Large-Scale Dynamics and Gravity Wave Momentum Flux Measurements in the MLT using a new generation Meteor Radar

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We have recently installed an advanced meteor radar at a critical southern latitude to pursue a number of synergetic research efforts. The proposed system provides measurements to characterize the meteoroid population and large-scale atmospheric dynamics such as mean winds, tides, and planetary waves (PW). In addition, the system was specifically designed to enable measurements of the vertical flux of horizontal momentum by small-scale gravity waves (GWs). This is a new technique and is achieved using a novel meteor radar configuration that employs very high peak power (P = 60 kW), pulse coding options, and a transmit antenna beam pattern optimized for detection at zenith angles less that 45° . This configuration enables momentum flux studies not currently possible with typical meteor radar systems. The radar has the flexibility to interleave meteor and dynamics modes as needed to ensure optimal performance of both functions.

The system has been operational since May, 2008 at the Rio Grande Astronomical Station in Tierra del Fuego, Argentina (53° 47'S, 67° 42'W). This unique geographic location was chosen for four reasons: 1) It provides observations from a key southern hemisphere latitude currently devoid of any other middle atmosphere instrumentation; 2) It provides a key link in a latitude chain of instruments extending from the Antarctic to the Arctic through the Americas; 3) It enables inter-hemispheric dynamics studies with sites at a conjugate N. hemisphere latitude, including Juliusruh, Germany, Obninsk, Russia, and Saskatoon, Canada; and 4) It provides sensitivity to dynamical forcing at one of the most dynamically active sites on the planet.

We describe the system and measuring technique and present initial results. These show great variability of the large and small scale dynamics, large tidal and planetary wave amplitudes in the MLT, and the potential to characterize the GW forcing of the large-scale flow.