

Energetics and dynamics of the Mesopause region during Counter Electrojet: An Investigation using Meteor Radar and Dayglow Photometer

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Abstract

This paper reports the behavior of the zonal wind and temperature at upper mesospheric altitudes during the equatorial Counter ElectroJet (CEJ) events over a dip equatorial station. The temperature is estimated using the intensities of two OH lines measured a unique Dayglow Photometer and the zonal wind is obtained from a co-located Meteor Wind Radar. The most important observations are; during the CEJ events: (i) an eastward acceleration in the zonal wind at an altitude of 98 km, and (ii) a cooling in the mesopause, which is proportional to the extent of the field reversal. These aspects are discussed in detail.

Introduction

The reversal of Equatorial Electrojet (EEJ) on certain days for a short duration is known as 'CEJ'. There had been a number of studies in the past dealing with the causative mechanism for the occurrence of CEJ. Though different mechanisms have been proposed for the occurrence of CEJ, the exact cause of the reversal of the EEJ current is still remains inexplicable.

Results and Discussion

The mesopause shows a cooling (~ 20 K) during and the zonal wind at 98 km exhibits an eastward acceleration during the CEJ events as shown in Figure 1. The gravity waves of lower atmospheric origin are suggested to be the causative forcing for these observations. Such a wind can oppose the downward diffusion of [O], which in turn leads to reduced temperature in the mesopause through the exothermic OH chemistry. At the same time, the upward wind in the ionospheric dynamo region would either weaken or reverse the polarization field.

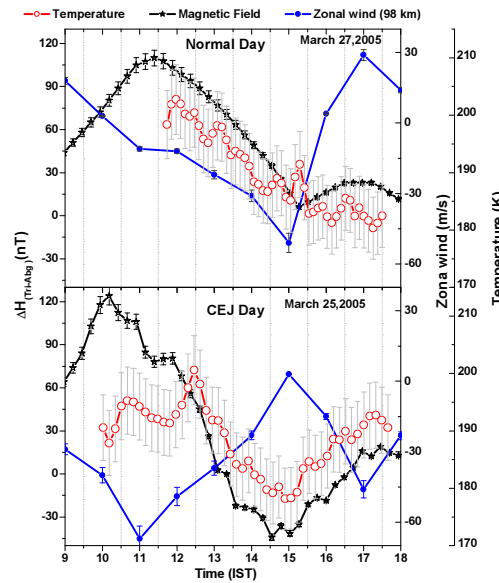


Figure 1:- Temporal variation of EEJ strength ($\Delta H_{TRV} - \Delta H_{ABG}$), mesopause temperature and zonal wind at 98 km on March 25, and 27, 2005.