2023 Workshop: Distributed instrument networks

Long title
CEDAR science advances enabled by distributed ground-based instrument networks
Conveners
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Description

Technological advances have recently enabled deployment of networks of distributed instruments for studying the geospace system. Networks of GPS receivers, all-sky imagers, magnetometers, HF radars, meteor radars, Fabry-Perot Interferometers, ionosondes and more are transforming our ability to measure the coupled mesosphere-lower thermosphere-ionosphere (MLTI) system with a broader field-of-view than previously possible. The recent distributed array of small instruments (DASI) initiative has supported building new instrument networks that are ready to be used towards addressing CEDAR science questions. In this session, we invite presentations on scientific advances made using networks of distributed instruments, current science questions that require distributed measurements, effective use of the data produced by these instrument networks, and new ideas for distributed instrument networks to address science questions.

Agenda

4:00-4:05 Introduction

4:05-4:10 **Scott Palo**: Zephyr MIMO meteor radar project

4:12-4:17 **Qian Wu**: Ground-based FPIs

4:19-4:24 **Anthea Coster**: The sum is greater than the parts – merging various arrays

4:26-4:31 **Jenn Gannon**: DASI project: MagStar array

4:33-4:38 **Asti Bhatt**: DASI project: MANGO nested network of all-sky imagers and FPIs

4:40-4:45 **Cesar Valladares**: LISN

4:47-4:52 **Eric Donovan**: THEMIS/SMILE/TREx

4:52-5:00 Discussion on measurement needs - inviting brief discussion, questions

5:00-5:05 **Pavel Inchin**: analysis of multi-GNSS TEC over CONUS

5:07-5:12 **Fabiano Rodrigues/student**: ScintPi: A brief description and example of distributed observations

5:12-5:20 Continue with the discussion of measurement needs, and introduce future ideas

5:20-5:25 **Simon Shepherd**: New SuperDARN radars in Iceland

5:27-5:32 **Lindsay Goodwin**: Gravity wave tracker

5:34-5:39 **Luis Navarro**: Western South America network of FPIs

5:41-5:46 **Olu Jonah**: CONGA (COntinuous Network of GNSS Receivers over North Africa)

5:46-6:00 Open discussion

Justification

Much of the work done over the past decades in investigating various scales were limited to standalone instruments, often co-located with major facilities. Our ability to achieve an in-depth understanding of the coupling and transport of energy across these scales is hampered by our inability to make coordinated observations of the necessary physical drivers, which can often be separated by large distances between cause and effect. In order to understand how drivers of energy and momentum at multiple scales and over large distances manifest as variability in the geospace system, observations at various spatial scales spanning large distances need to be obtained.
The Heliophysics decadal survey 2013 and the mid-term assessment of the decadal survey goals have identified that the Atmosphere-Ionosphere-Magnetosphere

Interaction priorities are well served by distributed instruments. The mid-term assessment states: “Distributed observational capabilities increasingly enforce the realization that the geospace system, from below the ionosphere to the outer reaches of the magnetosphere, is a single connected system”. As the first NSF-DASI funded networks are getting realized, it is time to assess how these distributed instrument can serve the science needs and what new capabilities are required.

Related to CEDAR Science Thrusts:
Encourage and undertake a systems perspective of geospace
Develop observational and instrumentation strategies for geospace system studies
Keywords
System science, MLTI, Instrument networks
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