The Neutral-ion Vertical Coupling between Mesopause and Lower Thermosphere-ionosphere System-a Classical Example for the Chemical Coupling

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Extensive studies have been carried out in the Mesosphere Lower Thermosphere Ionosphere (MLTI) region, to investigate various types of coupling processes, but most of them were concentrated on its dynamical and electrodyanmcial aspects. In the present study, we address the least explored part i.e., the chemical coupling between the mesopause and the F region ionosphere over Trivandrum (8.5° N, 77°E, 0.5° N diplat.), a geomagnetic dip equatorial station in India. For the 'first time', it is shown that the temporal variations in the monthly mean daytime mesopause temperatures corroborate well with that of ionsophereic base height changes (h'F) with a characteristic time delay varying from ~30 to 90 minutes. The observations were strictly restricted for the geomagnetically quiet days during the years 2005-2007. The mesopause temperatures were estimated using the OH dayglow emissions obtained from a unique multi-wavelength dayglow photometer and the h'F measurements were deduced from the co-located Digital Ionosonde. The observed time delay is believed to be due to the inter-competing roles between the downward diffusion of atomic oxygen and its advective transport. These observations are new and have significant implications as far as the vertical coupling in the equatorial MLTI system is concerned.