

2012年に本格観測を開始した南極大型大気レーダーによる研究 Program of the Antarctic Syowa MST/IS Radar (PANSY) – after one year continuous operation since 2012 –

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The PANSY radar is the first Mesosphere-Stratosphere-Troposphere/Incoherent Scatter (MST/IS) radar in the Antarctic region. It is a large VHF monostatic pulse Doppler radar operating at 47 MHz, consisting of an active phased array of 1,045 Yagi antennas and equivalent number of transmit-receive modules with total peak output power of 500 kW. Its first stage has been installed at Syowa Station (69°00'S, 40°35'E) in early 2011, and is currently operating with 228 antennas and modules. This paper reports its scientific objects, technical descriptions, and preliminary results of observations made so far. The radar aims to clarify the role of atmospheric gravity waves in important polar events such as polar mesospheric clouds (PMC) and polar stratospheric clouds (PSC). The generation mechanism of gravity waves from katabatic winds is 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 extending from the lower troposphere to the upper ionosphere. From engineering points of view, the radar had to overcome restrictions due to severe environments of Antarctic research, such as very strong winds, limited power availability, and short period of construction with small manpower. We cleared these problems with specially designed class-E amplifier, light-weight and tough antenna elements, and versatile antenna arrangements. Although the radar is operating with only about a quarter of the full system, we have already obtained interesting results on the Antarctic troposphere, stratosphere and mesosphere, such as observation of gravity waves and multiple tropopause associated with a severe snow storm in the troposphere and stratosphere, and polar mesosphere summer echo.

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