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Forcing of the thermosphere-ionosphere through gravity wave dissipation in the bottom F-Layer

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The importance of gravity waves for thermospheric and ionospheric dynamics has been amply demonstrated by both observational and modelling studies. This is true for both the initial perturbations and the changes to background conditions due to wave attenuation. In detecting and analyzing atmospheric GWs, Travelling Ionospheric Disturbances act as a tracer. We use Dynasonde derived ionospheric measurements to determine the amplitude, phase, frequency, wavelength and direction of propagation for gravity waves at Wallops Island, San Juan and Tromso. The objective of this study is to determine the magnitude and variability of the body forces exerted on the background system by waves as they are attenuated and dump their momenta. For atmospheric dynamics it is very important to know both the spatial and temporal variability of this momentum source. The continuous operation of Dynasonde instruments allows for temporal variations to be monitored within the altitude interval covered by the bottom F-Layer. The method we use is illustrated using a sample dataset from Wallops Island. The forcing due to gravity waves is then inferred for several time intervals in 2013 and 2014. Our approach allows for the impact of each wave mode to be determined, and also the cumulative effect of the gravity wave spectra at any given time and altitude. Characteristics common to each location are determined, such as the predominant direction of propagation and the seasonal variations in the wave spectra and the total body force.