EGU21-9739
https://doi.org/10.5194/egusphere-egu21-9739
EGU General Assembly 2021

Evaluating simulated linear kinematic features in high-resolution sea-ice simulations of the FAMOS Sea Ice rheology experiments (SIREx)

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Simulating sea-ice drift and deformation in the Arctic Ocean is still a challenge because of the multi-scale interaction of sea-ice floes that compose the Arctic sea ice cover. The Sea Ice Rheology Experiment (SIREx) is a model intercomparison project formed within the Forum of Arctic Modeling and Observational Synthesis (FAMOS) to collect and design skill metrics to evaluate different recently suggested approaches for modeling linear kinematic features (LKFs) and provide guidance for modeling small-scale deformation. In this contribution, spatial and temporal properties of LKFs are assessed in 33 simulations of state-of-the-art sea ice models (VP/EVP,EAP, and MEB) and compared to deformation features derived from RADARSAT Geophysical Processor System (RGPS). All simulations produce LKFs, but only very few models realistically simulate at least some statistics of LKF properties such as densities, lengths, lifetimes, or growth rates. All SIREx models overestimate the angle of fracture between conjugate pairs of LKFs pointing to inaccurate model physics. The temporal and spatial resolution of a simulation and the spatial resolution of atmospheric forcing affect simulated LKFs as much as the model's sea ice rheology and numerics. Only in very high resolution simulations (≤2km) the concentration and thickness anomalies along LKFs are large enough to affect air-ice-ocean interaction processes.