Creating accurate **JWST data simulations** is important, and here's **how** you do it

JWST NIRISS Data Simulations and How to Make Them

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Motivation

Accurate JWST NIRISS (Near Infrared Imager and Slitless Spectrograph) data simulations are necessary in order to prepare for telescope commissioning, validate the JWST pipeline, and to confirm the scientific potential of NIRISS.

NIRISS Observing Modes

NIRISS has 4 observing modes:

1) High-resolution imaging
2) Aperture Masking Interferometry (AMI), ideal for detecting planetary and stellar companions
3) Wide Field Slitless Spectroscopy (WFSS), ideal for studying medium- to high-redshift galaxies
4) Single Object Slitless Spectroscopy (SOSS), ideal for obtaining spectra of transiting exoplanet systems

Data simulations are made using Mirage and Awesimsoss, which are both open-source python packages produced and maintained by STScI.

Mirage

Mirage (Multi-Instrument RAmp GEnerator) can simulate NIRISS Imaging, WFSS, and AMI data, as well as other JWST instrument data.

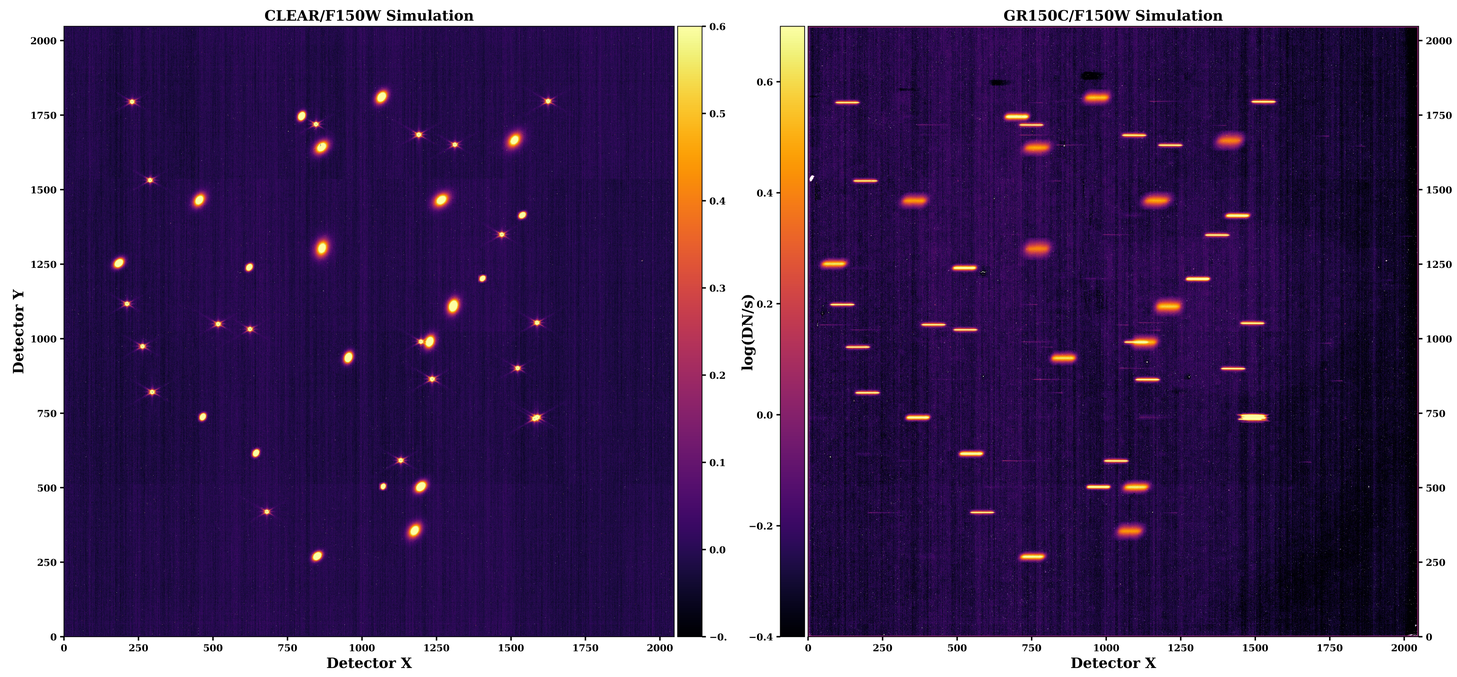
github.com/spacetelescope/mirage

Awesimsoss

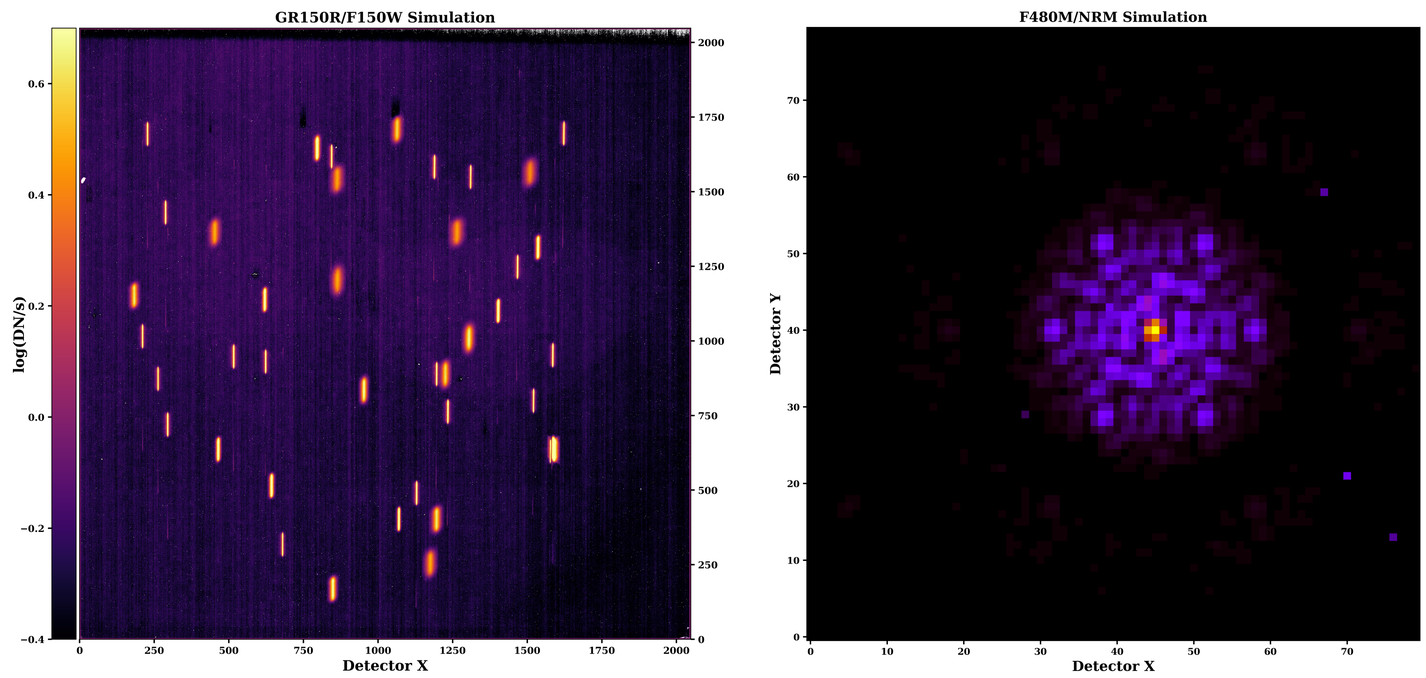
Awesimsoss (Advanced Webb Exposure SIMulator for SOSS) produces simulated time-series data for the NIRISS SOSS mode.

github.com/spacetelescope/awesimsoss

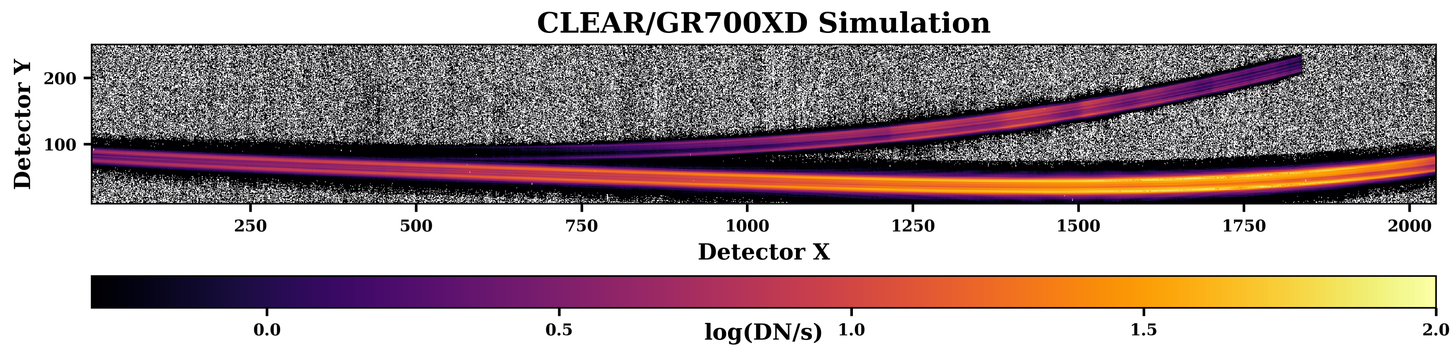
All simulations have had basic detector-level corrections applied, e.g. bias and dark correction, saturation flagging, and ramp fitting.



Above: Mirage simulations of left) direct F150W imaging, and right) F150W observations dispersed with the GR150C grism.



Above: Mirage simulations of left) F150W observations dispersed with the GR150R grism, and right) AMI F480M observations.



Awesimsoss simulation of an A0 star spectrum during a planetary transit.

Take a picture or scan to download the full paper

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