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Thermospheric wind variations in the pulsating aurora measured with FPI and IS radars

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Pulsating aurora is a typical phenomenon of the recovery phase of magnetic substorm and is frequently observed in the morning sector. While our understanding of pulsating aurora has not yet reached maturity, the widely accepted generation mechanism causing pulsations in precipitating electrons is related to wave-particle interactions around the equatorial plane in the magnetospheric tail. The closure current system in pulsating aurora may not be as strongly evolved as compared to that in the discrete arc because of smaller precipitation flux (or upward field-aligned current) and weaker perpendicular electric field (or the Pedersen current). Thus one may assume that Joule energy dissipation and/or Lorentz force does not play an important role for modifications of the thermospheric wind dynamics in pulsating aurora. However, we found thermospheric-wind variations in the pulsating aurora during simultaneous observations with a Fabry-Perot Interferometer (FPI; 557.7 nm), an all-sky camera (557.7 nm), and the European Incoherent Scatter (EISCAT) UHF radar. Of particular interest is that the location of the fluctuations was found in a darker area that appeared within the pulsating aurora. During the same time period, the EISCAT radar observed sporadic enhancements in the F-region backscatter echo power, which suggests the presence of low-energy electron (1 keV or lower) precipitation. Using other data sets archived by the EISCAT radar, a statistical analysis shows that the F-region enhancement tends to coexist with hard-particle precipitation or the pulsating aurora. This presentation will summarize our experimental evidences showing several events of the pulsating aurora, and discuss application of the phased-array IS radar to this study.

Keywords: pulsating aurora, thermosphere, FPI, IS radar