Program of the Antarctic Syowa MST/IS radar (PANSY)

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We have been promoting a project to introduce the first MST (Mesosphere-Stratosphere-Troposphere) /IS (Incoherent Scatter) radar, which is a VHF pulse Doppler radar, in the Antarctic to Syowa Station (39E, 69S) (Program of the Antarctic Syowa MST/IS Radar, PANSY), as an important station observing the earth's environment with the aim to catch the climate change signals that the Antarctic atmosphere shows. This radar consists of about 1000 crossed Yagi antennas having a peak power of 500kW which allows us to observe the Antarctic atmosphere with fine resolution and good accuracy in a wide height range of 1-500 km.

The interaction of the neutral atmosphere with the ionosphere and magnetosphere as well as the global-scale atmospheric circulation including the low and middle latitude regions are also targets of PANSY. The observation data with high resolution and good accuracy obtained by the PANSY radar are also valuable from the viewpoint of certification of the reality of phenomena simulated by high-resolution numerical models. The scientific importance of PANSY is discussed and resolved by international research organizations of IUGG, URSI, SCAR, SCOSTEP and SPARC, and documented in a report by Council of Science and Technology Policy in Japan.

One major issue for the operation of the MST/IS radar at an isolated place such as Syowa Station is the reduction of power consumption. We have developed a new power-efficient transmitter (class-E amplifier) and successfully reduced the needed power consumption to an acceptable level of about 70kW. Another significant problem is a very limited period for the radar construction in the Antarctic. We have designed antennas which are light (less than 20 kg) and easily assembled but still robust enough to survive the maximum wind speed of 65 m/s and measure winds up to 50 m/s. Some sets of proto-type antennas were placed at the radar candidate site, and currently under an environmental test. We have also been conducting an intensive field survey in the site to find an optimal construction method.