UCLouvain

LPHYS2265 - Sea-ice-ocean interactions in polar regions

TSIM Presentation

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The python code of the *Thermodynamic Sea Ice Model* (TSIM) can be found at the GitHub repository of the project.[1] A comprehensive *readme file* has been made in this repository in order to explain the structure of the files.

The TSIM include all the features suggested in the instructions. Hence there is three different python scripts corresponding to the three major parts.

- The *IGCT1.py* model stands for *Ice Growth with Constant Temperature* which as its name suggest represent a **dynamical evolution of the thickness of a sea-ice layer with a forced constant temperature.** There is no possible melting in this model but there is a layer of snow and an ocean heat flux.
- The *FST2.py* model stands for *Freeing Surface Temperature* which is an improved version of the IGCT1 model with surface heat fluxes represented and the computation of a dynamical surface temperature. This temperature and the ice thickness are coupled so that it is possible to represent surface melting and bottom melting. This model is **able to simulate multi-year sea ice without snow.**
- The *TSIM.py* model is the complete *Thermodynamic Sea Ice Model* which is the fully improved version of the FST2 model. An ocean mixed layer is added in order to model ocean warming in cases when it is the summer period and there is no longer sea-ice at the surface. When the surface temperature becomes colder and the water temperature drops below freezing point the excess heat is used to grow some new ice. A dynamical layer of snow can be represented with some snow fall periods and snow melting before ice melting. Lastly the snow-ice formation process is implemented. **This model can simulate first-year and multi-year sea ice regimes with snow.**

All the interesting figures made with these three models are available on the GitHub. The different figures related to the intermediate questions of the instructions are also present. **Fig(1)** shows the 4-panel figure of what I call the *control simulation*. It shows the daily evolution of ice thickness, snow depth, surface temperature and water temperature over 50 years with oceanic flux = $5W/m$ and $\alpha_s = 0.8$. This is the **control simulation for the multi-year ice regime. Fig(2)** shows the same 4-panel figure for the ***control simulation*** **of the one-year ice regime.** The only change in the parameters is $\alpha_s = 0.6$ in this case.

[1] `https://github.com/AmauryLaridon/TSIM.git`

Figures

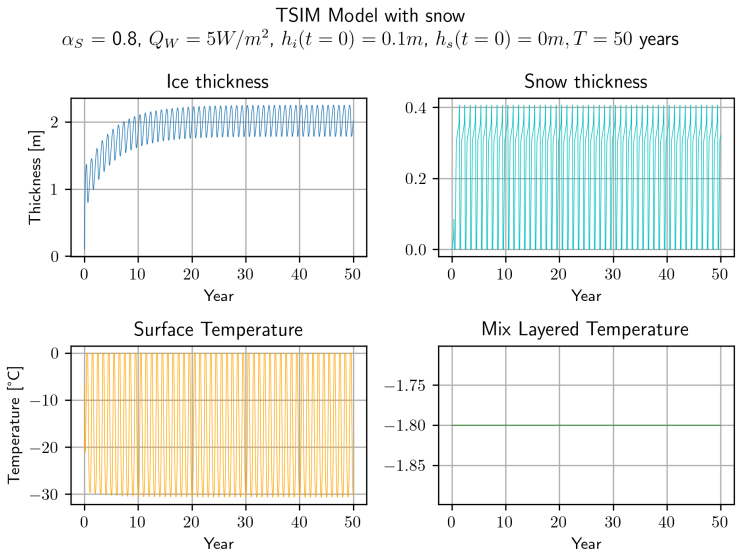

Figure 1: *Control simulation with snow for the multi-year ice regime*

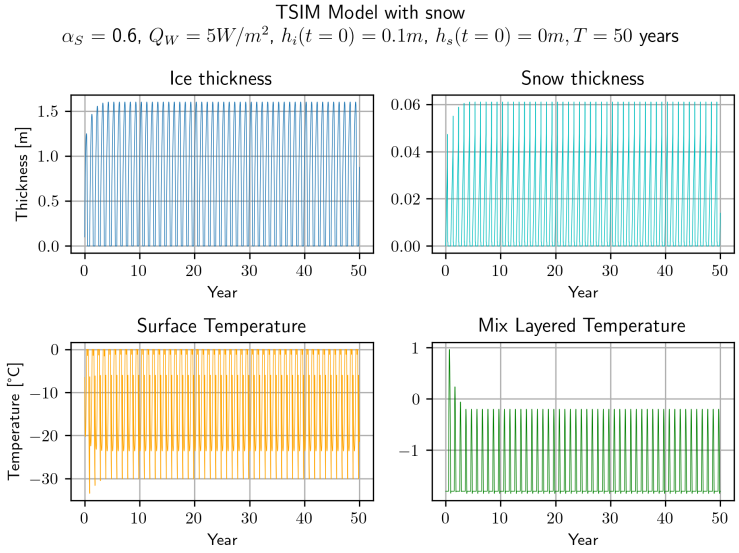

Figure 2: *Control simulation with snow for the one-year ice regime*