MMM SEMINAR SERIES

Arctic summer air-mass transformation: Potential effects on the surface energy budget

Michael Tjernström

Department of Meteorology & Bolin Centre for Climate Research
Stockholm University, Sweden

Arctic climate is ultimately determined by a balance between meridional heat transport into the area, and radiation heat loss at the top of the atmosphere over the same area. Since the net radiation loss is due to small-scale processes parameterized in models, and the meridional heat flux is due to larger scale atmospheric dynamics resolved by the models, the two has usually been studied separately. In this seminar this concept will be called into question.

In an episode during the Arctic Clouds in Summer Experiment (ACSE) in the summer of 2014, warm air from the Siberian mainland flowed in over melting sea-ice in the East-Siberian Sea for over a week. As the ~25 °C warm air flowed over the melting surface, maintained at the melting point, a strong surface inversion formed in which dense fog also formed. This resulted in a positive net longwave radiation while the sensible heat flux was downward. Although solar radiation was attenuated by the fog, this led to an additional 10-20 Wm-2 energy to the surface. This led us to hypothesize a zone from the ice edge where the surface will receive enhanced energy when the atmospheric flow is northward onto the ice.

To test this hypothesis, we analyzed the observation from the entire ACSE expedition. All temperature profiles taken over sea ice were categorized into cases with or without a surface inversion; the inversion cases where further divided into two categories using the humidity profiles. When projecting other observations onto these three classes, many are systematically different. Surface inversion with increasing moisture with height systematically added 10-20 Wm-2 energy to the surface energy budget, indicating that meridional heat flux must be considered together with the small-scale processes caused by the air mass transformation.

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Thursday, 1 June 2017, 3:30 PM
Refreshments 3:15 PM
NCAR-Foothills Laboratory
3450 Mitchell Lane
Bldg. 2, Small Seminar Room 1001