

**Faculty of Civil Engineering and Geosciences**

**Geoscience and Remote Sensing**

**Master of Science Project**

**Themes: Ocean and sea ice modeling**

**Sea ice breakage and melt**

**due to ocean turbulence**

**Information:**

Dr. Mukund Gupta

Room 2.30 (Building 23) | E-mail: [Mukund.Gupta@tudelft.nl](mailto:Mukund.Gupta@tudelft.nl)

For students of Applied Earth Sciences, Aerospace Engineering, Mathematics or Computer Science

**Context**

Sea ice is one of the most rapidly changing components of the climate system. The margins of the pack are very sensitive to these changes because they are subject to strong forcings from the ocean. In these regions, sea ice consists of individual pieces called floes, which interact with ocean turbulence, leading to collisions, breakage and melt. These fascinating processes are unresolved by current climate models, and lead to biases in sea ice forecasts.



**Project description**

The aim of the project is to develop a better understanding of fine-scale interactions between floes and ocean turbulence. You will make use of a fast and user-friendly model to conduct simulations, analyse model data, and explore physics regarding breakage and melt. As shown in the figure above, the simulations will consist of realistic floes stirred by ocean currents. Your work will focus on quantifying the breakage and melt rates as a function of turbulent properties, ice thickness and sea ice concentraton. The computational framework is already set up, so you will not need to signficantly modify it.

*Simulation displaying sea ice floes interacting with ocean eddies. You will conduct such simulations to understand how sea ice breaks and melts. This will help devise parameterizations for coarser models.*

**Student profile**

An interest in climate modeling, turbulence or mechanics would be appreciated.

The model is written in Julia, but no prior experience is required in that language. The analysis will be conducted with Python.

Guidance and mentoring on the technical aspects of the work, data analysis and fundamental science will be provided.

The project tasks will aim to advance your skills in modeling, fluid/solid mechanics, data analysis and creativity.