

Vertical Coupling from the Atmosphere to Geospace at Arrival Heights in Antarctica

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The observational campaign with Fe Boltzmann and Na Doppler lidars has entered its 9th year at Arrival Heights near McMurdo (77.8S, 166.7E), Antarctica. The unique datasets have opened an exceptional window for exploration in the vertical coupling from the lower atmosphere to the thermosphere, and vertical coupling among the neutral atmosphere, ionosphere, and magnetosphere. Collaborating with theoreticians and modelers, we are attempting to establish a vertical picture of gravity waves in Antarctica from near the surface to the thermosphere, and a key concept is the secondary gravity wave generation initially hypothesized by Dr. Sharon Vadas. Combining observations with numerical modeling, we are also trying to understand how metal layers with cosmic dust origins are formed high in the thermosphere and ionosphere F-region via a complex atmosphere-ionosphere-magnetosphere (AIM) coupling and even correlating with solar wind activity. In this paper we will report a few studies that may be intriguing for advancing the understandings of vertical coupling from the atmosphere to the geospace at Arrival Heights that is a gravity-wave hotspot and by the edge of polar cap and auroral zone.