2024 Workshop: Ground-based instrumentations

Long title
Needs for ground-based instrumentation over the equatorial and low-latitude regions.
Conveners
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Description

This workshop will explore current status and potential instrumentation capabilities for scientific studies and space weather applications equatorial and low-lat latitudes Geospace environment. Although there are lots of interesting scientific phenomena over the equatorial and low-latitude region, there are very few ground-based Instruments that can be used carry-out the studies. Scientific progress requires co-located networks of instrumentation that include both radio radar systems, optical imaging arrays, orbital platforms, and in-situ measurements made using satellite and rocket instrumentations. The analyses of physical parameters of the ionosphere and neutral atmosphere using experimental measurement/ground-based instruments are critical to scientific progress in key areas such as ionospheric variability, response to storm’s main and recovery phases, plasma instabilities, sporadic-E layer formation, subauroral polarization streams and drifts, and atmospheric coupling. The workshop will discuss the need for ground-based instrumentations, what is achievable with current instrumentation systems and what can be achieved with upgraded systems, ground-based developments that are currently underway, and longer-term visions for a comprehensive set of experimental capabilities at the equatorial and low-latitude regions.

Agenda

We would like to invite you to attend a CEDAR session titled: "Needs for ground-based instrumentation over the equatorial and low-latitude regions" on Tuesday (June 11) 10am-12pm at the Westcoast room.

We have 10 presenters (see the list below), a 10min with 2 min for questions would be perfect.

It would be much appreciated if presenters could drop the presentation in folder " https://drive.google.com/drive/folders/1qqO-FEl7Nh9AaO9oaQu4lg0FuYccRHjK?usp=sharing" before the session.

Let's know if you have any questions.

Opening Presentation

1. **Koki Chau**, Leibniz Institute of Atmospheric Physics (Germany); The status of ground-based instrumentations over the global equatorial and low-latitudes, Advantages of ground-based instruments, unresolved problem, knowledge gaps resulting from insufficient ground-based instruments, and efforts that are currently underway to enhance existing instrumentation and deploy new systems.

Session Presentations

2. **Rafael Mesquita** – *APL*, OmniMAG Network of magnetometer, A network of 1000 Science-Grade magnetometers.
3. **Fabiano Rodrigues** - *UTD*, Need for ground-based instrumentation at equatorial and low latitudes: Contributions from ScintPi monitors
4. **Mike Ruohoniemi** - *Virginia Tech*, NigerBEAR.
5. **Qian Wu** - *High Altitude Observatory, National Center for Atmospheric Research*, FPI observations in Africa
6. **Michel Blanc** - CNRS-University Toulouse III-CNES, IMCP project contributions to developing low-latitude ground-based instrumentation.
7. **Endawoke Yizengaw** – *Aeropsace Corporation*, Ground-based instrumentation.
8. **Luis Navarro -** *University of Colorado, USA;* Fabry-Perot Interferometer network in Western South America.
9. **Alan Liu** - *Embry-Riddle Aeronautical University*, Meteor radars along with OH, green and red line imagers + FPIs - A Distributed Meteor Radar and Optical

Network in South America.

10. **Cesar Valladares** - *UTD*; LISN, a network containing different types of Instruments.

Justification

The equatorial/low-latitude ionosphere is an exciting domain for space science research with many open and unresolved questions. There have been many space explorations and rocket launchings over the last several decades while ground-based instrumentations have lagged behind particularly over the equatorial and low-latitude regions. Attention of Geospace science research efforts is gradually turned to mid and high latitudes, while questions about electrodynamics and unresolved plasma irregularities as well as long-term variability persist over the equatorial and low-latitude regions. Key physical mechanisms related to phenomena over regions are also not fully understood and a large number of critical systems rely on a highly detailed understanding and specification of the equatorial and low-latitude ionospheric physics and state. Our ability to detect, quantify, and forecast such phenomena are currently very limited given the current status of ground-based distribution network over the region. Different ground-based sensor systems often measure different aspects of phenomena. Deploying and utilizing these systems effectively requires coordination between community members and the development of new approaches to experimental investigations. Interestingly, many efforts are underway to enhance existing instrumentation and deploy new systems and these efforts need to be visible to the larger CEDAR community. Example of such effort is the CONGA project. Coordination of efforts to justify and develop future instrumentation rests critically on the ability of the CEDAR community to advocate for such efforts in a focused manner. We will provide a forum for such discussions as part of this session.

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