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The differing impact of local and remote moisture sources on cloud formation and the surface energy budget at Summit, Greenland

Amy Solomon, Matthew Shupe, and Ola Persson
NOAA/ESRL and University of Colorado, Boulder, United States (amy.solomon@noaa.gov)

Clouds and the atmospheric state play fundamental roles in the cryospheric mass budget of the Greenland Ice Sheet both as a source, via precipitation, and a potential sink, via modulation of the surface energy budget. In this study we use regional climate model simulations to identify the differing impact of local and remote moisture sources on cloud formation and the surface energy budget at Summit, Greenland. A focus of these studies is to investigate air mass sources that cause both mid-tropospheric ice clouds and mixed-phase stratocumulus to form and the interaction between these different cloud types. For example, how the modification of air masses aloft may prevent stratocumulus from forming by producing ice clouds through homogeneous freezing that precipitate ice into the boundary layer. Sensitivity studies will be presented and discussed that explore how perturbations to local and remote moisture sources, due to changes in sea surface temperatures and sea ice extent, impact cloud formation and the surface energy budget at Summit.