

Turbulent Fluxes Over Arctic Sea Ice:
Measurements, Interactions, and Comparisons to Models

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Though sparse, reliable observations of turbulent fluxes of momentum, sensible heat, and moisture over sea ice began with measurements from AIDJEX in the 1970's and have continued with field programs every 5 years or so since. One of the most complete data sets of on-ice turbulent flux measurements was obtained during the year-long Surface Heat Flux of the Arctic Ocean (SHEBA) campaign from October 1997-October 1998 in the Beaufort and Chukchi Seas. Other useful data sets have been obtained during the LEADDEX92, AOE-2001, and ASCOS (2008) field campaigns, which were all 6-8 week long field programs. The LEADDEX92 field program was conducted in March-April of 1992 over the Beaufort Sea, while the AOE-2001 and ASCOS field programs were conducted in August and September near the North Pole. Because of covering an entire year and because of its quality, the SHEBA data set is still being used for a variety of purposes, including understanding the annual variability of turbulent fluxes over sea ice, diagnosing processes producing these fluxes, producing turbulence parameterizations, and providing validation data for modeling studies. The availability of coincident high temporal-resolution boundary-layer data and aircraft data during ASCOS makes this data set unusually complete, allowing analysis of interactions between the surface turbulent fluxes and a variety of lower-tropospheric processes. The ASCOS data set is also useful for validation of more recent satellite remote sensing estimates of turbulent fluxes. Multi-level profile measurements of turbulent fluxes were made during both field programs, allowing a better understanding of the surface-layer structure. After summarizing the turbulent flux measurements obtained during the SHEBA and ASCOS programs, this presentation will describe some of the recent uses of the SHEBA data and illustrate the unique aspects of the ASCOS data set. Some of the topics to be discussed include sea-ice heterogeneity impacts on the turbulent fluxes, interactions between cloud and boundary-layer processes and the turbulent fluxes, recent parameterization improvements based on the SHEBA data, and results of model validation studies, including reanalysis evaluations.