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The Unmanned Aerial System SUMO: an alternative measurement tool for polar boundary layer studies

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Numerical weather prediction and climate models face special challenges in particular in the commonly stable conditions in the high-latitude environment. For process studies as well as for model validation purposes in-situ observations in the atmospheric boundary layer are highly required, but difficult to retrieve. We introduce a new measurement system for corresponding observations.
The Small Unmanned Meteorological Observer SUMO consists of a small and light-weight auto-piloted model aircraft, equipped with a meteorological sensor package. SUMO has been operated in polar environments, among others during IPY on Spitsbergen in the year 2009 and has proven its capabilities for atmospheric measurements with high spatial and temporal resolution even at temperatures of -30 deg C.
A comparison of the SUMO data with radiosondes and tethered balloons shows that SUMO can provide atmospheric profiles with comparable quality to those well-established systems. Its high data quality allowed its utilization for evaluation purposes of high-resolution model runs performed with the Weather Research and Forecasting model WRF and for the detailed investigation of an orographically modified flow during a case study.