Planetary wave coupling of the low latitude atmosphere-ionosphere system

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The lower, middle and upper atmosphere regions compose a strongly coupled system in which phenomena occurring at one height can have profound effects elsewhere. The mesosphere/lower thermosphere (MLT) region is a critical region in the vertical coupling since here the physical processes filter and shape the flux of waves and tides ascending through the mesosphere into the overlaying thermosphere. The dynamics of the MLT region which is dominated by atmospheric tides, planetary and gravity waves of large amplitudes establish a wind system of the lower thermosphere whose interaction with the ionospheric plasma produces the dynamo electric fields and currents that control the quiet time electrodynamic processes of the low-latitude thermosphere-ionosphere system. The basic aim of this work is to find evidence and to clarify the most appropriate mechanism(s) for vertical coupling in the low-latitude atmosphere-ionosphere system. The planetary waves observed in the low-latitude MLT region during June - December 2004 are studied by five meteor and middle frequency radars. A special attention is paid to the latitudinal variability of the equatorial planetary waves. The variability of the large-scale currents driven by the combined action of the wind system and electric field is investigated by analysing ground-level magnetometer data from stations located between ś 25o geomagnetic latitude. The response of the ionosphere to planetary waves from below is studied mainly by the peak height and the critical plasma frequency of the ionosphere F2-layer.