

MU Radar Observations of Nighttime-like Quasi Periodic Echoes Induced by a Partial Solar Eclipse

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The first observations of solar eclipse induced mid-latitude plasma irregularities using the middle and upper atmosphere radar (MU radar) at Shigaraki (34.85°N, 136.1°E, 25.0°N geomagnetic) are presented. The observations were done during the partial solar eclipse on 22 July, 2009. The observations show that the sudden withdrawal of solar radiation could deplete the background E-region densities, thereby unmasking the long-lived metallic ions within the strong and patchy Sporadic E-layers. As a result of this, Quasi-Periodic (QP) echoes were generated, which were detected by the MU radar. These echoes resemble the normal post-sunset QP echoes observed over mid-latitudes as revealed by the multi-channel interferometry imaging. This example shows that over mid-latitudes E-region plasma irregularities can be generated during a partial solar eclipse, revealing a hitherto unobserved aspect of mid-latitude ionospheric responses to eclipses.