



## **The Impact of Sea Ice Heterogeneity on Atmospheric Drag Coefficients for Polar Climate Models**

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Realistic modeling of atmospheric processes over polar sea ice and their impact on sea ice dynamics needs a detailed representation of the near-surface atmospheric fluxes of momentum. Parametrizations of neutral drag coefficients mostly used in general circulation models (e.g., ECHAM, CCSM, MITgcm) are compared with a recently developed parametrization of drag coefficients accounting for the effect of skin drag over open water and sea ice and of form drag caused by edges at ice floes, leads, and melt ponds. First, results are presented as a function of different sea ice concentration scenarios that are based on remote sensing data. It is shown that during Arctic summer the traditionally used drag coefficients differ from the new ones by a factor 0.5-1.2 dependent on the region. It is further shown how the inclusion of sea ice pressure ridges and of different assumptions on the skin drag over open water would influence the results. Then, we demonstrate how the results would change, when no information about melt ponds would be available as is often the case in state-of the art climate models. Finally, the new parametrization, which has been developed originally for neutral stratification, is extended to non-neutral conditions to allow its application to climate models. Different levels of complexity of the stability correction are discussed.