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Study of snow-atmosphere interactions over an Antarctic surface using large eddy simulations coupled with a Lagrangian stochastic model FRANCESCO COMOLA, MARCO GIOMETTO, ERNESTO TRUJILLO, KATHERINE LEONARD, Ecole Polytechnique Federale de Lausanne, TED MAKSYM, Woods Hole Oceanographic Institution, MARC PARLANGE, University of British Columbia, MICHAEL LEHNING, Ecole Polytechnique Federale de Lausanne — The need for a better understanding of fluid and morphodynamic processes over Antarctic sea ice motivates the development of detailed models of small-scale snow-atmosphere interactions. At large scales, these interactions drive spatial patterns of snow distribution and snow transport from the marginal ice to the sea. However, challenges arise when representing the detailed sequence of processes involved, such as aerodynamic entrainment, particle dynamics, feedback on fluid momentum and particle impacts. We use a Lagrangian stochastic model coupled to large eddy simulations to represent particle trajectories in turbulent flows. An immersed boundary method is used to represent the underlying surface and a dynamic surface roughness model is used to account for the drag induced by the subgrid-scale roughness. The model is set up for an Antarctic sea ice floe over which pre- and post-storm snow distributions were measured using a terrestrial laser scanner. The dataset, collected as part of the Sea Ice Physics and Ecosystem Experiment 2, indicates marked changes in the snow distribution as a result of snow drift, providing valuable testing grounds for the model. Model results are in agreement with blowing snow concentrations at different heights and with the observed patterns of erosion and deposition.

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