

## Azimuthally propagating ionospheric flow fluctuations during storm times as seen from satellite-radar conjunctions

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The recent Super Dual Auroral Radar Network (SuperDARN) observations show that ionospheric flow fluctuations of the mHz or lower frequency range appear even in the subauroral to mid-latitude region during magnetic storm times. An intriguing feature of the flow fluctuations is that they appear to propagate azimuthally either westward or eastward, and occasionally bifurcate toward the both directions. Taking a closer look with high spatial resolution measurements provided by the radars reveals that those flow fluctuations consist of meso-scale patchy structures of ionospheric convection with a significant latitudinal flow component and a longitudinal scale of ~1 h MLT. The azimuthal propagation properties strongly suggest that westward-drifting ions and eastward-drifting electrons of tens of keV in the inner magnetosphere can be the moving sources responsible for excitation of the flow fluctuations seen at the ionospheric height. Recent observations in the inner magnetosphere by the Arase satellite and the Van Allen Probes have provided excellent evidence for it as well as a good opportunity to examine their magnetospheric counterpart in further detail. The close conjugate observations of the radars and the satellites reveal that multiple drifting clouds of ions and electrons can be mapped to the electric field fluctuations propagating westward and eastward, respectively, in the ionosphere. The most likely interpretation for it would be that meso-scale pressure gradients carried by drifting ring current ions and electrons distort field lines one after another as they drift through the inner magnetosphere.