What's New in SPIRE Photometer Pipeline in HIPE 13.0

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on behalf of the SPIRE ICC

What's New in HIPE 13.0

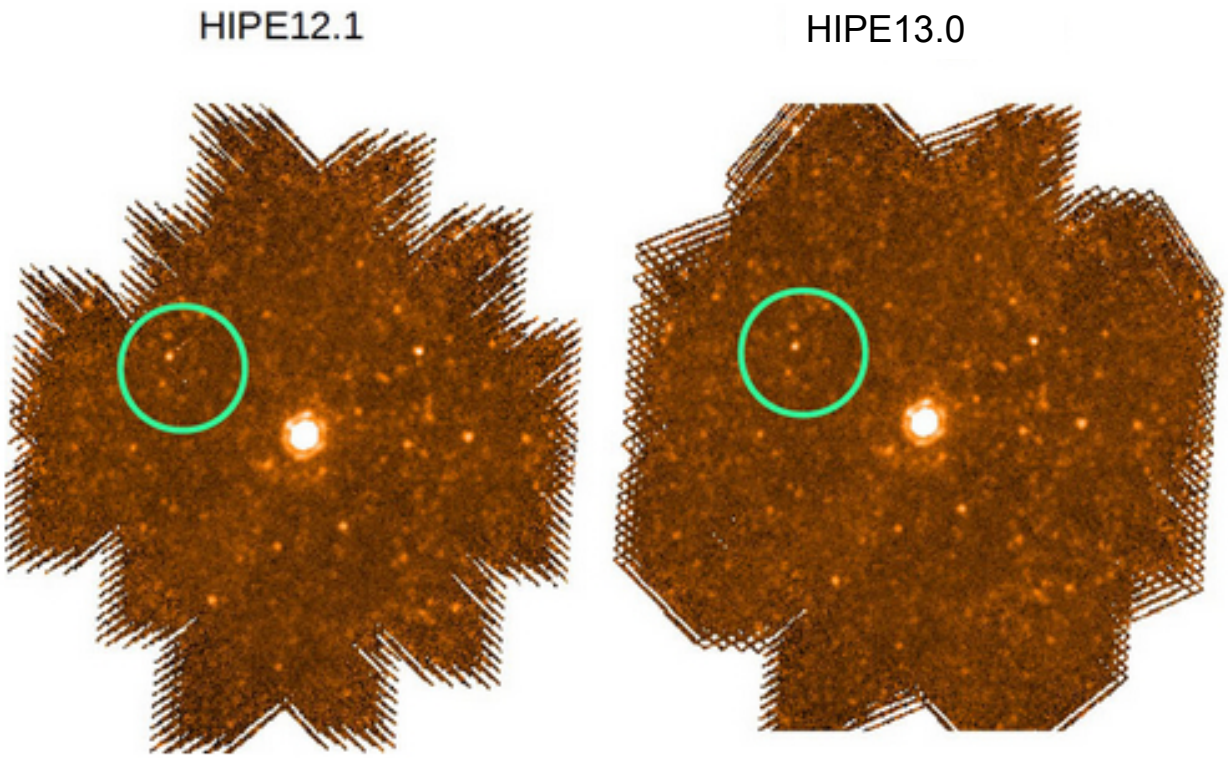
- New pipeline: 2nd-level deglitcher (better deglitching)
- New pipeline: 2-pass pipeline (minimizing ringing due to FFT)
- New pipeline for parallel mode: merging paired obs's in the 1st pass in 2-pass pipeline (better 2nd level deglitching)
- New beam profiles and solid angles: highly improved accuracy
- Improved parameters in Timeline Fitter photometry script
- Better cooler burp correction

New Pipeline in HIPE 13.0

- **New Feature:**

2nd level deglitcher:

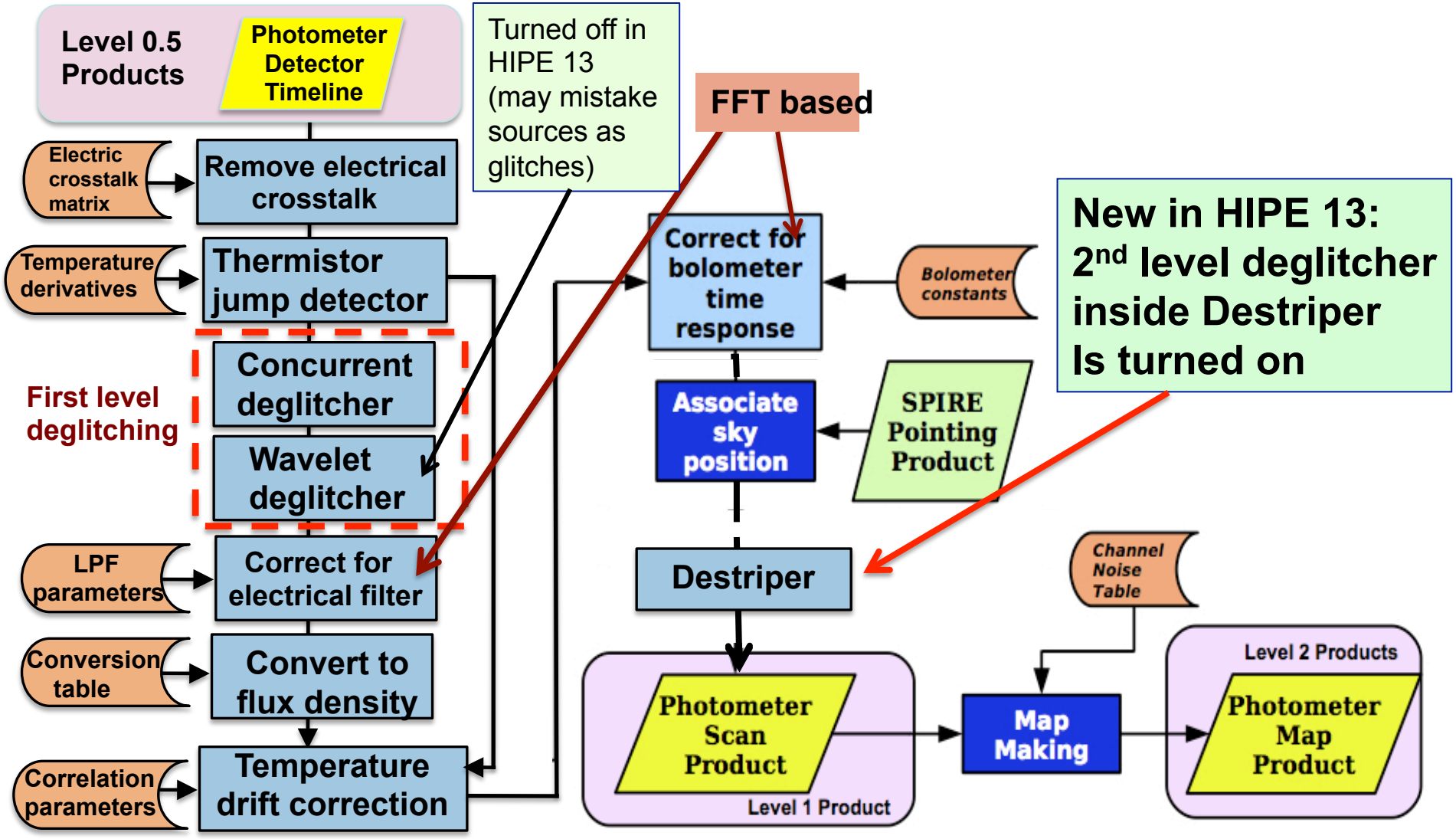
In addition to 1st level deglitchers (taking off spikes on timelines), the new pipeline includes a 2nd level deglitcher that identifies and removes outliers in spatial (map) pixels.



Without 2nd level deglitcher

With 2nd level deglitcher

Pipeline Flow Chart

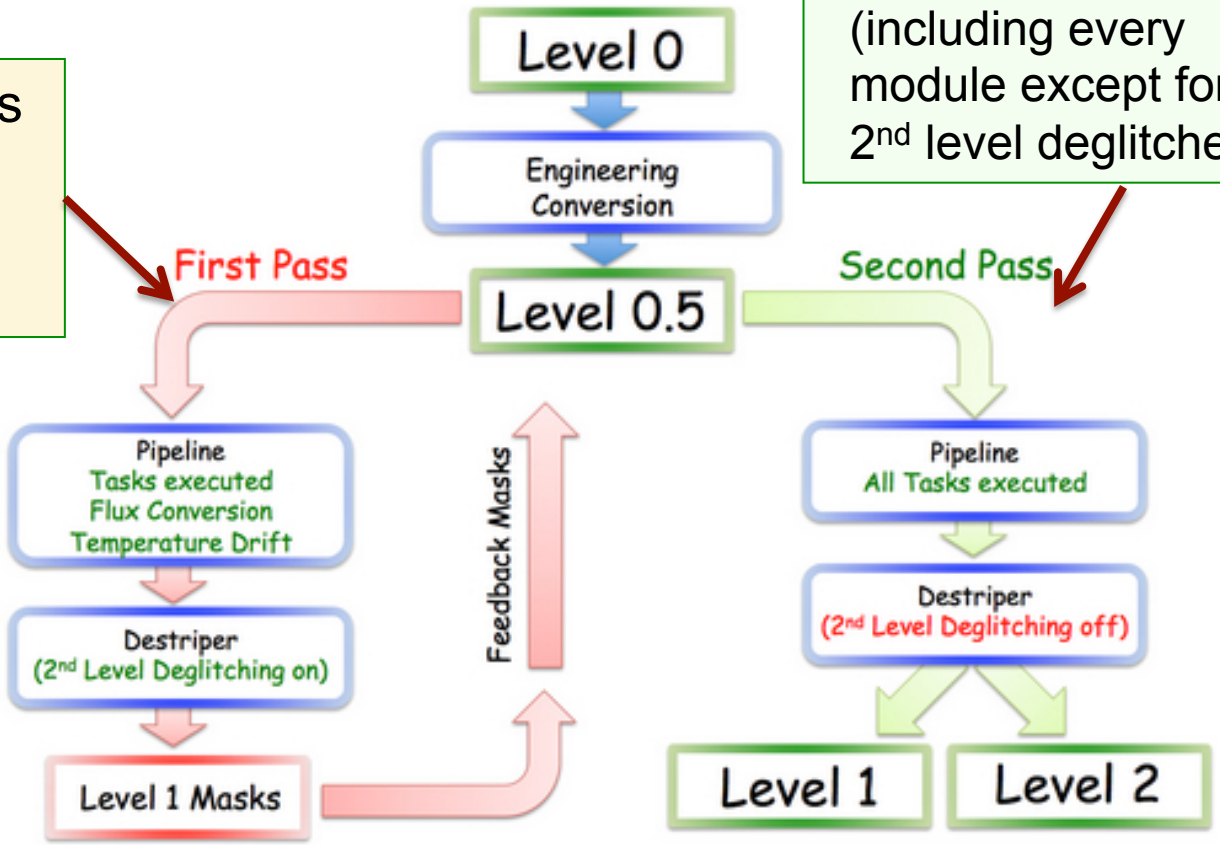


New Pipeline in HIPE 13: 2-Pass

- **2-pass Pipeline:**

1st Pass: deglitching pass (for 2nd level deglitching, no FFT modules)

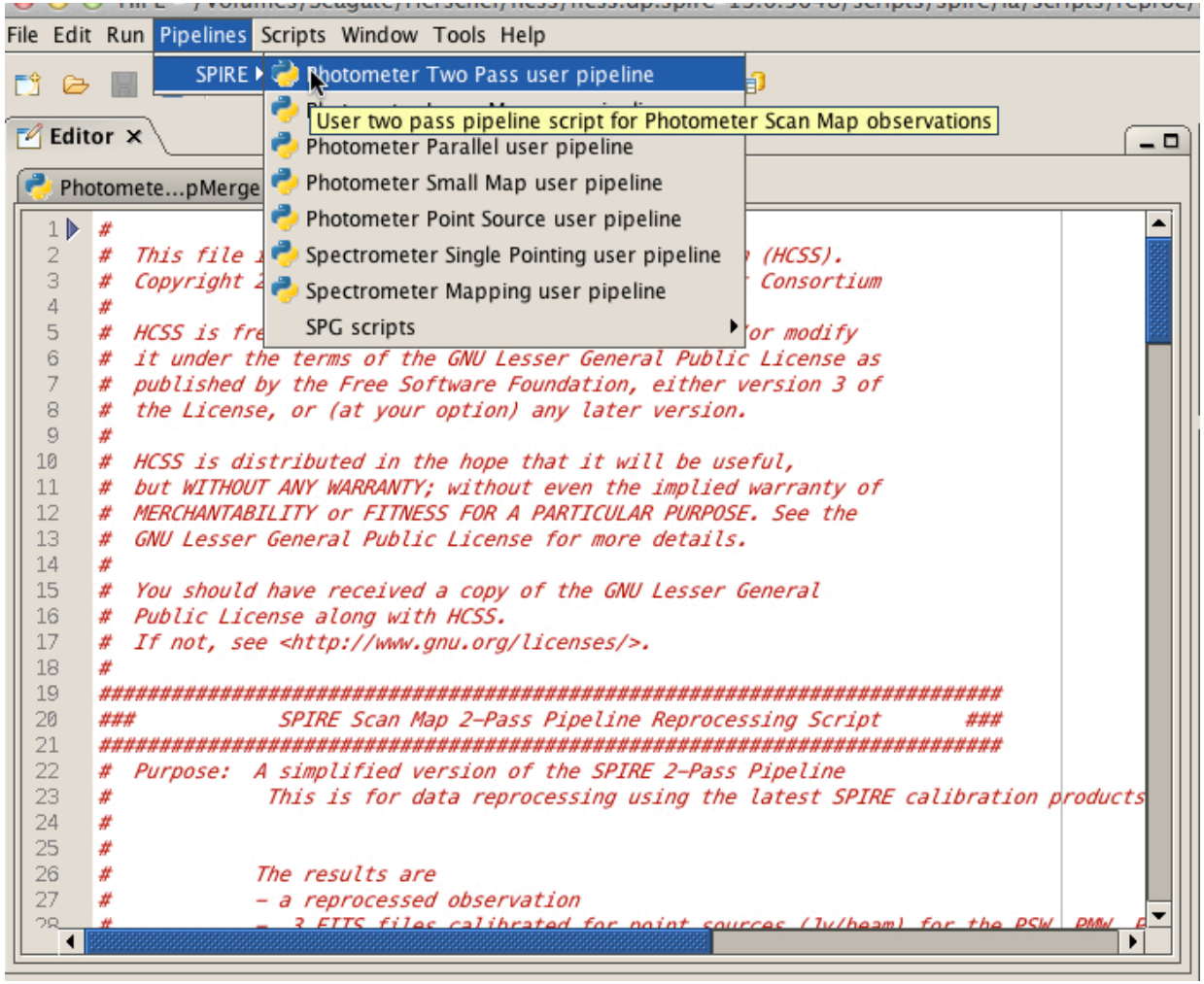
2nd pass: regular pass (including every module except for 2nd level deglitcher)



New 2-Pass Pipeline in HIPE 13

Users script for the new (2-pass) pipeline:

(to reprocess data produced by earlier HIPE)



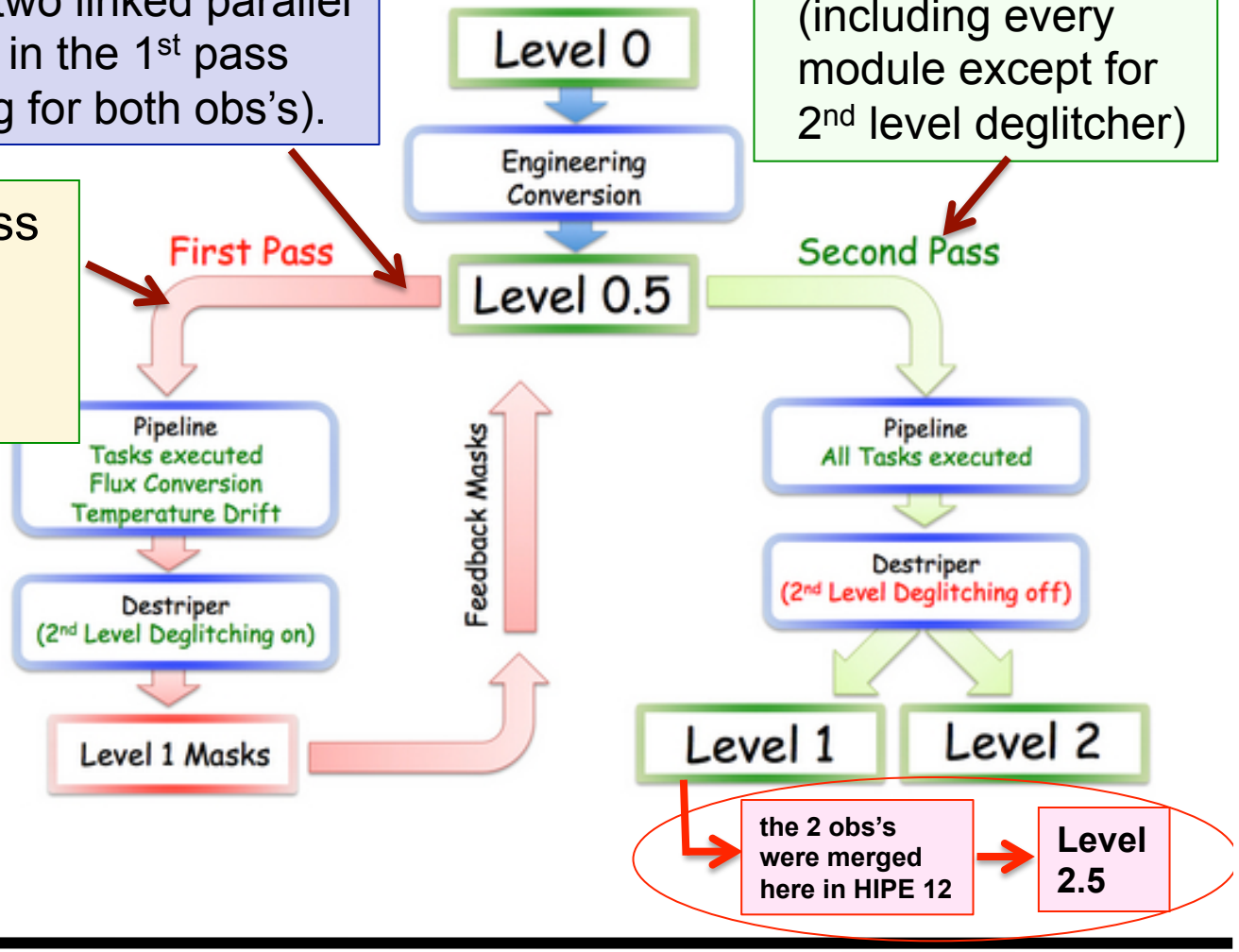
New Pipeline for Level 2.5 Maps (merging 2 parallel mode obs's)

- **2-pass Pipeline for Parallel Mode:**

Level 0.5 timelines of the two linked parallel mode obs's are combined in the 1st pass (better 2nd level deglitching for both obs's).

1st Pass: deglitching pass (2nd level deglitching, no FFT modules)

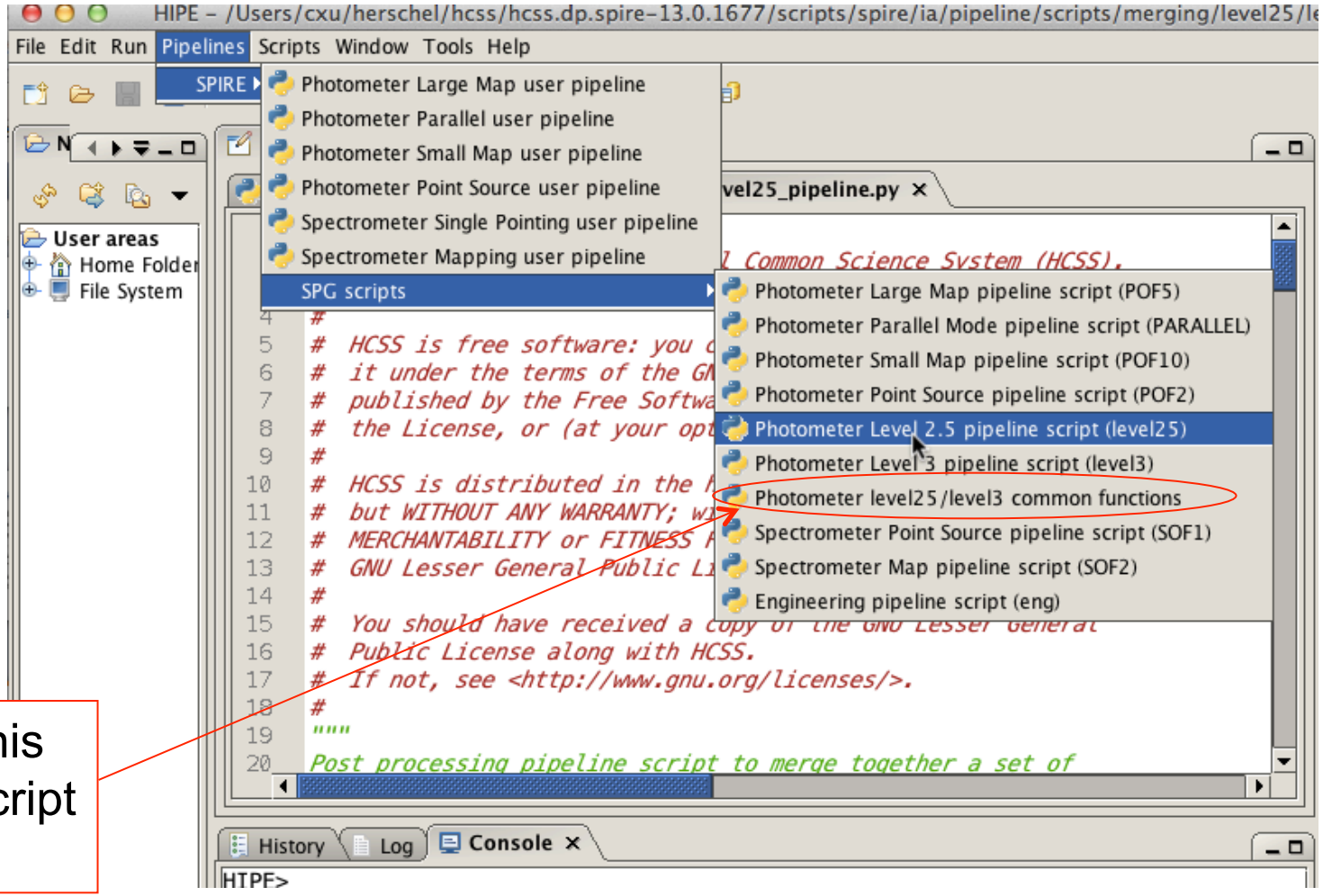
2nd pass: regular pass (including every module except for 2nd level deglitcher)



New Pipeline for Level 2.5 Maps (merging 2 parallel mode obs's)

script for the new (2-pass) level 2.5 pipeline:

(only in SPG, not in user pipelines, yet)



Need to run this preparation script first

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New Beam Profiles Calibration

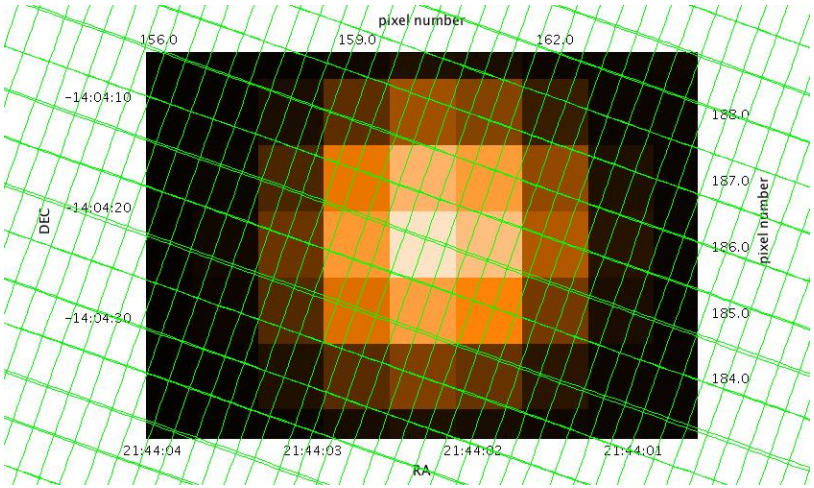
Input Data for New Analysis

- 4 observations on Neptune: tracking, scanning in Z- and in X-direction, and starting in opposite directions.
- 2 observations on background ("Shadow"): fixed position, scanning in Z- and in X-direction.

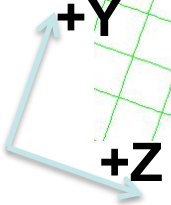
New: big improvement for background subtraction!!

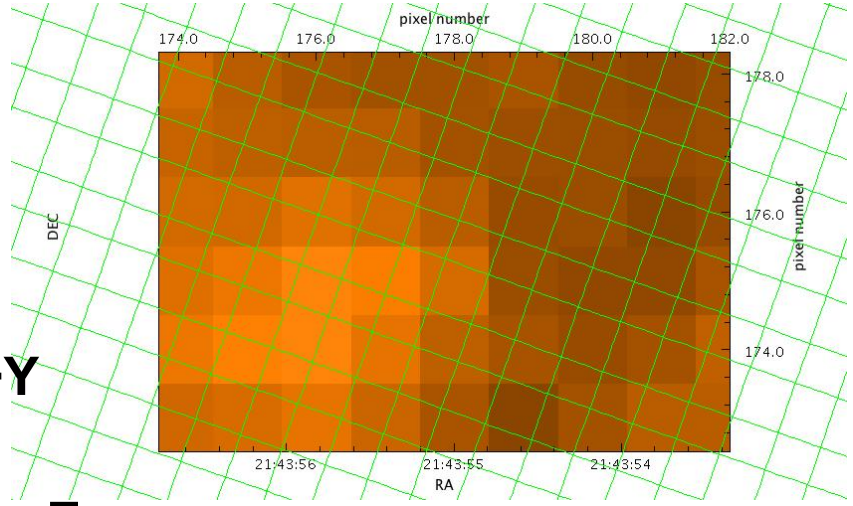
Obs ID	Target	Start Time	End Time	RA Nominal	Dec Nominal
1342186522	Neptune	2009-10-29 03:42:53	2009-10-29 07:14:04	21h 44m 2.31s	-14° 4' 21.31"
1342186523	Neptune	2009-10-29 07:15:01	2009-10-29 10:46:12	21h 44m 2.19s	-14° 4' 21.99"
1342186524	Neptune	2009-10-29 10:47:09	2009-10-29 15:14:20	21h 44m 2.06s	-14° 4' 22.66"
1342186525	Neptune	2009-10-29 15:15:15	2009-10-29 19:42:26	21h 44m 1.92s	-14° 4' 23.49"
1342255134	Shadow	2012-11-15 22:39:15	2012-11-16 01:47:38	21h 44m 2.31s	-14° 4' 23.5"
1342255135	Shadow	2012-11-16 01:48:08	2012-11-16 05:43:31	21h 44m 2.31s	-14° 4' 23.5"

New Beam Profiles



PSW 6" Neptune map (observed in 2009)

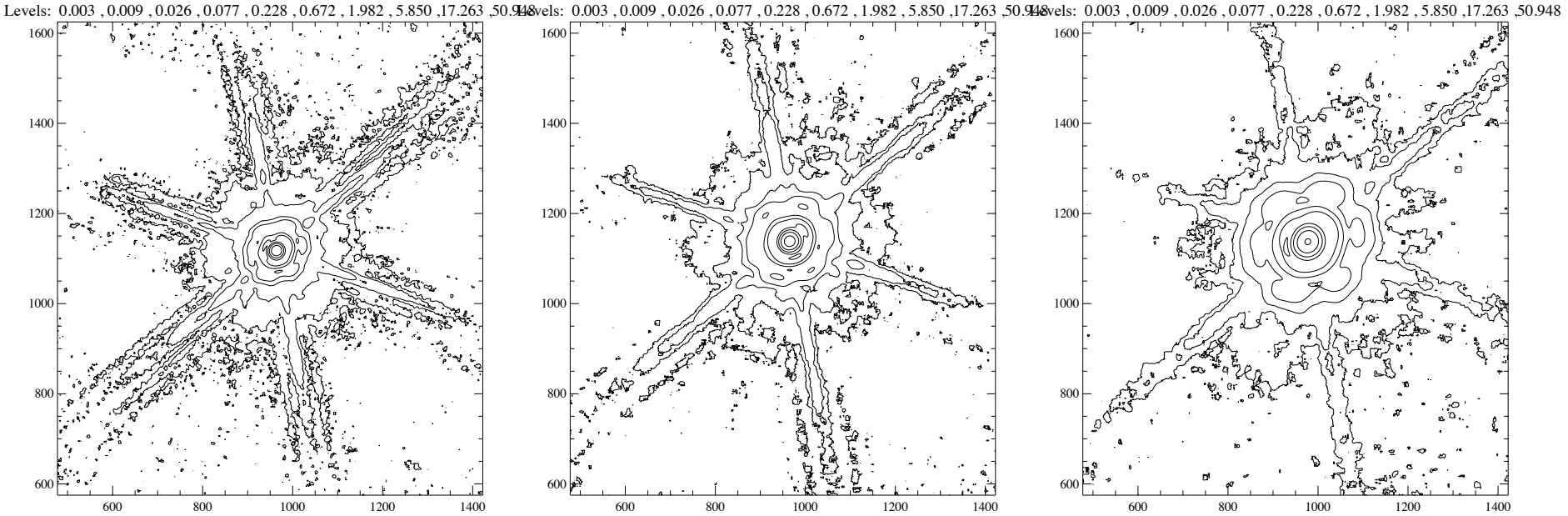




PSW 6" background ("shadow") map (observed in 2012)

New PSF Maps

The Isolated Neptune Beam Profile



New Beam Profiles

Beam Profile Model

- Effective Frequencies that align Solid angles for Neptune spectral indices
- PSW: 1224.0683 GHz
- PMW: 873.06788 GHz
- PLW: 609.86168 GHz

- Standard Solid Angles for νF_ν = const.
- PSW 469.7 +/- 0.6
- PMW 831.8 +/- 1.9
- PLW 1793.4 +/- 6.2

(arcsec^2)

Accuracy: better than 1%!!

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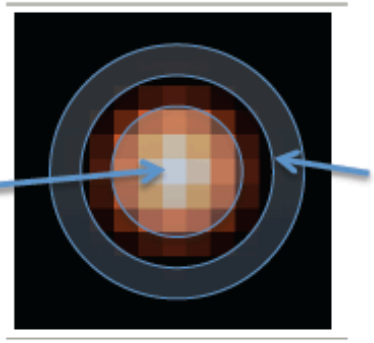
New Timeline Fitter Parameters

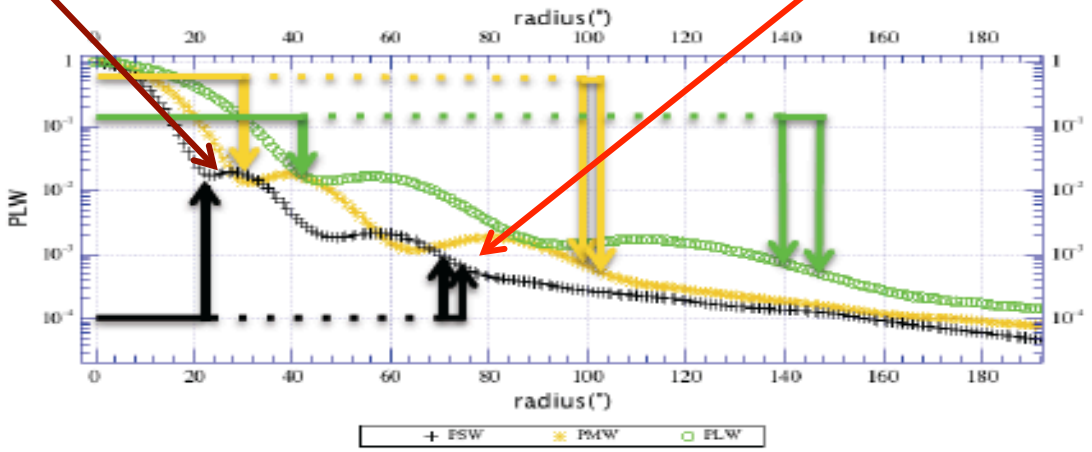


Old: same for PSW/PMW/PLW;
inner = 300", outer=350"

New: much smaller;
different for PSW/PML/PLW

No change (at 1st minimum of the PSF)

	PSW	PMW	PLW
Core radius ["]	22	30	42
Inner radius ["]	70	98	140
Outer radius ["]	74	103	147



Improvement: less sensitive to background sources.

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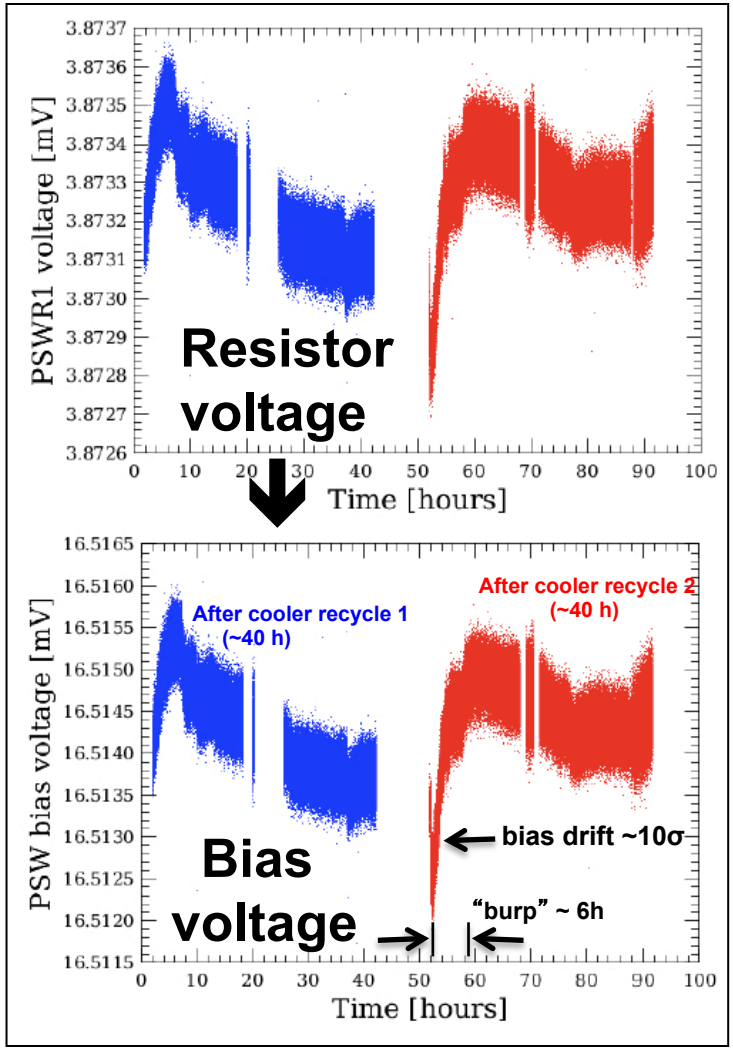
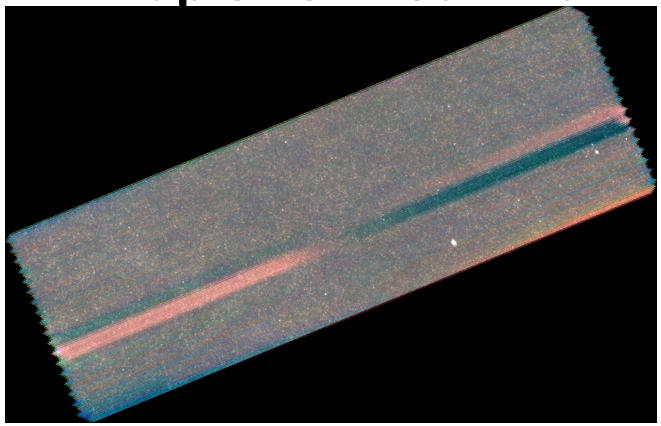
New: Improved "Cooler Burp" Correction

- Every time when SPIRE was switched on after a cooler recycle, the first ~6 h saw rapid drifts of the temperature and of the bias voltage.
- It caused abnormal drifts in detector timelines, which in turn caused stripes in maps observed during the "cooler burp" period.



Map size: ~ 8d x 2d

An example of stripes caused by cooler burp:

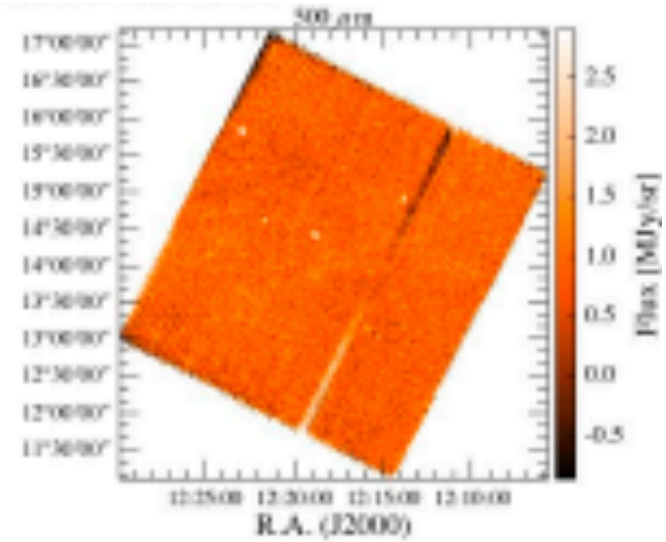


- Already corrected in HIPE 12, but …

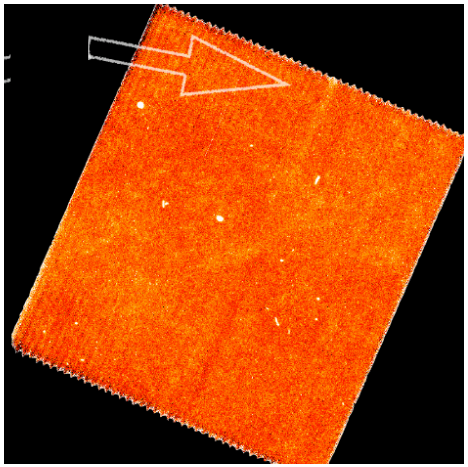
New: Improved "Cooler Burp" Correction

Cooler-Burp correction:

before correction

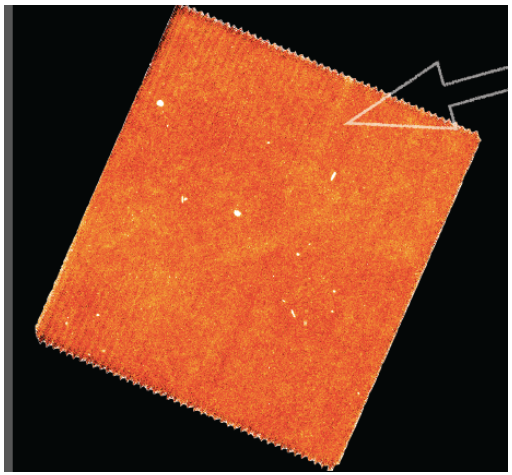


after correction (HIPE 12)



residual stripes: much fainter than uncorrected

after correction (HIPE 13)



residual stripes: slightly improved over those in HIPE 12 results

Summary

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Major Changes

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Anticipated Major Changes in HIPE 14 (Targeted release date: the end of 2015?)

- **Including HiRes ("super-resolution") maps in the standard Level 2 & Level 2.5 products**
- **Further improvements for the destriper and the 2nd level deglitcher.**