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Vertical coupling in the MLT region using long-term ground-based measurements of O_2(0-1) and OH(6-2) nightglow emission intensity and temperature from Mount Abu (24.6^{o}N, 72.8^{o}E), India

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Vertical coupling of atmospheres under various timescales and varying geophysical conditions is being studied using simultaneous multiwavelength observations of nightglow emission intensities and temperatures. For this, we use in-house built spectrograph and photometer from Mount Abu, India. During October 2014 a cyclonic storm called Nilofar occurred in the Arabian sea near the western Indian coast. The location and strength of the convective activity was obtained by Indian meteorological satellite (Kalpana-1). We show through spectral analysis that the gravity wave characteristics due to this cyclone matches with those observed in the mesospheric airglow intensities which provided a clear experimental evidence of vertical coupling of atmospheres during tropospheric convections. For this event, we have experimentally derived all the gravity wave parameters (τ, c_h, λ_h, c_z, λ_z, and θ_v) using ground-based optical data. These kind of data are sparse during cyclonic events since cloudy conditions inhibit the optical observations using ground-based instruments. Such study provides important inputs for modelling studies to understand atmospheric coupling during cyclonic events. We have extended our work on the vertical coupling of the atmospheres to investigate the cause of the upper mesospheric temperature inversions (MTIs). We have used over 4.5 years of data of O_2 and OH nightglow emission intensities and temperatures observed from Mount Abu. We found that although both wave dynamics and chemical heating by the exothermic reactions do work together, the *in situ* chemical heating process seems to be a more probable cause as compared to the vertical transport of energy from lower below. These new findings on the vertical coupling of the atmospheres under varying geophysical conditions will be discussed.