THE RESPONSE OF THE THERMOSPHERE AND IONOSPHERE TO THE DISSIPATION OF GRAVITY WAVES GENERATED FROM DEEP CONVECTION

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In this talk, I discuss recent research relating the coupling of the lower and upper atmosphere via gravity waves (GWs) generated by deep convective plumes. These gravity waves are excited by the convective overshoot. Those GWs which reach the thermosphere tend to dissipate at z=140-220 km. Because of wind filtering in the lower thermosphere, they are oriented in a certain direction when they deposit their momentum in the thermosphere. This deposition of momentum accelerates the neutral fluid in the thermosphere horizontally, and is dubbed a thermospheric "body force". We discuss a case study here involving a convective plume in Brazil on 01 Oct, 2005. We find that this body force is quite large spatially, and has a large amplitude of $\sim 1 m/s^2$. It excites large scale secondary gravity waves with horizontal waveslengths of 2000 km and horizontal phase speeds of 500 m/s. These secondary GWs propagate up to at least z=420 km, and propagate globally on the nightside to the north and south poles after 4-6 hours. These secondary GWs propagate in all directions except that perpendicular to the force direction. Additionally, large-scale LSTIDs are created which "follow" the GWs around the globe. Finally, large "mean" neutral winds and wind shear are created in the body force region, which dissipate after 4 hours. This new mechanism for the generation of large-scale GWs during geomagnetically quiet times agrees well with existing equatorial observations of density and [O] perturbations at high altitudes.

Gravity wave, convection, thermospheric body force

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