

南極昭和基地大型大気レーダー計画の現状 Current status of Program of the Antarctic Syowa MST/IS radar (PANSY)

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The PANSY radar is the first Mesosphere-Stratosphere-Troposphere/Incoherent Scatter (MST/IS) radar in the Antarctic. It is a VHF monostatic pulse Doppler radar operating at 47 MHz, consisting of an active phased array of 1,045 Yagi antennas and an equivalent number of transmit-receiver modules with a total peak output power of 500 kW. The first stage of the radar was installed at Syowa Station (69°00'S, 39°35'E) in early 2011, and is continuously operating with 228 antennas and modules since April 2012. The full radar system operation will start in 2015. This paper reports the project's scientific objectives, technical descriptions, and the preliminary results of observations made to date. The radar is designed to clarify the role of atmospheric gravity waves at high latitudes in the momentum budget of the global circulation in the troposphere, stratosphere and mesosphere, and to explore the dynamical aspects of unique polar phenomena such as polar mesospheric/stratospheric clouds. The katabatic winds as a branch of Antarctic tropospheric circulation and as an important source of gravity waves are also of special interest. Moreover, strong and sporadic energy inputs from the magnetosphere by energetic particles and field-aligned currents can be quantitatively assessed by the broad height coverage of the radar which extends from the lower troposphere to the upper ionosphere. From engineering points of view, the radar had to overcome restrictions related to the severe environments of Antarctic research, such as very strong winds, limited power availability, short construction periods, and limited manpower availability. We resolved these problems through the adoption of specially designed class-E amplifiers, lightweight and tough antenna elements, and versatile antenna arrangements. We will show highlights of several interesting results from the radar observations regarding severe snow storms, gravity waves, multiple tropopause, and polar mesosphere summer/winter echoes.

Reference

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