

Late Autumn Boundary Layer Observations in the Ross Sea from the PIPERS project

John Cassano, Peter Guest, and Kelly Schick

The Polynyas, Ice Production and seasonal Evolution in the Ross Sea (PIPERS) project spent two months in the western Ross Sea from mid-April to mid-June 2017 observing the atmosphere, ocean, and sea ice states to estimate sea ice production and water mass transformation in the Ross Sea during the late autumn and early winter. The meteorological observations during PIPERS included a ship-based weather station, radiometers, and ceilometer, a flux tower deployed on the sea ice during ice stations, and radiosonde and unmanned aerial system (UAS) measurements. Ship-based and radiosonde observations were made during transects through Terra Nova Bay during a strong katabatic wind event with winds in excess of 30 m s^{-1} . Bulk estimates of the turbulent fluxes during this event ranged from several hundred to over 1000 W m^{-2} . A sequence of radiosonde measurements during the transects provide detailed observations of the downstream evolution of the katabatic air mass as it passed over the Terra Nova Bay polynya, documenting a downstream decrease in wind speed and an increase in boundary layer temperature and depth. UAS profiles through the lowest 1000 m of the atmosphere, repeated at hourly to several hour frequencies, documented the temporal evolution of the boundary layer during multiple ice stations. Both well mixed and inversion conditions were observed and the time evolution from these UAS profiles will be used in conjunction with the flux tower measurements to describe boundary layer processes occurring over the sea ice covered Ross Sea.