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Simultaneous multiple conjugate nighttime MSTIDs observations: 4 October 2018

This study reports on nighttime medium-scale traveling ionospheric disturbances (MSTIDs) observed by conjugate midlatitude all-sky imagers in Sutherland (32.4°S, 20.8°E; magnetic latitude: ~-40.9°) and Asiago (45.87°N, 11.53°E; magnetic latitude: ~40.3°) on the 4th of October 2018. These MSTIDs had fronts elongated along the northeast-southwest (NE-SW) and northwest-southeast (NW-SE) directions in the Southern and Northern Hemispheres. The NE-SW aligned MSTIDs propagated in the NW (SE) direction in the Southern (Northern) Hemisphere, while the NW-SE aligned MSTIDs propagated in the NE (SW) direction in the Southern (Northern) Hemisphere. This study reports the first optical observations of conjugate NE-SW/NW-SE aligned and equator-eastward propagating MSTIDs. These MSTIDs are possibly linked to gravity wave-induced polarization electric field in the Northern Hemisphere, as significant gravity wave activity in the mesosphere was detected from the OH and OI greenline observations by the Asiago imager, and mapped to the Southern Hemisphere. Their equator-eastward propagation direction was favoured by background winds at the hemisphere of origin, which were determined from a global model and observations. The NE-SW/NW-SE aligned and equator-westward propagating MSTIDs were likely generated through the coupled Perkins and sporadic E instabilities, since they were observed in the presence of sporadic E layers and with reasonable Perkins instability growth rates. Polarization electric fields induced by the observed gravity waves and sporadic E layers resulted in two pairs of conjugate MSTIDs.

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