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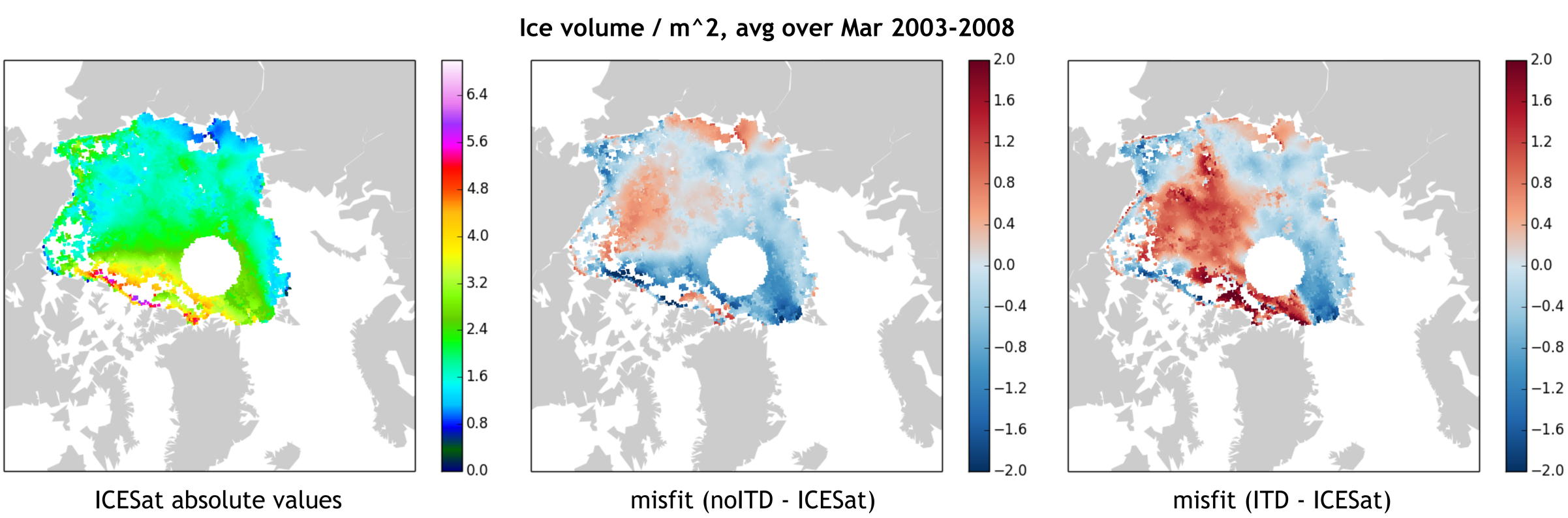
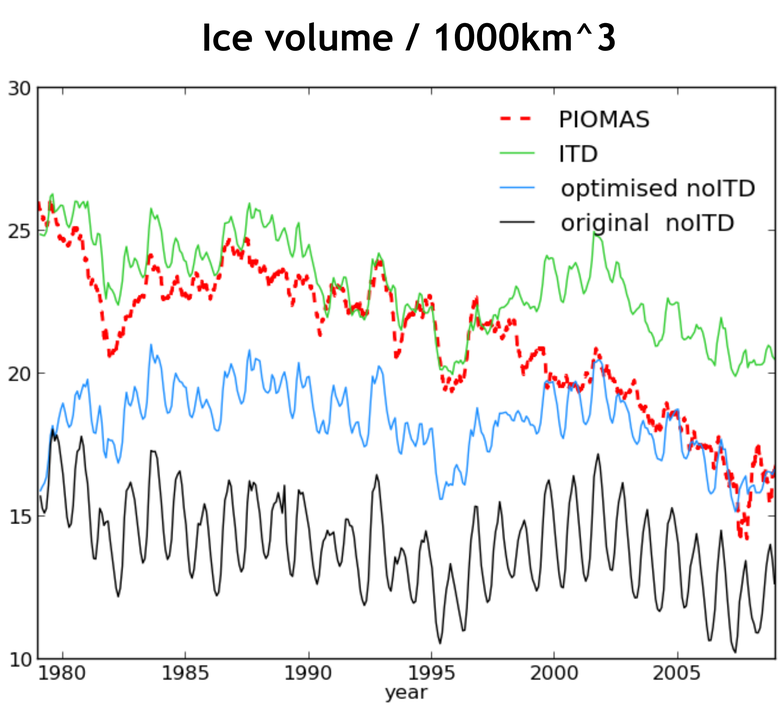
The impact of an ITD parameterisation on the quality of model results (A30)

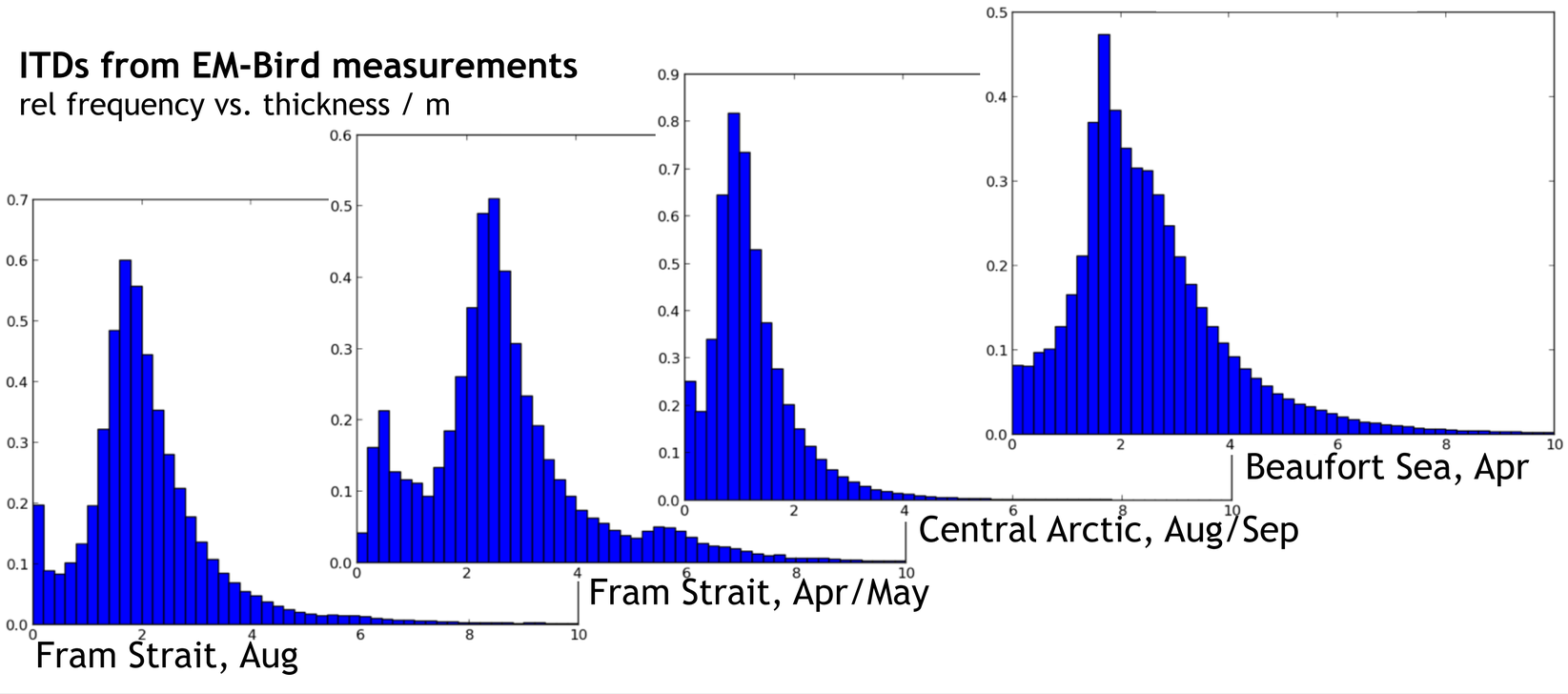
Introduction: An ice thickness distribution (ITD) parameterisation is by now part of most sea-ice models. Yet although it is based on a more physical reasoning, the gain for current models by its use is still unclear. By measuring the misfit to satellite observations for concentration, thickness and drift in a cost function [1] we arrive at a measure of the obtained change in quality of model results. In this respect the sea ice component of the MITgcm is compared with and without an activated ITD parameterisation.



Method: Using a cost function it is possible to optimise parameters by a Green's function approach [2]. Using this technique we optimise the water-ice drag C_w, the air-ice drag C_a, the lead closing parameter H_0 and the ellipsis axis ratio e for the VP rheology in a model configuration with a single category Hibler-type thickness. Starting from this configuration, we will investigate the change in model output first when activating the ITD and second when specifically tuning the ice strength parameters. The effect of this optimisation will again be compared between the Hibler-type and the ITD configuration.



Preliminary Results: At this early state, the model is tuned using only parameters affecting both configurations, with and without the use of an ITD. Using this technique the result could be clearly improved, although starting from a baseline model with an unusual choice of $H_0 = 0.1$. Activating the ITD parameterisation with a coefficient choice from literature leads to thicker ice on average, but seems at this point to not change the qualitative behaviour of the sea ice.



Further Work: The right tuning of used parameters is key to a good fit between model and observations. The amount to which this fit is determined only by this tuning, and to which it can be improved by the use of an ITD parameterisation will be the question we will try to answer next. For this the influence of tuning the single category ice strength parameterisation will be contrasted to the success of specifically tuning the coefficients in the actual ITD formulation.

Additionally, EM-Bird campaigns together with upward looking sonar data allows the measurement of regional, seasonal and decadal variation in ITDs. The precision with which those can be reproduced will be a suiting addition to the cost function and so included in the evaluation.

References
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[2] Nguyen, A. T., Menemenlis, D., and Kwok, R. (2011), Arctic ice–ocean simulation with optimized model parameters: Approach and assessment, *J. Geophys. Res. 116*, C04025, doi:10.1029/2010JC006573

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