

Coordinated observation with Solar Orbiter

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and DKIST Team and Solar Orbiter Team



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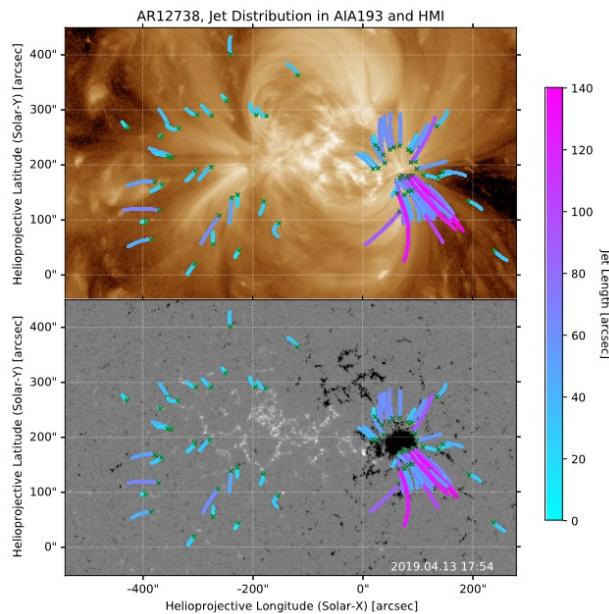
Coordinated observation

-aim

Science question

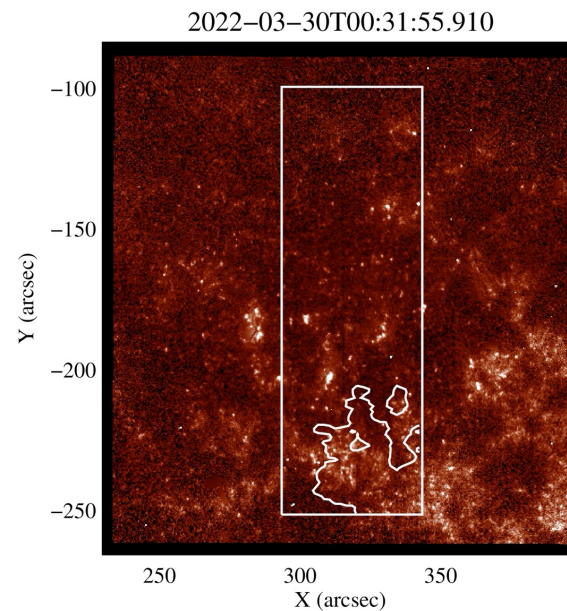
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Jets distribution in AR



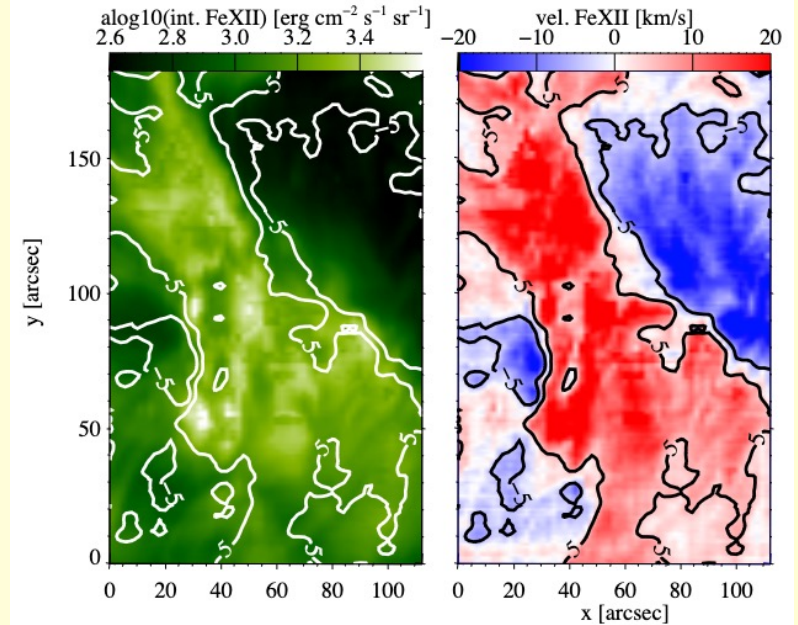
Odermatt et al. 2021

Small-scale structures in AR



Barczynski et al. 2023

Upflow region at the AR borders



Barczynski et al. 2021

Solar Orbiter one of four top level science question:

What drives the solar wind and where does the coronal magnetic field originate from?

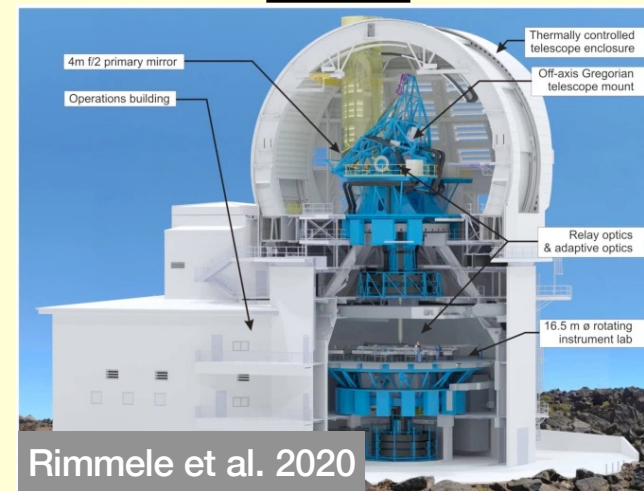
- how does an active region's structure and dynamics change with time?
- what is role of the small-scale features during an active region's evolution?
- what is the relationship between the solar wind sources and solar wind properties?

Solar Orbiter



- **chromospheric & coronal imaging**
-Extreme Ultraviolet Imager (EUI)
- **transition region and chromospheric spectral line raster maps**
-Spectral Imaging of the Coronal Environment (SPICE)
- **photospheric magnetic field**
-Polarimetric and Helioseismic Imager (PHI)

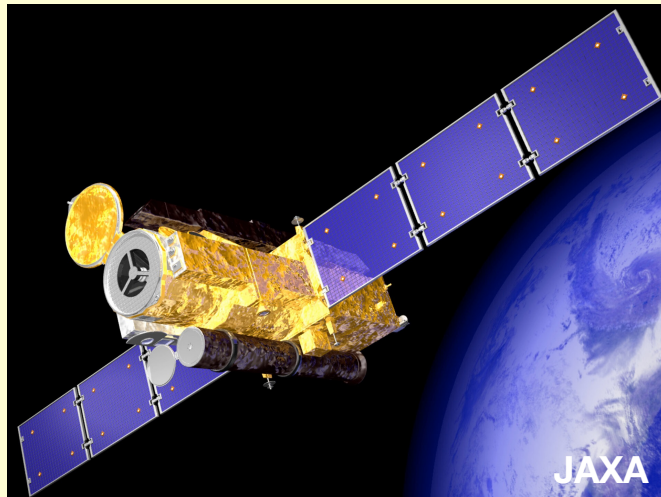
DKIST



- **photosphere and chromosphere imaging & photosphere plane-of-sky velocities**
-Visible Broadband Imager (VBI)
- **photospheric vector magnetograms & and line-of-sight velocities**
-Visible Spectro-Polarimeter (ViSP)
- **coronal spectro-polarimetry**
-Cryogenic Near-IR Spectro-Polarimeter (Cryo-NIRSP)

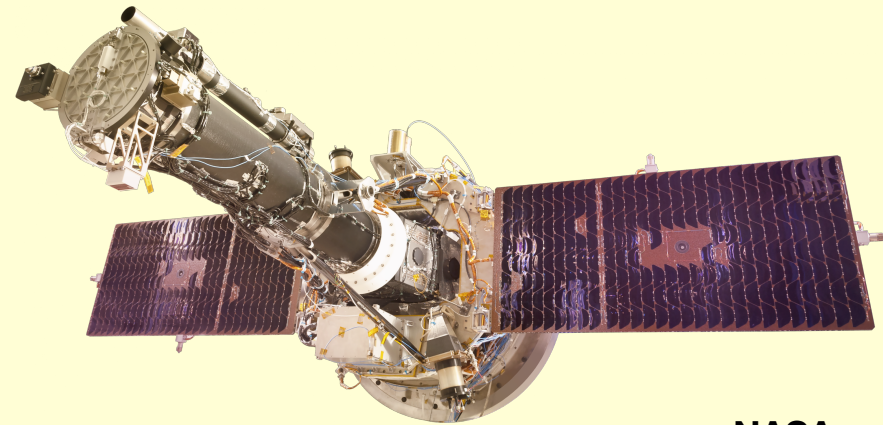
Instruments II: Hinode & IRIS

Hinode



- coronal imaging
-XRT (X-ray Telescope)
- transition region and coronal spectral data
-EIS (Extreme-Ultraviolet Imaging Spectrometer)
- photospheric magnetic field
-SOT (Solar Optical Telescope)

IRIS



NASA

- photosphere, chromosphere and transition region imaging
-slit-jaw imager (SJI)
- photosphere, chromosphere and transition region spectral data
-spectrograph

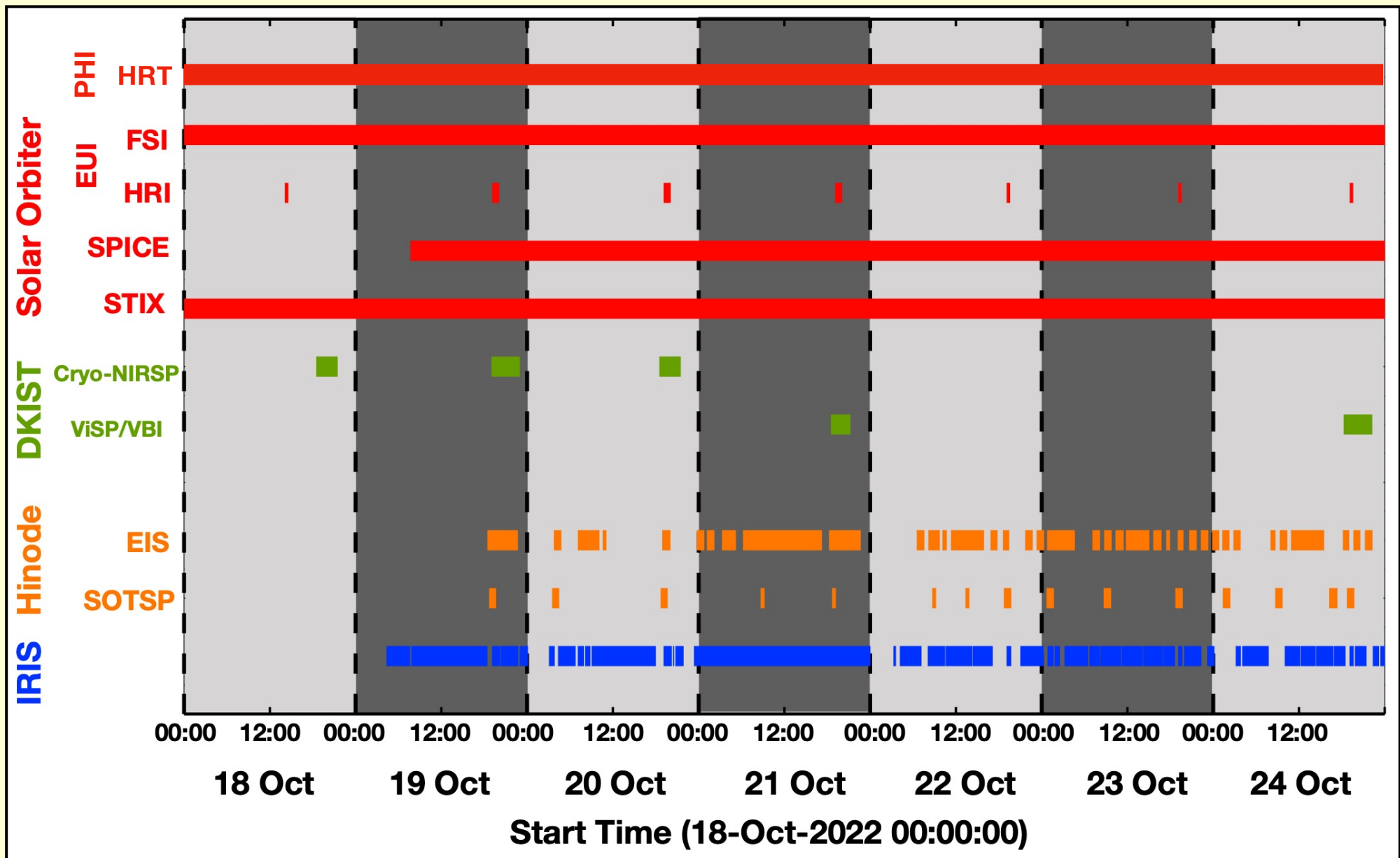
Additional coordination:

- SDO
- Big Bear Solar Observatory
- ALMA
- Mauna Loa
- Chinese H-alpha Solar Explorer (CHASE)

Example of coordinated observations
October 2022 and October 2024

Coordinated observations -timeline

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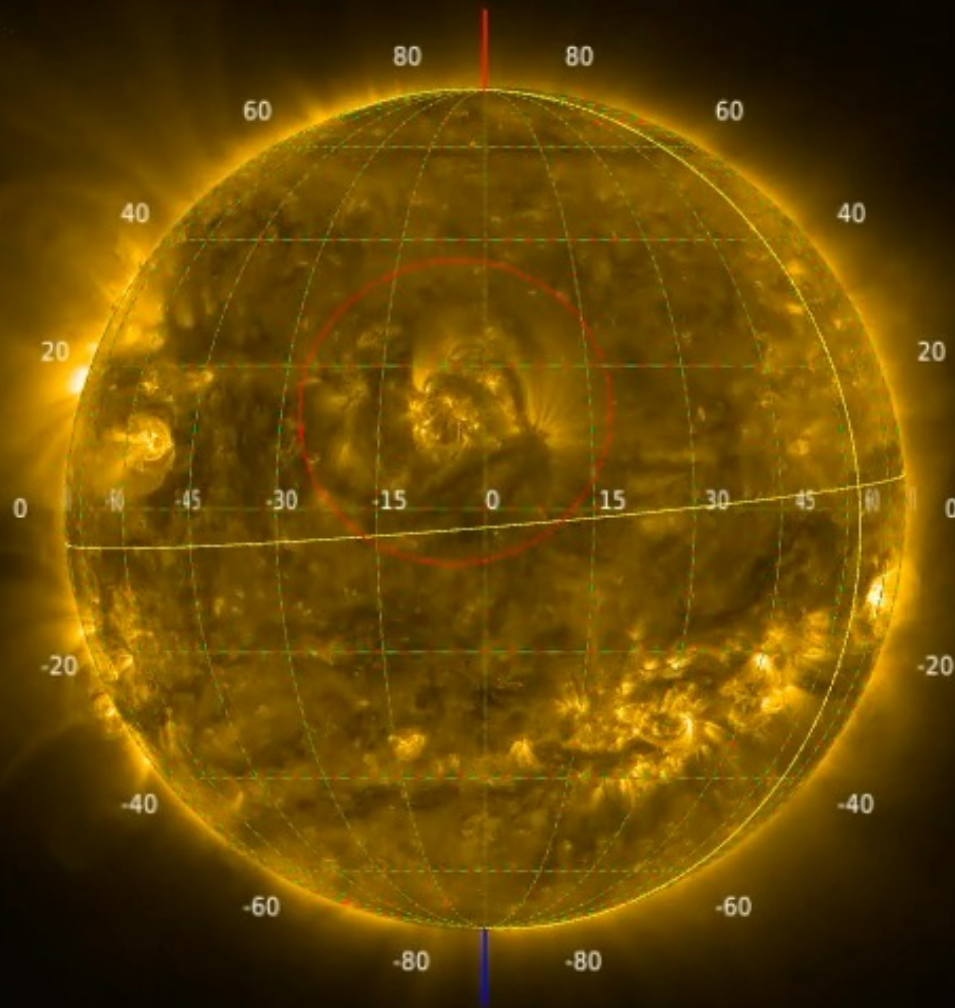


First ever coordinated observations between DKIST & Solar Orbiter
(Barczynski et al. 2025, submitted)

Solar Orbiter: context view

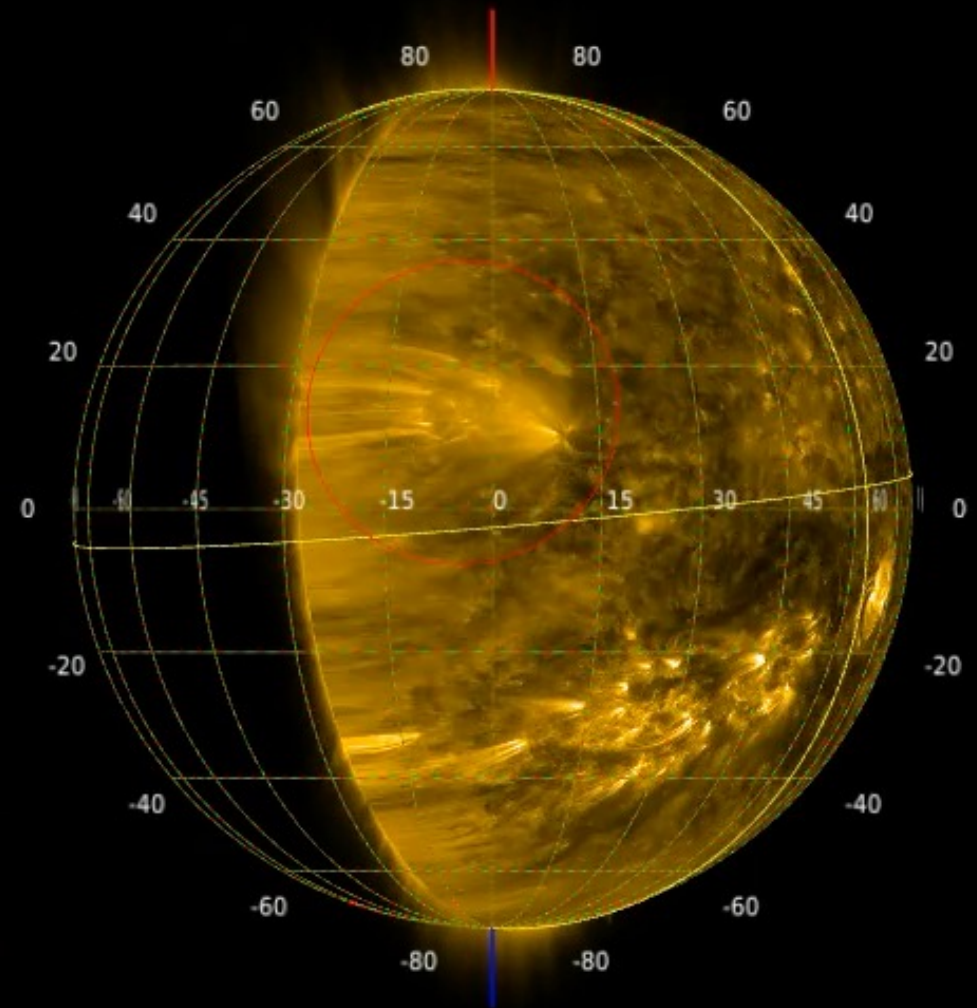
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Solar Orbiter /EUI FSI 174



EUI FSI 174 2022-10-21T17:00:55.207

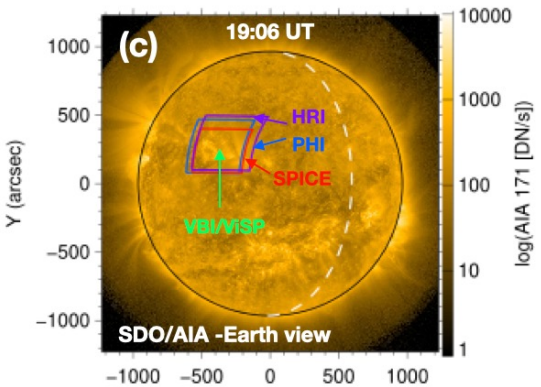
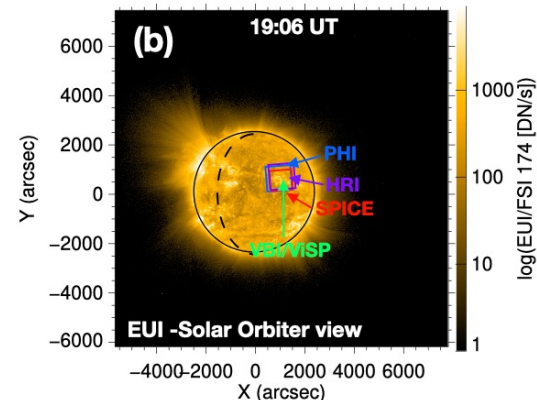
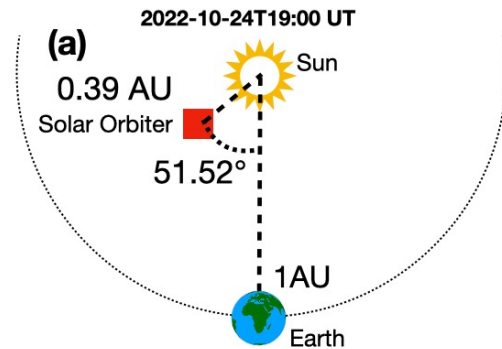
SDO/AIA 171



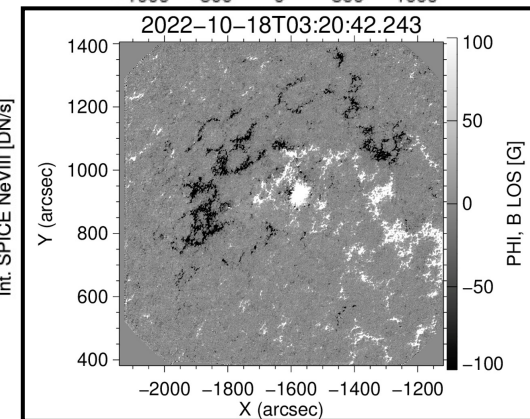
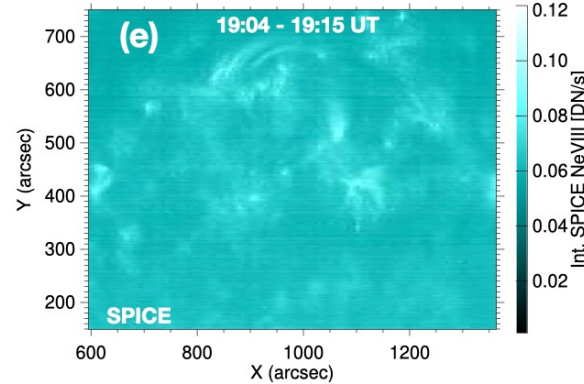
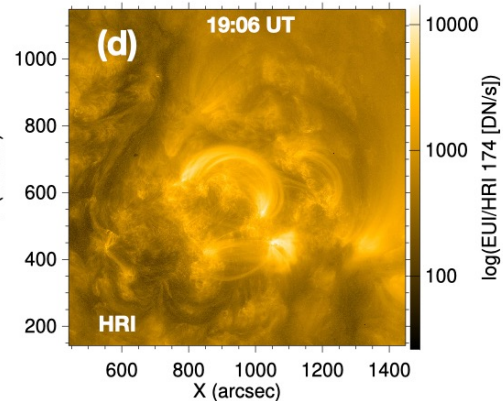
AIA 171 2022-10-21T17:05:09.349

Overview: 24 October 2022

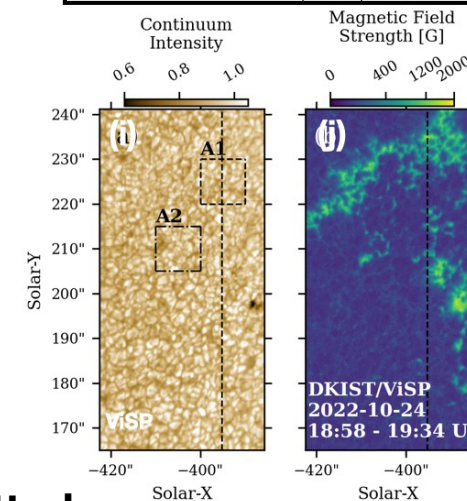
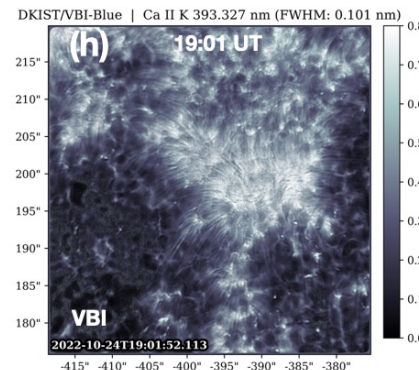
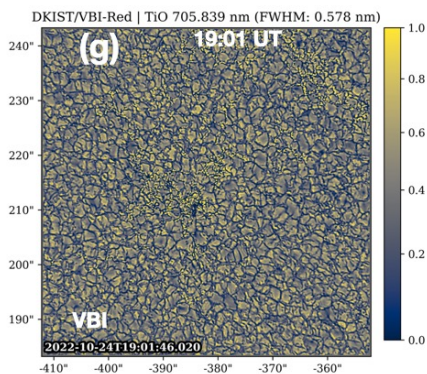
Overview



Solar Orbiter (Solar Orbiter view)



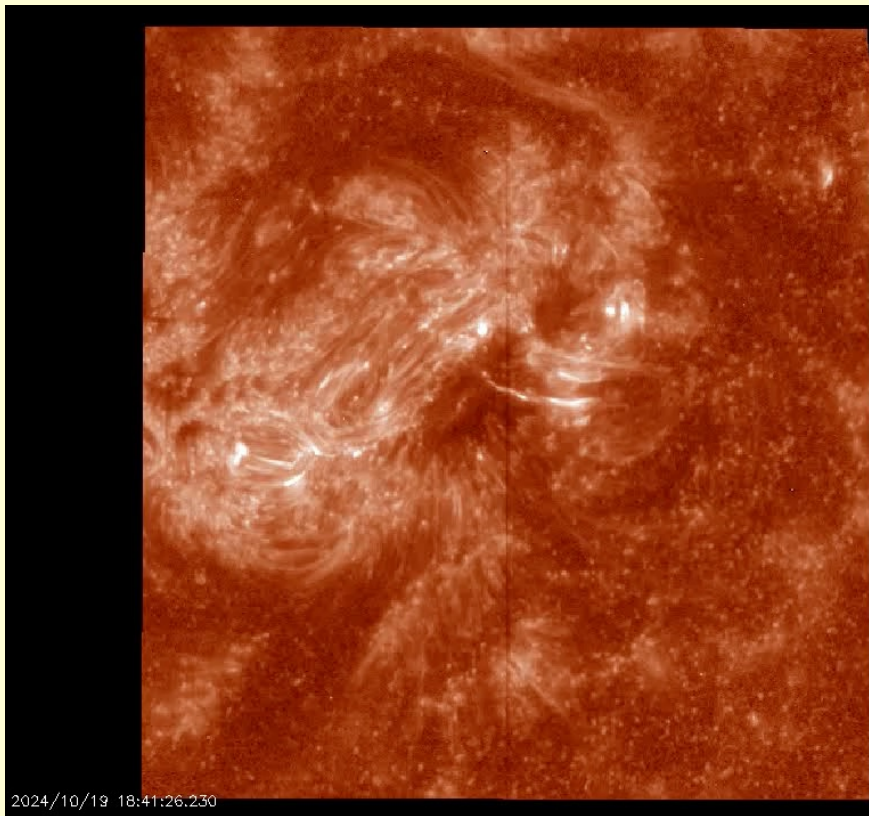
DKIST (Earth view)



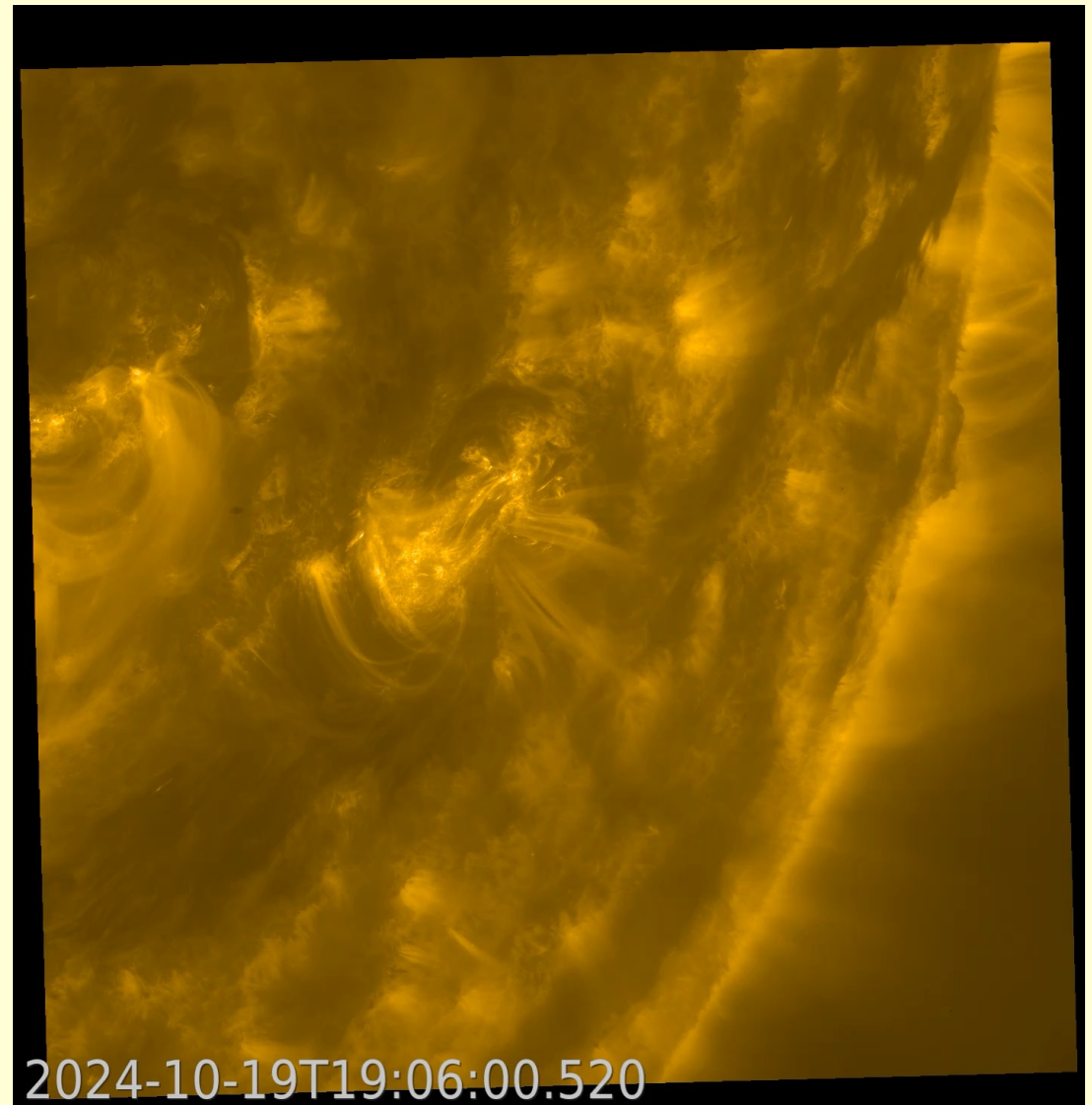
Overview: 19 October 2024

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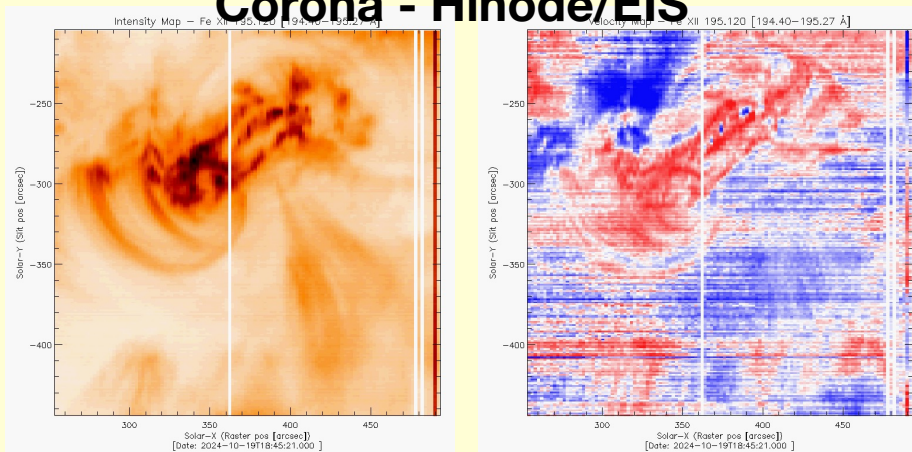
Transition region - IRIS/SJI 1400



Corona - Solar Orbiter /EUI HRI 174



Corona - Hinode/EIS

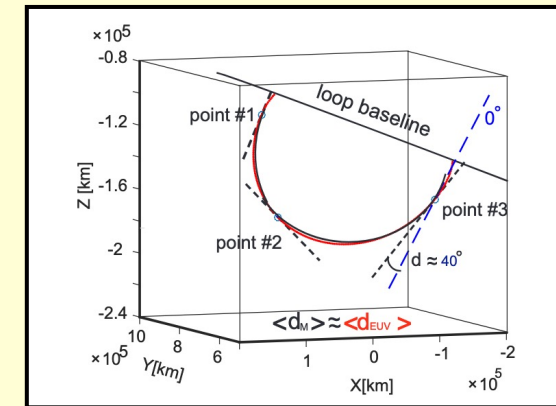


- Observations from two vantage points
- EUI/HRI -1 sec cadence!
- the best cadence imaging ever!

Possible new applications

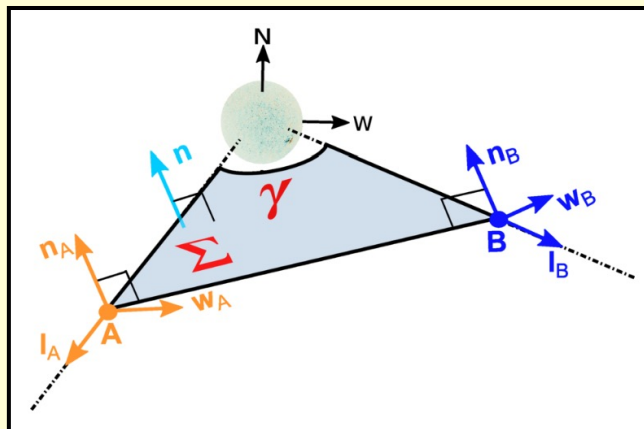
Milstones of new solar physics

- Stereoscopic spectroscopy
 - stereoscopic Doppler velocity measurements



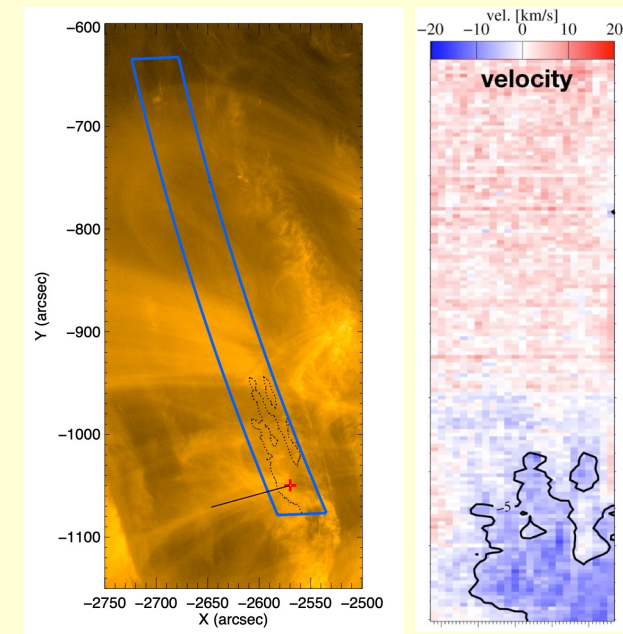
Podladchikova, O. et al. 2021

- Stereoscopic polarimetry
- Stereoscopic magnetic field measurement
 - electric current analysis



Valori et al. 2022

- Plasma velocity investigation
 - measurements from two vantage points



Barczynski et al. 2023

Conclusion

- Coordinated observations with Solar Orbiter open new possibilities
- Data analysis process is on-going



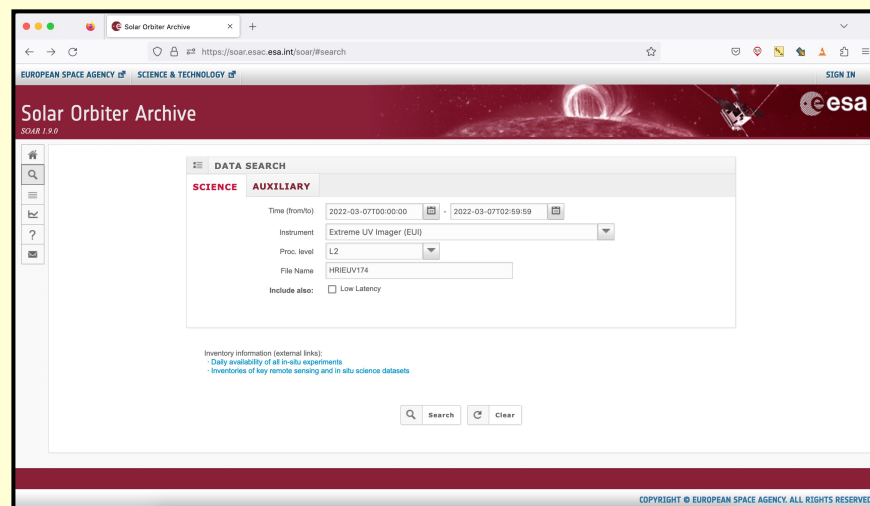
Active region evolution under the spotlight, with unprecedented coordinated high-resolution stereoscopic observations and numerical simulations

ISSI Team led by Barczynski K.

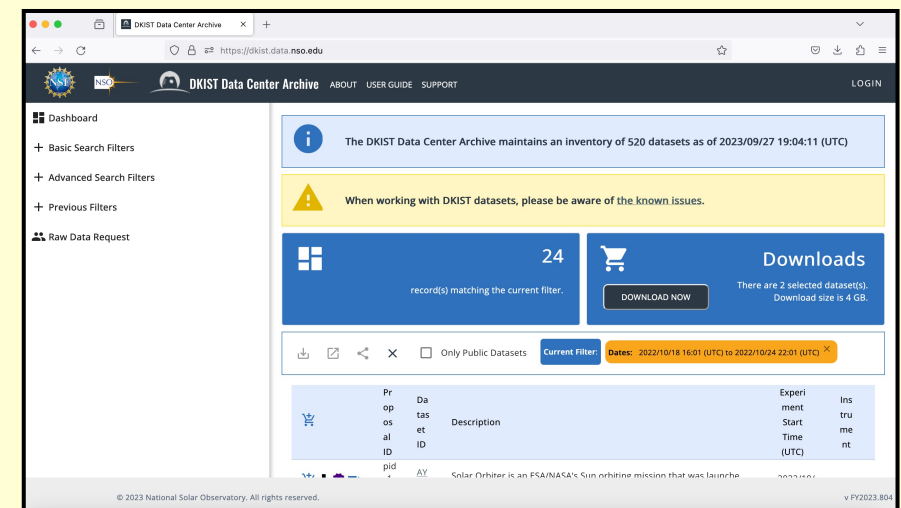
<https://teams.issibern.ch/activeregionevolution/>



- Data are publicly available
- ## Solar Orbiter Archive



DKIST Data Center Archive



Further coordinated observations are planned!!!

Thank you for your attention!

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QR code
-more detailed talk

