GOES-R Solar UltraViolet Imager
Extended Coronal Imaging

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Agenda

• Background
• Overview of the Campaign
• Preliminary Analysis Results
• Recommendation
Geostationary Operational Environmental Satellite (GOES-R)

Launched:
GOES-R: November 19, 2016
GOES-S: March 1, 2018

Nadir-pointed instruments:
  Advance Baseline Imager (ABI)
  Geostationary Lightning Mapper (GLM)

Sun-pointed instruments:
  EUVS and X-ray Irradiance Suite (EXIS)
  Solar UltraViolet Imager (SUVI)

Bus-mounted instruments:
  Space Environment In-Situ Suite (SEISS)
  Magnetometer

Space Weather Workshop, Boulder, CO

April 04, 2019
Solar UltraViolet Imager (SUVI)

- Generalized Cassegrain Telescope
- Multilayer coated primary and secondary mirrors
- Six channels:
  - 9.4nm, 13.1 nm, 17.1nm, 19.5nm, 28.4nm, 30.4nm
- Entrance and analysis filters for bandpass & OOB rejection
- 53 arcmin x 53 arcmin CCD
- Guide Telescope (GT) provides Sun-pointing information
- Spacecraft controls gimbals with the GT data
Motivation

Observation:
• SUVI image shows significant corona
  ▶ Largest among solar imagers
• No UV coronagraphs

Action:
• Image EUV corona up to a few solar radii
• Explore CME detection capability

Implementation:
• Off-point SUVI Line-of-Sight away from the Sun
Caught on camera: X8.2 flare

19.5 nm

2017 September 10*

First Investigation

• On GOES-16, February 12-13, 2018
• Two patterns, in two wavelengths
  ▪ 17.1 nm, 19.5 nm
  ▪ 9-panel: 17.1nm in forward, 19.5nm in reverse
  ▪ 7-panel: Both images at each offset
  ▪ 4 arcmin overlap
  ▪ Glass images
  ▪ 25 – 200 secs exposures
  ▪ One execution per each pattern
  ▪ ~ 2 hours execution for each
  ▪ Created composite images
17.1 nm composite

19.5 nm composite

GOES-16 Preliminary, Non-Operational Data

April 04, 2019  Space Weather Workshop, Boulder, CO

February 12-13, 2018
Demonstrated: EUV Corona exists to a few solar radii, even for quiet Sun.
GOES-17, June 4-7, 2018

• 3-panel option
• Exposure duration reduced w/on-chip binning
• Overlap, accounting for pointing errors, reduced to 2 arcmin
• 72 hour execution
• Precursor to an operational concept
19.5nm

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GOES-17 Preliminary, Non-Operational Data

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GOES-17, August 7 – September 13, 2018

• 3-panel options
• Exposure duration reduced w/on-chip binning
• Added 30.4nm
• ~5 week execution
• Objective: tracing CME from onset
09/09/18 CME, 17.1 nm
SUVI – LASCO connection
08/14/2018, 19.5 nm
Near-Term

• Pursuing a plan to execute ECI for a few months in 2019
• NCEI developing ECI products
Recommendation for Long-Term

• A Wide FOV (6-8*Rsun across) EUV Imager!
• There will be a GOES-East and a GOES-West
• One of the SUVI’s can operate in an ECI “mode”
  ▪ Can provide data to support COSIE and SunCET missions
• GOES-U, scheduled for launch in 2024 will have a white light Coronagraph (CCOR)
  • Imaging area: 3.7-17*Rsun
  • SUVI on the same platform will observe the Sun nominally
• SUVI from the “other” GOES satellite function in the ECI mode

A Great Opportunity for GOES-R instruments to observe Solar corona from the solar limb to the outer edge of the FOV of CCOR