

Atmosphere

State-of-the-art and challenges: Atmospheric data are well organized under the auspices of the WMO's global World Weather Watch and are available through national meteorological services. The challenge is to obtain regular and reliable data from unmanned platforms/stations. In the Arctic instruments ice-up within a matter of hours and in many cases it is impossible to determine a faulty sensor from a functional one by analysing the observations. Therefore, the operational network of atmospheric in situ observations to date is very sparse, over Arctic land and non-existing over the Arctic Ocean (ACIA, 2004; see also Figure 1). It is therefore challenge to develop autonomous instruments or measurement strategies that work in the harsh Arctic environment with a minimum of power requirements. Semi-autonomous instruments deployed on ships of opportunity are promising for obtaining more data from the Arctic.

With data so scarce, it is vital that all data be utilised where possible, and we see it as an important task to identify field experiment data that is not available to everyone. Sparseness of atmospheric in situ data influence processes studies and the weather prediction capability in the Arctic.

Polar orbiting satellites provide frequent and regular data coverage in the Arctic. Passive sensors have problems during the polar night when solar radiation is unavailable. This makes retrieval of atmospheric information very difficult and uncertain.

Expected progress beyond state-of-the-art:

- More in-situ data will be made available from atmospheric observatories and scientific field experiments.
- Improved and better-documented information about atmospheric vertical structure and clouds from passive satellite sensors will be made available to society and scientific community.
- Strategies and best practices for semi-autonomous ship-borne observations will be developed for use on research vessels and ships of opportunity.
- Provide integrated water vapour fields over sea ice and over open water in a consistent data set suitable for assimilation in atmospheric circulation models.