2013 Workshop: LISN a strategy to forecast

Long title
To build a strategy to forecast the state and dynamics of the ionosphere over South America using the LISN distributed observatory.
Conveners
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Description

The Low-Latitude Ionospheric Sensor Network (LISN) is a permanent array of geophysical instruments, closely coordinated as a Distributed Observatory dedicated to monitor and specify the conditions of the ionosphere over the South American continent. The ionospheric observations are conducted with 47 GPS receivers, 5 magnetometers distributed in 2 baselines and 2 VIPIR ionosondes installed on approximately the same magnetic field line that intersects the magnetic equator at 68º W longitude. Later this year, two more VIPIRs will be deployed to complete a set of 4 ionosondes placed along the same field line.

We propose to organize a brain-storming session to elucidate what processing techniques, concurrent measurements, and/or additional campaigns are required to add to the LISN instruments to achieve a forecast capability of the state and dynamics of the low-latitude and equatorial ionosphere over South America.

The session will start with a few (6) short presentations in which we will show the latest results on ionospheric data processing from South America, tomography density reconstructions, assimilation numerical techniques, and joint multi-disciplinary campaigns conducted at low latitudes. The later does not need to be carried out in South America. The second part of the session will consist of round-table discussions of different options that can be implemented to achieve a short time (1 – 3 hours) forecast of the ionosphere densities and dynamics.

Justification

Regional maps of TEC are now routinely constructed using measurements from GPS receivers that belong to the LISN and several other networks. These maps indicate a high degree of spatial and temporal variability of the ionosphere over South and Central America and the Caribbean region. Other instruments operating at low latitudes (e.g. baselines of magnetometers, ionosondes, radars and satellites) have also reported a pronounced variability across the continent. This workshop aims to answer the fundamental question: Can a first-principle assimilation model of the low latitude ionosphere duplicate this variability? We will use regional and long-term (5 years) measurements of the low-latitude ionosphere and several theoretical and empirical models of the ionosphere over South America to understand and estimate the scale-sizes of the drivers of this variability (electric fields, winds and thermosphere). We will use a large database consisting of ionosonde density profiles, distributed TEC values, and magnetometer derived electric fields that have been accumulated between 2008 and 2012. TEC, density, drifts and other observables that are available in South America will be used to evaluate the precision and quality of the modeling effort during different local times, seasons, solar activity, and magnetic conditions. When this task is completed, we should be able to move forward and address the question: Can we use an array of distributed instruments and a first principle model of the ionosphere to forecast the state and dynamics of the ionosphere?

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