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SNODAR: measuring the height of the Antarctic atmospheric boundary layer

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The nature of the atmospheric boundary layer above the Antarctic plateau is of interest both to atmospheric scientists and to astronomers wishing to plan future optical telescopes. SNODAR, or Surface layer NOn-Doppler Acoustic Radar, was designed at the University of New South Wales to measure the turbulence in the boundary layer at sites such as Dome C and Dome A.

The first SNODAR was deployed at Dome A in January 2008 as part of the PANDA project by a 1300km Chinese traverse from Zhongshan station. Data collection began on 10 February 2008, and early indications are that the instrument is working well and providing a clear measurement of the boundary layer thickness. A diurnal variation in the boundary layer is visible.

SNODAR is a monostatic acoustic radar with a minimum sampling height of 5m, a

range of at least 100m, a vertical resolution of 1m, and an operating frequency between 3kHz and 14kHz. Such high frequencies propagate relatively well in the low temperature Antarctic atmosphere.

SNODAR uses a single horn-loaded compression driver as both transmitter and receiver, and a 1.5m off-axis parabolic dish to collimate the acoustic beam. The signal is acquired using a USB sound card. A PC/104 computer performs the signal processing in real time. SNODAR runs autonomously, storing raw data on USB flash disks for retrieval the following summer, while uploading processed data via the Iridium satellite network through the University of New South Wales PLATO facility. The Iridium communication also allows SNODAR to be remotely controlled.