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RAPID SEA-ICE MELT DUE TO WARM AIR ADVECTION: OBSERVATIONS FROM THE ACSE FIELD PROGRAM

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Energy fluxes at the surface determine the annual summer melt and autumn freeze-up of Arctic sea ice, but are strongly modulated by interactions between atmospheric, ocean, and sea-ice processes. The Arctic Clouds in Summer Experiment (ACSE) program obtained measurements of surface energy fluxes, boundary-layer structure, cloud macro- and microphysical structure, and upper-ocean thermal and salinity structure from pack-ice and open-water regions in the eastern Arctic from early July to early October 2014. ACSE was divided into two legs. The first took a route from Tromsö, Norway, to Barrow, Alaska, during late summer (early July to late August) mostly on the Siberian Shelf, while the second leg was from traversed back mostly north of the shelf during September and early October. This paper will present ACSE and show examples of some results.

ACSE summer measurements showed energy flux surpluses leading to significant surface melt, while late August and September measurements showed deficits, leading to freeze-up of sea ice and the ocean surface. A weeklong episode with intensive melt resulting from warm air advection from continental Russia will be presented and discussed. During this episode, temperatures up to 20 ºC was observed aloft while near surface temperatures over the ice remained near melting. In the surface inversion dense fog formed that enhanced the downward longwave radiation. Together with a downward turbulent sensible heat flux this caused a rapid melt in this area.