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THE LOW-LATITUDE IONOSPHERE SENSOR NETWORK (LISN): SCIENCE RESULTS

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Abstract. The Low-latitude Ionospheric Sensor Network (LISN) is a distributed observatory designed to provide regional coverage in South America and high-temporal resolution measurements to nowcast the state and dynamics of the low latitude ionosphere and diagnose the initiation and development of mediumscale plasma structures. It combines inexpensive GPS receivers and state-of-the-art radars such as the Vertical Incidence Pulsed Ionospheric Radar (VIPIR) ionosondes and magnetometers.

During the first 2 years of operations, measurements conducted by 34 GPS receivers that belong to the LISN network and by 90 additional GPS receivers that belong to 3 other networks were utilized to construct maps of TEC over South America. This new regional observational capability allows us to characterize the day-to-day variability with a temporal resolution as short as 5 minutes. The regional maps have been used to study the appearance of TEC enhancements that are observed near local midnight at several equatorial stations. During these events, we observed the crests of the anomaly to displace toward the equator, which seems to imply the presence of convergent meridional neutral winds able to transport plasma from higher latitudes along the field lines toward lower latitudes. New processing algorithms, designed to detect the presence of TEC perturbations, have prompted us to build regional plots of TEC depletions and TIDs associated with atmospheric gravity waves. We have also conducted three campaigns to detect mediumscale ($\sim$ 100 km) TIDs in 2008 and 2009. We used 3 GPS receivers spaced by distances less than 20 km and arranged in a triangular configuration. TIDs were observed quite often during day and night having amplitudes less than 1 TEC unit. Phase velocities between 100 and 200 m/s, wavelengths of order 200 km and traveling directions between northward and eastward have been detected.

The first VIPIR ionosonde has been installed and is working temporarily at the Jicamarca radar site since November 2008. This VIPIR has spurred a series of investigations that include simultaneous operations with the IS radar to measure the density gradients at the altitudes where the 150 km echoes develop, along with frequency sweeps over 6

seconds to observe the onset of plasma bubbles and realtime ionogram inversion to derive bottomside density profiles.

Five 3-axis flux-gate magnetometers were designed, built, and tested at the Jicamarca Radio Observatory and were deployed at the center of South America forming two latitudinal chains near 70^o and 60^oW longitude. These two chains of magnetometers consist of one magnetometer placed at the magnetic equator and another 6^o away to provide the daytime zonal electric field. Here, we will describe the status of the instruments installation, present recent results of the investigations described above, and outline our future goals.