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Toward improved parameterization of surface sea ice processes in a basin-scale sea ice model: Melt ponds and blowing snow

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Surface albedo is a strong control on the summertime melt of sea ice, both in the physical world and modelled simulations. There exists large variability even on local spatial scales, but models typically must use grid-scale or possibly sub-grid scale parameterizations which impose a uniform value for a category or cell. Changing the surface albedo values for snow, bare ice, and melting ice merely changes the equilibrium solution, and, if this is not done in concert with improvements in other areas of (at least) the thermodynamic model, will result in the model producing an unrealistic solution. Typically this means too much ice will be lost in the summer melt season. Here, we investigate relatively simple parameterizations added to a dynamic-thermodynamic sea ice model and their effects on the simulation. One involves melt ponds in which surface area and depth are specified in terms of a prognostic surface melt water volume. A second involves the redistribution of surface snow due to blowing wind.