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Ice surface temperatures: seasonal cycle and daily variability from in-situ and satellite observations

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Surface temperature is an important parameter for understanding the climate system, including the Polar Regions. Yet, in-situ temperature measurements over ice- and snow covered regions are sparse and unevenly distributed, and atmospheric circulation models estimating surface temperature may have large biases. To change this picture, we will analyse the seasonal cycle and daily variability of in-situ and satellite observations, and give an example of how to utilize the data in a sea ice model.

We have compiled a data set of in-situ surface and 2 m air temperature observations over land ice, snow, sea ice, and from the marginal ice zone. 2523 time series of varying length from 14 data providers, with a total of more than 13 million observations, have been quality controlled and gathered in a uniform format. An overview of this data set will be presented. In addition, IST satellite observations have been processed from the Metop/AVHRR sensor and a merged analysis product has been constructed based upon the Metop/AVHRR, IASI and Modis IST observations.

The satellite and in-situ observations of IST are analysed in parallel, to characterize the IST variability on diurnal and seasonal scales and its spatial patterns. The in-situ data are used to estimate sampling effects within the satellite observations and the good coverage of the satellite observations are used to complete the geographical variability.

As an example of the application of satellite IST data, results will be shown from a coupled HYCOM-CICE ocean and sea ice model run, where the IST products have been ingested. The impact of using IST in models will be assessed.

This work is a part of the EUSTACE project under Horizon 2020, where the ice surface temperatures form an important piece of the puzzle of creating an observationally based record of surface temperatures for all corners of the Earth, and of the ESA GlobTemperature project which aims at applying surface temperatures in models in order to assimilate and correct biases.