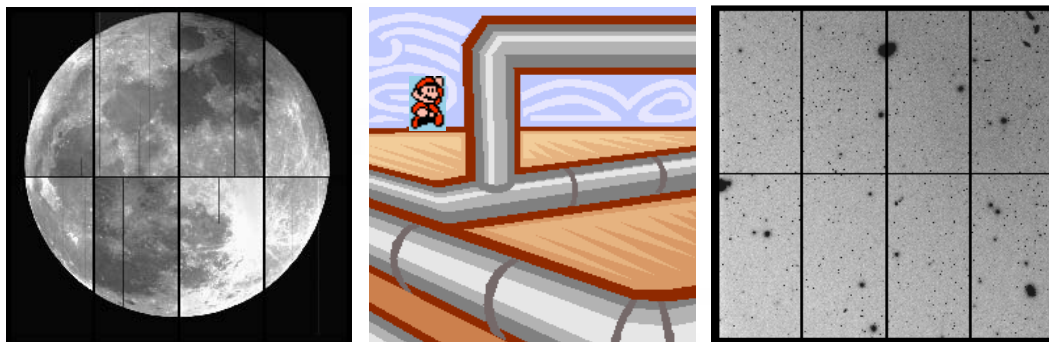




# The NOAO Pipeline Applications



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Mark Dickinson (NOAO)



# Outline

- Pipeline System
- Pipeline Applications
- Mosaic Pipeline
  - Functionality
  - Structure and Parallelization
  - Performance



# Pipeline System (E2E)

- Data Source
- Pipeline Framework
- Pipeline Applications
- Data Sink



# Pipeline Framework

## NOAO High Performance Pipeline System

- Parallel and Distributed
- Event Driven
- Multiple Pipeline Application Support (new)
  
- Node Manager, Pipeline Manager
- Data Manager, Calibration Manager
- Pipeline Scheduling Agent (new)

See: Valdes, et al, 2006,

*The NOAO High-Performance Pipeline System*

(<http://chive.tuc.noao.edu/noaodpp/pipeline.shtml>)



# Data Source and Sink

- Telescope Data Handling System
  - NEWFIRM Quick Reduce Pipeline
- NOAO Science Archive
  - Source/Sink for Mosaic and NEWFIRM Science PLs
  - Access for selected PI Mosaic PL Data Products
  - Access for NEWFIRM Science PL Data Products

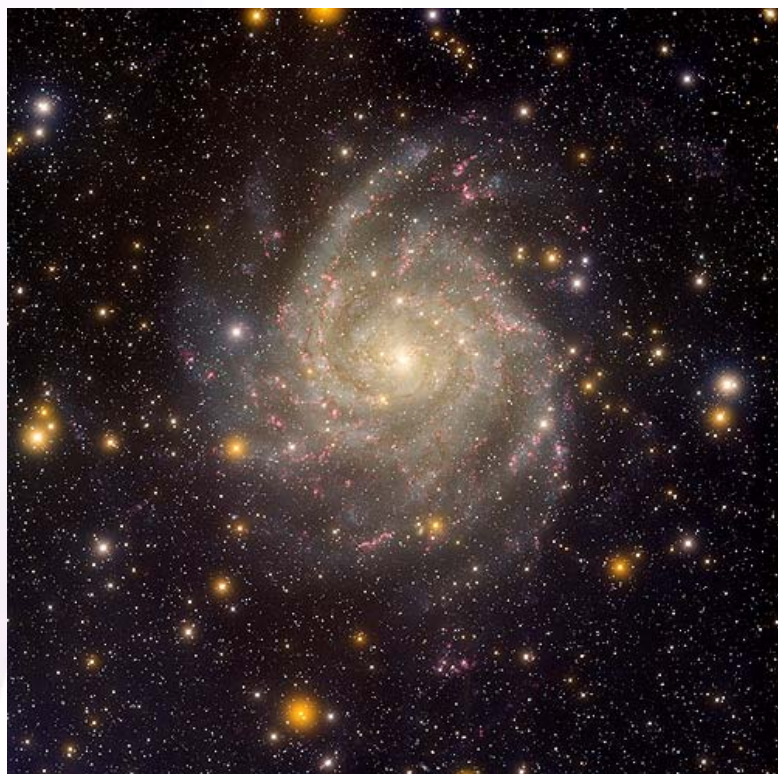


# Pipeline Applications

- Current
  - NOAO CCD Mosaic Imagers
    - 2 cameras, 8 x 2K x 4K SITe CCDs (64 Mpix)
    - 36 x 36 arcmin FOV @ 4m PF
  - NOAO Extremely Wide-Field IR Mosaic
    - 4 x 2K x 2K Orion InSb Arrays (32 Mpix)
    - 27.6 x 27.6 arcmin FOV @ 4m CF
- Future
  - Enhancements: Stacking, Catalogs, Transients
  - WIYN One Degree Imager (1 Gpix)



# Mosaic and NEWFIRM





# NEWFIRM Pipeline Application

- Quick reduction pipeline at telescope
- Science pipeline in Tucson
- Photometric and astrometric calibrations:
  - including: non-linearity and sky subtraction
- Registration and stacking
- See: Swaters, et al., P1.141



# Mosaic Pipeline Application

## Functionality and Data Products

- Bad pixel mapping and cleaning
- Flux calibration
- Astrometric calibration
- Data quality characterization
  
- Dome and sky calibration files
- Single exposures in multi-extension format
- Resampled standard image format
- Bad pixel masks
- PNG images (preview and near full scale)

2005B-0045\_ADASS-r1

file:///Users/valdes/Documents/ADASS07/html/Html/2005B-0045\_ADASS-r1.html

NOAO ▾ DPP ▾ IRAF ▾ Pipeline ▾ TCG ▾ Conference ▾ TimeSheets WebMail ▾ Tiamat ▾ VO ▾ Personal ▾ ADS

## 2005B-0045\_ADASS-r1

[Sky Analysis](#)

2006-07-28T23:04:47.3 xcs0152360101 obj141 r SDSS c6018 OEXPTIME = 600 Optical Follow-up of the XMM C... SKYMEAN = 38.7 AIRMASS = 1.1 MAGZERO(r) = 26.71 PHOTDPTH(r) = 23.13 SEEING = 1.11	MAXOBJAREA = 278994 SKYFRAC = 0.87 USNO Match = 2940	 ct4m20060728T230447	<input type="checkbox"/> Sky Stack  <a href="#">ct4m20060728T230447 [x2]</a>	 <a href="#">ct4m20060728T230447_r [x2]</a>
2006-07-28T23:16:29.9 xcs0152360101 obj142 r SDSS c6018 OEXPTIME = 600 Optical Follow-up of the XMM C... SKYMEAN = 21.8 AIRMASS = 1.1 MAGZERO(r) = 26.73 PHOTDPTH(r) = 23.56 SEEING = 1.01	MAXOBJAREA = 364286 SKYFRAC = 0.828 USNO Match = 2890	 ct4m20060728T231629	<input type="checkbox"/> Sky Stack  <a href="#">ct4m20060728T231629 [x2]</a>	 <a href="#">ct4m20060728T231629_r [x2]</a>
2006-07-28T23:58:42.5 xcs0100240801 obj149 r SDSS c6018 OEXPTIME = 600 Optical Follow-up of the XMM C... SKYMEAN = 14.1 AIRMASS = 1.1 MAGZERO(r) = 26.64 PHOTDPTH(r) = 23.69 SEEING = 1.05	MAXOBJAREA = 272265 SKYFRAC = 0.847 USNO Match = 3945	 ct4m20060728T235842	<input type="checkbox"/> Sky Stack  <a href="#">ct4m20060728T235842 [x2]</a>	 <a href="#">ct4m20060728T235842_r [x2]</a>

Done



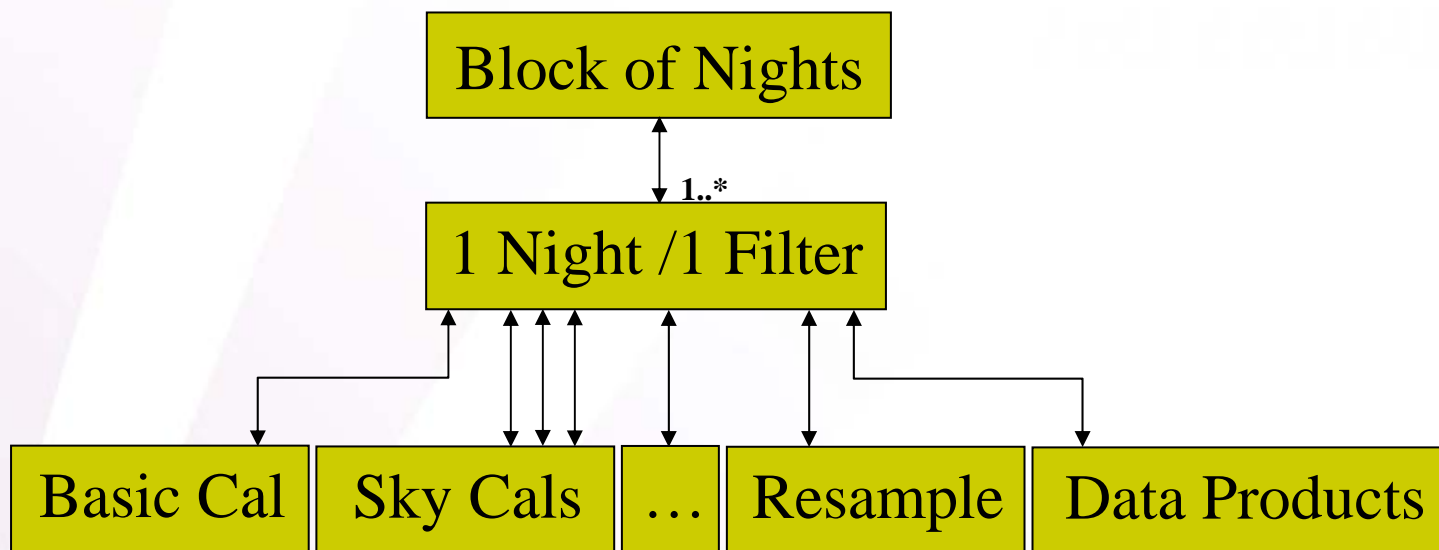
# Mosaic Pipeline Application

## Major Pipeline Groups

- Staging: PSQ, fetching, archiving, ftp, clean-up  
Dome Calibration Sequences: bias, dome flat, ...
- Basic Individual Exposure Calibration: CCD proc
- Sky Calibration: pupil, fringe, dark sky flat
- Resampling: sinc interpolation to standard image
- Data Products: MEF, resampled, masks, ...
  
- 22 pipelines, 165 stages

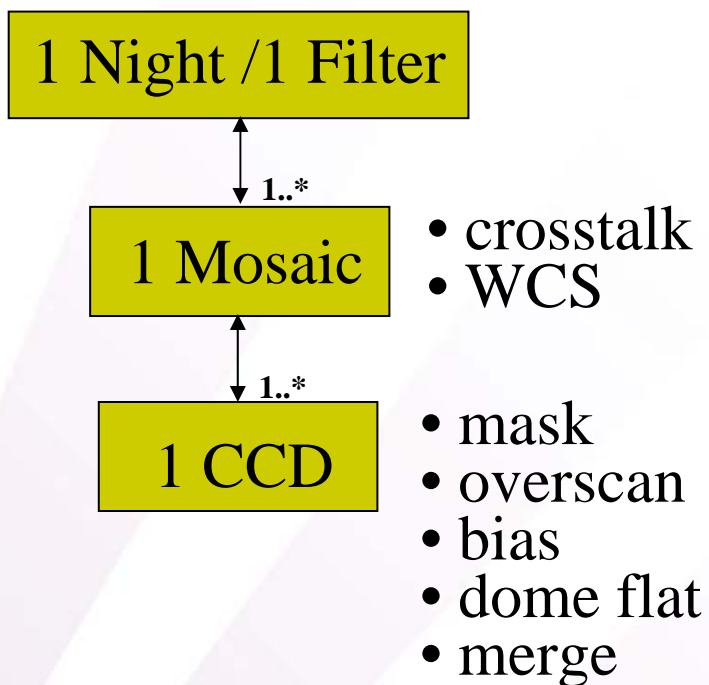


# Mosaic Parallelization



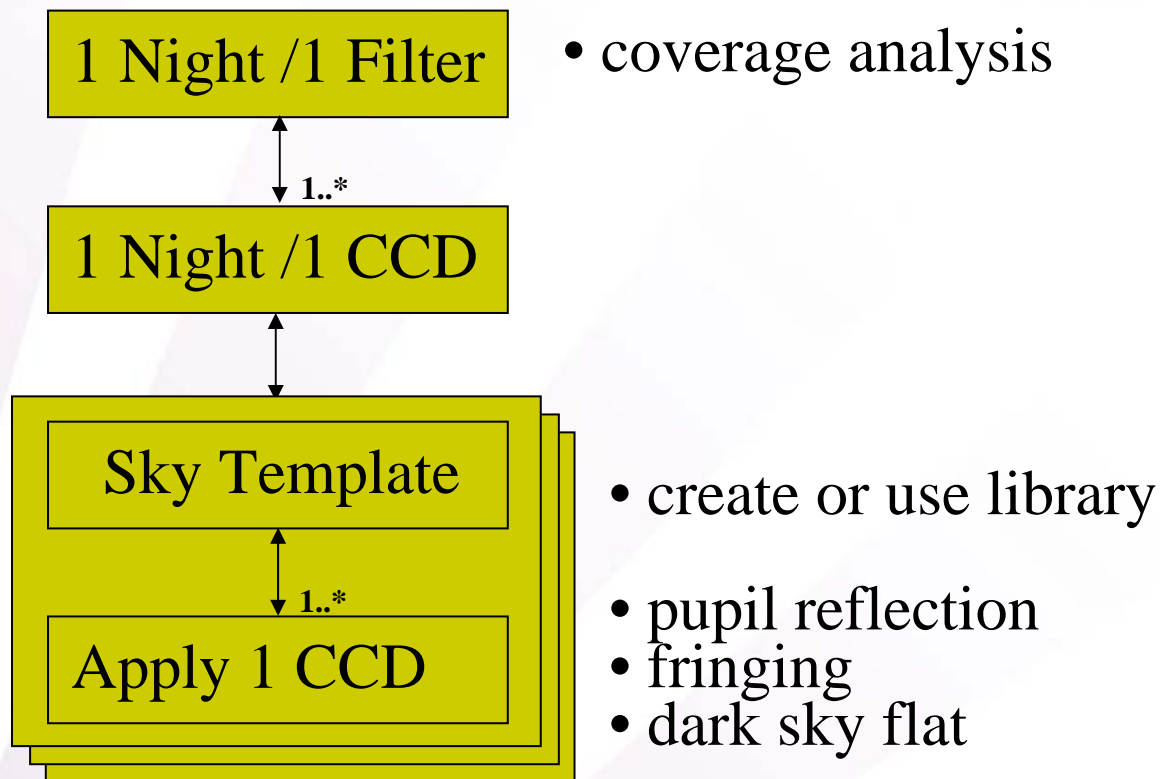
# Mosaic Parallelization

## Basic Calibration



# Mosaic Parallelization

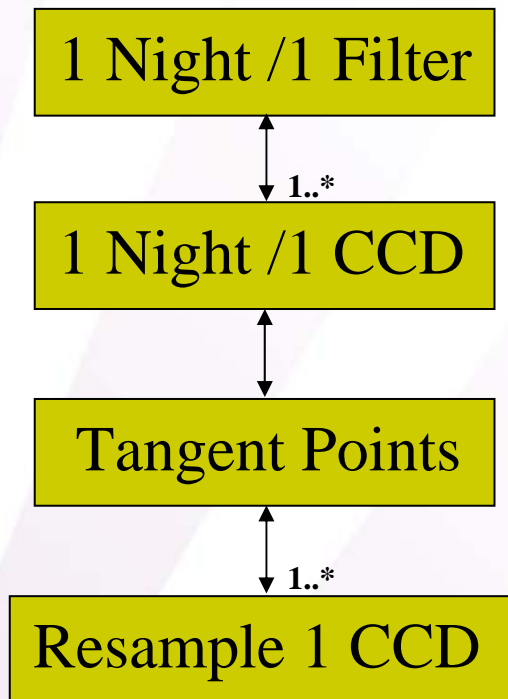
## Sky Calibrations





# Mosaic Parallelization

## Resampling

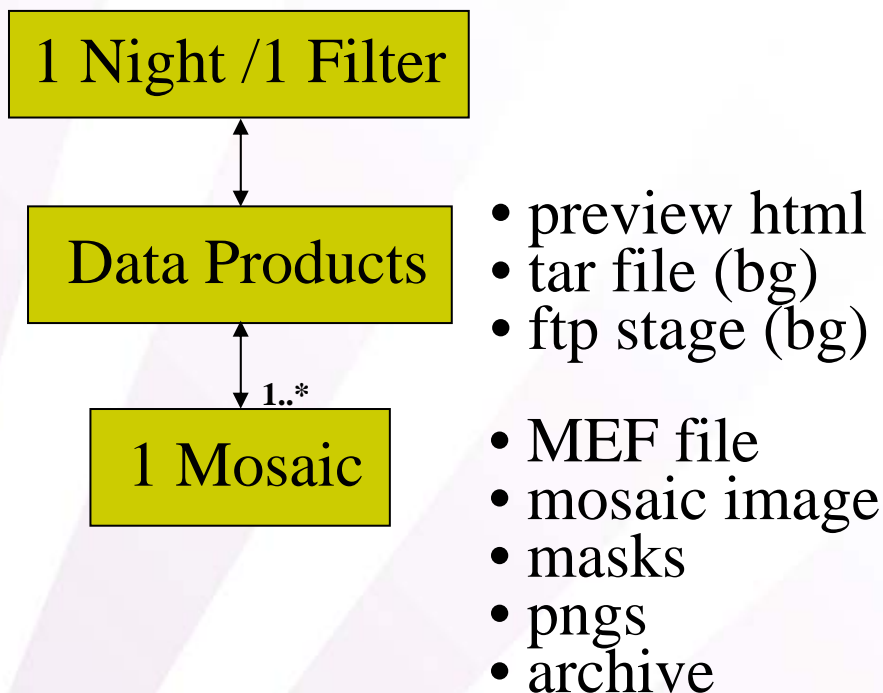


- grouping
- sky grid



# Mosaic Parallelization

## Data Products

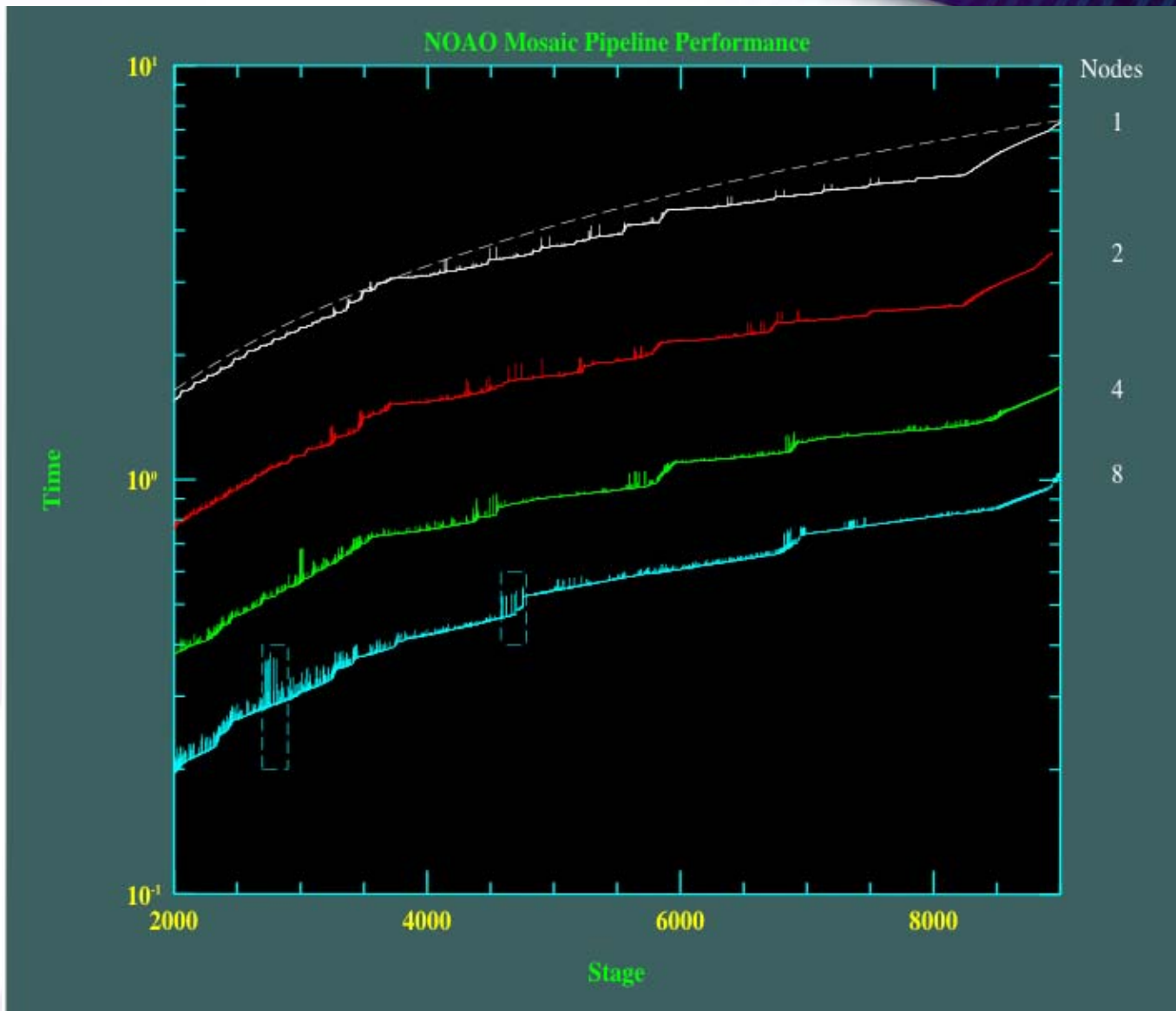


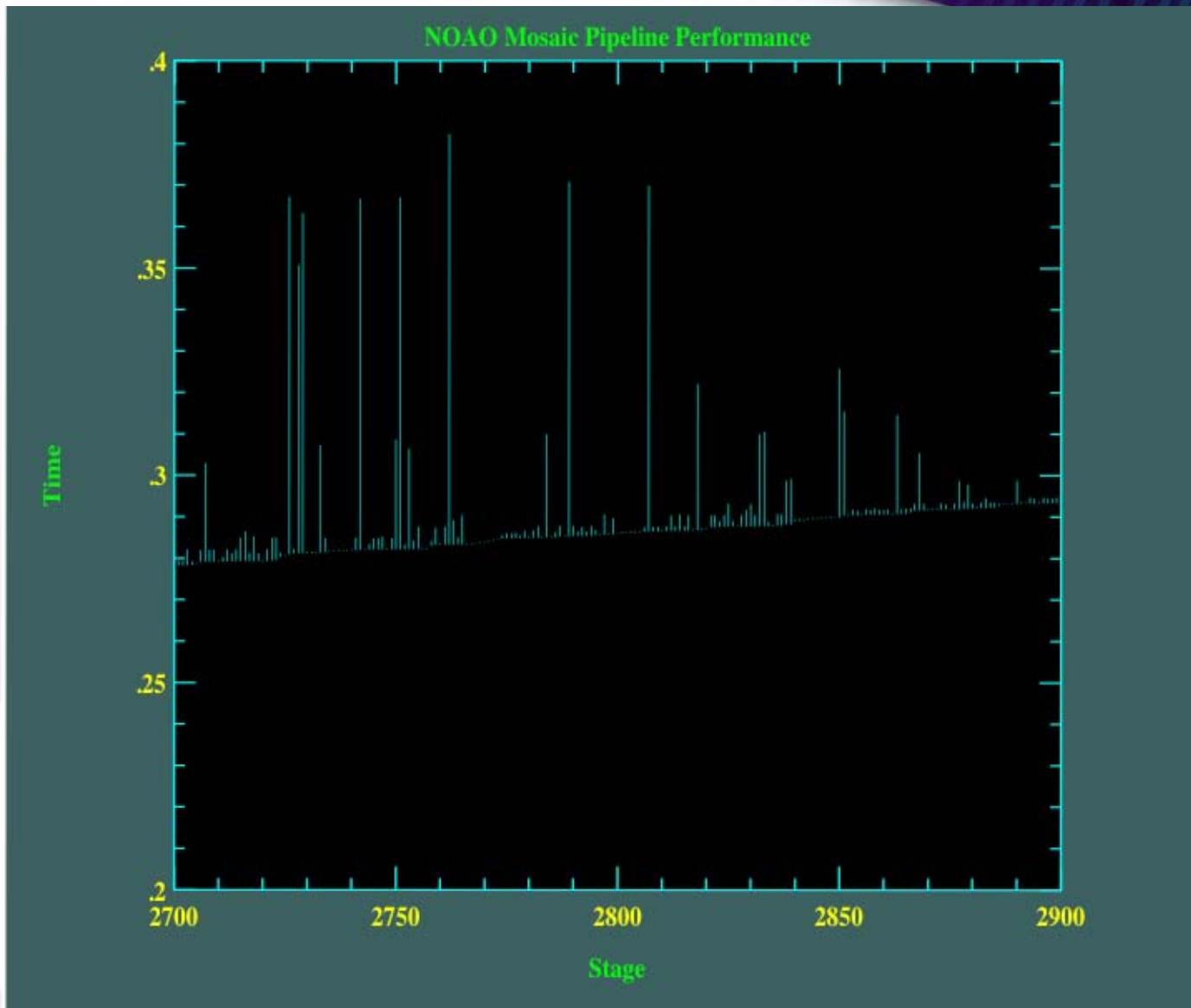


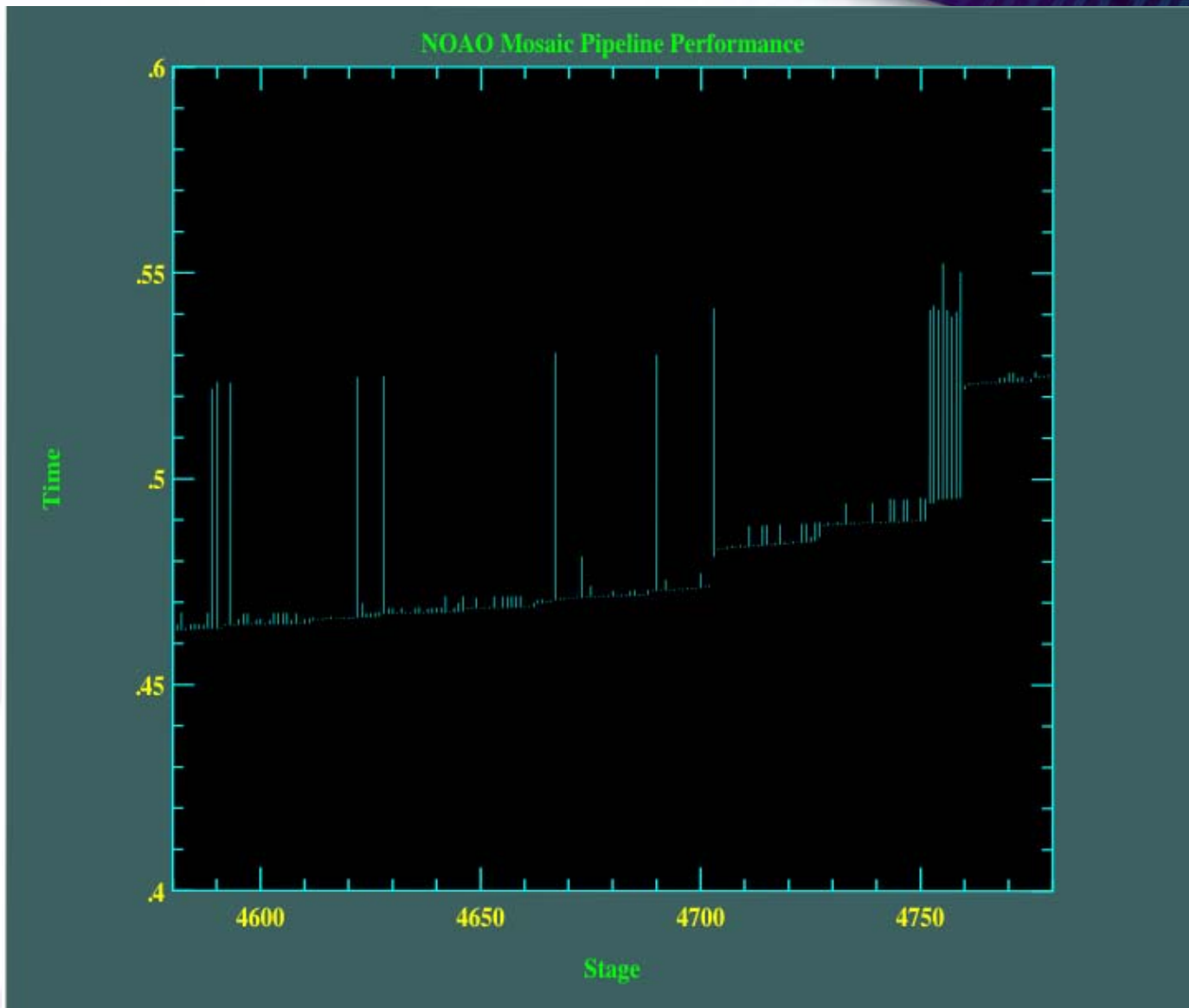
# Performance

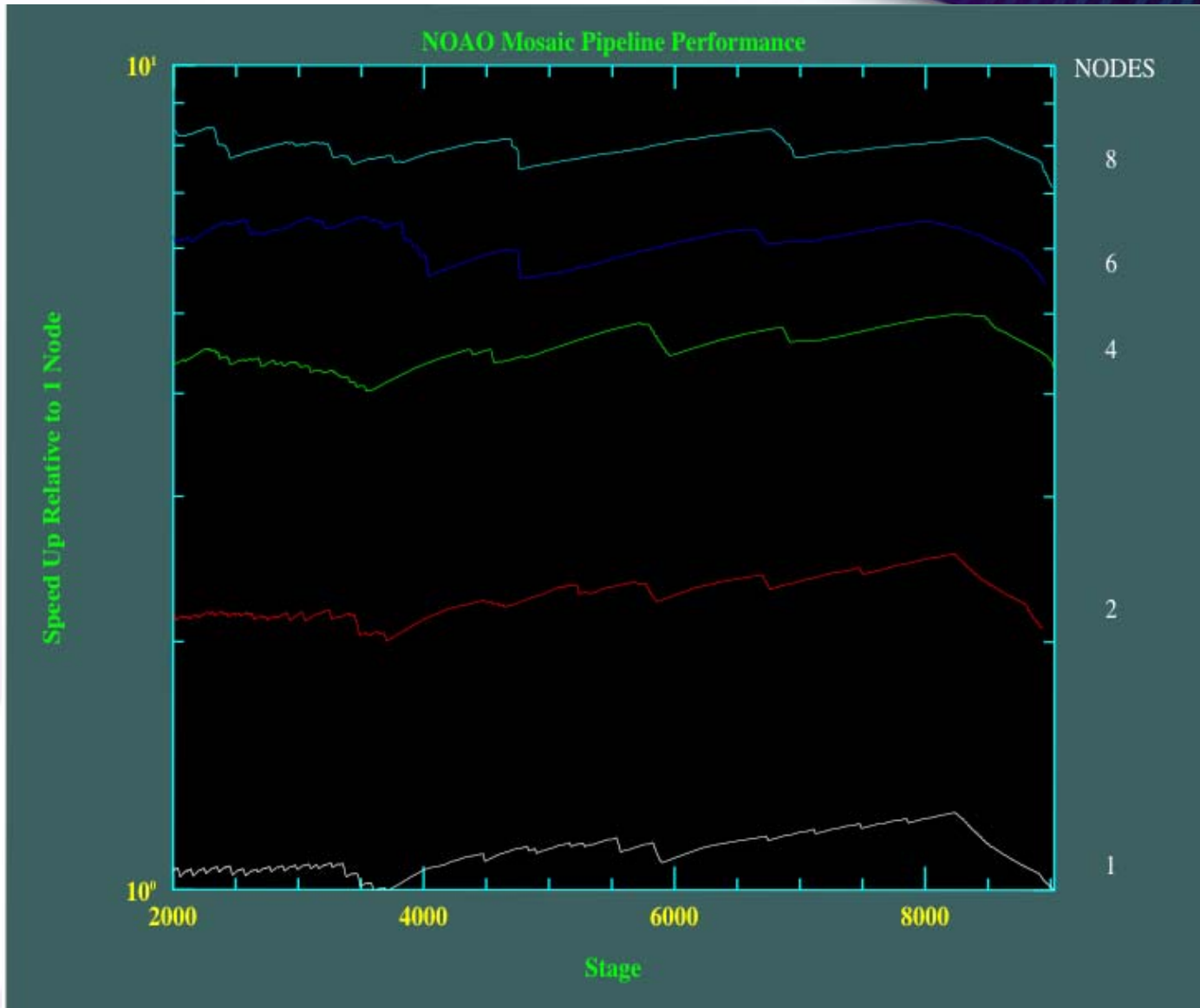
## NOAO Pipeline Cluster

- 1 data manager
- 8 processing nodes
- Dual-CPU Athelon rack mounted nodes
- Linux (Redhat 9)
- Raid Level 0 disks











# See Also

- P1.141, Swaters, NEWFIRM Pipeline
- NOAO Demo
  - Pipeline demonstration