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ULTRA-STABLE, HIGH POWER SODIUM TEMPERATURE/WIND LIDAR DEPLOYED AT EISCAT RADAR SITE, NORWAY (69.6ºN, 19.2ºE)

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We launched a newly developed sodium temperature/wind lidar at EISCAT radar site in Tromsø (69.6ºN, 19.2ºE) in March 2010 to investigate atmospheric variations such as temperature and/or wind in the Arctic region. The lidar consists of an all solid-state 589 nm pulse coherent light source (4 W, 1 kHz repetition rate) and the receivers with 5 telescopes. The 589 nm light source is designed to use two laser-diode pumped Nd:YAG lasers of 1064/1319 nm, so that those pulse beams generate sum frequency of 589 nm coherent light through a non-linear crystal. This light source is based on the Antarctic temperature lidar (Kawahara *et al.*, 2011, project period 2000-2002) of NIPR but is substantially upgraded in power and laser wavelength control. With high repetition rate, the output power of 4 W is achieved, that is the highest power of existing sodium lidars. Using precise wavelength monitoring and fine-tuning system of sodium D_2 absorption spectrum, technique of measuring MLT wind can be applied as well as measuring temperature. The high power output enables us to divide the beam to five different directions simultaneously, and to make observations with enough signal to noise ratio in each direction. Consequently, the five-beam observations provided us with data of neutral temperature, sodium density, and wind velocity from each beam, and then their horizontal structures can be derived with about 20 min temporal and 2 km height resolutions from about 80 to 105 km. In this talk, we present the detail of our lidar system and resulting observation variations. The lidar system has been successfully demonstrating high performance and capability for continuing the observation of whole winter season for four years.

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[1] Takuya D. Kawahara, Tsukasa Kitahara, Fumitoshi Kobayashi, Yasunori Saito, and Akio Nomura, Sodium temperature lidar based on injection seeded Nd:YAG pulse lasers using a sum-frequency generation technique, Optics Express, 19, 3553-3561, 2011.