

Jonathan Gardner

Deputy Senior Project Scientist

Presentation to the JSTUC, 2/28/2023



Retirement of Chuck Bowers and Randy Kimble



- Two of our long-standing project scientists have recently retired.
- Combined **29** years of service on JWST, with leadership on a wide range of technical issues for Webb, including the telescope, instruments, and commissioning.

The poster features a dark space background with a nebula and a satellite. At the top left is the Webb Space Telescope logo. The main title is in large, stylized fonts. Below the title is a suggested contribution amount and RSVP information. At the bottom, two portraits of the scientists are shown with their names and appreciation links. The event date and location are centered at the bottom.

WEBB
SPACE TELESCOPE

GREAT OBSERVATORIES
GREAT PROJECT SCIENTISTS
Retirement Celebration

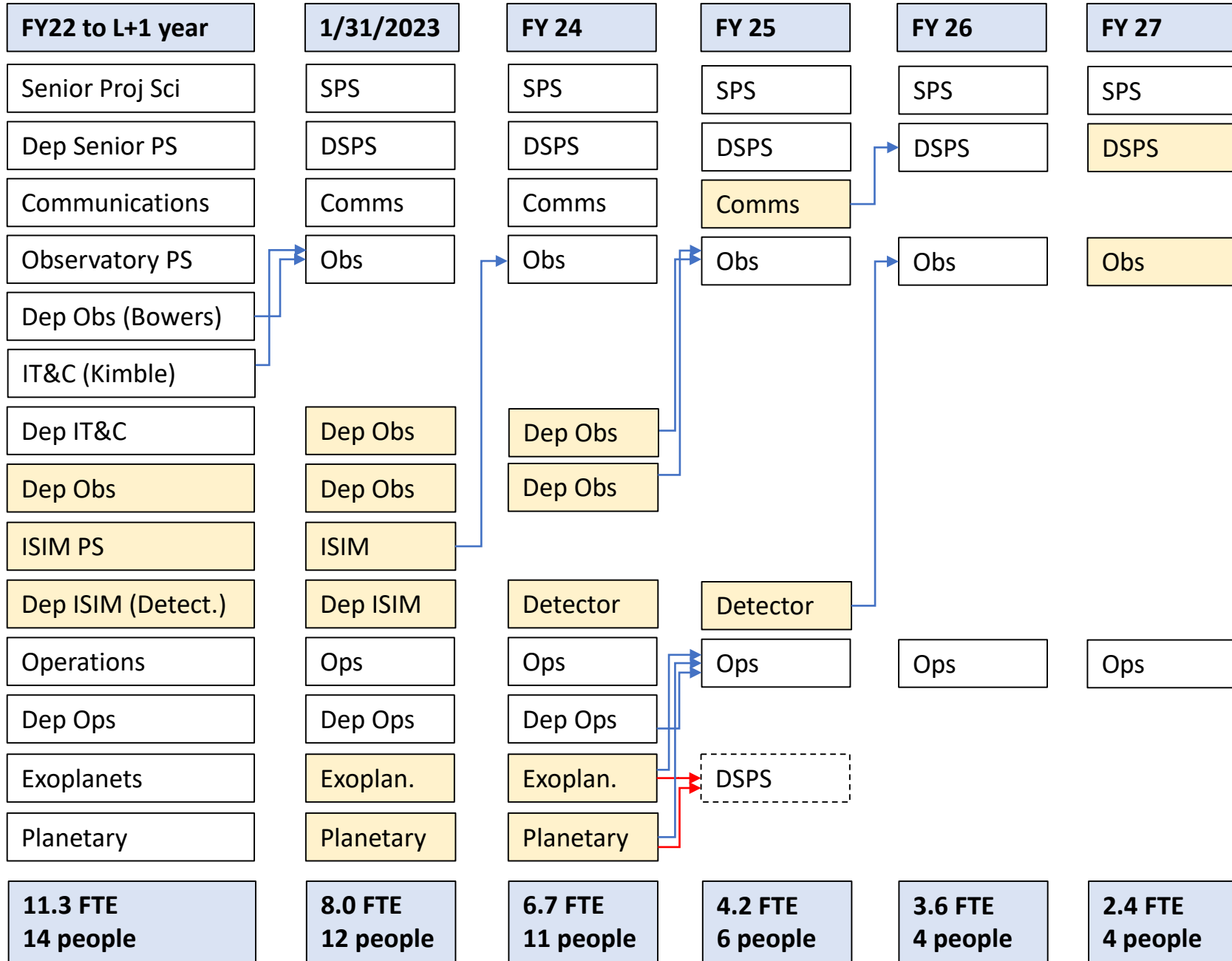
Suggested contribution of \$20 for senior and \$10 for junior attendees to cover gifts for both.
Please RSVP to Kayla Mrowczynski (kayla.mrow@nasa.gov, B34/Room S354)
Send payment via Venmo to @kayla-mrow.

Chuck Bowers
Send your appreciations!
<https://tinyurl.com/ChuckBowers>

Randy Kimble
Send your appreciations!
<https://tinyurl.com/RandyKimble>

Monday, February 27, 2023
1:00–4:00 PM Building 34/W150

JWST GSFC Project Science Team



<= 0.5 FTE

Bunker et al. JADES NIRSpec Spectroscopy of GN-z11: Lyman- α emission and possible enhanced nitrogen abundance in a $z = 10.60$ luminous galaxy

arXiv:2302.07256v1 [astro-ph.GA] 14 Feb 2023

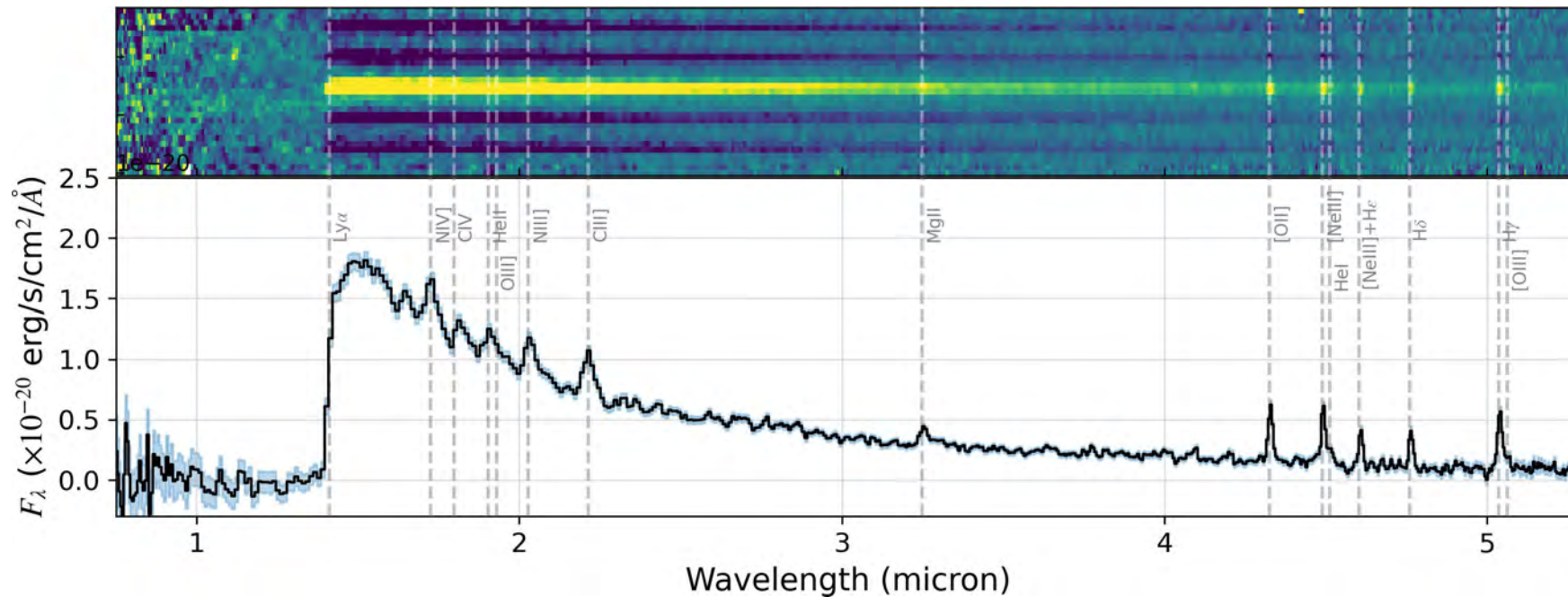


Fig. 1. 2D (top) and 1D (bottom) spectra of GN-z11 using PRISM/CLEAR configuration of NIRSpec. Prominent emission lines present in the spectra are marked. The signal to noise ratio (SNR) of the continuum is high and the emission lines are clearly seen in both the 1D and 2D spectra.

Redshift $z = 10.60$ is 430 Myr after the Big Bang. Can't rule out AGN component, but line ratios suggest active star-formation rate 20-30 M_{\odot} /year. Ly- α is spatially extended, which may indicate a Ly- α halo.

JWST Mission Status

- JWST is working very, very, very well!
- Micrometeoroids:
 - 1 to 2 hits per month that can be detected with routine wavefront measurements.
 - Only 1 micrometeoroid hit has had a significant effect on the optical performance.
 - A micrometeoroid avoidance zone will be implemented starting in Cycle 2.
- MIRI Medium-resolution Spectroscopy (IFU)
 - Increased friction was seen in the grating wheel, use of this mode paused in August.
 - Full return to operations in November using a different movement pattern.
- NIRISS time-out issue, resolved through power cycling.
- Safe mode December 7, due to software fault in the attitude control system
 - This was the only safe mode since the start of science operations in July.
 - The observatory's fault management system worked as expected to keep JWST safe.

JWST Project Science Perspective



1/31/2023

- Requirements
 - JWST science performance continues to exceed requirements.
- Science highlights and image releases:
 - 1/9: Distant galaxies similar to local “green pea” galaxies
 - 1/11: Dusty disk around red dwarf star
 - 1/11: Star-forming regions in nearby galaxies
 - 1/11: Webb confirms rocky exoplanet discovered by TESS mission
 - 1/23: Ice chemistry in pre-stellar molecular cloud
 - 1/24: NIRISS offline due to timeout issue
 - 1/25: Occultation light-curve of Chariklo’s rings in the outer Solar System
 - 1/31: A spiral galaxy among thousands →
 - 1/31: NIRISS returns to operations
- Project Science Watch List:
 - ACS/OSS Fault Management interactions – Project Science will support MSE-led search for improvements.
 - Micrometeoroid hits and their effect on telescope performance and observing efficiency. Implementation of Micrometeoroid Avoidance Zone (MAZ) in Cycle 2.
 - NIRISS time-out issue: on PS Watch List from 1/15 to 1/31; the issue is now resolved and NIRISS is back on-line.
 - MIRI Medium-Resolution Spectrograph grating wheel. Currently in phase 3 of plan for return to use.
 - DSN performance issues (trending better).
- Concerns: No concerns.
- News:
 - More than 1600 proposals received for Cycle 2, from 5450 scientists – both set HST/JWST records!
 - Webb received the Goddard Memorial Trophy from the National Space Club, and the Swigert Award from the Space Foundation
 - The JWST Users Committee (JSTUC) will meet Feb 28 & Mar 1 at STScI.
 - The JWST presence at American Astronomical Society meeting in Seattle, Jan 8-12, 2023, was a huge success.
 - Project Scientists attend important meetings, such as the JWST Weekly Briefing and Anomaly Management Boards.
 - Webb’s Images and science results continue to break outreach records within NASA and the US Government. Project Scientists were interviewed many times by media last month. There are frequent requests for speaking, virtual and in person, both public outreach and to the scientific community.



PASP special issue on JWST, all submitted

- Mission Overview: Gardner et al.
- NIRCcam: Rieke et al., in press
- NIRSPEC: Böker et al., in press
- MIRI: Wright et al.
- NIRISS: Doyon et al.
- Science Performance: Rigby et al., in press
- Telescope: McElwain et al., in press
- Design and testing: Menzel et al.
- Backgrounds: Rigby et al., in press



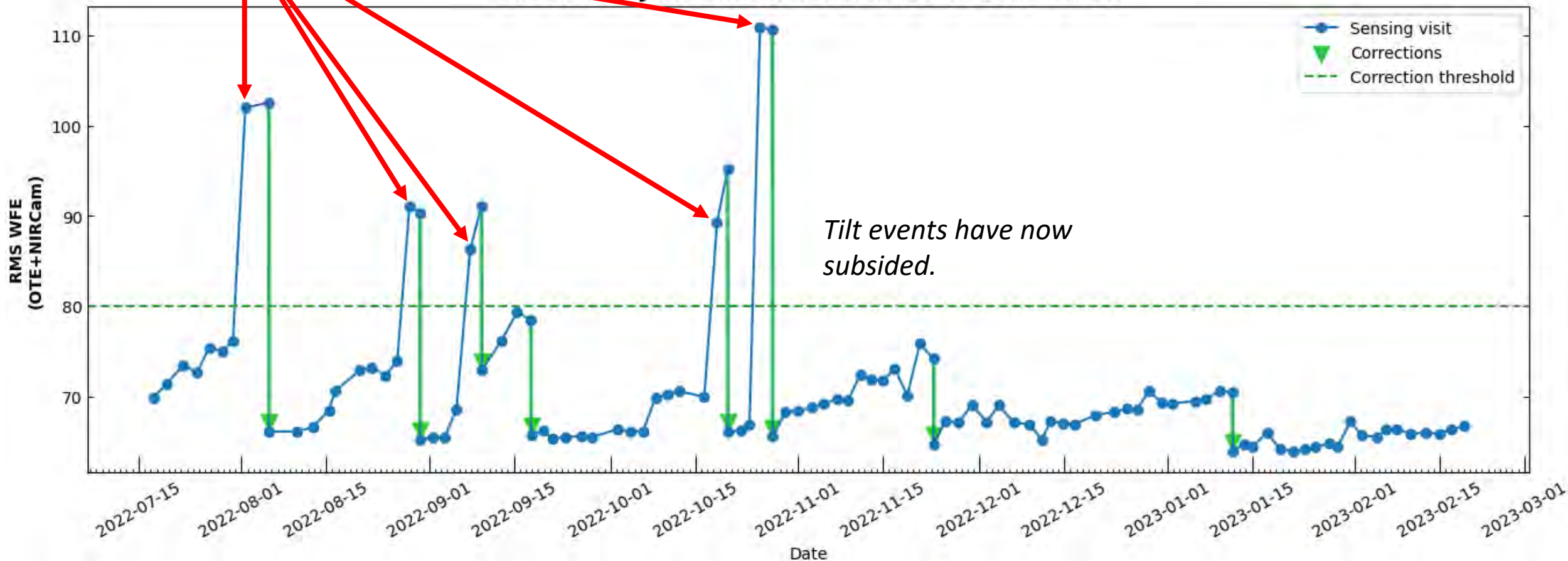
Telescope Performance



- **Telescope performance continues to be terrific, with the NIRCам shortwave channel operating around 70nm rms wavefront error (cf. 150nm requirement).**
- Wavefront sensing visits are scheduled every ~2 days, or 107 individual wavefront visits since the start of the science mission.
 - Includes phase diversity and jitter measurements.
- Wavefront corrections have been applied 8 times (~once per month, cf. no more frequent than every 2 weeks requirement)
- C3 micrometeoroid impact between May 22-24, 2022 added 9nm rms of uncorrectable observatory-level wavefront error. All other micrometeoroids damage has provided < 1 nm rms WFE (i.e., no appreciable change) to the observatory-level WFE.
- Telescope design, development, and performance published as part of the PASP Special Issue on JWST (McElwain+129 co-authors, PASP, 2023, see [arXiv:2301.01779](https://arxiv.org/abs/2301.01779))

Tilt events punctuated stability.

Observatory WFE from 2022-07-16 to 2023-02-21

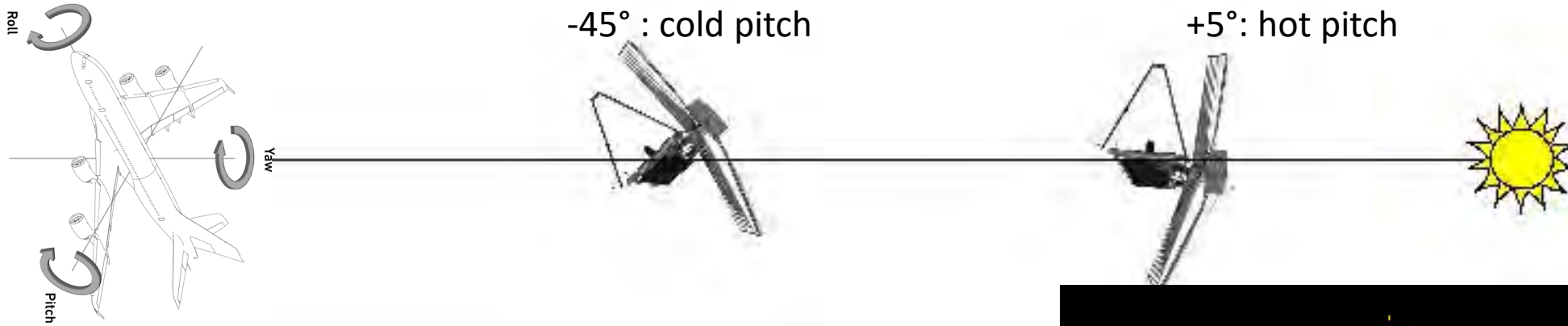




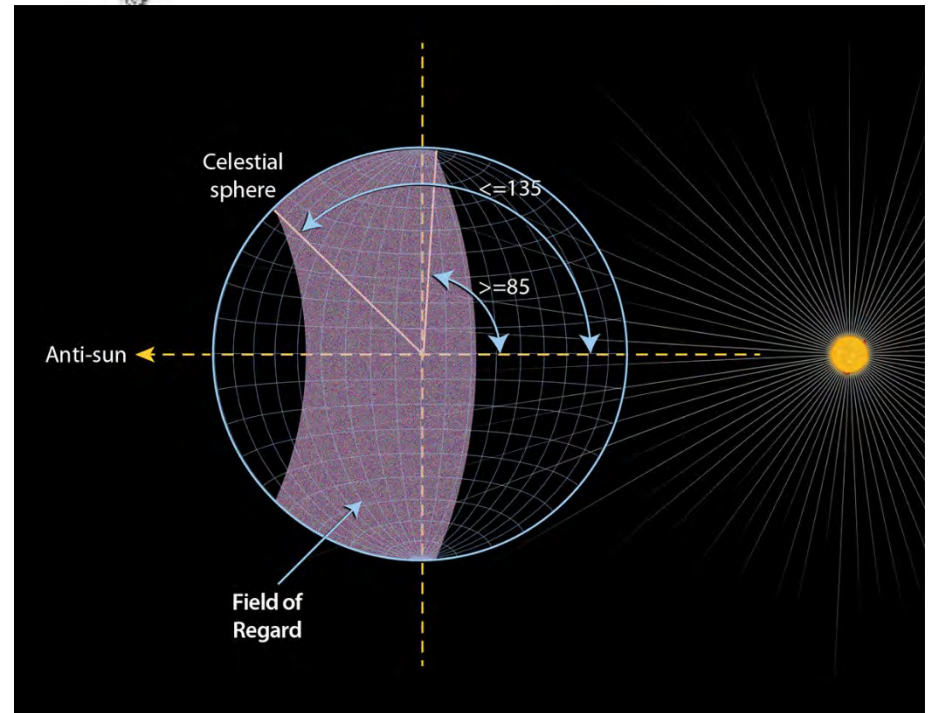
Wavefront Instabilities



- **Wavefront instabilities exist on multiple timescales, including:**
 - **Tilt events:** nearly instantaneous offsets -- have largely subsided and have decreased in both frequency and amplitude.
 - **Micrometeoroids:** nearly instantaneous changes, now seen as small but detectable (< 1 nm) changes observatory-level wavefront at the rate of ~ 2 per month. Quarterly NIRCam PIL images also reveal micrometeoroid impacts that do not cause measurable wavefront error.
 - **IEC heater on-off:** cyclic drifts at the ~ 3 nm level over ~ 4 minutes. These instabilities were reduced as far as possible and will need to be calibrated.
 - **Frill / PMSA closeouts:** drift amplitude of ~ 5 nm with a time constant of 45 minutes following a worst-case slew.
 - **OTE Thermal Distortion:** drift amplitude of ~ 18 nm with a time constant of ~ 1.4 days following a worst-case slew.



- The JWST science field of regard is +5 to -45 degrees in pitch and +/- 5 degrees in roll.
 - Normal science observations are carried out at various pointings within the field of regard, smoothing over the thermal state extremes.
- < 18 nm rms from telescope thermal distortion, added in quadrature with the observatory-level WFE.



Questions for the JSTUC

- Mather questions from August meeting:
 - Whether, Why and How to reduce Exclusive Access Time?
 - How to avoid most Cycle 2 proposers writing budgets twice?
 - What are the pros and cons of the proposed shorter interval between Cycle 2 and Cycle 3?
 - Are the user tools, documentation, archive, and pipelines we provide meeting user needs?

Questions for the JSTUC – New questions

- Will the very large number of Cycle 2 proposals that were received strain the TAC process? Any suggestions?
 - Is the JSTUC comfortable with external-only review of the smallest proposals?
- The Cycle 3 CFP is coming very soon! Do we want to do anything differently?
- Do we want to continue the same proposal size cutoffs:
 - Small (<25 hours), Medium, Large (>75 hours)?
 - What is the right balance for the provisional allocations between S/M/L?
- Should there be any new community initiatives in Cycle 3?
 - E.g. Multi-cycle Treasury or very-large programs? Other initiatives?
 - JSTUC, 9/13/2018: “Our current recommendation is that such a call should be timed to allow the results from Cycle 1 be adequately digested by the community, perhaps occurring first in Cycle 3.”
- Any feedback on DD time?