Observations of daytime tweek atmospherics

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It is known that tweek atmospherics can be observed only at night, except for special cases such solar eclipses, because the attenuation due to solar ionization is much greater in daytime. Tweeks at frequencies of 1.5-10.0 kHz originate from lightning discharge and propagate over several mega meters in the Earth-ionosphere waveguide reflecting between the bottom edge of the ionosphere and the Earth's surface. Daytime tweeks have been not reported at all except for solar eclipses. However, some tweeks were observed in daytime at Moshiri(44.37N, 142.27E) and Kagoshima(31.48N, 130.72E), Japan, during non-solar eclipse days in December 1980. The daytime tweeks were observed on geomagnetically quiet and storm days. The daytime tweeks had a clear frequency dispersion with an average duration of 19 ms, which was shorter than that in the nighttime (˜50 ms). The average occurrences of the daytime tweeks at Moshiri and Kagoshima were 2.0 and 0.7 tweeks per minute, respectively. Daytime tweeks up to the third-order mode were visible. There was no difference in the occurrence of each visible mode between storm time and magnetically quiet time. The reflection heights of the daytime tweeks at Moshiri in storm and quiet time were lower than those at Kagoshima. The daytime reflection heights were similar to those at night (90-100 km), but with much greater variation. We evaluated the attenuation rate of tweeks by strictly taking the ionospheric reflection coefficient into account. For each frequency, the attenuation rate was evaluated as a function of the electron density, electron density gradient, and ionospheric height. We found that the attenuation rate had an inverse relationship with the electron density (or conductivity), electron density gradient, and ionospheric height. We suggest that the best conditions for daytime tweek observations are when the bottom side of the ionosphere is sharply defined and the ionospheric height is high. In the presentation, we discuss the cause for the daytime tweek observations.