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Lower E region wind dynamics at low latitudes and their connection to equatorial valley region plasma instabilities

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In the equatorial valley-region the interplay of neutral and plasma forces is difficult to separate given the Earth's magnetic field geometry. In addition, this region has been difficult to observe with both ground- and satellite-based instruments. However, from the observations available, mainly radar echoes, the region shows a significant structure in both time and space. Such structure points towards the influence of waves from lower altitudes that either propagate directly vertically, or indirectly via the E-region dynamo. In this work, we present the preliminary results of lower E region winds under and south of the magnetic equator obtained with a newly developed and installed spread-spectrum multi-static radar network called SIMONe, i.e., SiMONe Peru, and SIMONe Argentina. SIMONe allows the estimation of horizontal wind fields with a few tens of kilometer and a few hundreds of meters horizontal and vertical resolutions, respectively. In addition, by exploiting second-order statistics of measured projected velocities, autocorrelation, spectra and second-order structure functions of the wind field are obtained directly without the need of regularization. The preliminary results of both networks under different geophysical and geometrical (magnetic) conditions will be presented and discussed, with a special emphasis on their possible contributions to the observed spatio-temporal features of the daytime equatorial valley region irregularities.

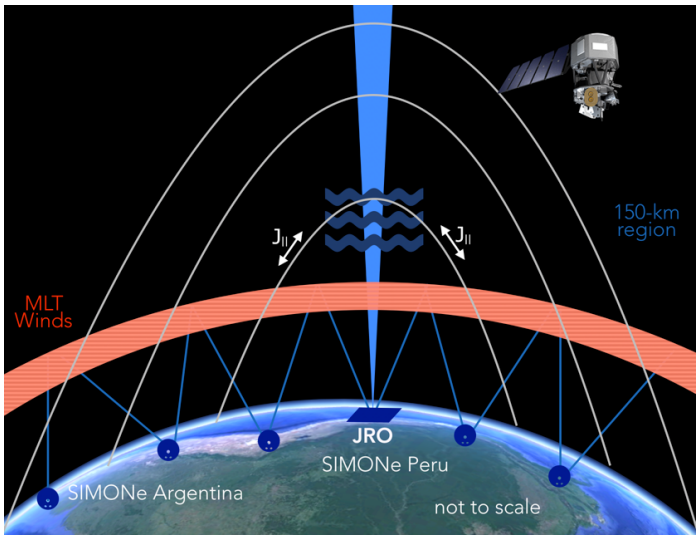

Figure 1. Sketch of low-latitude valley region and their connection to lower E region (or MLT) winds. The Jicamarca Radio Observatory, SIMONe Peru, SIMONe Argentina, and ICON are shown not to scale (courtesy Kiara Chau).