Two-wavelength optical measurements on the Omega band aurora

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Omega-band auroras are auroral phenomena that often occur during the late expansion and recovery phases of a substorm. They usually drift eastward from midnight to dawn. The omega band auroras are known to have a latitudinal structure with discrete auroras on the polar side and diffuse/pulsating auroras on the equatorial side. Previous studies have also reported a non-pulsating diffuse aurora on the western side of the torch structure of the Omega Band aurora. The Omega Band auroras have been suggested to be associated with fast plasma flows such as Bursty Bulks Flows (BBFs). In this study, we observe the Omega band aurora at two wavelengths (427.8 nm and 844.6 nm) using two EMCCD cameras installed in Tromsø, Norway, and estimate the 2D distribution of the characteristic energy and downward energy flux of the precipitating electrons, by comparing observations and simulations. We investigate the two omega-band events on March 2, 2017 and February 24, 2018, respectively. The two events are typical the omega-band aurora events: a discrete aurora on the polar side and a pulsating aurora on the equatorial side. The estimated characteristic energy is not significantly different between the eastern and western sides of the Omega Band. The west side has more downward energy flux than the east side. The estimated results indicate that there is a region on the west side of the torch where the downward energy flux is about 1.3 times larger than in other auroral regions, while the characteristic energy does not depend on the region inside the torch. The characteristic energy also depends on the type of aurora, with discrete aurora having the highest, followed by pulsating and diffuse aurora. And during the March 2017 event, the footprint of MMS 1-3 satellites crossed the Omega-band including the aurora arcs and pulsating aurora region. The MMS satellites detected variations of the magnetic field, suggesting the existence of FACs associated with the aurora arcs. In this presentation, we will report spatial distributions of precipitating electron energy flux inside the omega band aurora and relationship between the energetic spatial structure of the omega band aurora and magnetospheric phenomena observed by the MMS satellites.