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Ground-based network observations of wind and temperature of the thermosphere using five Fabry-Perot interferometers

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It is well known that dynamic variation of Earth's ionosphere affects human activities in space through interference on the ground-satellite radio communications and degradation of GNSS positioning accuracy. The measurement of wind and temperature of the thermosphere is essentially important to understand dynamic variation of the ionosphere, because collision with neutral atmosphere is a dominant force to cause ionospheric plasma variation. High-resolution interferometry of airglow emissions using Fabry-Perot or Michelson interferometers is the unique technique to make remote sensing of the thermospheric wind and temperature from the ground. Since 2011, the Solar-Terrestrial Environment Laboratory (STEL), Nagoya University have been operating five Fabry-Perot interferometers (FPIs) at Shigaraki (Japan, FP00), Tromsoe (Norway, FP01), Chiang Mai (Thailand, FP02), Kototabang (Indonesia, FP03), and Darwin (Australia, FP04). They measure thermospheric wind and temperature through Doppler shift of the 630-nm airglow emission that has an emission layer at altitudes of 200-300 km. The use of 70mm-diameter etalons for FP02-FP04 makes the cost of the FPIs about three times lower than those with 116mm-diameter etalons for FP00 and FP01. By revising procedure of fringe-center determination we obtained reliable temperature of the thermosphere with accuracies of 10-40 K using these small-etalon FPIs. In this presentation, we show recent results of thermospheric and ionospheric dynamics obtained by these five FPIs.

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