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Modelling the areal evolution of Arctic melt ponds

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An accurate estimate of the fraction of the upper sea ice surface covered in melt ponds during the summer melt season is essential for a realistic estimate of the albedo for global climate models. I will present a cellular automaton sea ice model that simulates the two dimensional areal evolution of melt ponds on an Arctic sea ice surface. The model simulates a section of a sea ice floe with either the characteristics of first year or multi year ice. Periodic boundary conditions are used so that melt lost from one edge is fed back into the other edge; consequently edge effects are neglected. If the ice thickness in a cell reaches zero any flux of melt into the cell is considered lost. The snow melts at a fixed rate and creates the first melt ponds. The lateral evolution of the upper surface of the sea ice is described using variable melt rates and simple descriptions of horizontal flux to neighbouring cells. The initial topography of the sea ice surface is input from data collected from the Arctic and the melt pond evolution is modelled for both first year and multi year sea ice. Currently the initial conditions include topography data for first year and multi year ice and a layer of snow cover; the data is SHEBA data collected from the Arctic. The melt pond coverage characteristics and the evolution of melt ponds throughout the summer season are compared to satellite imagery of the same season.