



# **The Center for Solar-Terrestrial Research (CSTR): THE Top Experimental Space Weather Program**

**Andrew J. Gerrard**  
Professor

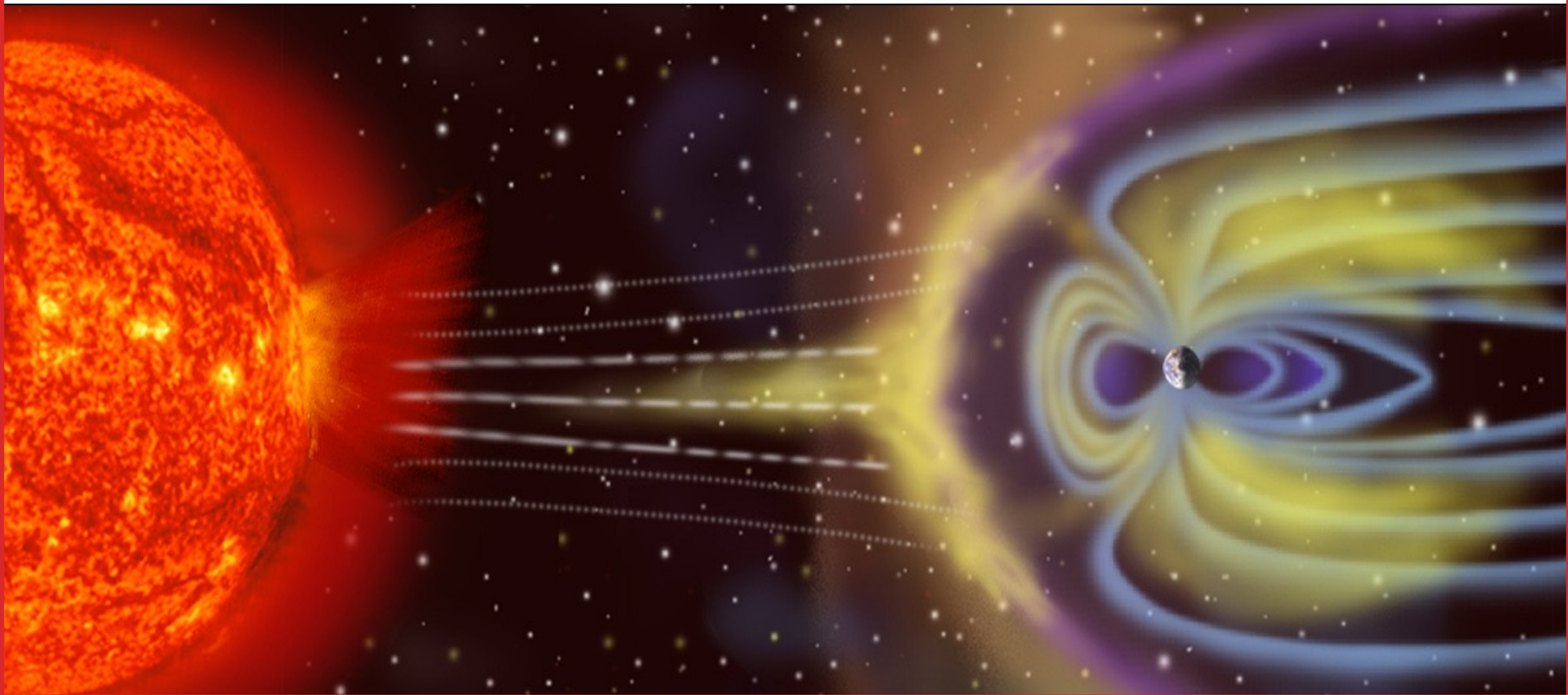
Chair, Department of Physics  
Director, Center for Solar-Terrestrial Research

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# Center for Solar-Terrestrial Research

Solar-Terrestrial  
Research

= Space Weather = Heliophysics = Geospace



# Center for Solar-Terrestrial Research

Solar-Terrestrial  
Research

= “...branch of space physics and aeronomy ... concerned with the time varying conditions within the Solar System, including the solar wind, emphasizing the space surrounding the Earth, including conditions in the magnetosphere, ionosphere, thermosphere, and exosphere.” -The Great Wiki

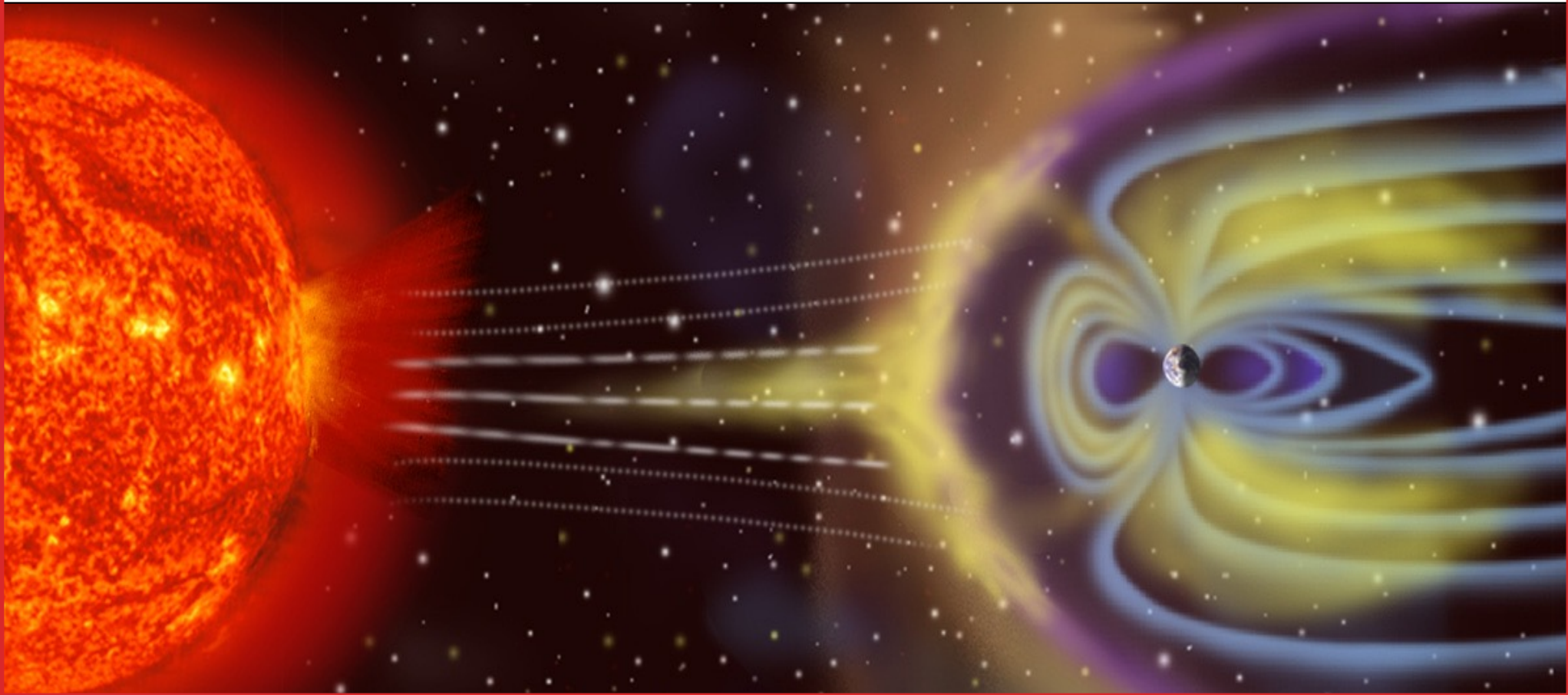


# Center for Solar-Terrestrial Research

Solar-Terrestrial  
Research

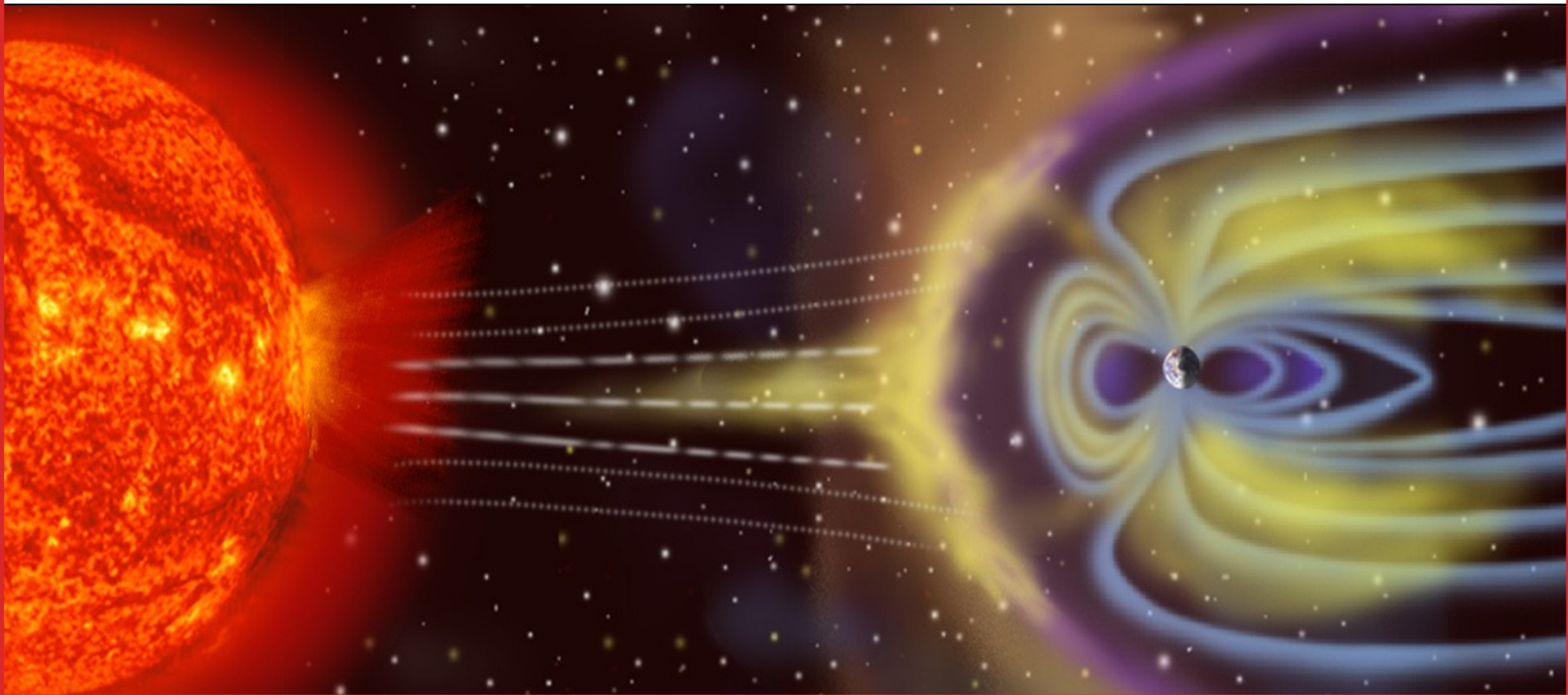
=

Plasma Physics +  
Fluid Dynamics +  
Remote Sensing/Instrumentation +  
Data Reduction and Inversion +  
Modeling

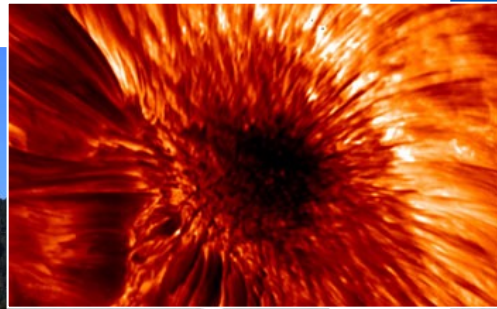
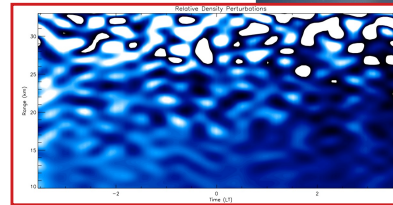
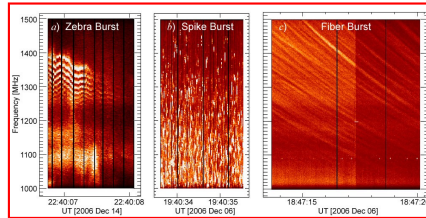
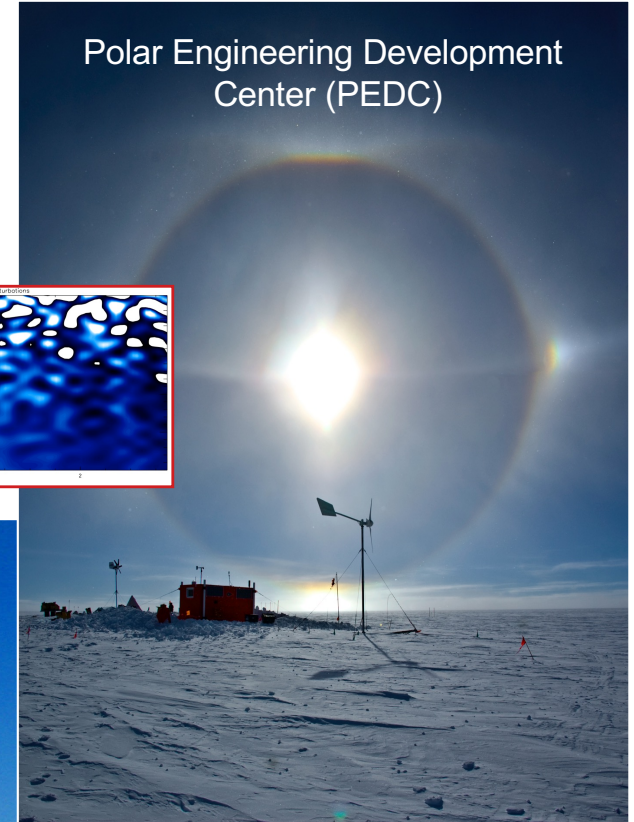
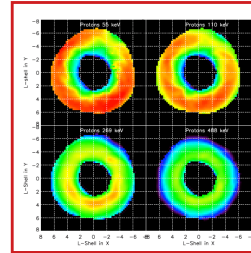
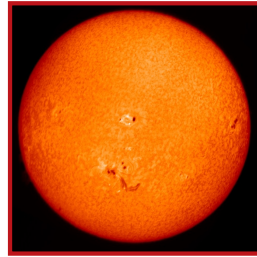


# Center for Solar-Terrestrial Research

As an “Institute of Technology,” we are: **EXPERIMENTAL**  
We design, build, test, operate, and analyze instruments!



# Center for Solar-Terrestrial Research



# Who We Are (~40 FTE, not including Students)

Prof. Andrew Gerrard, Director, gerrard@njit.edu

Prof. Wenda Cao, Director of BBSO-Solar Optical

Dist. Prof. Dale Gary, Director of EOVS-Solar Radio

Dist. Prof. Haimin Wang, Director of SWRL-Solar Data/Optical

Assoc. Prof. Bin Chen-Solar Radio

Asst. Prof. Satoshi Inoue-Solar Modeling/Optical

Asst. Prof. Hyomin Kim-Terrestrial Magnetosphere

Asst. Prof. Gareth Perry-Terrestrial Ionosphere

Asst. Prof. Lindsay Goodwin-Terrestrial Ionosphere

+ 3 Post-Docs

+ 13 Research Staff

Dist. Res. Prof. Phil Goode-Solar Optical/EarthShine

Dist. Res. Prof. Lou Lanzerotti-Heliosphere

Dist. Res. Prof. Gregory Fleishman-Solar Radio

Dist. Res. Prof. John Meriwether-Aeronomy

Research Professors:

Administration:

Dr. Ilya Kuzichev

Dr. Ju Jing

Dr. Gelu Nita

Dr. Yan Xu

Dr. Sijie Yu

Dr. Vasyl Yurchyshyn

Dr. Matt Cooper

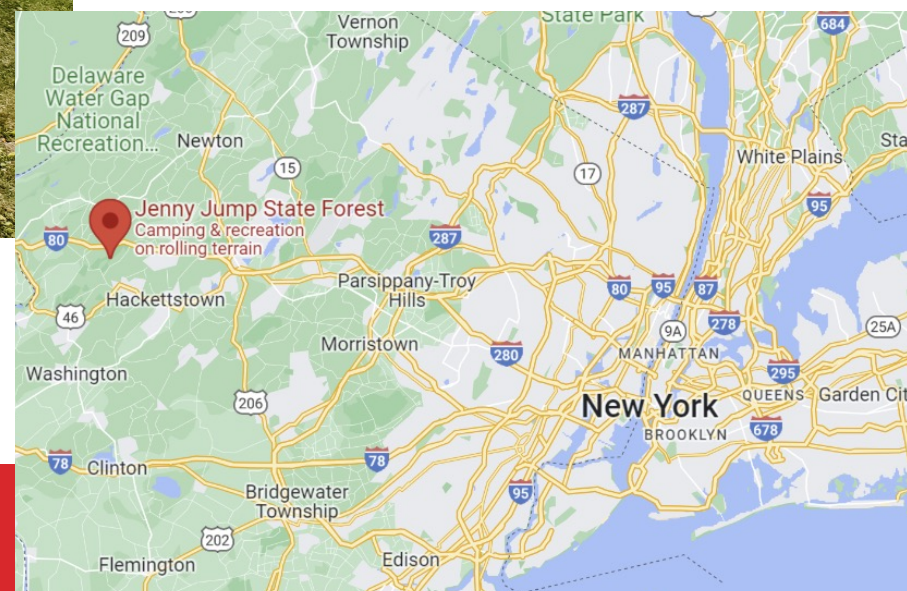
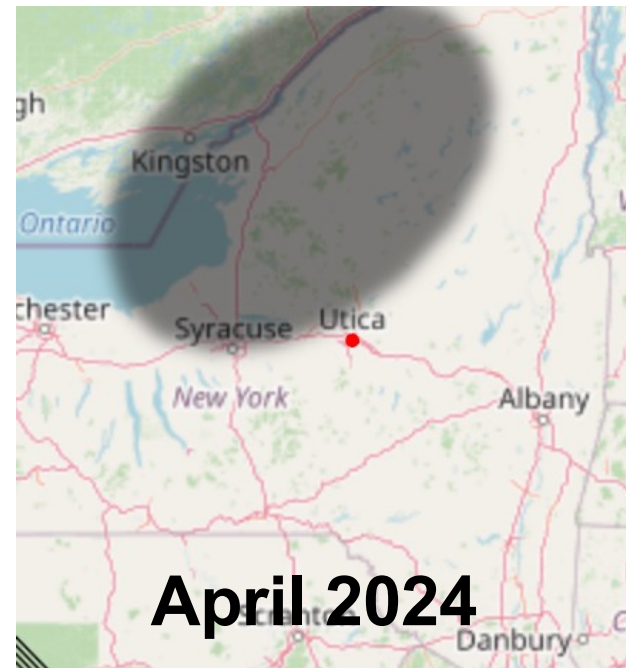
Dr. William Longley

Ms. Felicia Margolies- CSTR Program Manager

Ms. Cheryl James- CSTR Administrative Coordinator

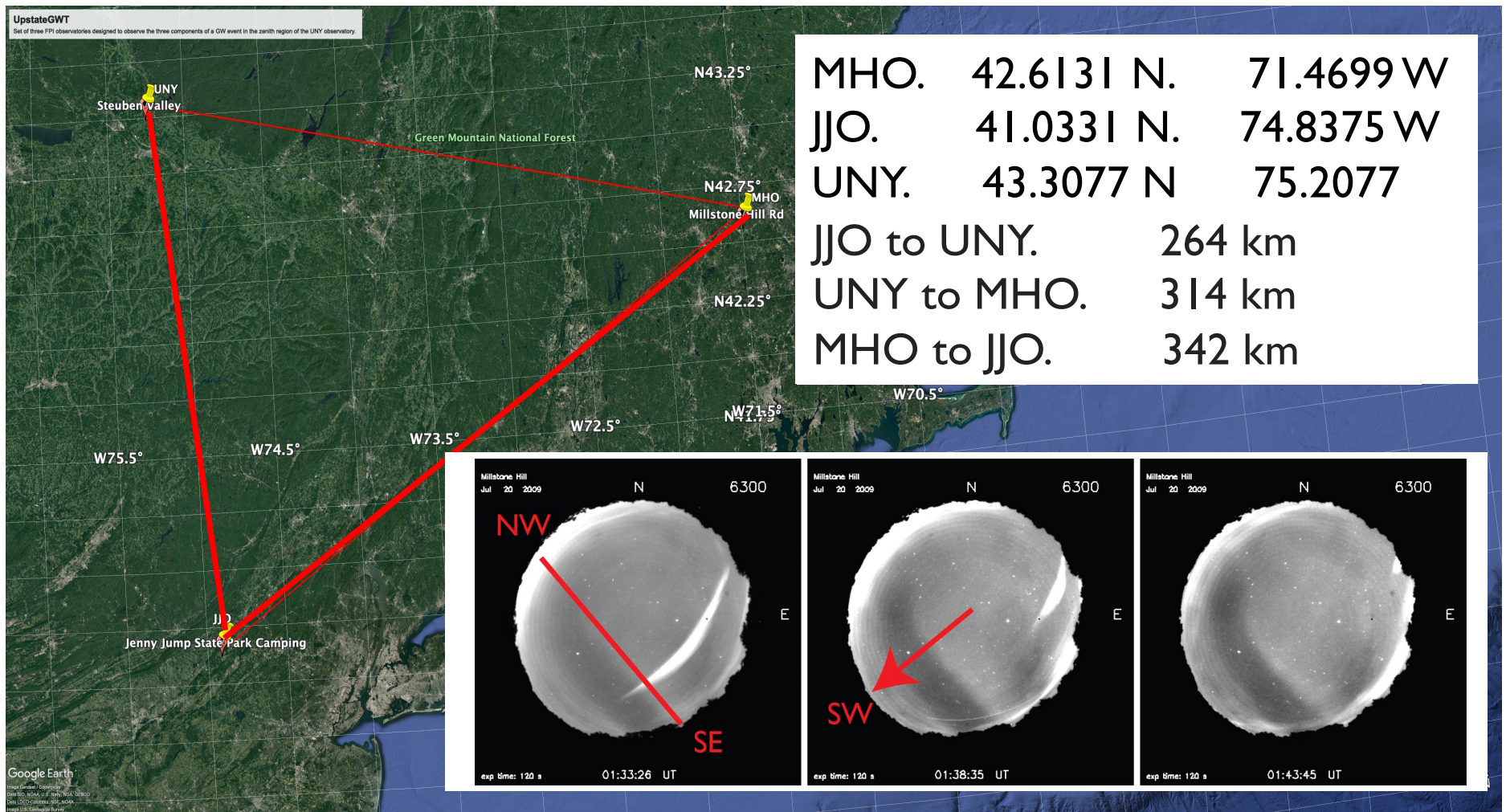
Ms. Erika Norro- Administrative Assistant-BBSO

# Jeffer Observatory, Jenny Jump State Forrest, Hope, NJ (40.92 N, 74.9 W)



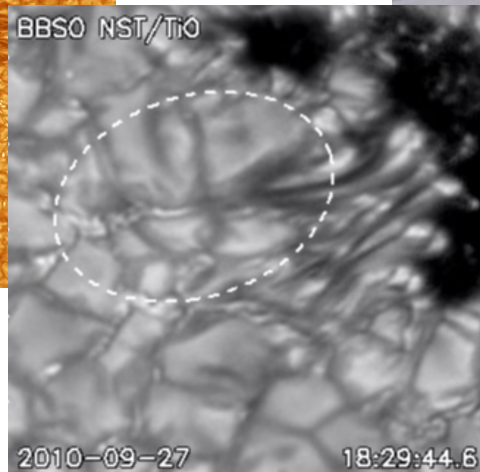
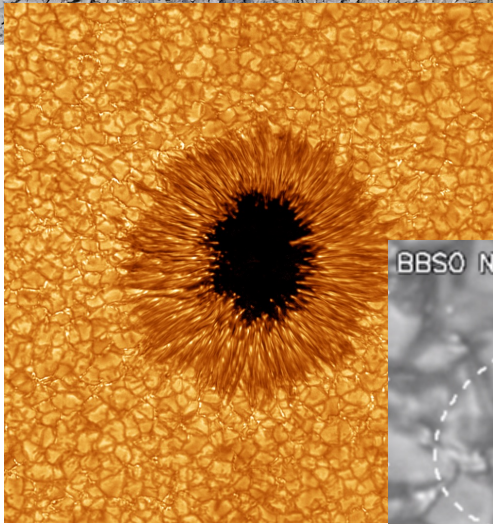


# Tristatic 15 cm FPI system at MHO-JJO-UNY



Zenith angles for CV observation within range of 40 to 50 degrees.  
**Perfect for measuring winds!**

# Big Bear Solar Observatory (BBSO), Big Bear, CA



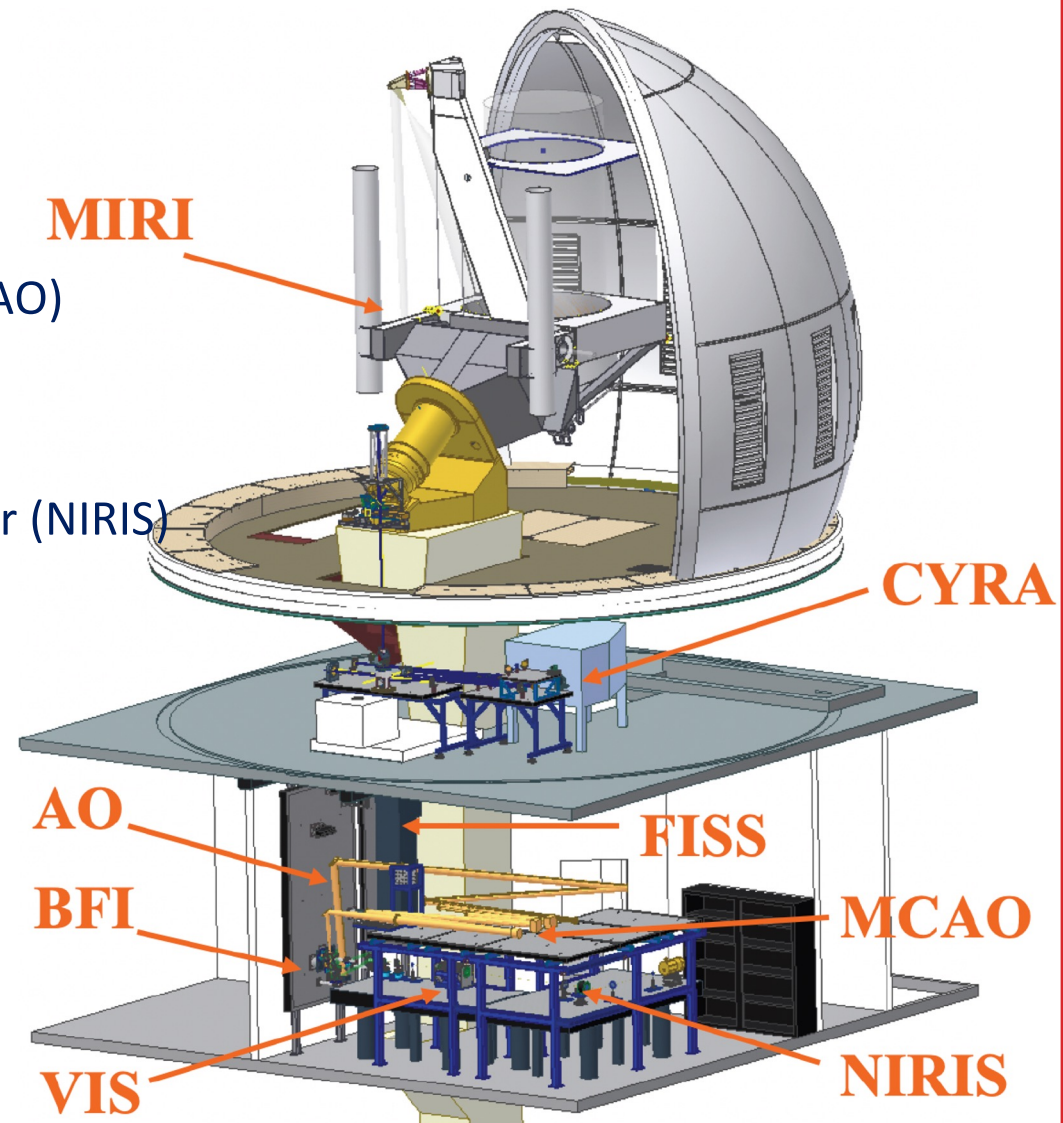


## **Big Bear Solar Observatory (BBSO), Big Bear, CA**

**Recent [2023]  
Snow Storms**

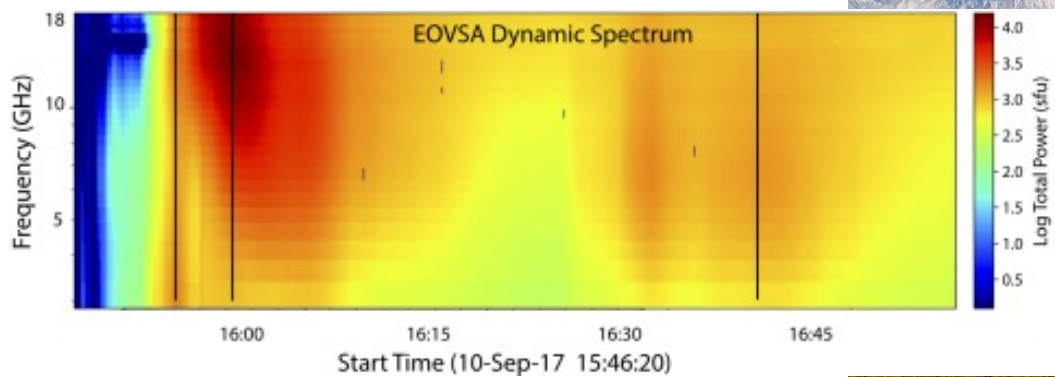
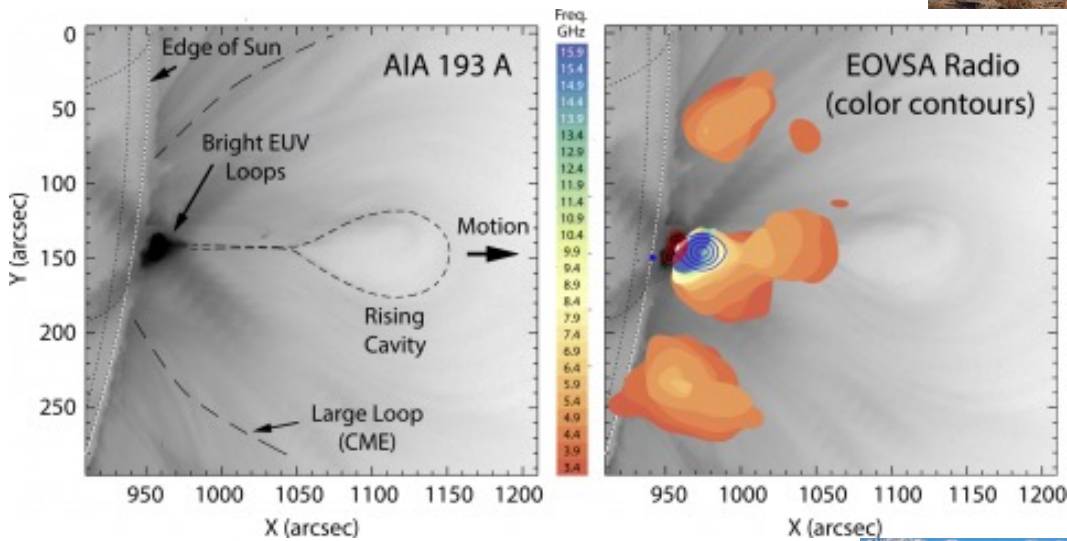
# GST and its Scientific Instruments

- Adaptive Optics System (AO: AO-308, MCAO)
- Visible Imaging Spectrometer (VIS)
  - upgrade to double FP system
- Near Infrared Imaging Spectro-polarimeter (NIRIS)
- Fast Imaging Solar Spectrograph (FISS)
- Broad-band Filter Imager (BFI)
- Cryogenic Infrared Spectrograph (CYRA)
- NASA Mid-Infrared Imager (MIRI)



# EOVSA

Owens Valley Solar Array



# Pending Upgrade to EOVSA

A proposal was submitted to NSF's Major Research Instrumentation (MRI) program to upgrade EOVSA (\$1.9M over 3 years)

Proposed upgrade includes:

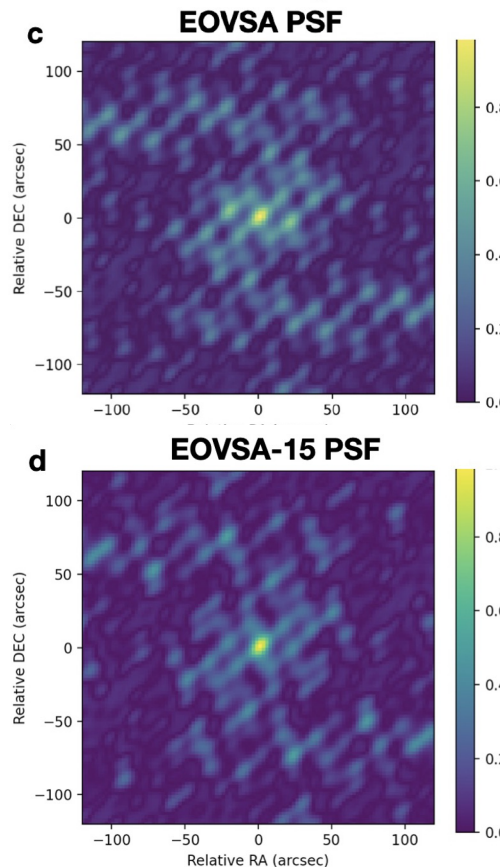
- Replace 6 old antennas to create a uniform array
- Add 2 new antennas to the array
- Develop and install new-generation antennas feeds

New capabilities:

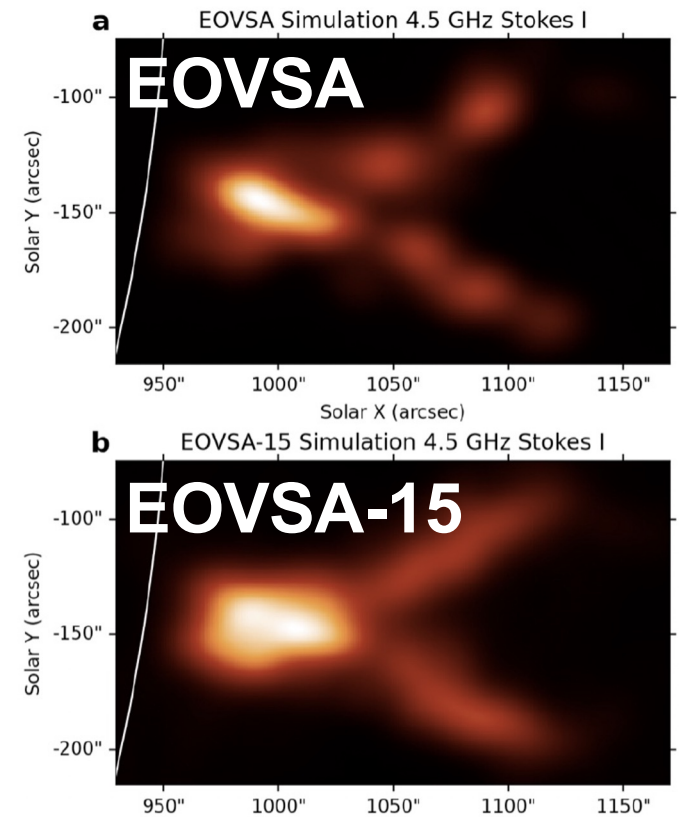
- Greatly improved imaging quality
- New capability of imaging spectro-polarimetry

Enabling new windows for studying physics of solar flares and solar active regions.

Greatly improved point spread function



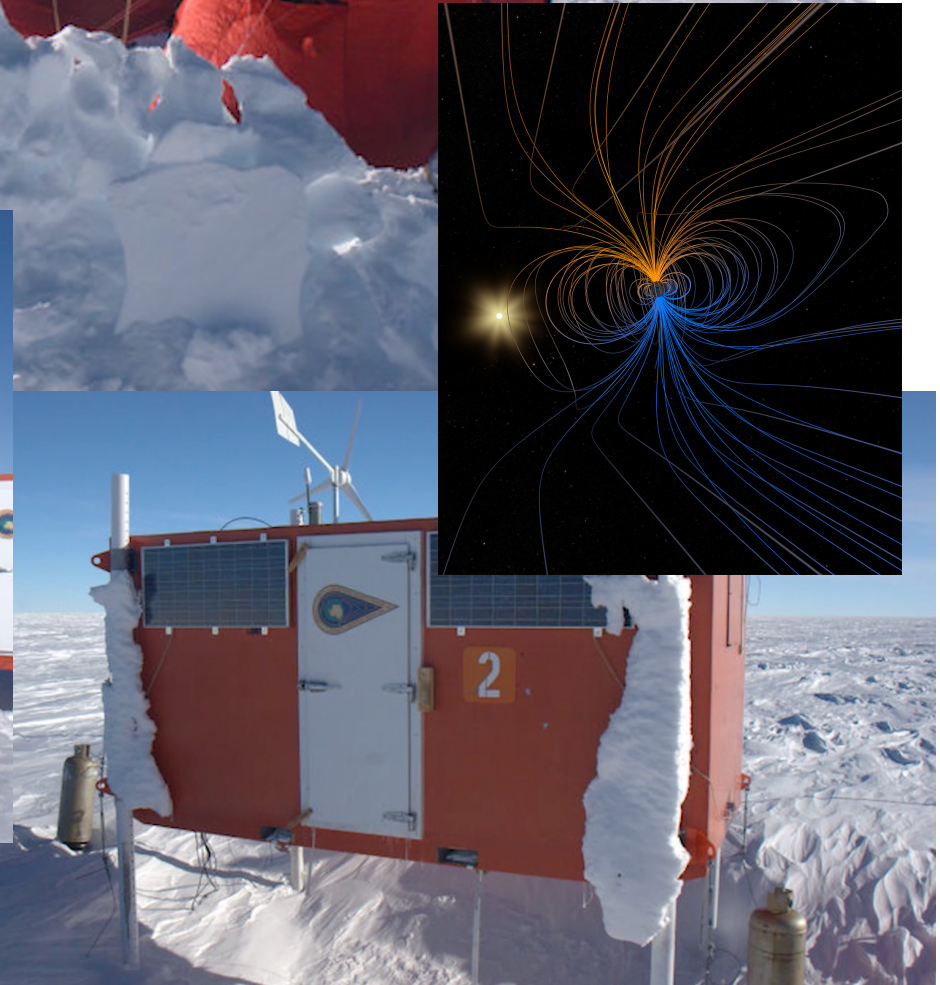
Greatly improved imaging quality



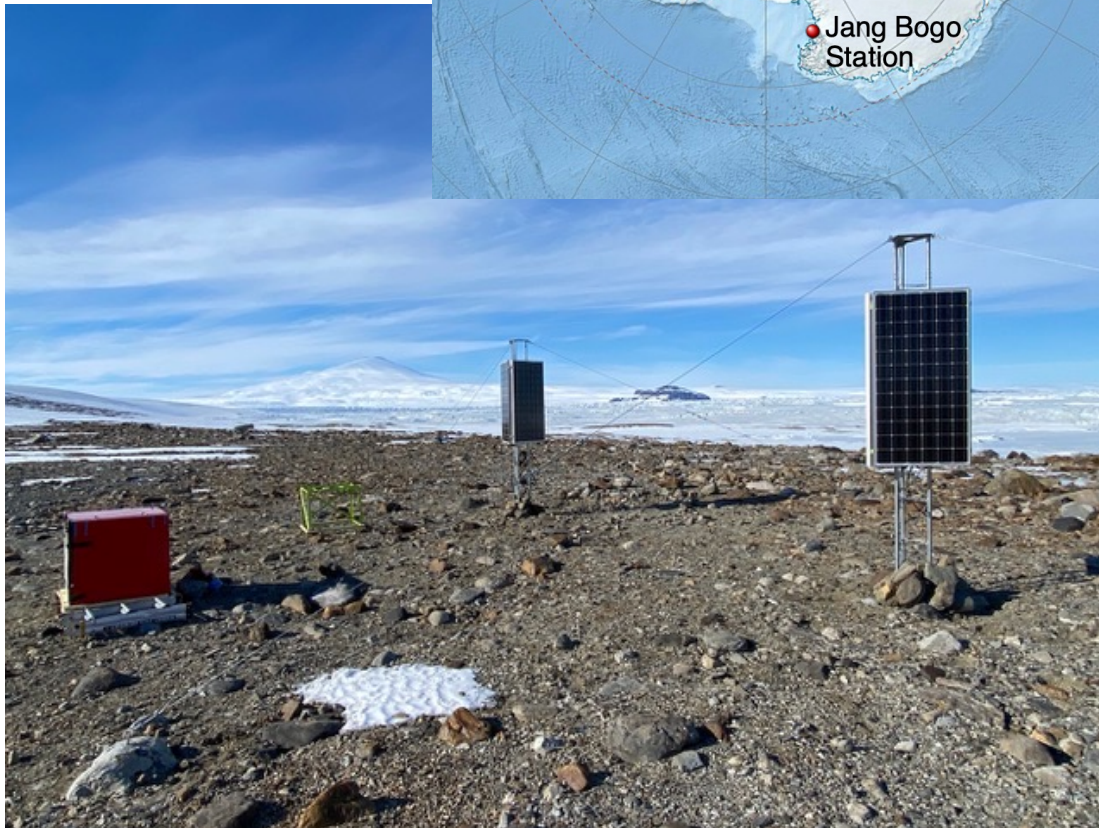
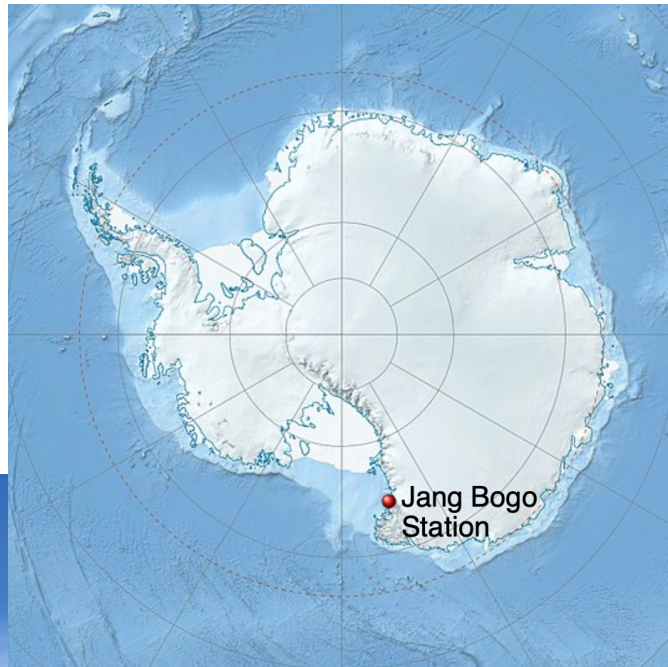
# Geospace From Antarctica



Geospace instrumentation at the 3 US manned stations and across the continent.



# KAGO



Systems to be deployed from Jang Bogo Station, en route to the magnetic pole.

PEDC partnership with KOPRI

“Engineering in conditions worse than space”



# Geospace From All Over!



**Across Peru**



**Svalbard, Norway**



**NASA Van Allen Probes**