Nighttime Zonal Plasma Drifts and Neutral Winds in the Low Latitude Ionosphere

B. G. Fejer
Center for Atmospheric and Space Sciences,
Utah State University, 4405 Old Main Hill,
Logan, UT 84322-4405

J. Emmert
School of Computational Sciences, George Mason University,
4400 University Drive
Fairfax, VA 22030

J. Jensen
Center for Atmospheric and Space Sciences,
Utah State University, 4405 Old Main Hill,
Logan, UT 84322-4405

We use incoherent scatter radar Fabry-Perot interferometer observations in the American sector and DE-2 and UARS satellite data to study the relationship of low latitude F-region ambient and irregularity zonal plasma drifts and their relationship to thermospheric neutral winds. In the equatorial early night sector, low altitude upward propagating plasma irregularities have westward drifts much larger than the undisturbed plasma which appears to result largely from ion Hall conduction effects. We compare these irregularity drifts with those of the ambient plasma and thermospheric winds to infer the polarization electric field set up by large-scale equatorial plasma depletions. The higher altitude plasma irregularities have generally downward and eastward drifts comparable to those of the ambient plasma and the corresponding neutral winds. Satellite measurements indicate that the thermospheric plasma and neutral drift vary significantly with longitude during geomagnetically quiet and disturbed conditions. We will show that this longitudinal effect is season dependent and is strongly affected by the variation of the vertical plasma drift velocity, which controls the height of the equatorial F-layer. Our observations indicate that ionospheric zonal disturbance dynamo electric fields are largest near solar maximum and during periods of high F-layer heights. These results suggest that the latitudinal variation of the equatorial zonal drifts and neutral winds is longitude and season dependent, particularly near solar maximum conditions. These effects appear to decrease at higher latitudes.