2014 Workshop: Distributed observatories

Long title
Distributed instrumentation for ionospheric measurements over South America
Conveners
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Description

This workshop will present the latest results on measurements of the ionosphere and/or thermosphere over South and Central America obtained using distributed, conjugate, multiple instruments, arrays and networks. One of these distributed networks is the low-latitude ionosphere sensor network (LISN) consisting of 47 GPS receivers, 5 magnetometers distributed in 2 baselines and 2 VIPIR ionosondes installed along the magnetic field line that intersects the magnetic equator at 68º W longitude. However, results from other networks such as chains of Fabry-Perot interferometers, all-sky imagers, GPS receivers, and multiple RF receivers are also welcome to participate. Conjugate observations using the C/NOFS satellite and ground-based instruments are also part of this workshop as well as assimilation and modeling investigations employing real-time data from distributed instruments. We propose to organize a 2-hour session in which we will emphasize the importance of multiple-sensor measurements, regional coverage, and continuous (24/7) operations. The session will start with presentations of anomalous TEC distributions over South and Central America, maps of TEC depletions in Central America and the statistics of TIDs/GWs observed in Central and South America during magnetically disturbed and quiet periods. We hope to conclude with a brain-storming, round-table discussion to elucidate what processing techniques, what concurrent measurements, and/or additional campaigns are required to advance our knowledge on the dynamics of the ionosphere and the initiation of equatorial plasma bubbles. A key question is on how real-time assimilation techniques can improve our forecasting capability of the state and dynamics of the low-latitude ionosphere over South America to achieve a short time (1–3 hours) predicting capability.

Justification

Regional maps of TEC 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 two fundamental questions: Is the present instrumentation in South America able to assess the temporal and spatial variability that exists at all local times, and all ionospheric conditions? And, can a first-principle assimilation model of the low latitude ionosphere duplicate this variability? Advancing the prediction capability of the background ionospheric densities and its longitudinal dependence is related to CEDAR strategic thrusts #2, and #3. This workshop is also related to the study of the ionosphere-thermosphere system in an integrated fashion and the effective space weather and climatology capabilities emphasized in the 2013-2022 Decadal. This is within science goal # 2 of the Decadal Survey for Solar and Space Physics: Determine the dynamics and coupling of the Earth’s ionosphere and atmosphere and their response to solar and terrestrial inputs. Progress should be measured by comparing the regional predictions against the ionospheric measurements conducted by the different networks of instruments.

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