

QuikSCAT as a Land/Ice Climate Record Sensor

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Abstract

QuikSCAT was originally designed for measuring near surface winds over the ocean. It does this indirectly by measuring the normalized radar cross section (NRCS) of the ocean's surface from which the near-surface vector wind is derived. This is a valuable ocean wind climate data set. In addition, the NRCS measurements have direct application in vegetation and ice studies. Over land and ice radar backscatter is extremely sensitive to liquid water and snow, ice, and soil melt/freeze, as well as vegetation and ocean conditions. The signal is insensitive to lighting conditions and can be collected under all-weather conditions. This makes radar backscatter a very useful fundamental measurement to support climate studies.

QuikSCAT has now collected nearly 9 years of continuous, high quality NRCS observations of the Earth. The length, accuracy, and stability of the general QuikSCAT Sensor Data Record (SDR) for backscatter measurements have enabled production of a scatterometer *Fundamental Climate Data Record* (FCDR) for land and ice observations. Coupled with earlier scatterometer missions, (Seasat in 1978, ERS-1/2 from 1991-2001, NSCAT in 1995-96, SeaWinds in 2003, and ASCAT from 2008), the scatterometer FCDR provides a multi-decadal data set for climate studies over land and ice.

The Scatterometer Pathfinder has been generating a comprehensive FCDR consisting of suite of processed scatterometer imagery to support climate studies over the polar and terrestrial regions. Because the different sensors operated in different modes and at different frequencies and have different sampling characteristics, careful cross-validation techniques have been developed. Innovative processing techniques have been developed to generate backscatter images on consistent and compatible grids. Optimum spatial and temporal grid sizes have developed that facilitate fusing with radiometer and other data sets. Ancillary products and images complete the basic scatterometer FCDR. The FCDR products have been adopted in polar climate research community as well as in used in vegetation and land surface studies. The scatterometer FCDR compliments passive microwave datasets. A number of derived thematic CDR (TCDR) products based on the scatterometer FCDR are in various stages of development and validation. Some of these include iceberg tracks, sea ice extent, sea ice age, sea ice motion, sea ice concentration, land and sea ice melt-onset and refreeze, snow accumulation, and ice and polynya formation.