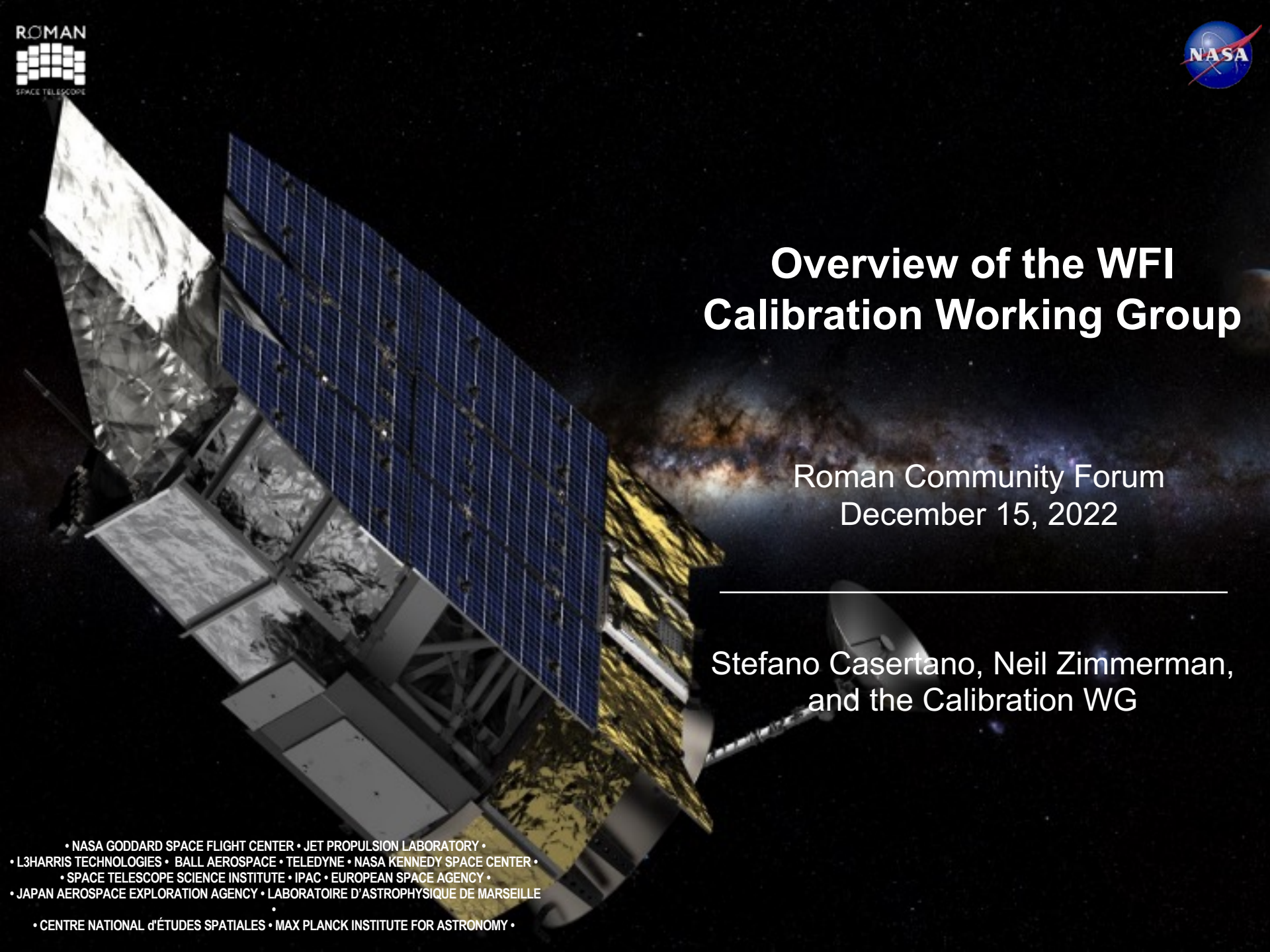

Overview of the WFI Calibration Working Group

Roman Community Forum
December 15, 2022

Stefano Casertano, Neil Zimmerman, and the Calibration WG

• NASA GODDARD SPACE FLIGHT CENTER • JET PROPULSION LABORATORY •
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• SPACE TELESCOPE SCIENCE INSTITUTE • IPAC • EUROPEAN SPACE AGENCY •
• JAPAN AEROSPACE EXPLORATION AGENCY • LABORATOIRE D'ASTROPHYSIQUE DE MARSEILLE
•
• CENTRE NATIONAL d'ÉTUDES SPATIALES • MAX PLANCK INSTITUTE FOR ASTRONOMY •

The WFI Calibration Working Group

- **Started in February 2016 as one of the Project-wide working groups empaneled by the Formulation Science Working Group**
- **Co-chairs: Stefano Casertano, Dan Scolnic (through 2020), Neil Zimmerman (starting 2021)**
- **Over 50 members: GSFC, SOC, SSC, most previous Science Teams, other experts**
  - Membership open; regular invites issued during project-wide telecons
  - Close collaboration with Detector Working Group
  - Meeting virtually on a bi-weekly basis (currently Tuesdays 2pm EST/EDT)
    - Typical attendance 20-25 people
    - Notes and presentations available on Outerspace (https://outerspace.stsci.edu/x/gIREAQ)
  - Four in-person Calibration Workshops (1-2 days each, 2018-2019)
  - Splinter groups created as needed, e.g., Touchstone fields (2021), sRCS (active)
- **Main responsibilities:**
  - Advise Project on issues concerning WFI performance and data quality
  - Maintain knowledge of expected calibration accuracies
  - Follow ground tests and support evaluation of their results as appropriate
  - Develop on-orbit calibration plan tailored to meeting Mission science objectives, including resource estimates
  - Create ad-hoc study teams to address specific questions (e.g., sRCS performance and test)
  - Report regularly to broader Roman community
    - Status reports at in-person FSWG meetings (2016 – 2020)
    - Since 2020, brief updates at project-wide telecons

Main activities in 2021

- **Support development of Calibration Overview Document**
  - Provides more detailed breakdown of specific Science Requirements; complementary to Calibration Plan
- **Review plans for simplified Relative Calibration System**
  - New hardware presented in June 2021; different approach to direct flux measurement
- **Flat field analysis**
  - Review plans for flat field quality during ground test
    - Issues include smoothness, S/N, number of wavelengths
    - Might be revisited in greater detail during TVAC plans
- **Review of reference pixel information in Level 2 (calibrated) data**
  - WG requested that Level 2 data contain reference pixels (used in first stage of calibration pipeline)
  - Proposal for data organization from SOC DMS reviewed and approved
- **Ground Test reviews**
- **Endorsed the development of the Improved Roman Reference pixel Correction (IRRC)**

Main activities in 2022

- **Multi-Accum tables**
  - Only a subset of exposure frames can be downlinked; the choice of frames has implications for scene dynamic range and slope-fitting noise.
  - Provided feedback on the Project's proposed table of possible frame configurations available to users, evaluating in the context of various science use cases.
- **Flight detector Triplet and Focal Plane System testing**
  - Continued periodic assessment of detector test results.
  - Independent analysis of noise in dark test data.
- **Grism and Prism optical testing**
  - Optical characterization of the flight Grism and Prism assemblies took place this year at Goddard.
  - Provided feedback to Project team on test results and potential sources of error.
- **Simplified Relative Calibration Source (sRCS):**
  - **sRCS Interchange** splinter group formed mid-2022.
  - Meeting periodically with WFI/sRCS engineering team to discuss the Combinatorial Flux Addition method for flux-dependent nonlinearity calibration.
  - Assisting in defining sRCS performance tests with flight spare hardware and during instrument I&T.

Other recent topics

Topics recently discussed in Calibration WG meetings include:

- Relative flux calibration for spectroscopy data
- Results of radiation testing on H4RG-10 engineering-grade detectors
- Cosmic ray properties in JWST NIRSpec data and possible relation to Roman WFI
- Flux standards: options and progress in HST observations
- Features in dark frames with Leach and ACADIA controllers
- A WFI imaging simulator
- Updates on the Improved Roman Reference Correction

Workshops and Reviews

- **Workshops**
  - Four in-person calibration workshops were held between 2018-2019. These workshops covered requirements, flight calibration plans, and ground test plans.
  - Aiming to resume in-person calibration workshops in 2023.
- **The Calibration WG has participated in several reviews associated with the Wide Field Instrument:**
  - WFI Ground Characterization and Calibration Table-top Review, June 2019
  - Relative Calibration Source Peer Review, September 2020
  - Pre-CDR Calibration Engineering Peer Review (EPR), July 2021
- **Future: Calibration error budgets**
  - The 2021 Calibration EPR panel recommended the Project hold in-depth reviews of the error budgets associated with individual calibration requirements.
  - These reviews will be a priority of the WG when the next phase of science teams are integrated.

Future Activities

- **Continue biweekly telecons (Tuesdays 2-3pm ET)**
- **Currently Planned:**
  - Develop detailed budgets for specific flight calibration programs as directed by the Calibration Review Board
  - Follow progress of sRCS (hardware and operations) and advise as needed
  - Maintain in-flight Calibration Plan; update with actual sRCS capabilities
  - Review results from continuing ground tests:
    - Focal Plane System tests (ETU, Flight)
    - Linearity tests
    - Radiation tests
    - Long-term detector stability tests
- **Other Support:**
  - Participate in engineering peer reviews as needed
  - Revisit definition of primary calibrators
  - Support preparation for Instrument I&T
  - Help develop Commissioning calibration plan (if needed)
- **Please sign up at if you want to join the Working Group at https://asd.gsfc.nasa.gov/roman_signup/**