Jet Propulsion Laboratory
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Community Participation Program (CPP) Plans

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1 fully supported mode + "best effort" & "unsupported" modes

λ_{center}	Mode	Coronagraph Type	Approx. FOV radius	FOV Coverage	Support
575 nm	**Narrow FOV Imaging**	**HLC**	**0.15" – 0.45"**	**360°**	**Required (full support)**
730 nm, 660 nm	Slit + R~50 Prism Spectroscopy	SPC SPEC	0.2" – 0.55"	slit	Best Effort
575 nm, 825 nm	"Wide" FOV Imaging (SPC	SPC WFOV	0.3" – 1.4"	360°	Best Effort
575 nm, 825 nm	Imaging Polarimetry	HLC + SPC WFOV	0.15" – 1.4"	360°	Best Effort
any	Other coronagraph mask combinations	HLC, SPCs	0.15" – 1.4"	various	Unsupported
any	Other technology demonstrations: binary star, transmissive Zernike wavefront sensor, alternative wavefront sensing algorithms	various	various	various	Unsupported

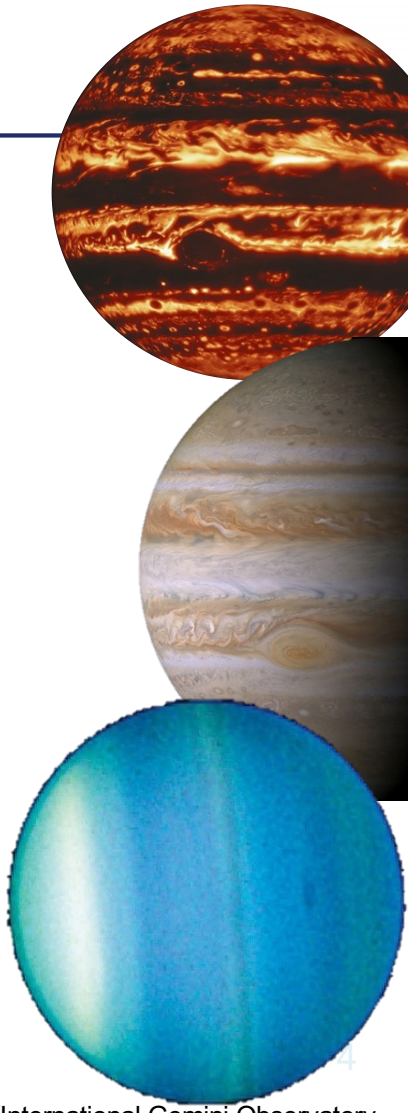
Best effort: partially tested in TVAC; no guaranteed support on-orbit.
Unsupported not tested in TVAC; no guaranteed support on-orbit

Contributed by ExEP: 575nm "Wide" FOV mask & all "unsupported" masks

Observation Phase Guiding Principles

- Nominally 2200hr (90 days) during first 18mo of Mission
  - Clock starts after Commissioning ("In Orbit Checkout")
- Top priority: achieve L1 Technology Requirement ("TTR5")
  - L1 would constitute a successful technology demonstration for HWO
- Then, *as time/resources allow*, push performance limits
  - Guiding principle for decision-making: Maximize long-term value to science community & Habitable Worlds Observatory
    - Use scientifically-interesting targets whenever possible
  - Baseline resources are not sufficient to support all "best-effort" and "unsupported" mode tests
    - Prioritize more mature modes
    - Require maturation plans for low-TRL concepts before any substantial investment of Project resources to add support

Opportunities in Exoplanet Science



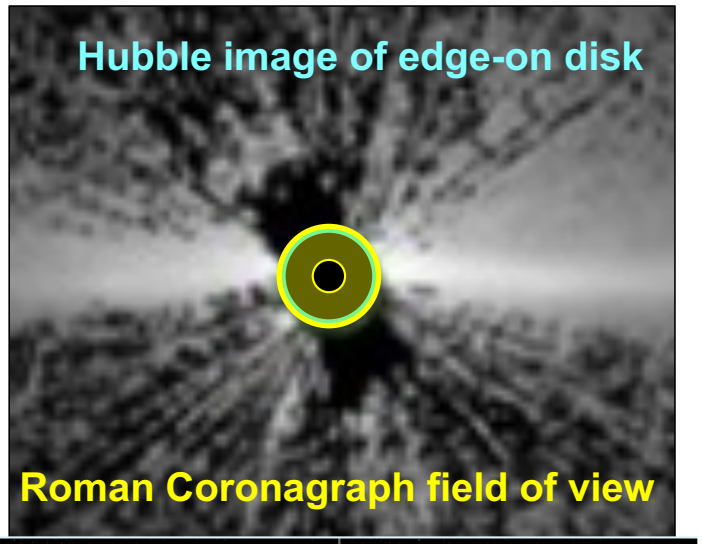
- young, self-luminous super-Jupiters
  - State of the art: Infrared photometry & spectroscopy
  - Roman Coronagraph: add visible light photometry & low-resolution spectroscopy (eg: Lacy & Burrows 2020)

- Jupiter analogs:
  - State of the art : indirect detection only; no characterization
  - Roman Coronagraph: potential for 1st images & low-resolution spectrum (eg: Batalha+2018, Saxena+2021)
  - Cloudy or clear?
  - Super-solar or solar metallicity?

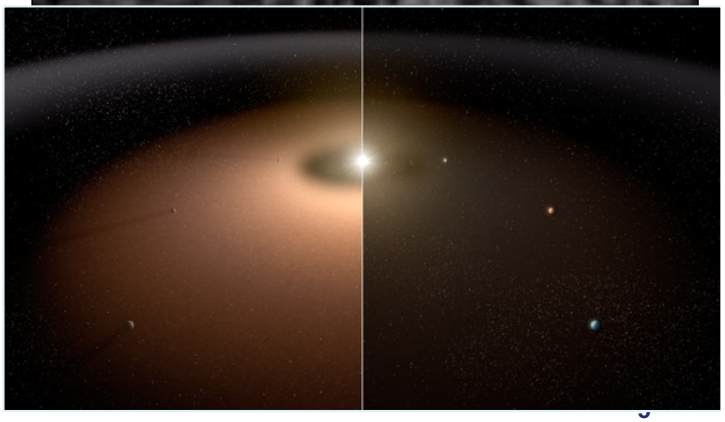
Jupiter thermal IR: AURA/NSF/NOIRLab/ESA/NASA/International Gemini Observatory

Opportunities in circumstellar disk science

- Debris disks (Kuiper belt analogs)
  - **State of the art :** Hubble imaging
  - **Roman**: Observe closer to the star
    - (Mennesson+2018)



- Exozodi disks (terrestrial zone dust)
  - **State of the art :** IR excesses
  - **Roman**: *potential* for first visible-light image
    - Are any HWO high-priority systems too dusty?
    - (Douglas+2022)



Coronagraph Community Participation Program (CPP)

- US and international researchers who become an integral part of Coronagraph team through operations phase
  - *not just end users*
  - Baseline functionality: Observation design, preparatory work, data analysis, simulations, …
  - Engage external research community to optimize tech demo observations for broad, long-term impact (eg: target selection, …)
  - Add-ons: commissioning modes beyond req'd one and/or wavefront sensing and control
- CPP funding is (appropriately) modest for a Class D "tech demo" instrument
  - CGI has modest proportion of Mission time
  - 7 US proposals selected via ROSES; each annual budget <$200K
    - Expect 1-2 add'l funded US selections in 2025
  - + 4 PIs selected by partners CNES, ESA, JAXA, MPIA
  - Focus first & foremost on preparing for successful *baseline* operations

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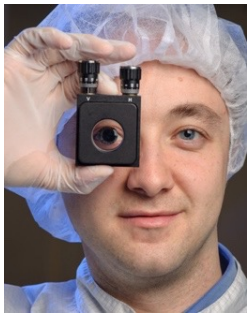
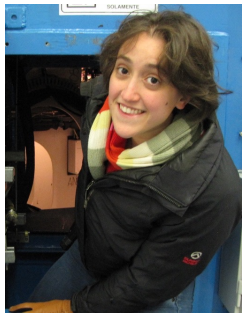
Who's leading the CPP?

Vanessa Bailey, *JPL*
CPP Chair
Roman Coronagraph Instrument Technologist



Rus Belikov
Ames

Beth Biller
ESA



Alexandra Greenbaum
Caltech/IPAC
SSC

Oliver Krause
MPIA

Bertrand Mennesson
JPL Roman Deputy Project Scientist

Max Millar-Blanchaer
UCSB
DRP & Sims WG co-lead

Naoshi Murakami
JAXA

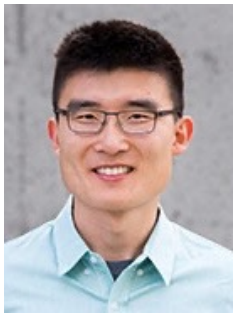
Laurent Pueyo
STScI

Jason Rhodes
JPL Roman Project Scientist

Ty Robinson
U. Arizona

Dmitry Savransky, *Cornell*
Inaugural CPP co-chair

Arthur Vigan
CNES



Jason Wang
Northwestern
DRP & Sims WG co-lead

Schuyler Wolff
U. Arizona
Obs WG lead

Neil Zimmerman, *GSFC*
Roman Project Coronagraph Scientist

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Who is the CPP?

Ramya Anche (UArizona)
Ewan Douglas (UArizona)
Jessica Gersh-Range (Princeton)
Satoshi Itoh (Nagoya Univ.)
Bruce Macintosh (UC Observatories)
Jun Nishikawa (NAOJ)
Frans Snik (Leiden University)
Takahiro Sumi (Osaka Univ.)
Taichi Uyama (Cal State U. Northridge)
Michele Woodland (GSFC)
Hibiki Yama (Osaka Univ.)
Hanying Zhou (JPL)
Oscar Carrion-Gonzalez (LESIA)
John Debes (STScI)
David Doelman (SRON)
Markus Feldt (MPIA)
Hajime Kawahara (ISAS/JAXA)
John Livingston (ABC/NAOJ)
Axel Potier (Bern)
Matthias Samland (MPIA)
Aoi Takahashi (ABC/NAOJ)
Pierre Baudoz (LESIA)
N. Jeremy Kasdin (Princeton)
Jürgen Schreiber (MPIA)
Lisa Altinier (LAM)
Eduardo Bendek (JPL)
Ellis Bogat (UMaryland)
Robert De Rosa (ESO (Chile))
Motohide Tamura (UTokyo/ABC)
Jorge Llop Sayson (JPL)
Tsutsumi Nagai (Osaka Univ.)
Masataka Aizawa (Riken)
Yui Kawashima (ISAS/JAXA)
Kenta Yoneta (NAOJ)
Benjamin Charnay (LESIA)
Malachi Noel (Northwestern)
Justin Hom (UArizona)
Samantha Hasler (MIT)
Patrick Lowrance (IPAC)
Lee Armus (IPAC)
Zhexing Li (UCR)
Stephen Kane (UCR)
Toru Yamada (ISAS, JAXA)
Masayuki Kuzuhara (NINS Astrobiology Center)
Emmanuel Joliet (Caltech / IPAC)
Eric Mamajek (JPL)
Susan Redmond (Caltech / JPL)
Nick Schragal (University of Arizona)
Alexis Lau (LAM)
Leonid Pogorelyuk (RPI)
Toshiyuki Mizuki (ABC/NAOJ)
Marah Brinjikji (ASU)
Sarah Blunt (Northwestern)
Elodie Choquet (LAM)
Julien Girard (STScI)
Sergi Hildebrant Rafels (JPL)
John Krist (JPL)
Sarah Moran (UArizona)
Karl Stapelfeldt (JPL)
Marie Ygouf (JPL)
Robert Zellem (JPL)
Mark Marley (UArizona)
Remi Soummer (STScI)
Tyler Groff (GSFC)
Bijan Nemati (Tellus1)
Cynthia Wong (JPL)
Kevin Ludwick (U. Alabama-Huntsville)
Tim Koch (JPL)
Jennifer Sobeck (IPAC)
James Ingalls (IPAC)
Amanda Chavez (Northwestern)
Zarah Brown (UArizona)
Gaël Chauvin (OCA)
Dan Sirbu (Ames)
Wolfgang Brandner (MPIA)
Shota Miyazaki (ISAS/JAXA)
Emiel Por (STScI)
Johan Mazoyer (LESIA)

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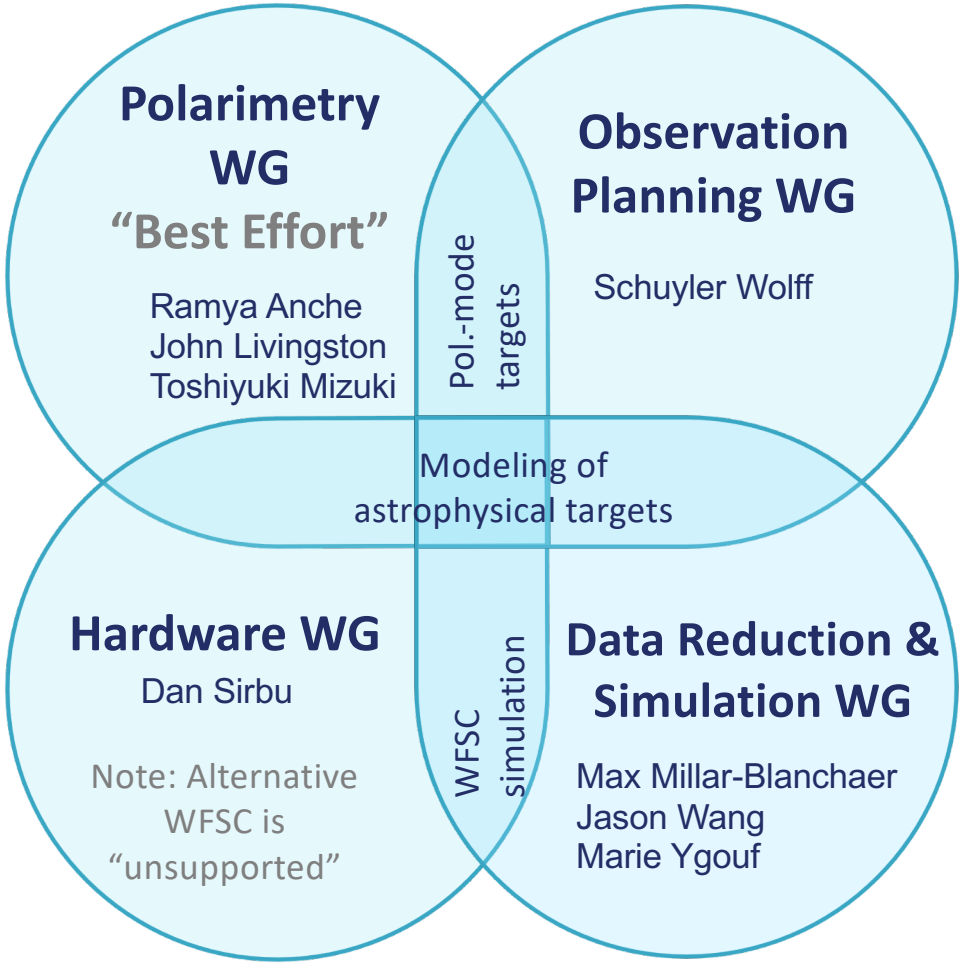
How is CPP work organized?

Contact WG leads if you have questions

Climate Committee
Tyler Robinson

WG = working group



SPIE proceedings

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Engaging the broader community in observation planning and preparation

- Coronagraph has no GO program
- Coronagraph observation prioritization is a joint exercise between the instrument team and the CPP
  - Final planning is iterative with rest of the Roman Project
- CPP will solicit feedback from the community on observation priorities
  - (See next slide)

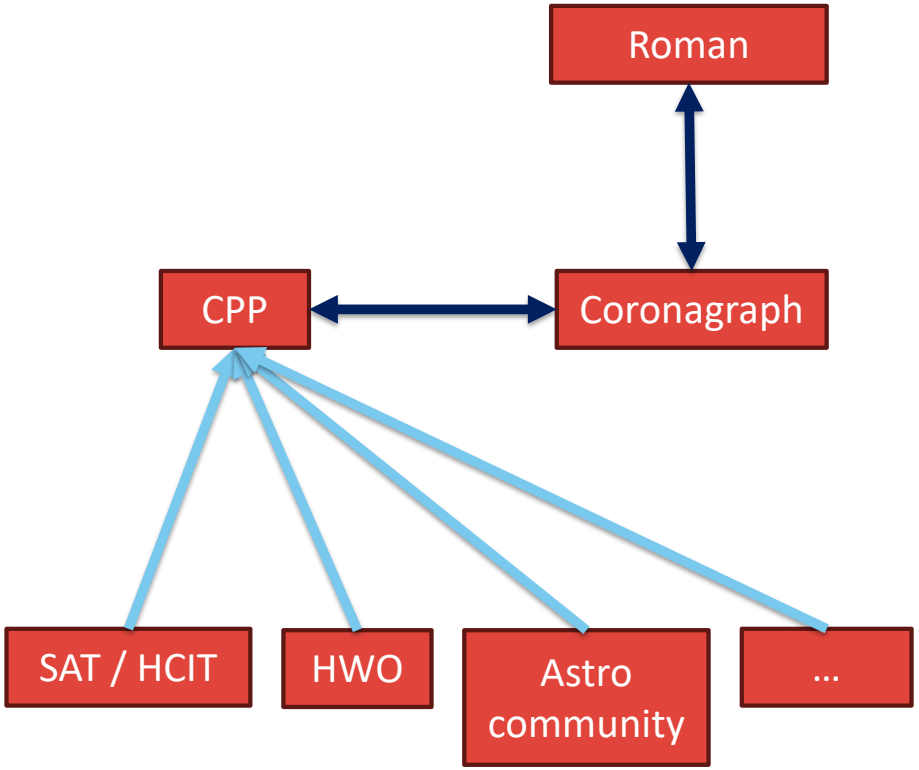
- As with WFI, there is no proprietary period on Coronagraph data

CPP is the conduit for community input

Planed CPP-run efforts to solicit input:

- Late 2024: info briefing and short survey
  - < 15min time commitment
  - high-level ranking of priorities
  - Very brief ideas for tests or targets

- 2025: CPP issues call for whitepapers to flesh out specific concepts
  - once supporting tools are available



Summary

- CPP is an integral part of the Coronagraph team, not just end users
- Prioritize required mode (HLC imaging) operations first and foremost
- Preparing for other best effort modes as well in support of the general philosophy that
  - The best way to pave the way for HWO is to aim beyond tech requirements and observe challenging targets
- No GO program => CPP are conduit for community input to observation planning
  - Watch for opportunities for input in late 2024 & 2025
  - Sign up for Roman announcements mailing lists
    - https://lists.ipac.caltech.edu/mailman/listinfo/roman_announce
    - Send an e-mail to roman-news-join@lists.nasa.gov subject 'join'

Back-up charts

Science & Tech Potential vs Capabilities

	10^{-7}, 6-9 λ/D, Band 1 (TTR5)	10^{-8}, 3-9 λ/D, Band 1 (conservative)	'best effort' modes, 10^{-8} (conservative)	all modes, 3×10^{-9} (optimistic)
Technology maturation	All key imaging technologies at TRL9	… + all key imaging technologies are *necessary* to achieve performance	… + spectroscopy and polarimetry technologies at TRL9	… + tech demos & performance is approaching HWO needs in multiple areas
Jupiter analog spectra	No	No	No	A few*
Jupiter analog Images	No	Unlikely	Unlikely	**A handful***
Young giant planet spectra	No	No	**Yes**	**Yes***
Young giant planet images	No	No	**Yes**	**Yes***
Circumstellar disk images	Yes	Yes	**+ polarimetry & (potentially**) H-alpha**	**+ lower-mass disks**
Exo-Zodi Disks images	~5000 zodis	~100 zodis	~100 zodis	**~40 zodis *****

* Roman will likely be target-limited. Corollary: a modest extended operations period could observe all high-priority targets

** H-alpha imaging of transition (planet-forming) disks will depend on Coronagraph's faint star performance, which is TBD

*** Potential for survey of prime HWO targets if Coronagraph operations are extended

Science & Tech Potential vs Capabilities

Tested in TVAC?

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Under baseline plan (90 days across 1st 18mo), Coronagraph will be time-limited & resource-limited, not target-limited

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Preliminary plan for Coronagraph extended operations review

- Originally presented by Roman PS Julie McEnery in June 2023 APAC meeting
- Hold a Coronagraph extension review early in mission (e.g. 6 months into science observations)
  - Is there a *compelling* case for continued operations beyond nominal 90 day allocation? For how long?
  - Based on demonstrated on-sky performance & what could be realistically supported
- If favorably reviewed: add TBD months of Coronagraph observations *within first 3 years* & increase prime mission duration correspondingly
  - Driver for front-weighting: Coronagraph is class D (higher risk posture)
  - Reschedule *some* of the WFI Core Community Survey (CCS) observations to later years
  - May be complicated, if WFI guest investigations depend on the original CCS schedule.
    - Could mitigate by collecting information during GI proposal selection)
- Plan add'l observations similarly to the first 90 days: with Coronagraph CPP as mediators