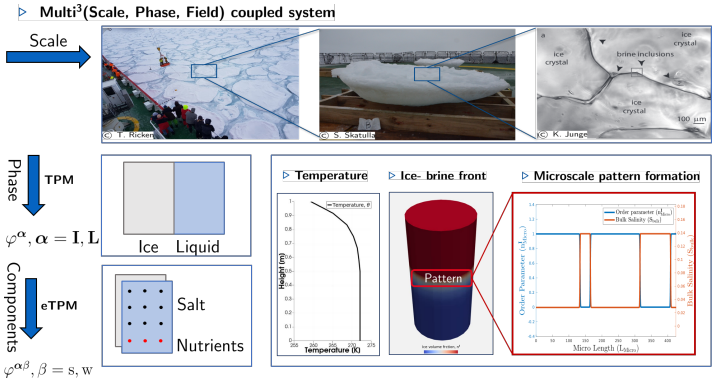
Develop a mathematical model capable of simulating algal growth through a coupled ODE system of carbon and nutrient dynamics.

Procedure:

Develop a coupled ODE model to simulate all important intra and extracellular nutrients.
Parametric studies to identify critical environmental factor eg. temperature, salinity, light etc.
Develop functions to incorporate BGC in macroscale TPM model.

Requirements:

Ideally you have experience with continuum mechanics or even TPM, numerical simulations and FEM (Introduction to FEM, Numerics) as well as programming experience (Fortran/ FEniCS).



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