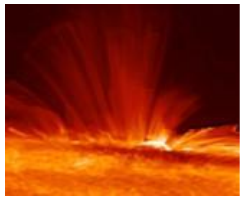
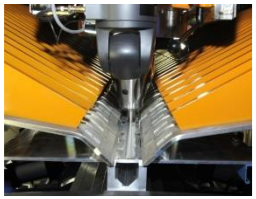
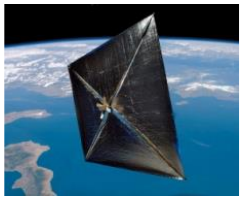
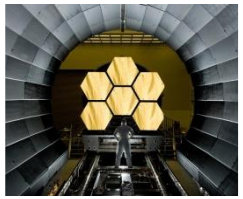
National Aeronautics and Space Administration

Marshall Space Flight Center
SWG meeting
9/16/15



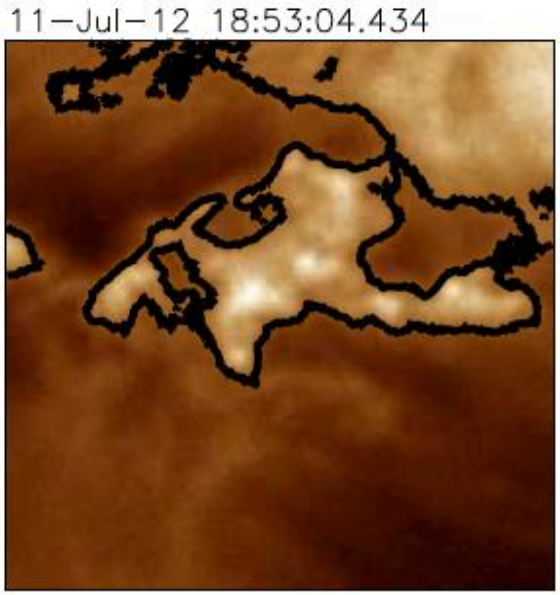

marshall

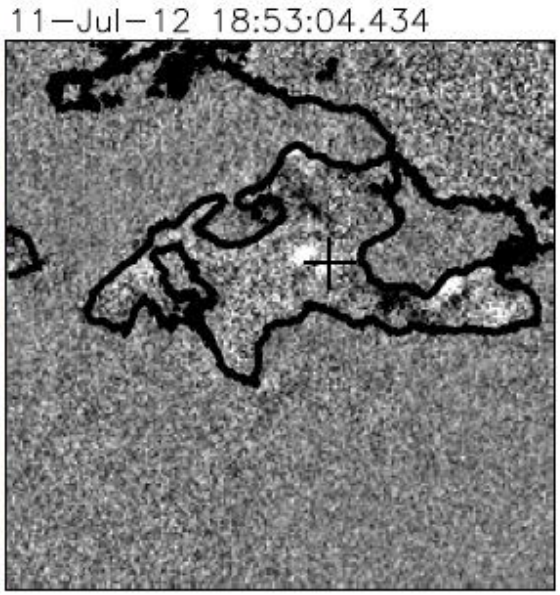
Sabrina Savage

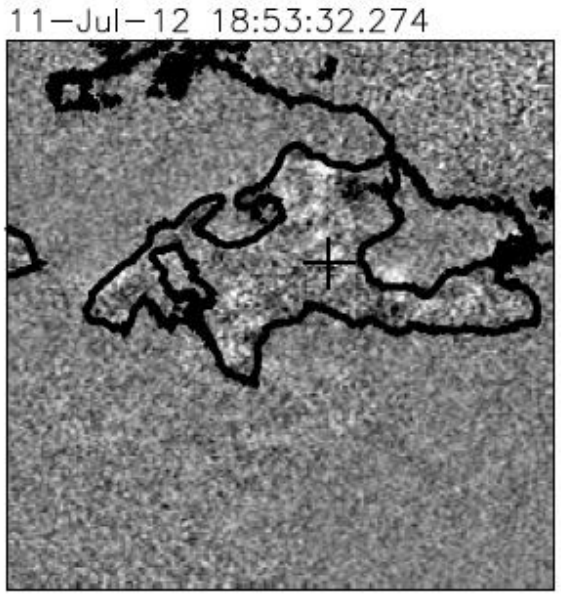
Motivation for HCI/Solar-C

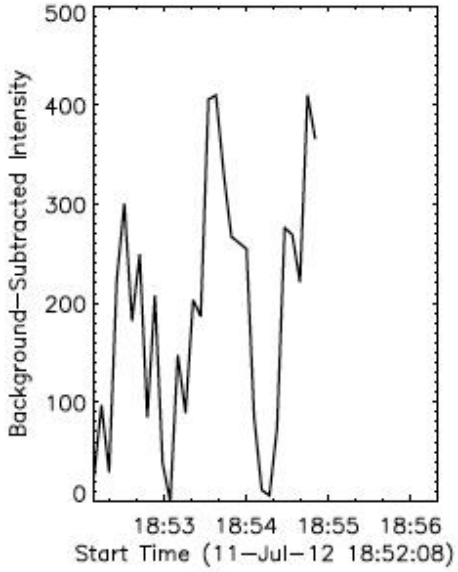
- The fine-scale structure of coronal loops and the role of magnetic field line braiding in atmospheric heating.
- Heating mechanisms in the chromosphere and coronal footpoint regions.
- High frequency Alfvénic waves in the transition region and corona.
- The role of chromospheric jets in supplying hot plasma to the corona.
- Prominence and Filament eruptions.
- Flare onset.

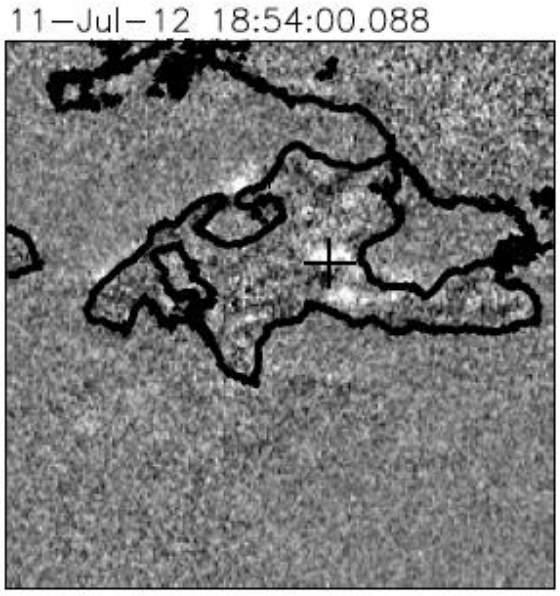
Heating mechanisms in the chromosphere and coronal footpoint regions

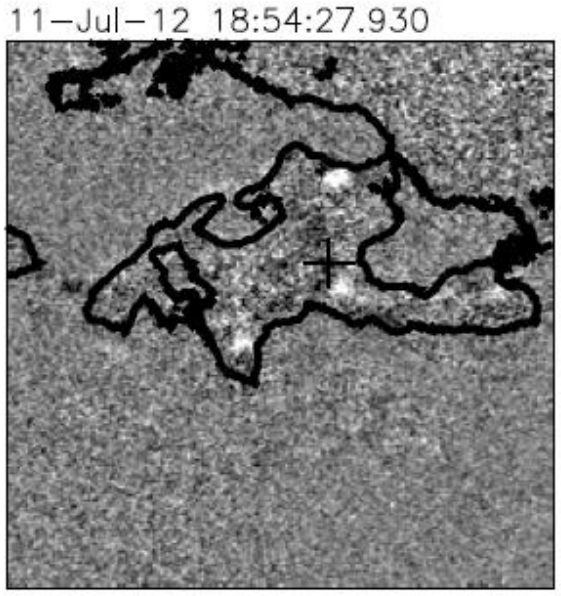




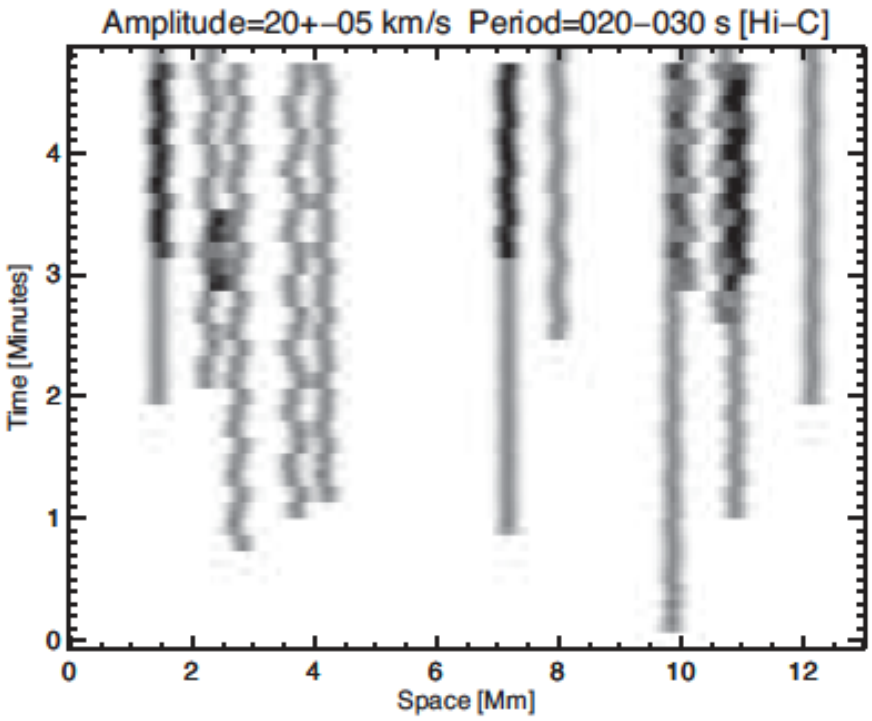


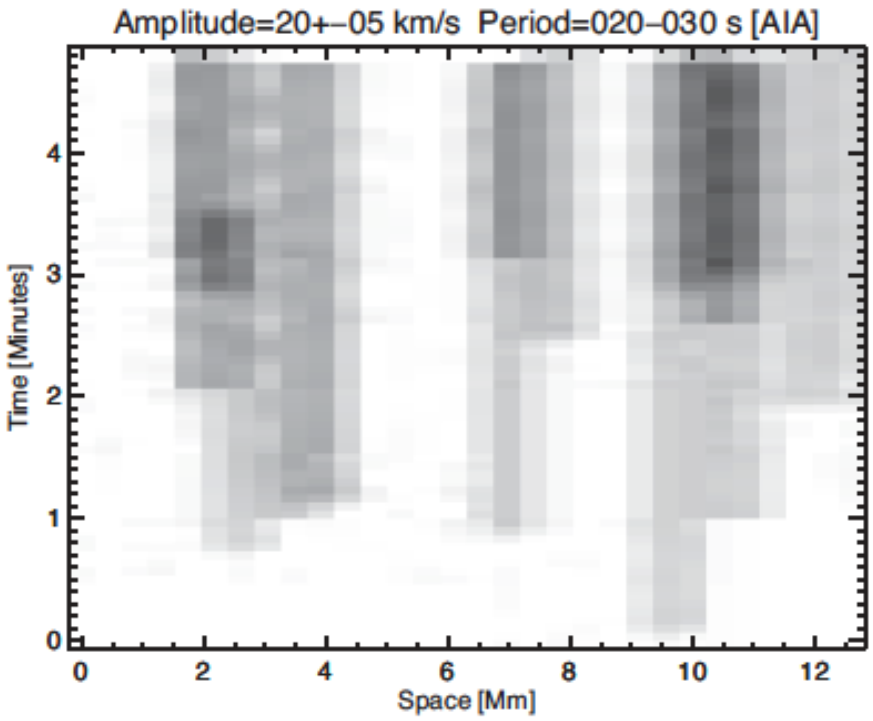




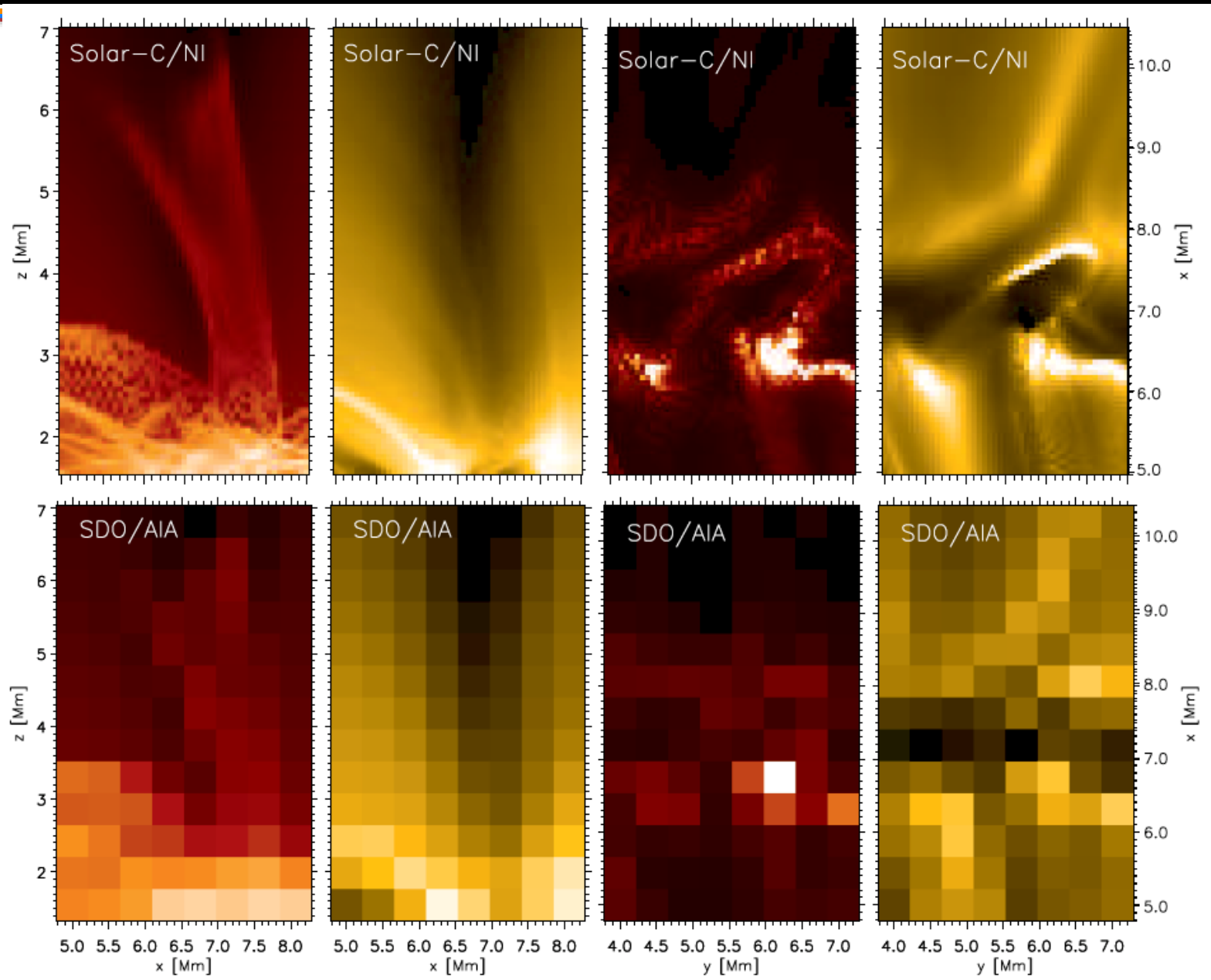


High frequency Alfvénic waves in the transition region and corona.





The role of chromospheric jets in supplying hot plasma to the corona

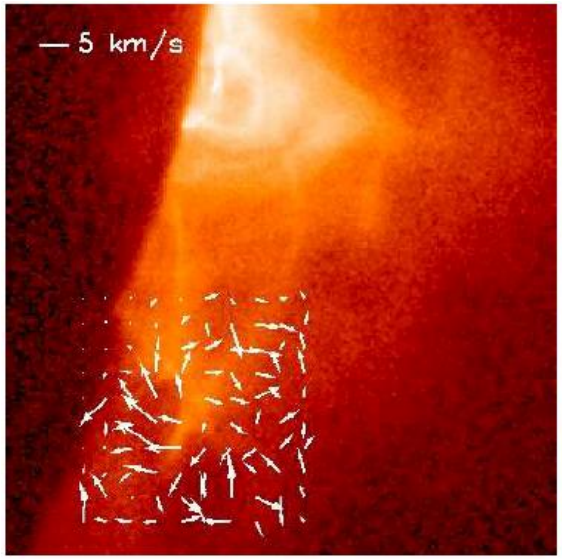


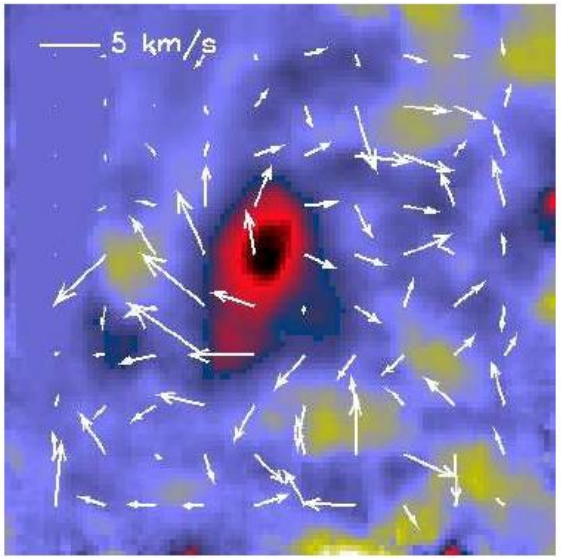
Flare onset (?)

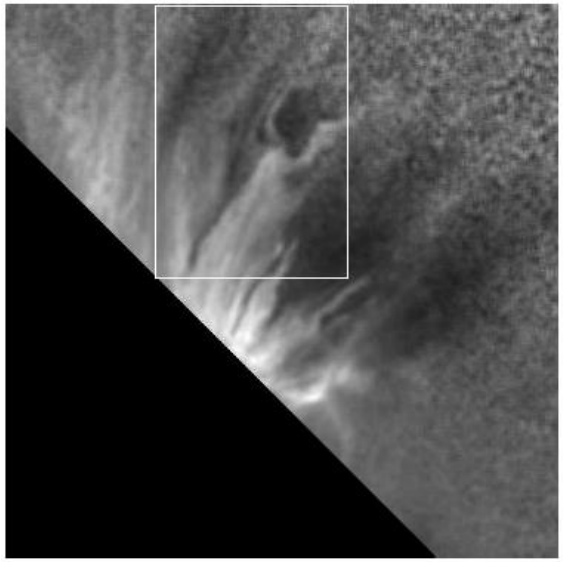
Turbulence in flare plasmas has long been inferred spectroscopically from nonthermal broadening of emission lines

Studies with Hinode/XRT and SDO/AIA demonstrate that two-dimensional investigations of turbulence can be made (McKenzie, 2013), in addition to the one-dimensional (i.e., line-of-sight) signatures detectable with spectroscopy

To reduce total instrument cost for both EUVST and HCI, the spectral coverage of EUVST may be reduced and the number of imaging channels for HIC may also be limited (2-3)





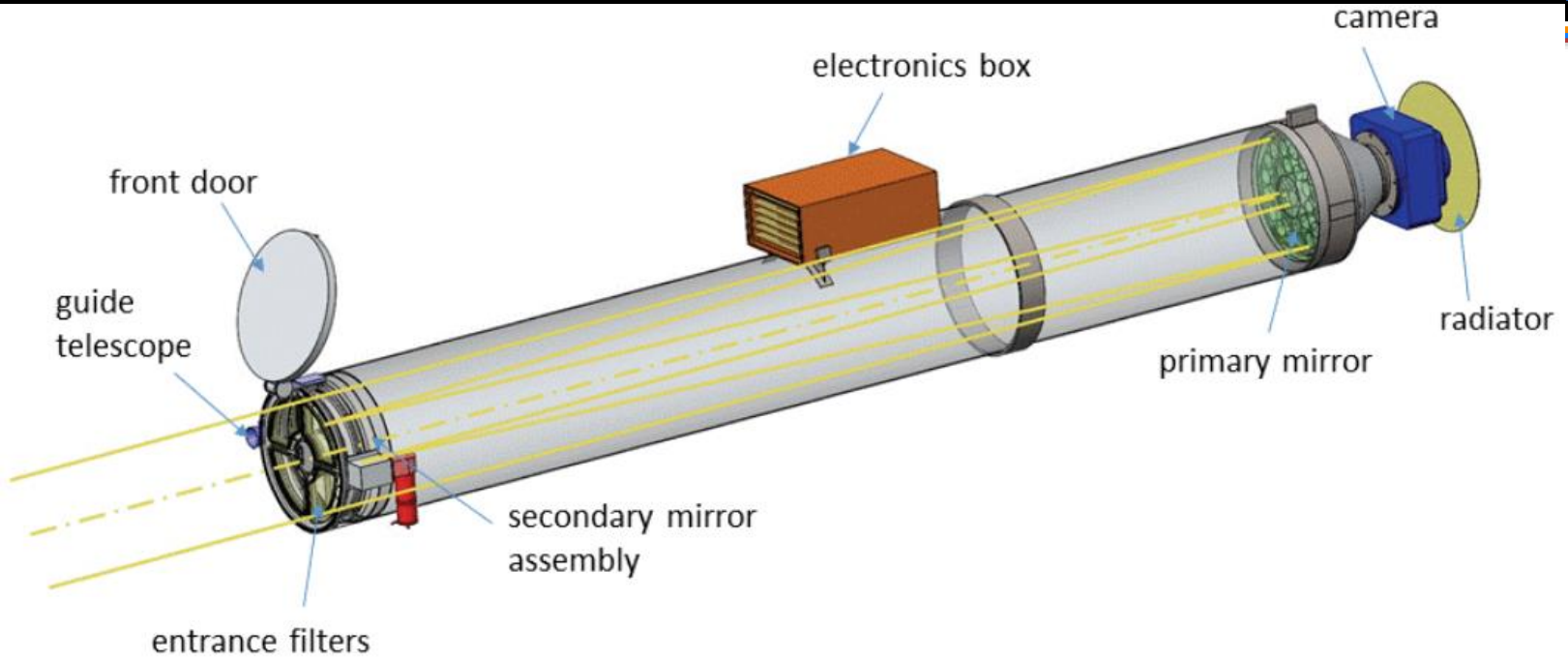


Instrument requirements to address these goals

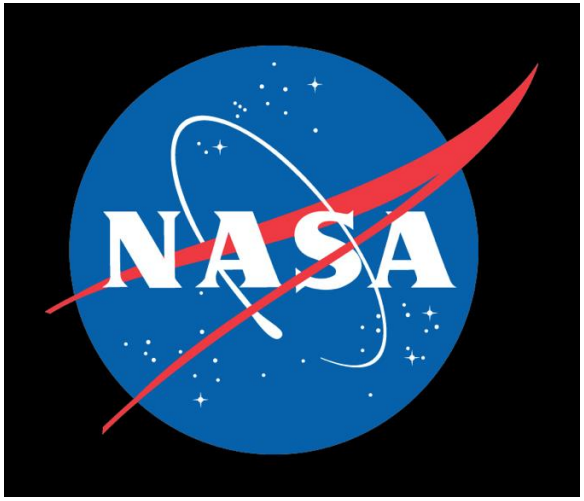
- Spatial resolution of 0.1-0.2″: allows resolution of individual loop strands (see Cirtain et al., 2013, Brooks et al., 2012)
- Temporal resolution of a few seconds: required to track temporal evolution of loop strands and Alfvénic/thermal changes (Cirtain et al., 2013, Testa et al., 2013)
- Thermal coverage of EUVST/NI combined from low transition region to hottest parts of corona (0.1-10/NLT 2 MK)

Without these basic instrument performance parameters, the core science goals for Solar-C, as originally formulated, cannot be met.

Scaleable Instrument concept



Spatial resolution	0.2”-0.3” with 0.1”/pixel
Field of view	~400” × 400”
Wavelength bands	171 Å, 94 Å and 304 Å (or 1550 Å) chosen as a model instrument while 131 Å, 193 Å, 211 Å and 335 Å are also candidates.
Exposure time	a few seconds for active region(*) (171 Å and 304 Å) <1 s for flare a few × 10 s for quiet Sun with 0.2”-0.3” resolution (171 Å and 304 Å) [(*) For 94 Å, ~2 s exposure time is expected for detecting brightenings of GOES C1 level.]
Cadence	~< 2.0 s



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