

THE SNOWSAR TOOL FOR BRIDLING GLOBAL WARMING

Breaking the Way through Snow to Sea Ice



Global warming is a very hot topic nowadays. Although there are still some who doubt its existence, it has recently become so obviously visible as to exceed even the most imaginative expectations of many scientists. In fact, global warming's visibility is the result of invisibility – namely of the snow and ice which is disappearing from the Earth's surface at a very fast pace. This is important for several reasons. Firstly, more than a sixth of the Earth's population depends on fresh water derived from the spring runoff of melted snow and ice. Due to accelerated melting in the last four decades, it is seriously questionable whether future generations will have access to a sufficient amount of fresh water. Secondly, the Arctic Ocean is losing its sea ice extremely rapidly, and some scientists even forecast that it will remain free of sea ice by as early as 2020.

While various disadvantages are associated with this change, the melting of the sea ice is also opening up new possibilities, such as the navigable Northern Sea Route (NSR) which reduces the shipping distance between Europe and East Asia by almost a third. This passage, which is currently opened for several months per year, is seeing more and more traffic every year, but to navigate this route ships still need some advanced technological tools.

One such advanced technological tool for the research and exploitation of changes brought about by global climate change was manufactured from scratch in 2011 by high-tech company MetaSensing. It was called the SnowSAR.

Radar Sensor

The SnowSAR is a radar sensor which was commissioned to support the European Space Agency's (ESA) Cold Region Hydrology High-Resolution Observatory (CoReH2O) mission candidate Earth Explorer 7 satellite. Together with international partners, the idea of CoReH2O is to research the properties of snow and ice by employing a space-borne twin-frequency (X and Ku bands) polarimetric Synthetic Aperture Radar (SAR) instrument.

In order to optimally design the system and to develop retrieval algorithms, it was necessary for ESA managers and scientists to mimic the future satellite radar data. The SnowSAR was created to meet the short-term need for an airborne SAR platform to do so. The SnowSAR instrument, unique in the world, is a polarimetric radar sensor which simultaneously operates at the two frequency bands targeted by the CoReH2O: X-band signals can moderately penetrate snow layers, reaching in some cases the underlying ground, while Ku-band signals are more sensitive to shallow, dry snow. By simultaneously using both of these two frequency bands, the SnowSAR can reveal the amount of freshwater stored in the snow and ice. Besides developing the sensor itself, in the past three years MetaSensing has conducted several SnowSAR measurement campaigns for ESA and has processed the acquired SnowSAR data according to the CoReH2O specifications.