

高緯度電離圏擾乱の SAR イメージング

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High latitude ionospheric disturbances in space-borne Synthetic Aperture Radar images

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We present space borne L-band Synthetic Aperture Radar (SAR) observation of small-scale plasma density irregularities over Tromsø, Norway. Low-frequency SAR systems have been suggested to achieve mapping of ionospheric density distributions in terms of Total Electron Content (TEC) at a finer resolution than do GPS/GNSS measurements. This study uses Advanced Land Observation Satellite 2 (ALOS-2)/Phase Array type L-band Synthetic Aperture Radar-2 (PALSAR-2) system and simultaneous ground observations. The SAR system detects local change of TEC down to sub-kilometer scale in in 70 km x 50 km acquisition frame. Such images are compared with European Incoherent Scatter (EISCAT) UHF radar measurement and 558 nm all sky images. The irregular electron density is typically characterized by tens of kilometers of band-like structures aligned in the east-west direction with small patch-like structures. We present a method for estimating the local change of TEC gradient and the height of ionospheric irregularities by using single-image sub-band data. The results suggest that these observed small scale density structures are likely to be associated with precipitating electrons in auroral ionosphere.