MEASUREMENTS OF THE METEOR DISTRIBUTION AND MESOSPHERE-LOWER THERMOSPHERE WIND FIELD AT THE SOUTH POLE

Avery Susan,Elias Lau,James Avery,Diego Janches,Scott Palo,N.A. Makarov
University of Colorado CB 216 Boulder Colorado USA

Abstract:

Meteor radars have been routinely used to estimate atmospheric winds in the mesosphere-lower thermosphere (MLT) region by measuring the Doppler signature of the diffusing meteor trails. These trails are ionization columns created by the ablation of meteoroids that enter the upper atmosphere and drift with the wind.A meteor radar system was installed at the South Pole in 2001 to measure the horizontal wind field in the MLT region. The radar operates at a frequency of 46.3 MHz and transmits a peak pulse power of 10 kW. A 36 microsecond Gaussian tapered pulse is transmitted at a pulse repetition frequency of 305 Hz. The radar uses four 6-element yagi antennas pointing in orthogonal directions for transmission. For reception two independent systems are used: (1) the same yagi antennas used for transmission (COBRA data acquisition system) and an interferometric array of five crossed-dipole antennas (MEDAC data acquisition system). This system is capable of locating the meteor trail as well as providing information on a variety of atmospheric parameters.Data is transmitted daily from the South Pole site to Boulder, Colorado where it is processed using a variety of algorithms that have been developed and tested. Significant time has been spent on calibration issues using 3 different methods.We will present a summary of the data processing and calibration methods. The main characteristics of the meteor distribution will be shown and discussed. Time, altitude, angular, and seasonal distributions show that the bulk of the meteor activity takes place around a concentrated region around the ecliptic plane and is more pronounced during the Antarctic summer. Additionally, we will present the features of the observed wind field. The main tidal components during the Antarctic summer are the westward-propagating diurnal and semidiurnal tides (both having wavenumber s = 1). The interferometric observations allow us to take a first look at the height structure of these atmospheric waves. We will compare results from the two receiving systems as well as with previous observations made over Antarctica. These results will be discussed in terms of current understanding of the MLT dynamics in polar regions.