Improved *E*-region electron density and meridional wind measurements over Jicamarca using multi-static configurations

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At equatorial latitudes standard incoherent scatter radar techniques used at other latitudes, cannot be used routinely to diagnose the *E* region. This limitation is mainly due to the presence of strong coherent echoes from equatorial electrojet (EEJ) field-aligned irregularities. In recent years, a variety of radar techniques have been developed at the Jicamarca Radio Observatory (JRO) to make use of the strong EEJ echoes to diagnose the *E* region. Given the strong EEJ echoes, particularly during the day, all of these techniques make use of small antenna systems with grating-lobe array and/or bistatic configurations, allowing daytime measurements of electric fields, and zonal neutral wind and electron density profiles. Measurements at night (including sunrise and sunset times) have not been possible due to the poor sensitivity of the systems used.

In this work, we propose to use specular meteor echoes using JRO’s large power-aperture for transmission and small interferometric systems for reception few tens to hundreds of kms south and east of Jicamarca. The detection and identification of the specular echoes will be done in a similar manner to the traditional all-sky meteor systems, allowing the direct measurement of the horizontal winds. Moreover, by using cross-polarized antennas on reception, the phase difference, due to Faraday rotation, between orthogonal polarizations will provide the total-electron content until the scattering point. Compared to standard all-sky meteor systems, the multistatic measurements will be done on a very small volume avoiding the assumption of a homogeneous wind field on a large area. The use of meteor echoes will allow measurements at night. Moreover, since the Bragg wavelength of the multistatic system is larger than the monostatic system, better sensitivity is expected as well as higher altitude coverage. Finally, as a by product of this experiment, we’ll be able to study the three known meteor echoes at the same time, i.e., meteor-head, non-specular meteor trail, and specular meteor trail. Preliminary results using a receiver station ~250 km south of Jicamarca will be presented and discussed.