Preparing for JWST Commissioning, Calibration, and Science with the Multi-Instrument Ramp Generator (MIRaGe)

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Star-Forming Region LH 95 in the Large Magellanic Cloud. Credit: Hubble/STScI

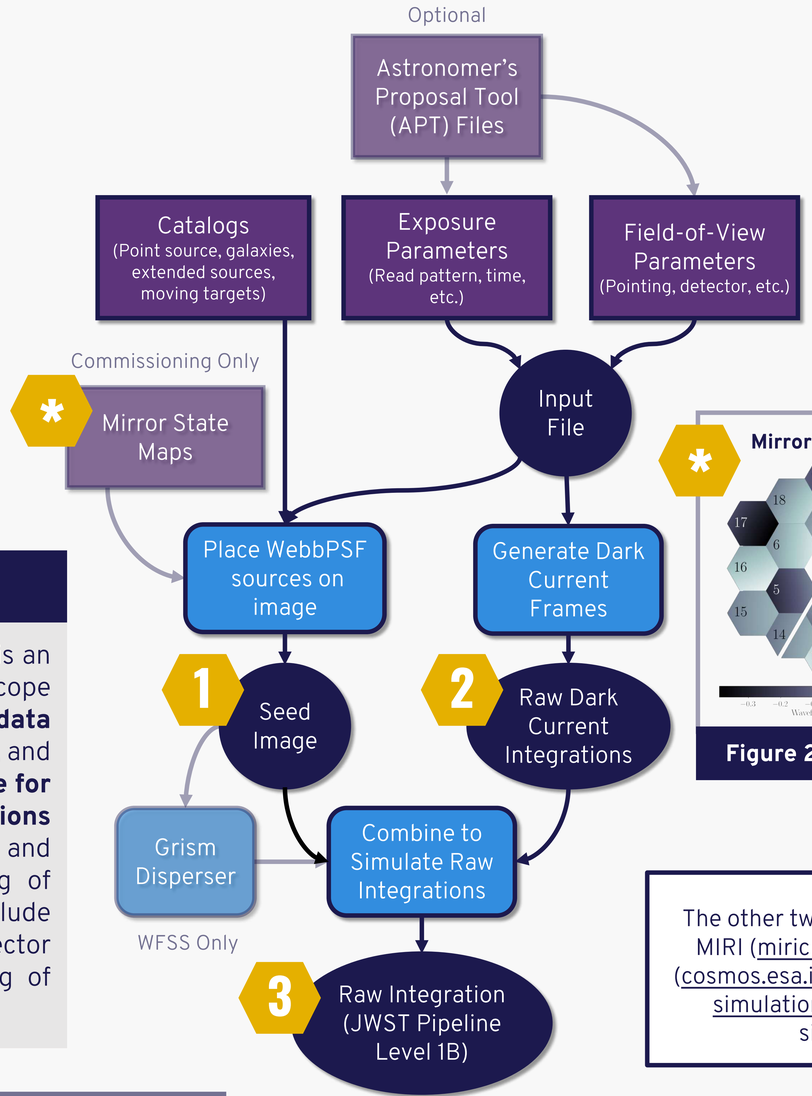
JWST

The James Webb Space Telescope (JWST) is NASA's next great observatory. Scheduled to launch in March 2021, JWST will enable astronomers to study the **infrared universe**. The **accurate simulation of JWST data**, for use by both engineers and by future observers, is an imperative part of successful preparation for launch.

Credit: NASA

MIRAGE

The **Multi-Instrument Ramp Generator (MIRaGe)** is an open-source Python package developed at Space Telescope Science Institute that generates **high-fidelity data simulations** for three JWST instruments: FGS, NIRCam, and NIRISS. It is a flexible tool which will be used to **prepare for commissioning, calibration, and science observations** with JWST. It can be used to generate imaging data and wide-field slit-less spectroscopic data, with modeling of time series data in development. MIRaGe products include Poisson noise, cosmic rays, and other realistic detector effects, and thus are used for comprehensive testing of JWST data reduction pipelines and algorithms.



COMMISSIONING

New modifications to MIRaGe enable simulation of data from the commissioning of the JWST Optical Telescope Element (OTE). Such simulations incorporate **models of non-nominal mirror states** and are necessary to design **procedures** for the early steps of commissioning, to develop **analysis software**, and to plan for **contingencies**.

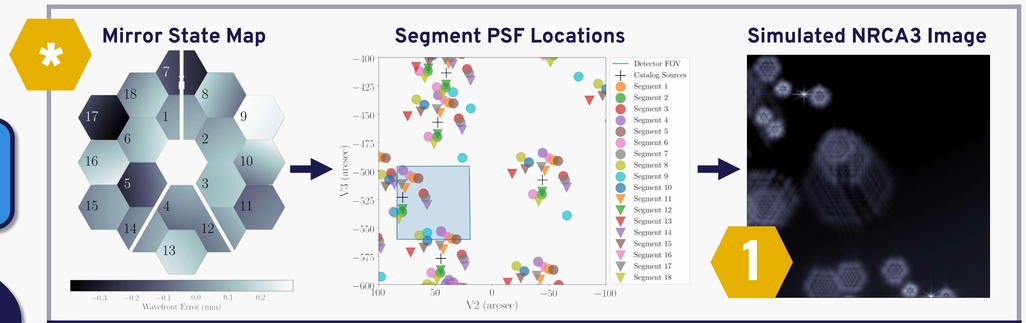


Figure 2: Elements to generate MIRaGe simulations of early JWST OTE commissioning.

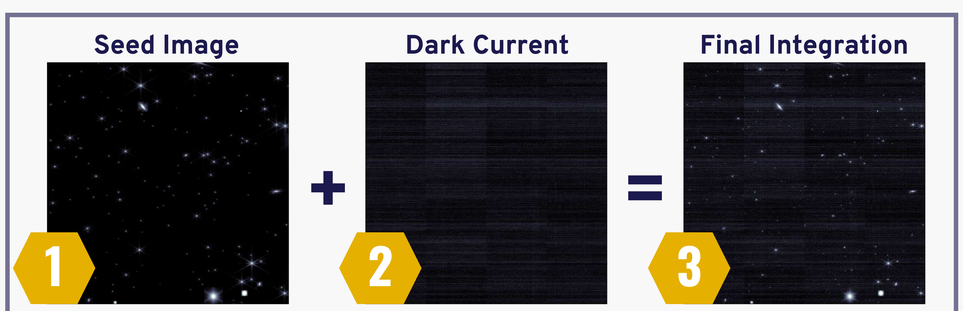


Figure 1: NIRCam B long-wave count rate simulations from the three steps of MIRaGe.

The other two JWST instruments, MIRI (miricle.org) and NIRSpec (cosmos.esa.int/web/jwst-nirspec-simulations), have separate simulators.

INSTRUMENT	MIRAGE CAPABILITIES
NIRCam Near Infrared Camera	Imaging, Time Series Imaging, Wide-Field Slitless Spectroscopy
NIRISS - Near Infrared Imager & Slitless Spectrograph	Imaging, Wide-Field Slitless Spectroscopy
FGS Fine Guidance Sensor	Imaging

LEARN MORE

MIRaGe is an open-source Python package that is available on GitHub. Check out our repository and Jupyter Notebook examples online:

github.com/spacetelescope/mirage

If you are interested in using MIRaGe, please contact us about obtaining the necessary data files.

Questions? Comments?
Contact lchambers@stsci.edu