

Herschel Map-Making Workshop
ESAC, 28-31 January 2013



PACS Metrics: Difference maps

Vera Könyves
IAS/Orsay – CEA/Saclay

On behalf of the PACS map-making test team

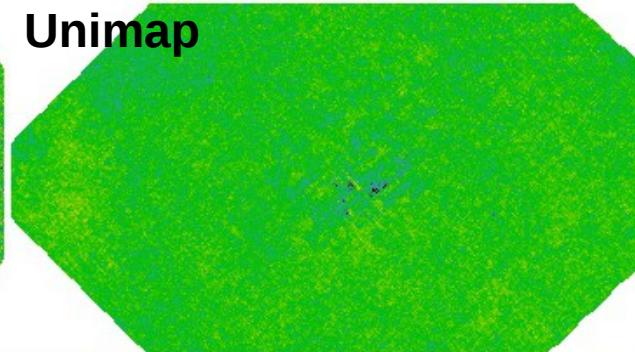
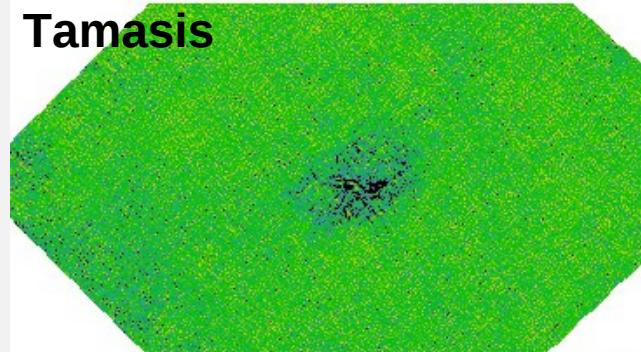
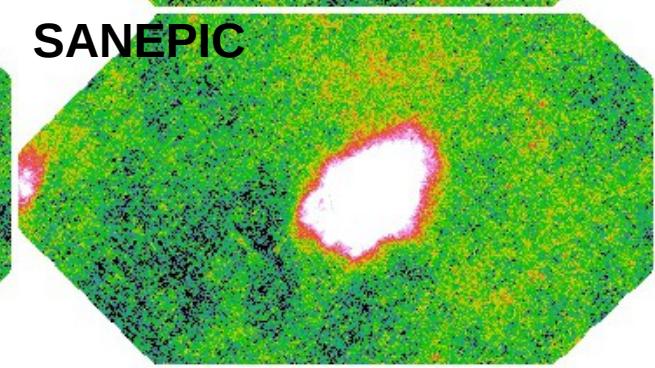
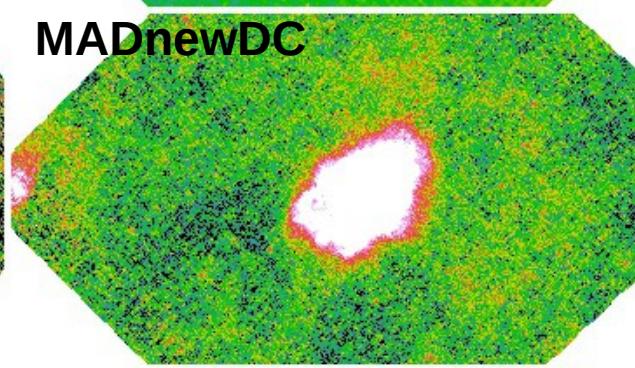
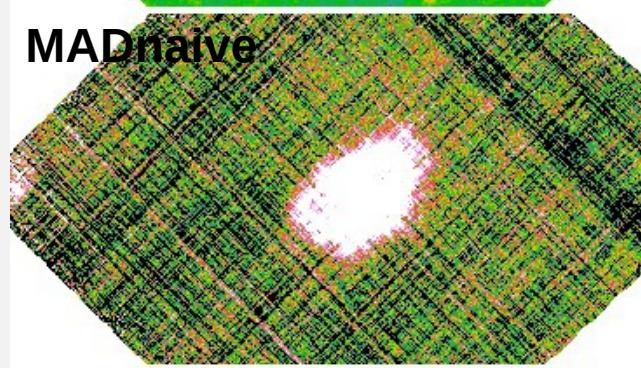
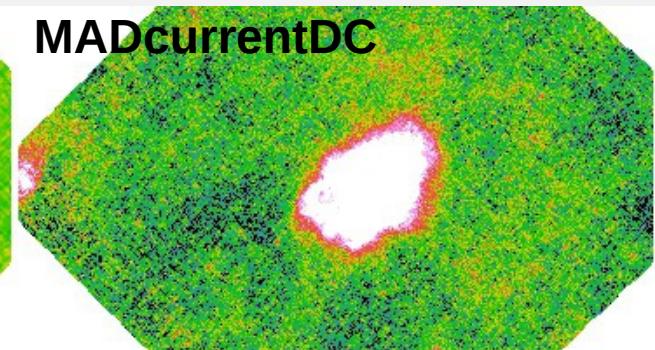
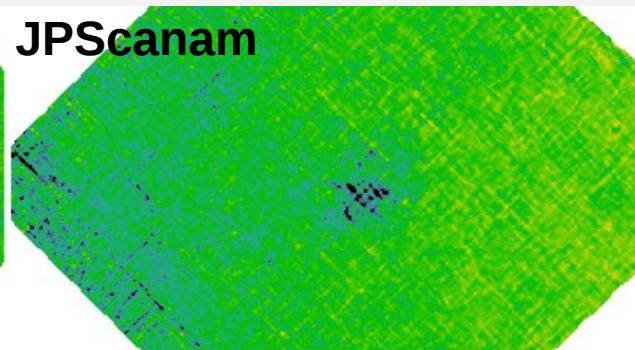
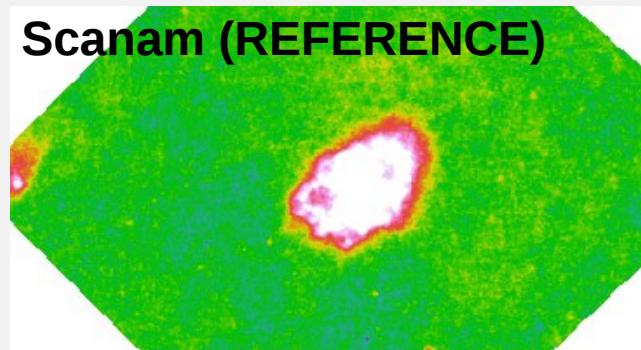
PACS metrics (Difference maps)

- Compare real observations, chosen reference: Scanamorphos maps
 - Crab, Polaris, HiGal, Rosette
 - Difference maps ($S - S_{\text{reference}}$)
- Compare simulations: v2, v3 hybrid simulations (Vavrek et al.) for “Faint” and “Bright” sky
 - scatter plot of $(S - S_{\text{true}})$ vs S_{true} for individual pixels
 - absolute difference, standard deviation of $(S - S_{\text{true}})$
 - slope of $(S - S_{\text{true}})$ vs S_{true}

Calculations, plots done in IDL.

PACS: Difference maps – observations

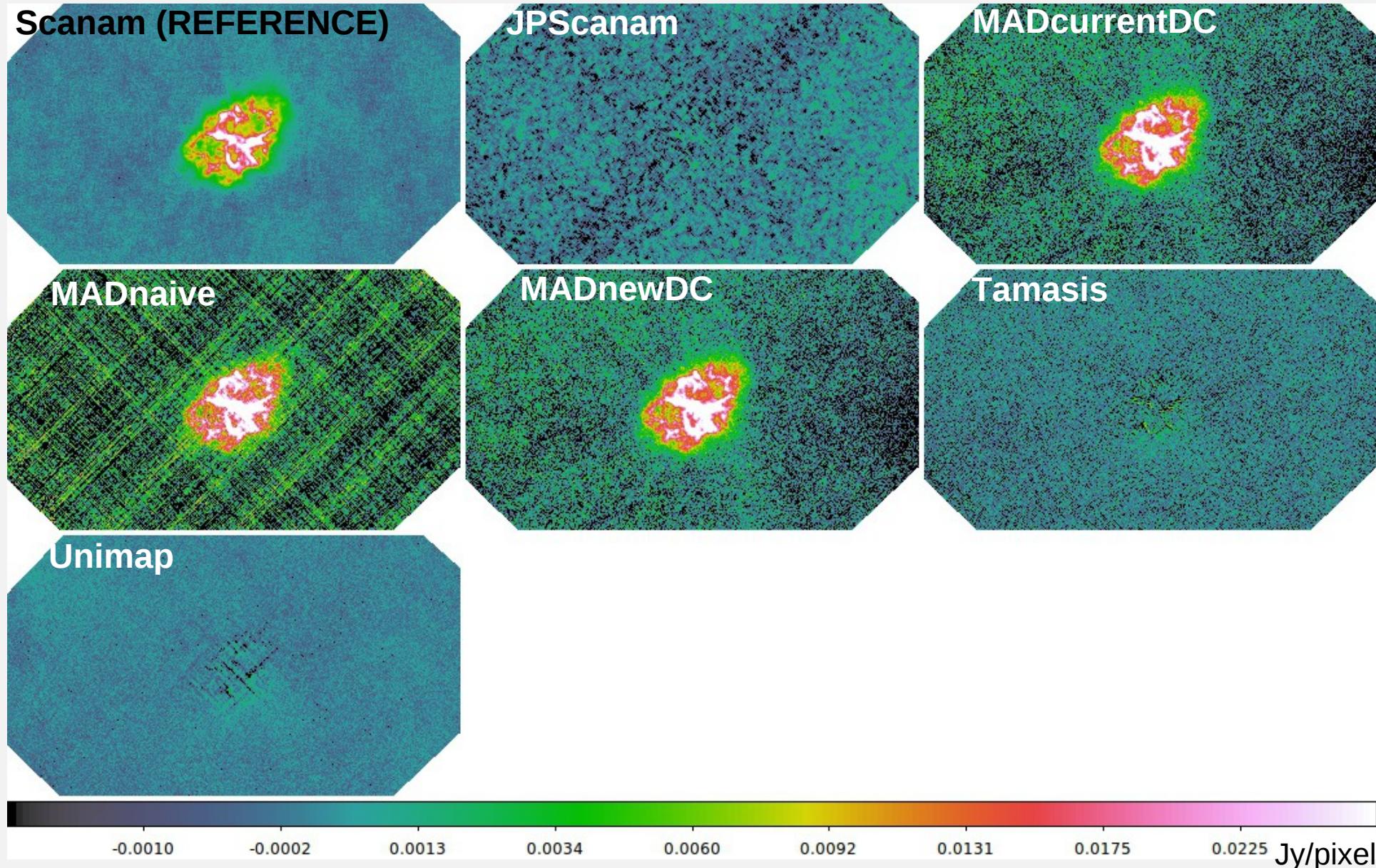
$(S - S^{\text{reference}}) - \text{median}(S - S^{\text{reference}})$, Crab red



Scale is comparable for the reference and for the difference maps

PACS: Difference maps – observations

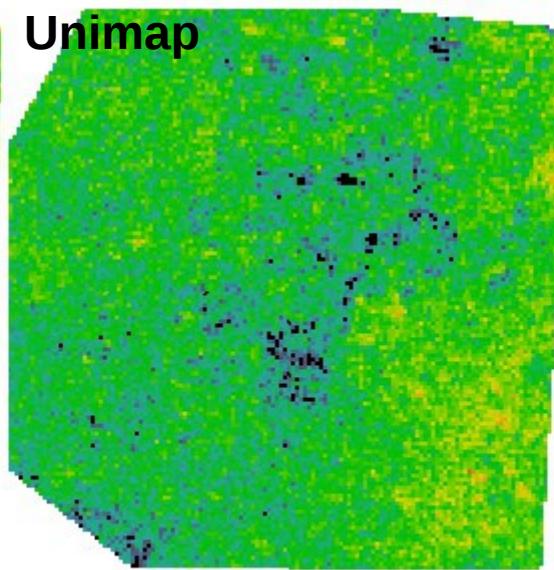
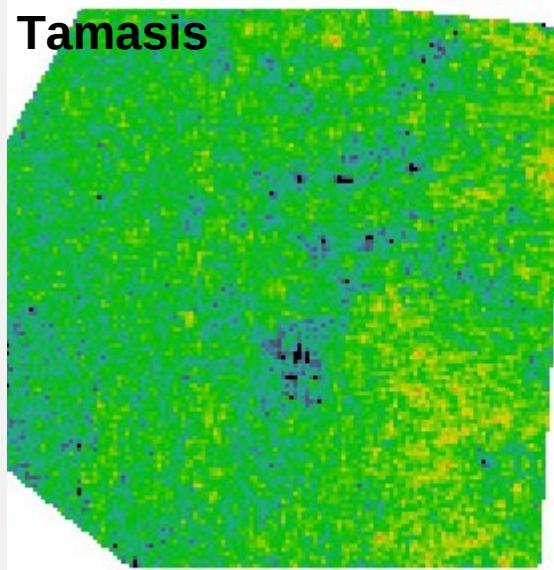
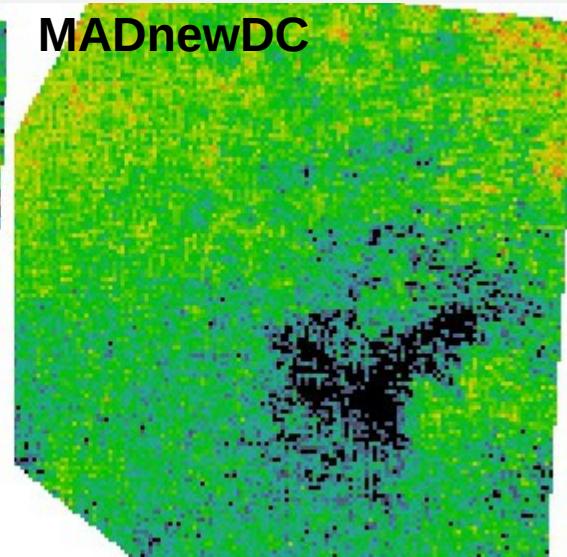
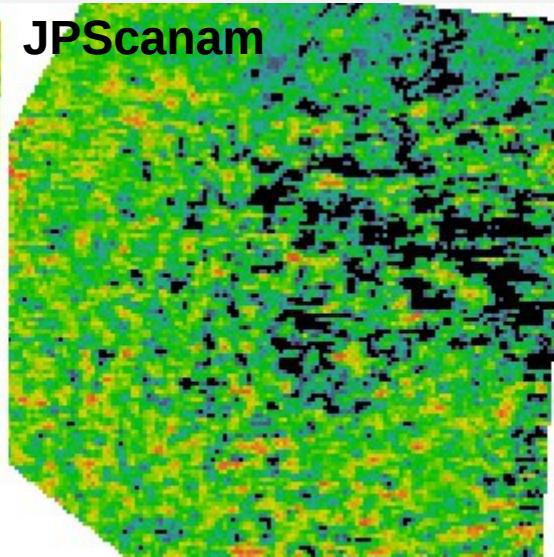
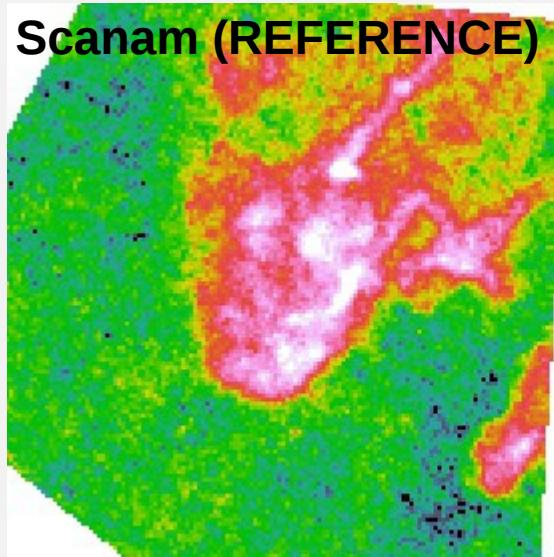
$(S - S^{\text{reference}}) - \text{median}(S - S^{\text{reference}})$, Crab blue



Scale is comparable for the reference and for the difference maps

PACS: Difference maps – observations

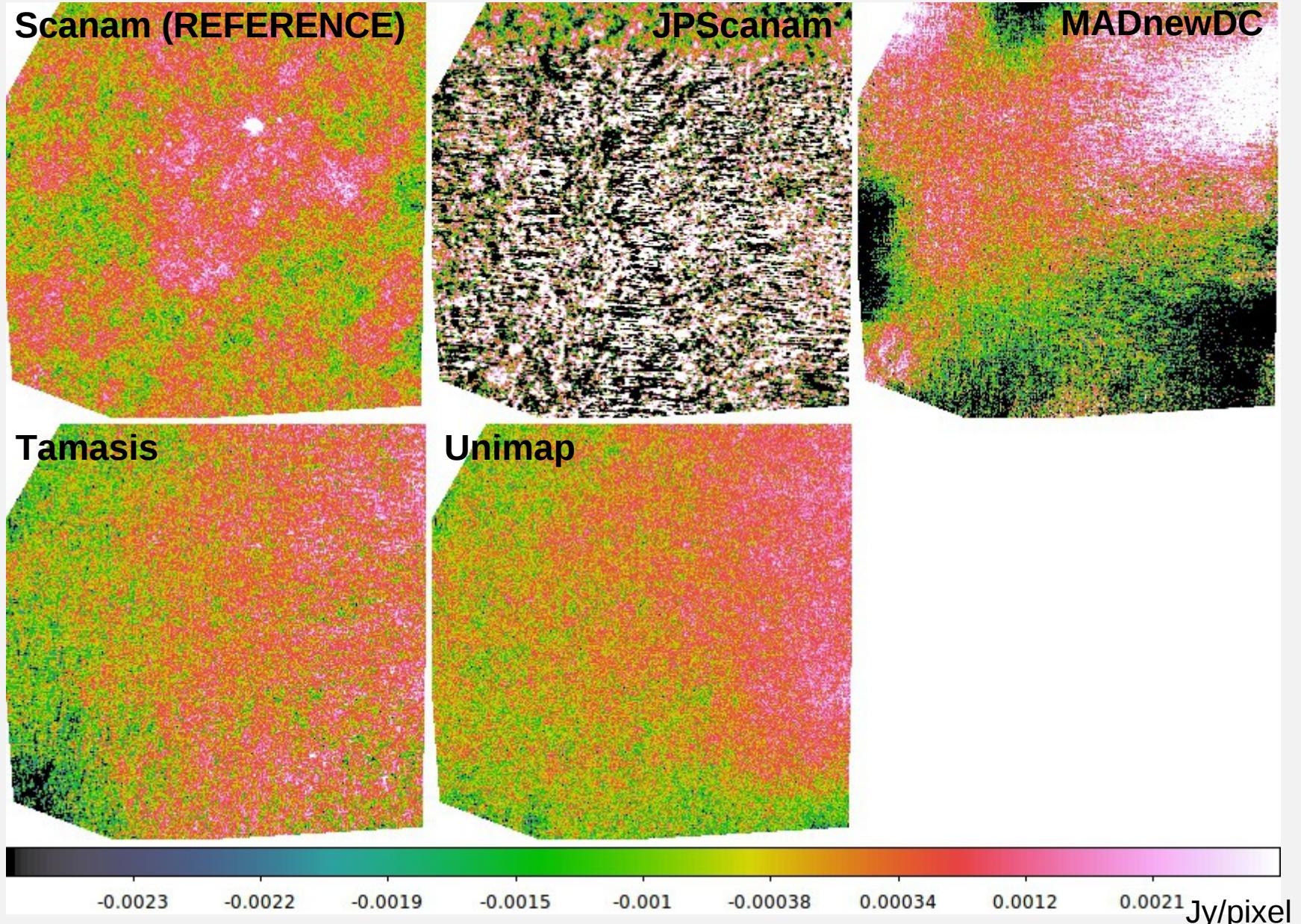
$(S - S^{\text{reference}}) - \text{median}(S - S^{\text{reference}})$, Polaris red



Scale is comparable for the reference and for the difference maps

PACS: Difference maps – observations

$(S - S^{\text{reference}}) - \text{median}(S - S^{\text{reference}})$, Polaris green

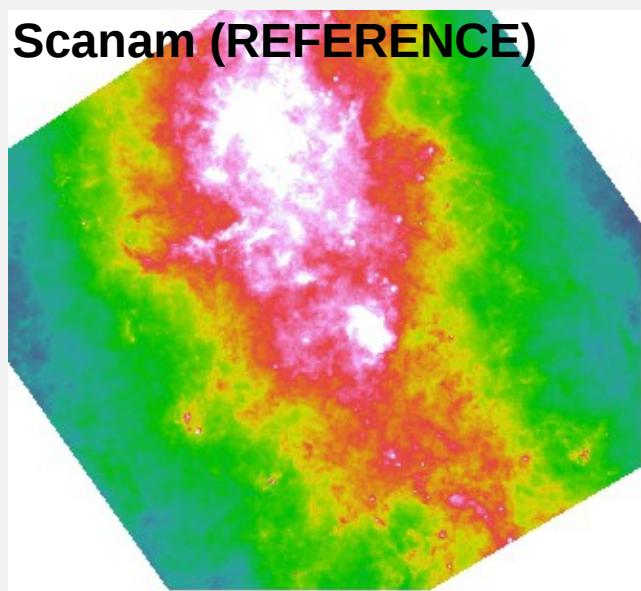


Scale is comparable for the reference and for the difference maps

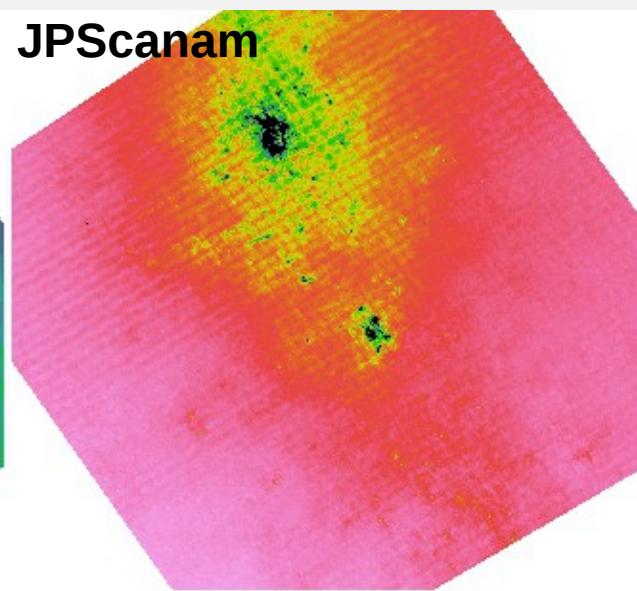
PACS: Difference maps – observations

$(S - S^{\text{reference}}) - \text{median}(S - S^{\text{reference}})$, HiGal-L30 red

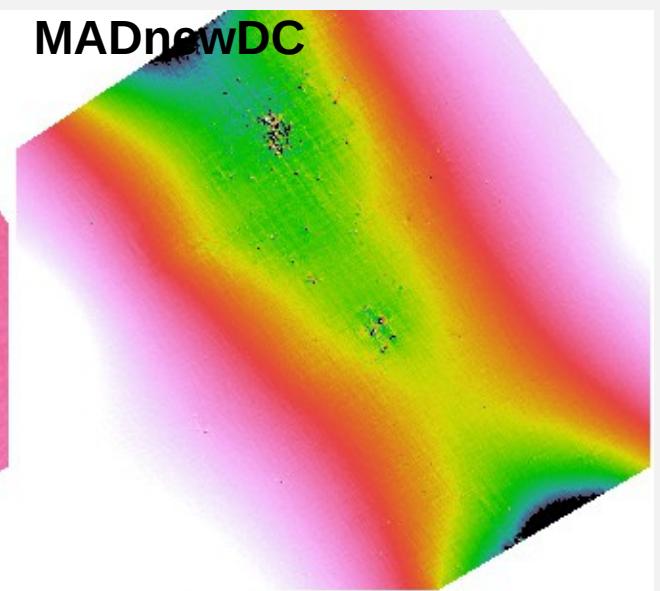
Scnam (REFERENCE)



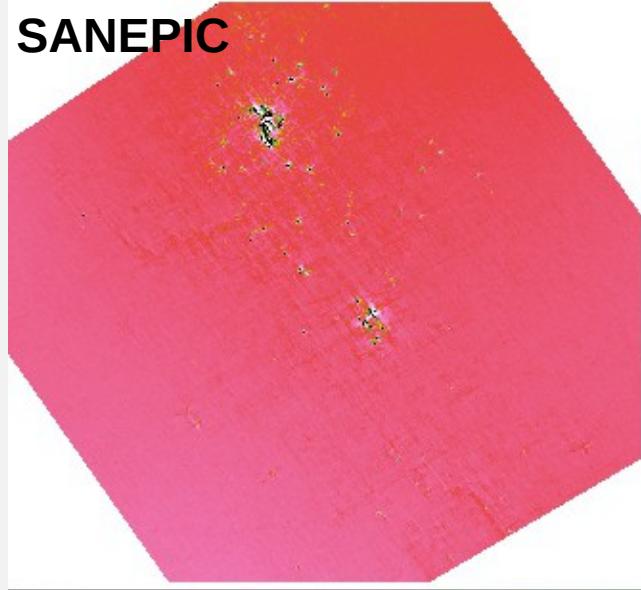
JPScanam



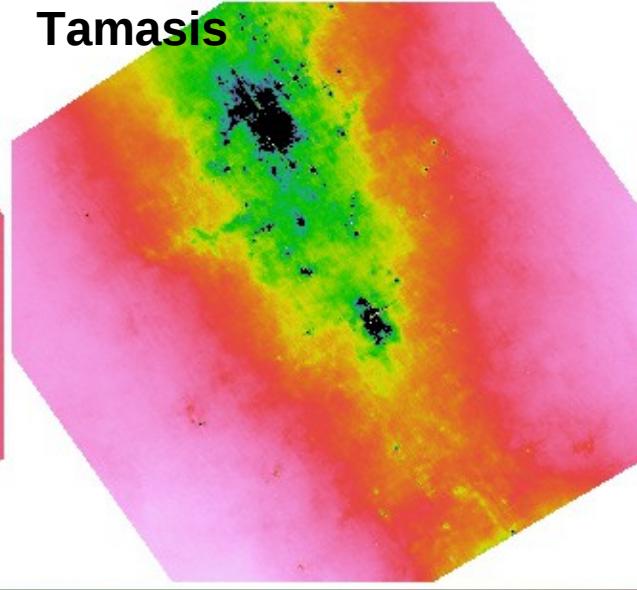
MADnewDC



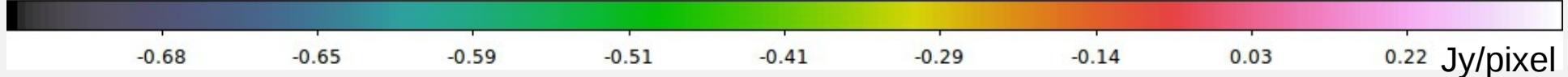
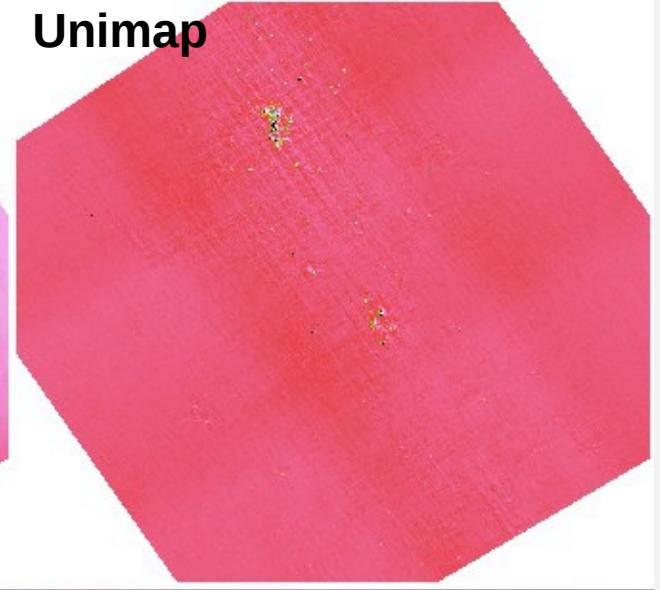
SANEPIC



Tamasis



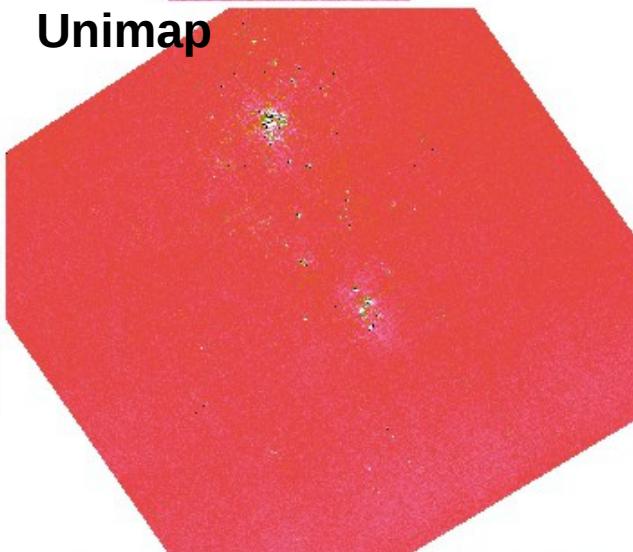
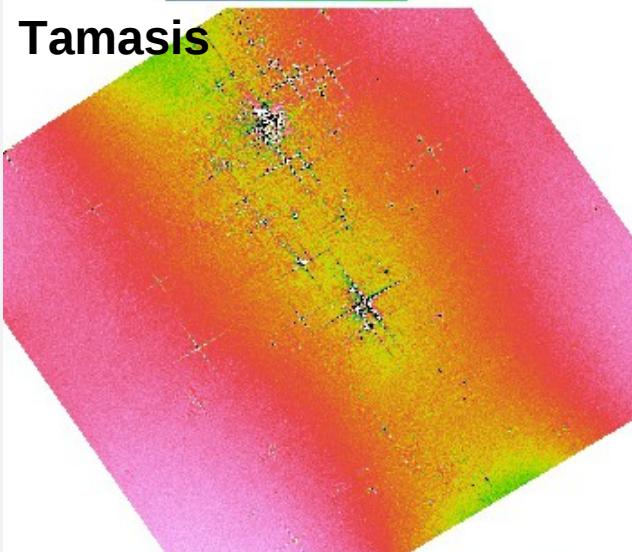
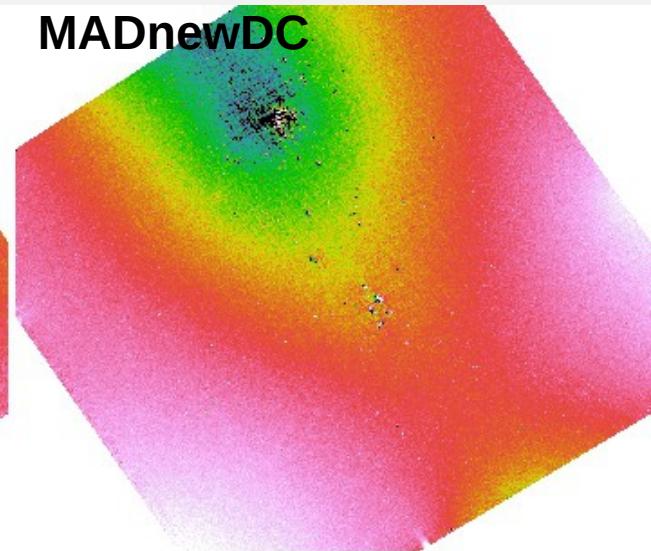
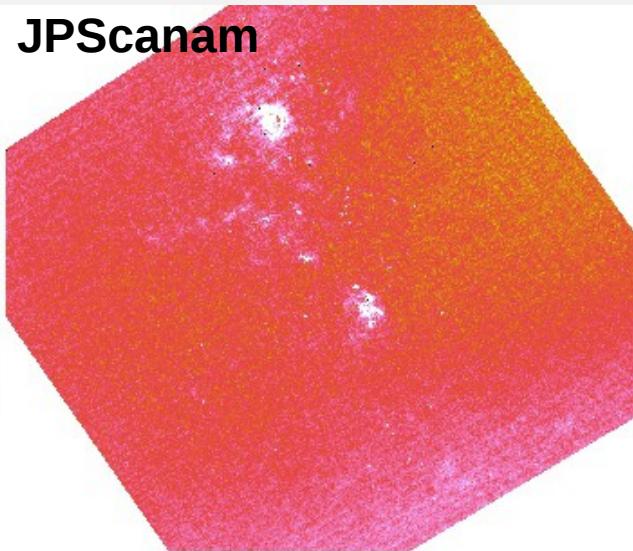
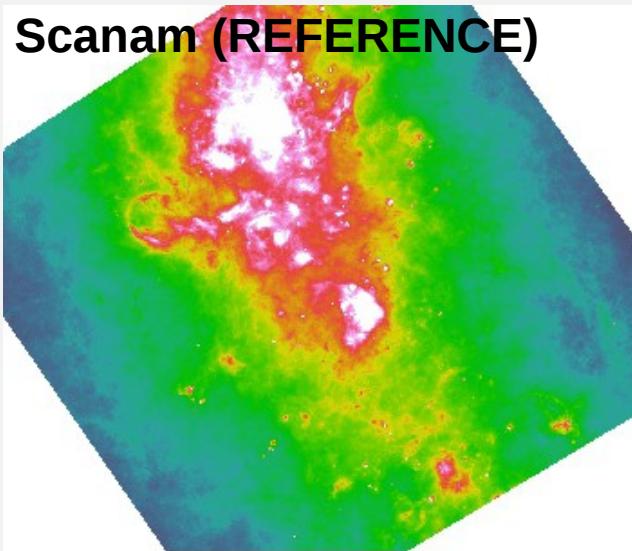
Unimap



Scale is comparable for the median-removed difference maps

PACS: Difference maps – observations

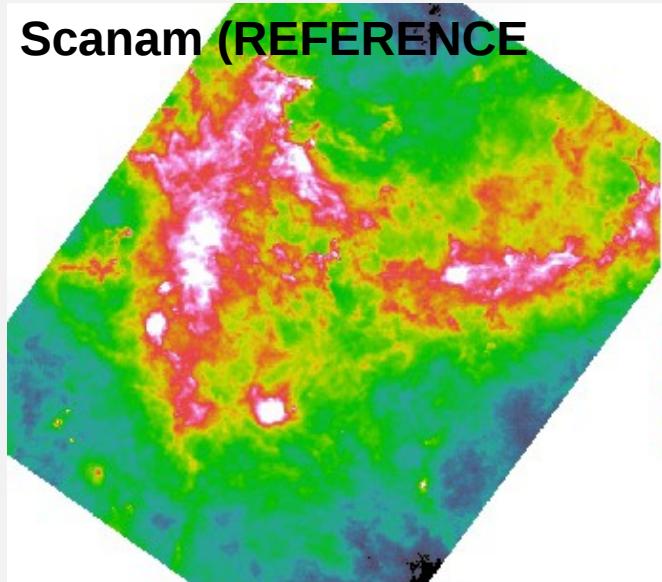
$(S - S^{\text{reference}}) - \text{median}(S - S^{\text{reference}})$, HiGal-L30 blue



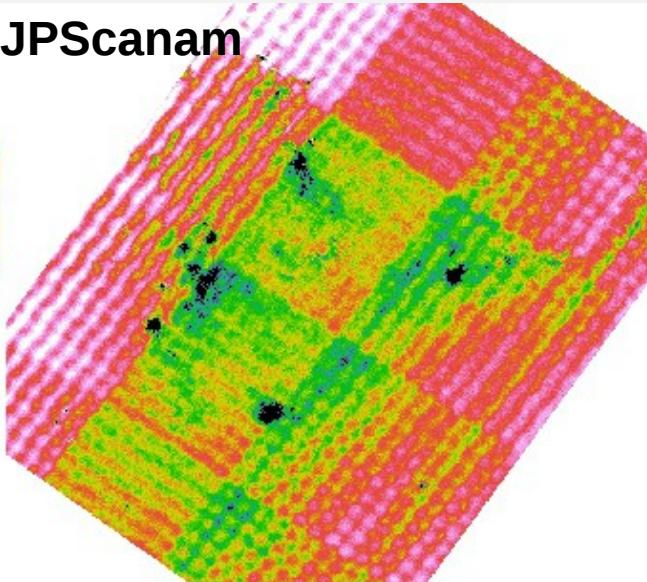
Scale is comparable for the median-removed difference maps

$$(S - S^{\text{reference}}) - \text{median}(S - S^{\text{reference}}), \text{ Rosette red}$$

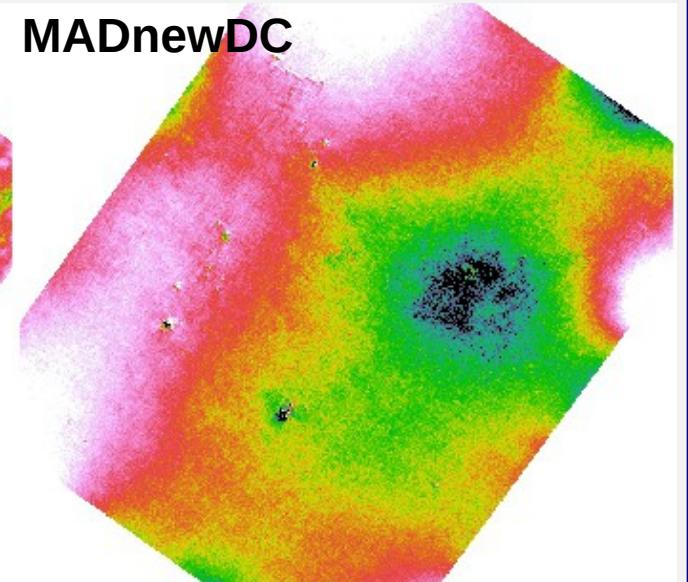
Scnam (REFERENCE)



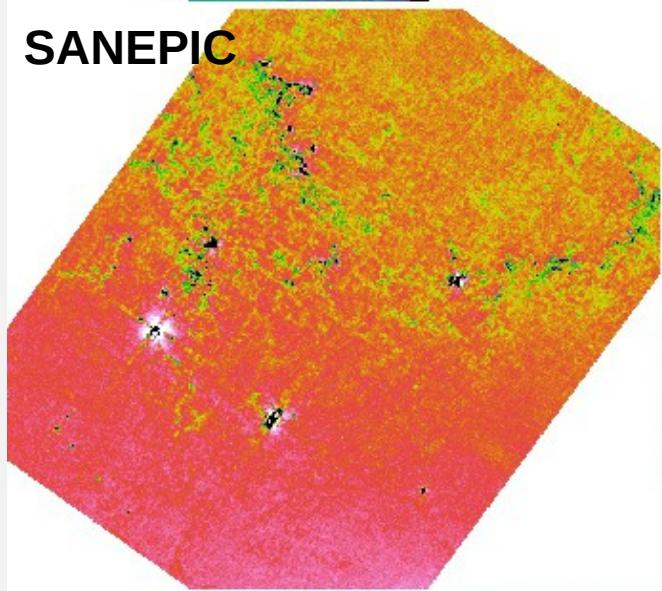
JPScanam



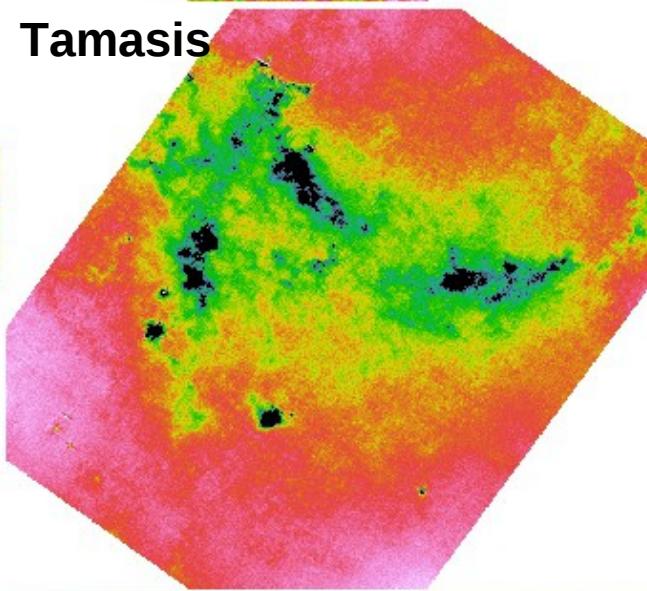
MADnewDC



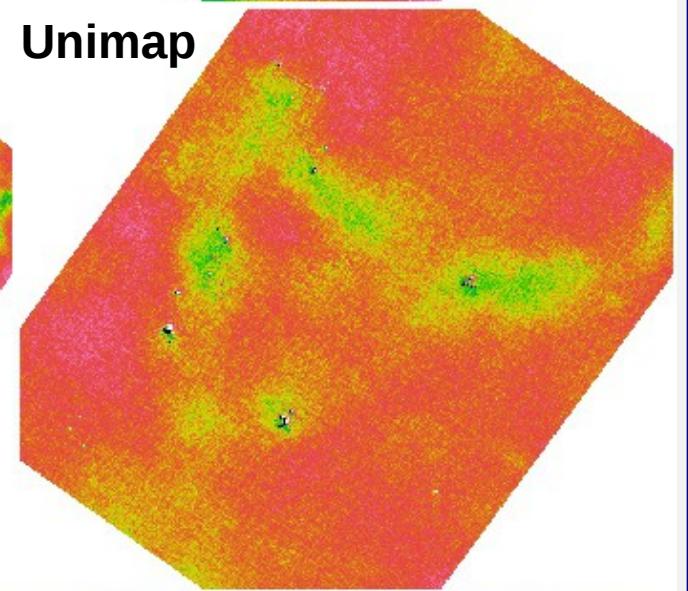
SANEPIC



Tamasis



Unimap



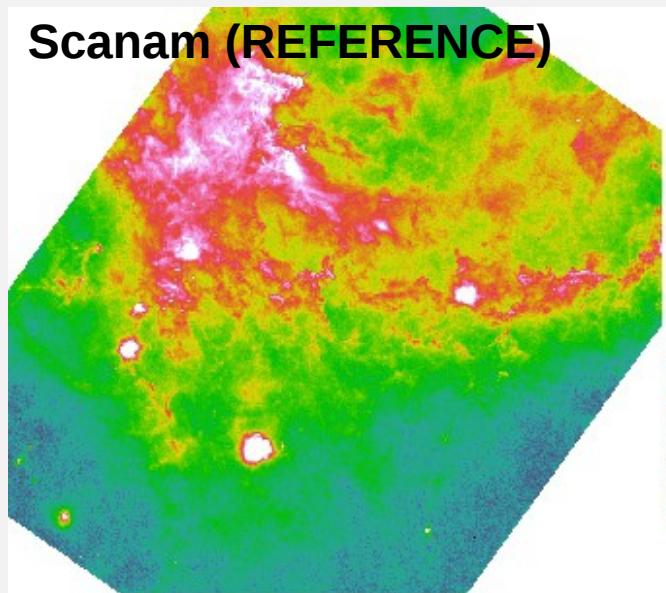
-0.056 -0.053 -0.047 -0.038 -0.028 -0.015 0.00089 0.019 0.039 Jy/pixel

Scale is comparable for the median-removed difference maps

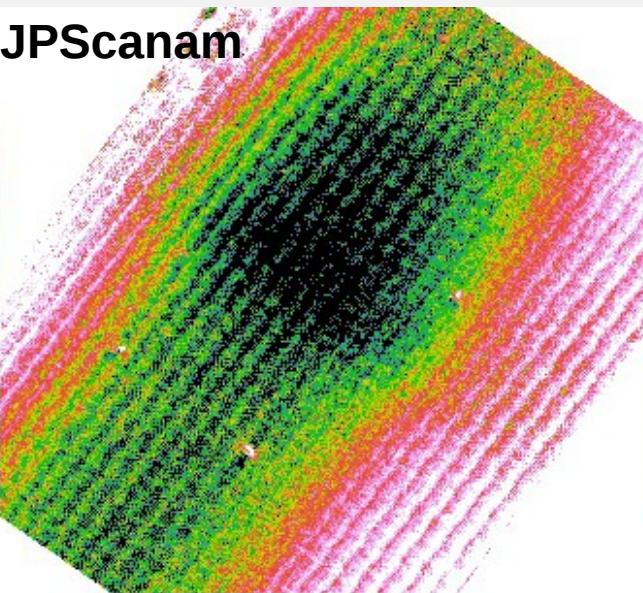
PACS: Difference maps – observations

$(S - S^{\text{reference}}) - \text{median}(S - S^{\text{reference}})$, Rosette blue

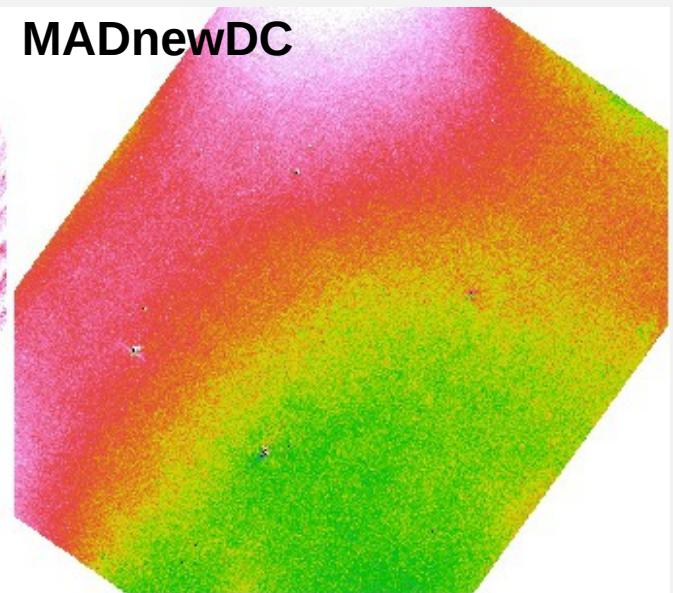
Scnam (REFERENCE)



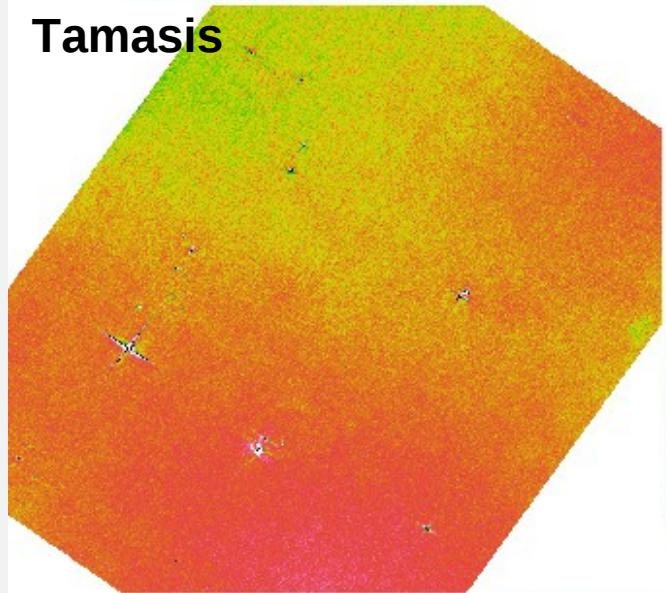
JPScanam



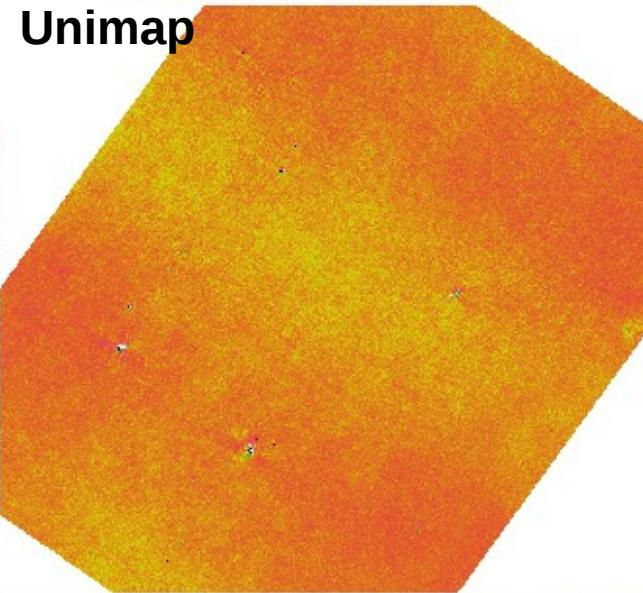
MADnewDC



Tamasis



Unimap



$-0.0196 \quad -0.0182 \quad -0.0159 \quad -0.0128 \quad -0.00873 \quad -0.00379 \quad 0.00204 \quad 0.00884 \quad 0.0165 \text{ Jy/pixel}$

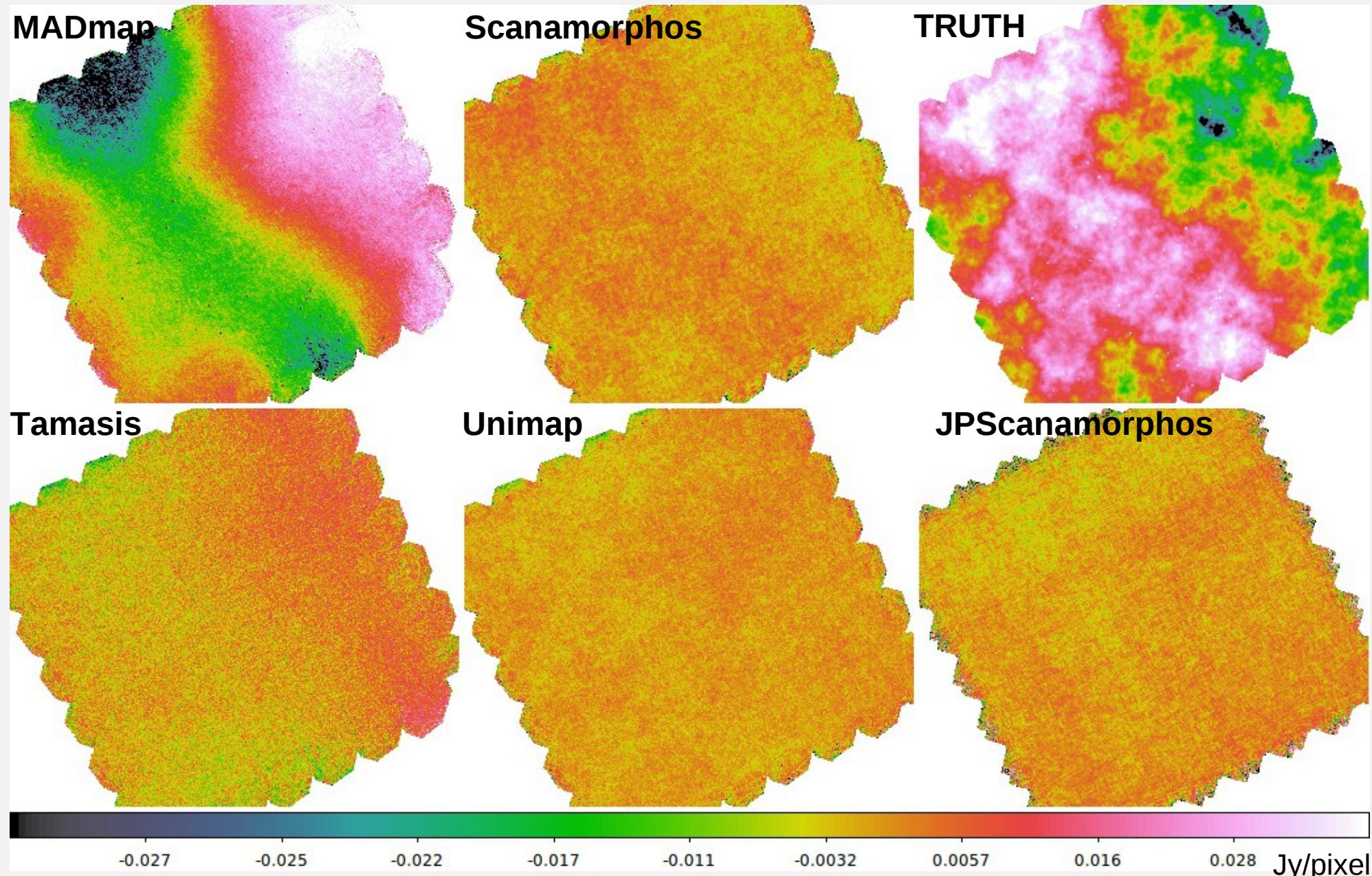
Scale is comparable for the median-removed difference maps

PACS metrics (Difference maps)

- V3 Hybrid simulations (“Bright”, “Faint”, reprojected):
 - processed maps from **MADmap**, **Tamasis**, **Scananmorphos20**, **Unimap**, **JPScanamorphos**
 - scatter plot of $(S - S_{\text{true}})$ vs S_{true} for individual pixels
 - absolute difference, standard deviation of $(S - S_{\text{true}})$
 - slope of $(S - S_{\text{true}})$ vs S_{true}

PACS: Difference maps – v3 simulations

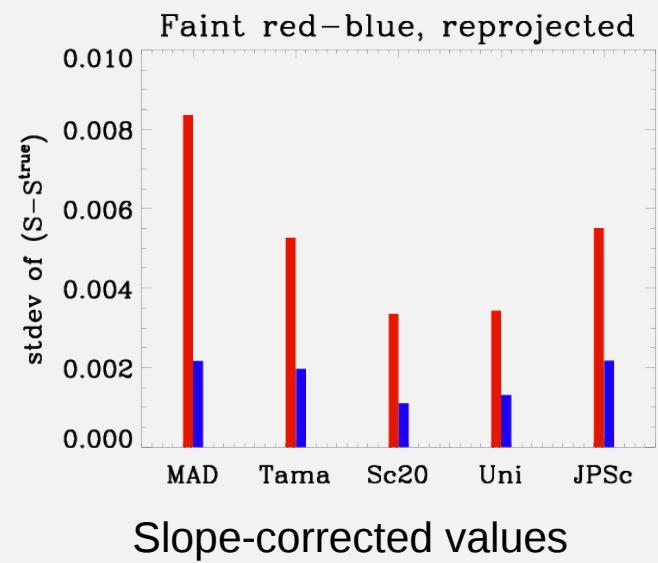
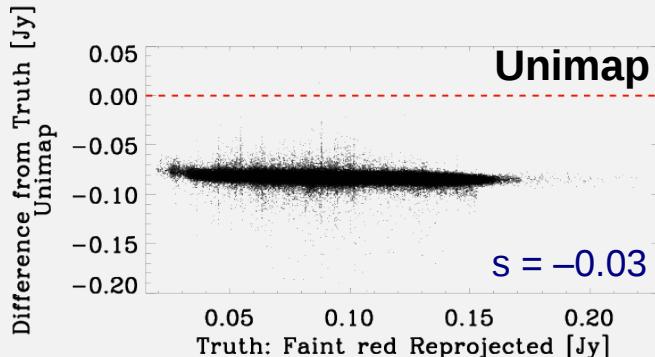
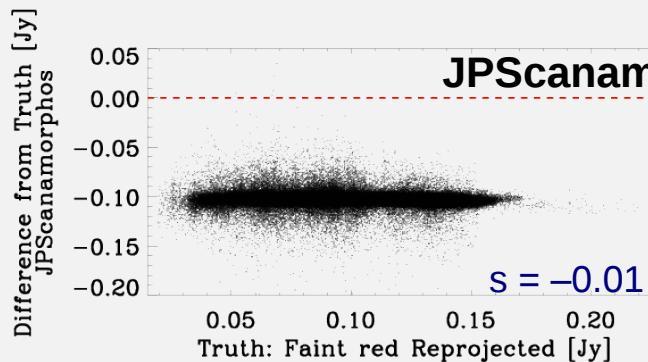
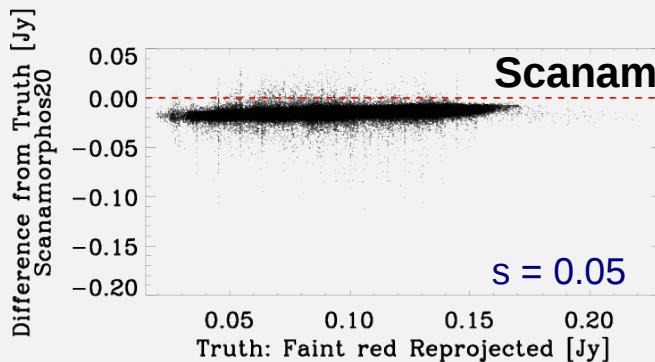
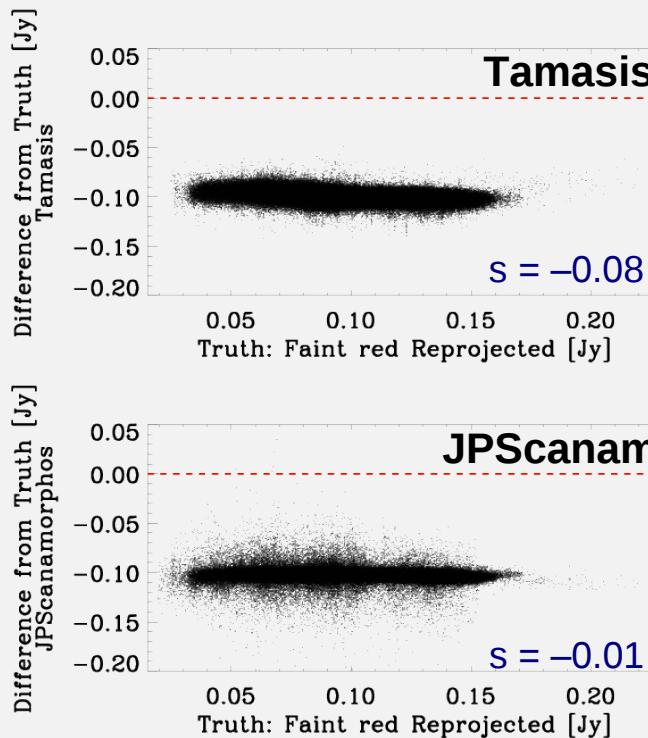
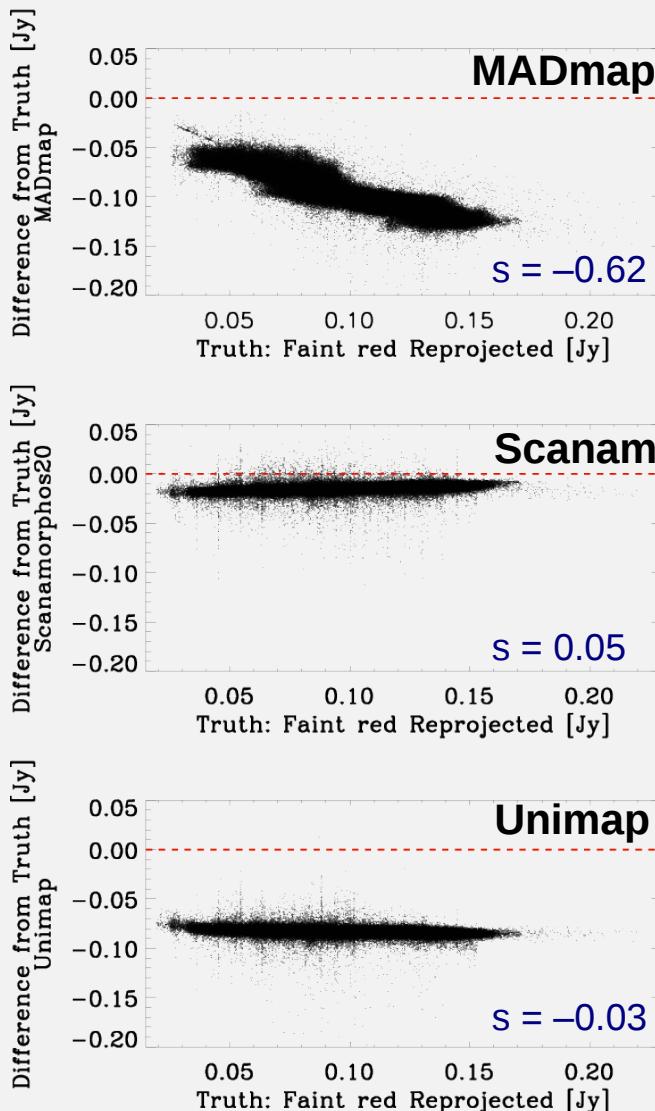
$(S - S^{\text{true}}) - \text{median}(S - S^{\text{true}})$, “Faint” red



Scale is comparable for the median-removed difference maps

PACS: Difference maps – v3 simulations

“Faint” red case

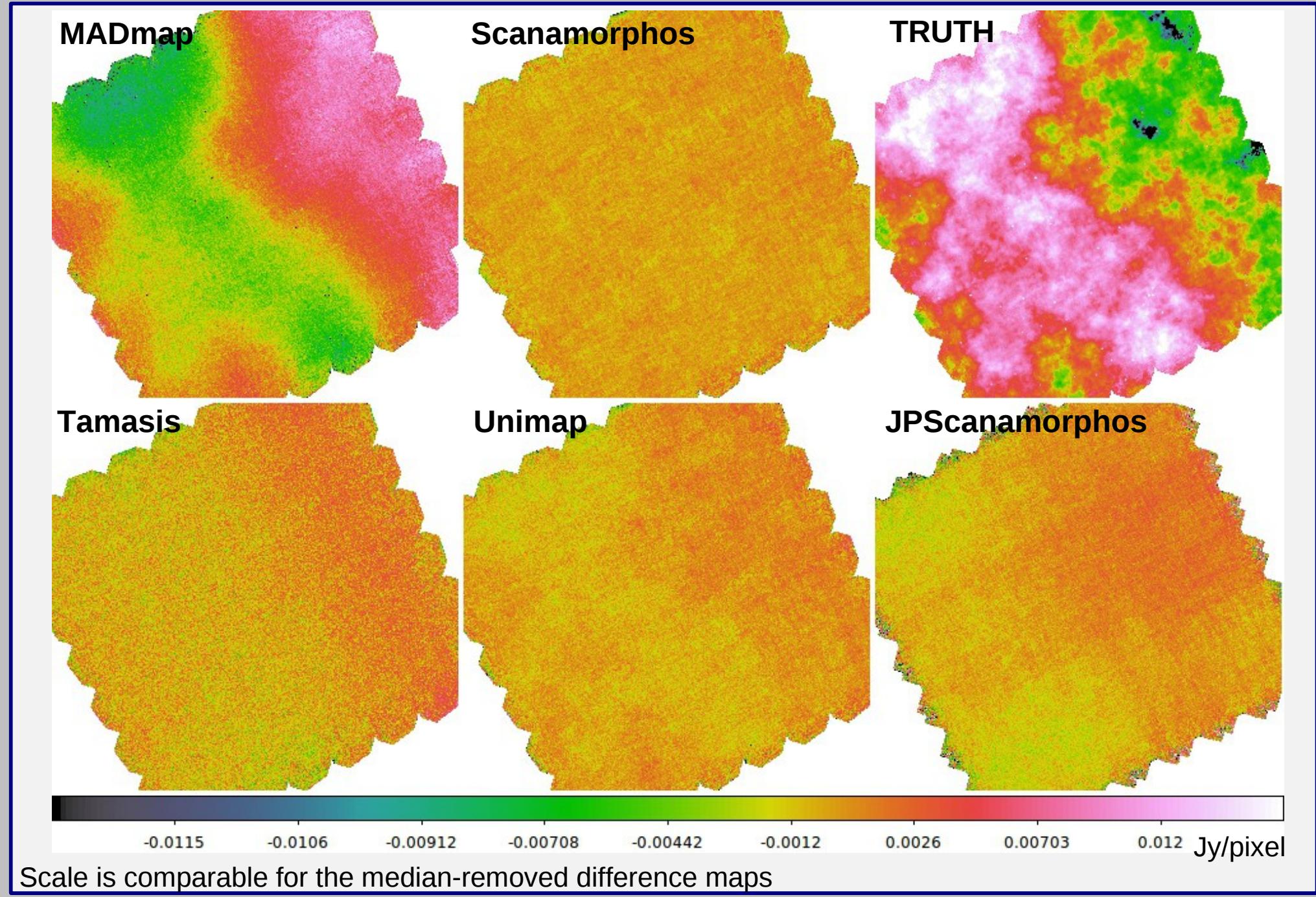


Scatter plots of
 $(S - S_{\text{true}})$ vs S_{true}

Not offset corrected

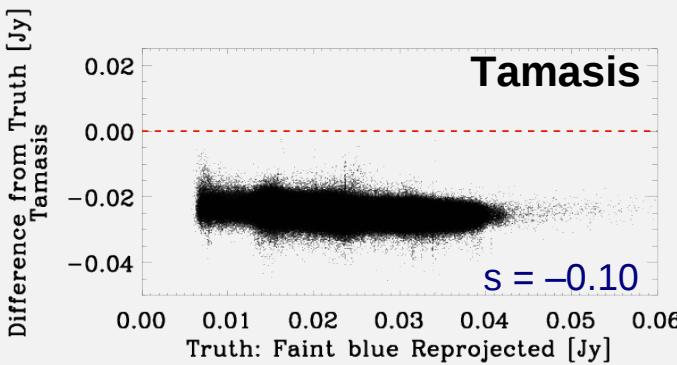
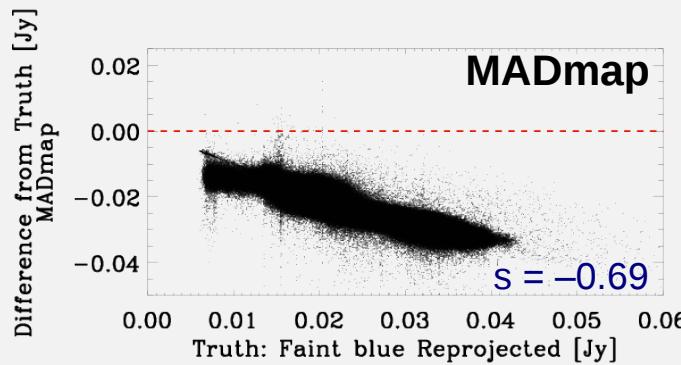
PACS: Difference maps – v3 simulations

$(S - S^{\text{true}}) - \text{median}(S - S^{\text{true}})$, “Faint” blue

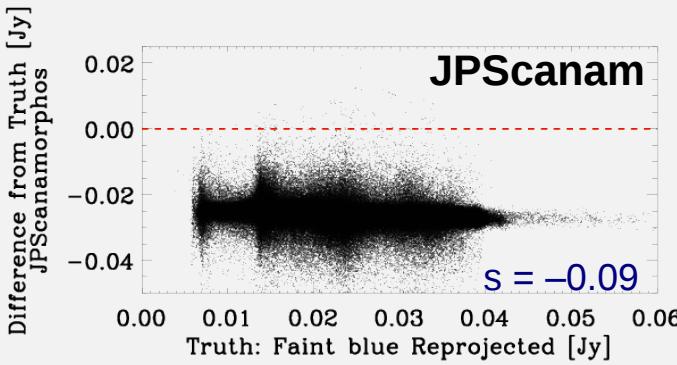
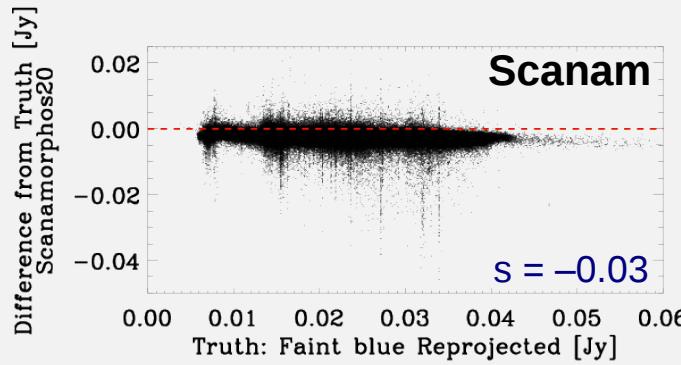


PACS: Difference maps – v3 simulations

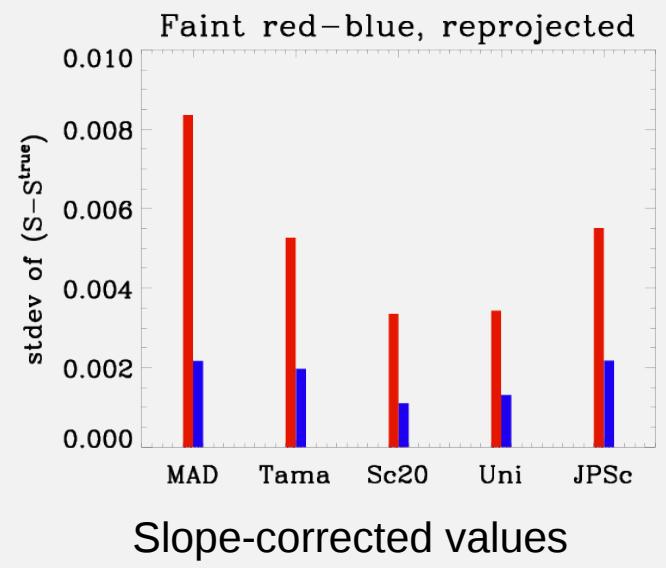
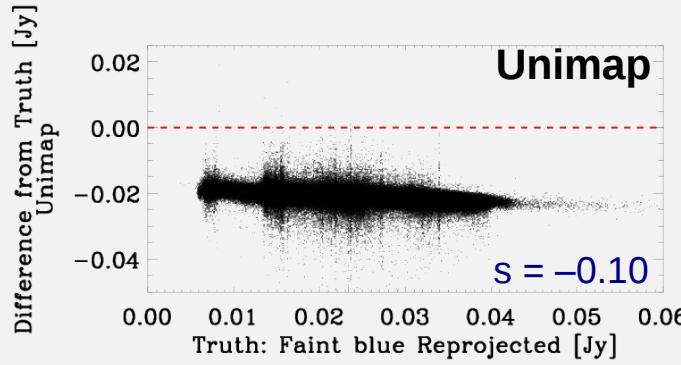
“Faint” blue case



Scatter plots of
 $(S - S_{\text{true}})$ vs S_{true}

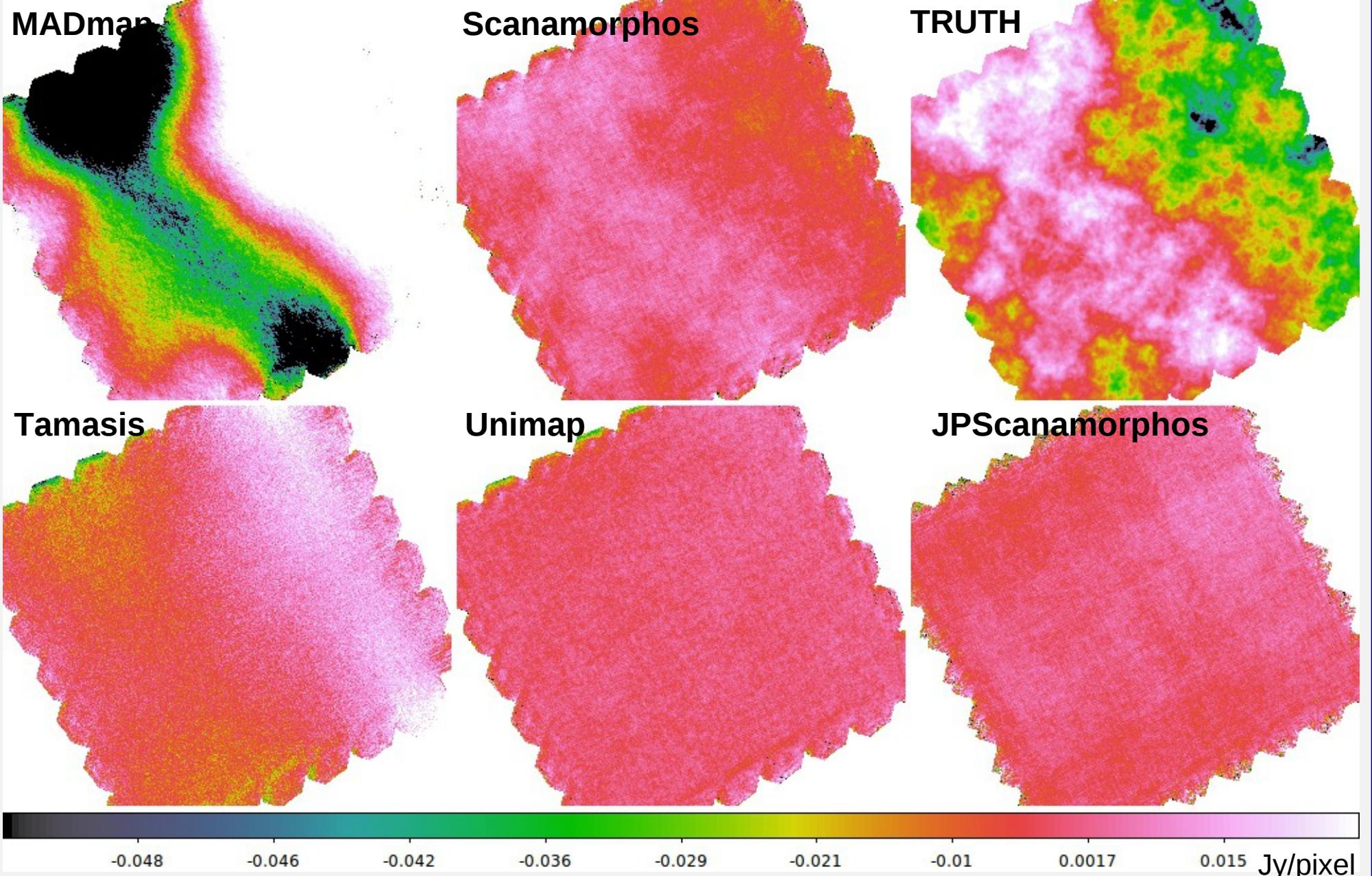


Not offset corrected



PACS: Difference maps – v3 simulations

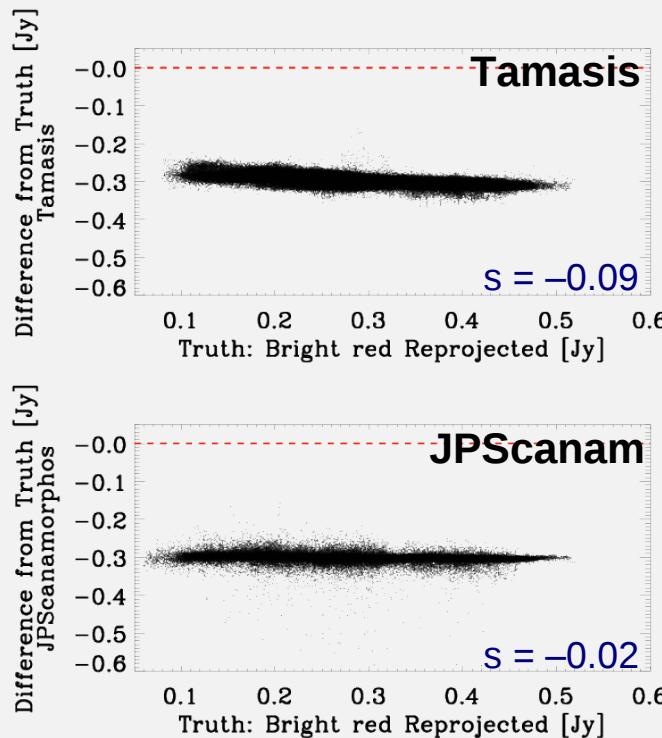
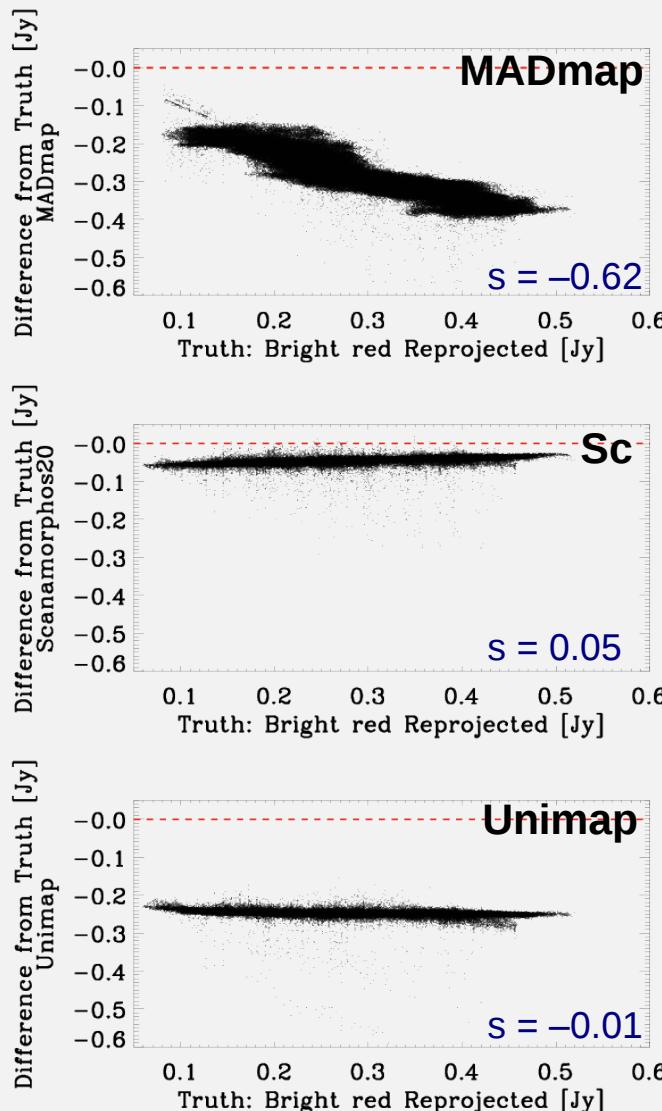
$(S - S^{\text{true}}) - \text{median}(S - S^{\text{true}})$, “Bright” red



Scale is comparable for the median-removed difference maps

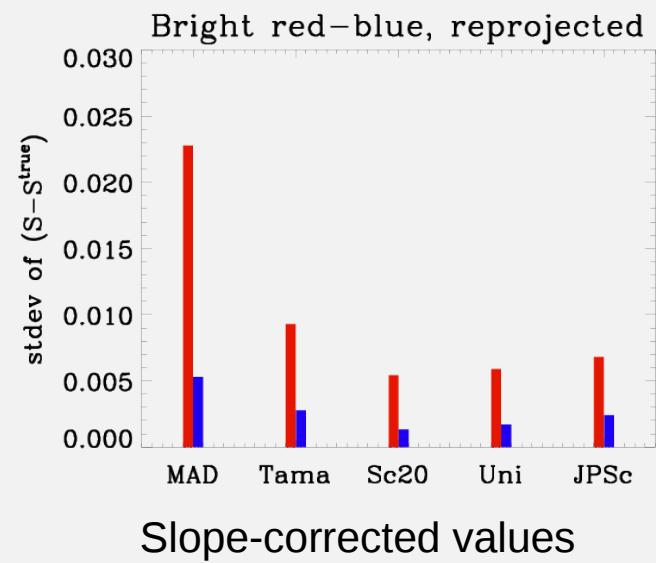
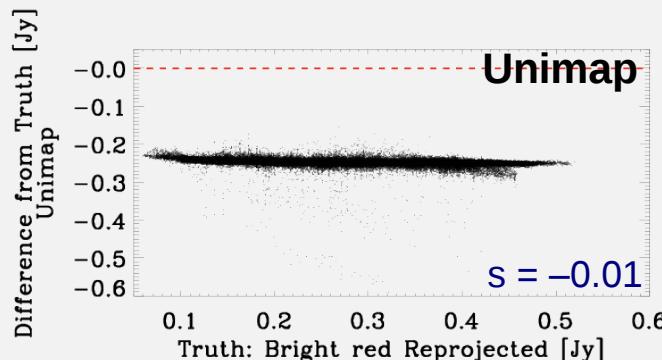
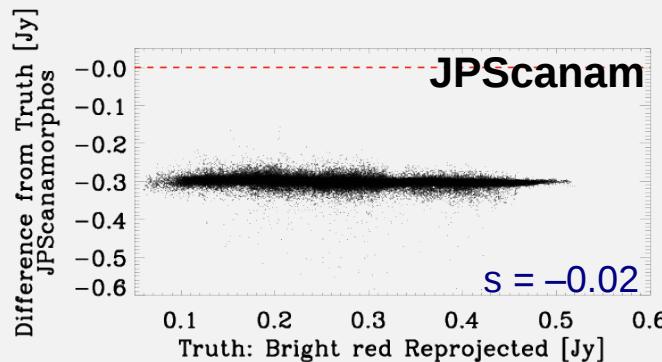
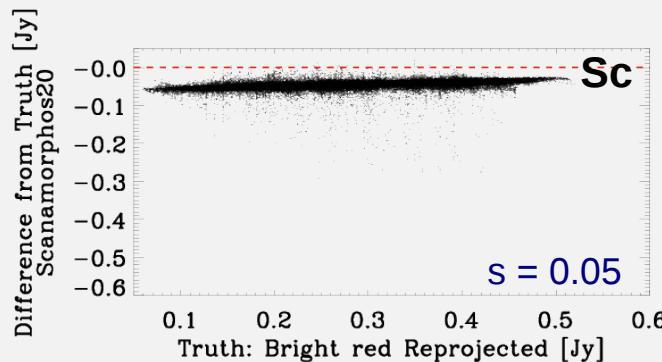
PACS: Difference maps – v3 simulations

“Bright” red case



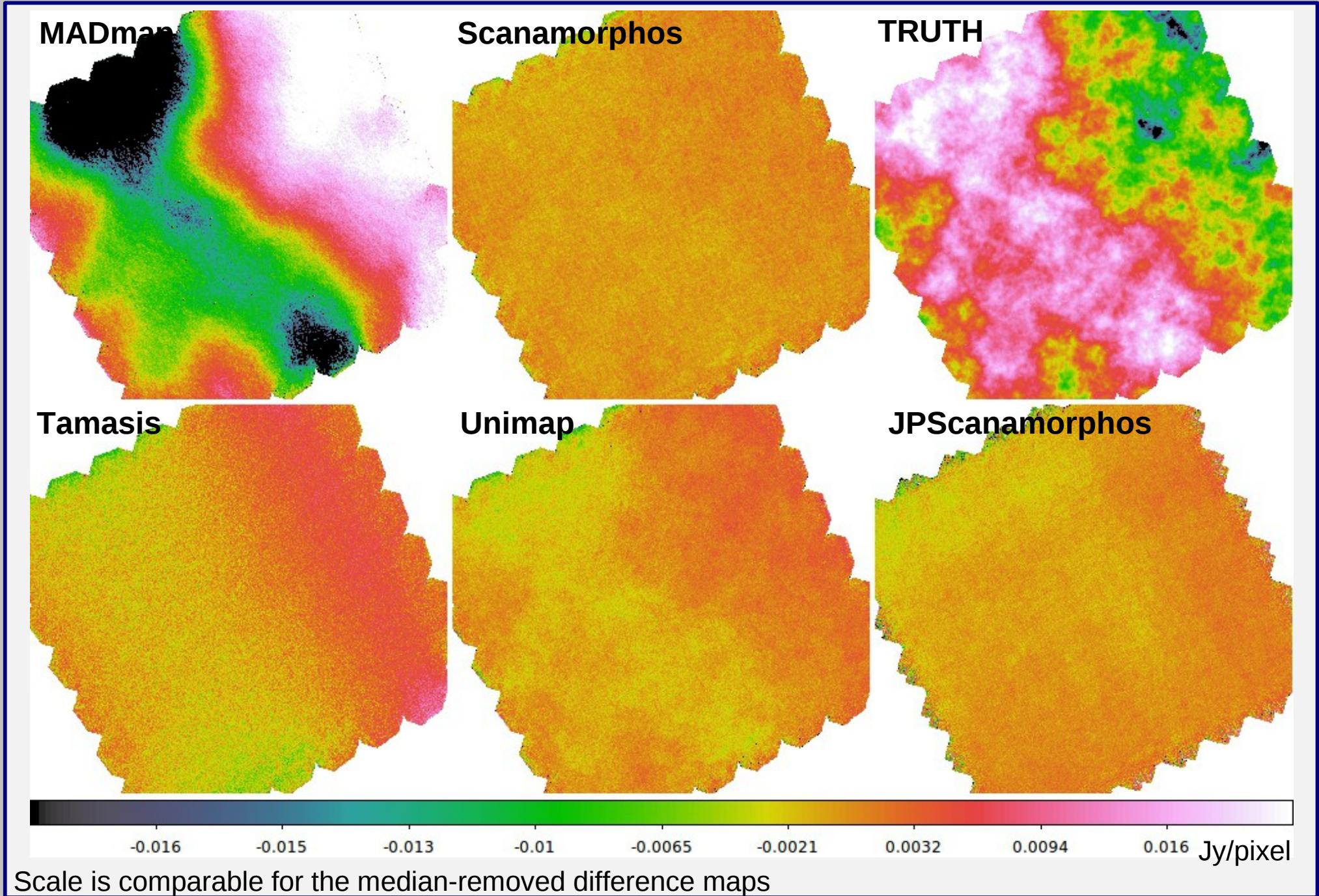
Scatter plots of
 $(S - S_{\text{true}})$ vs S_{true}

Not offset corrected



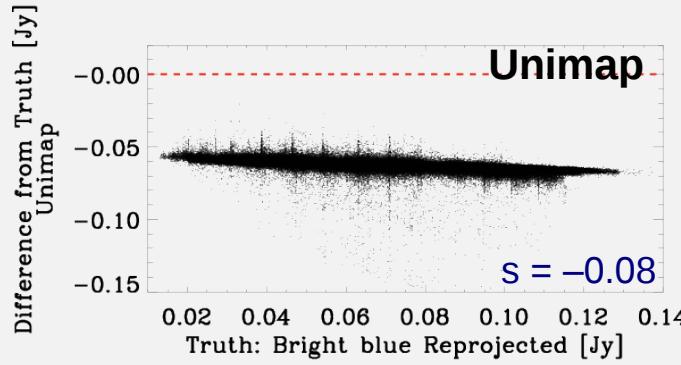
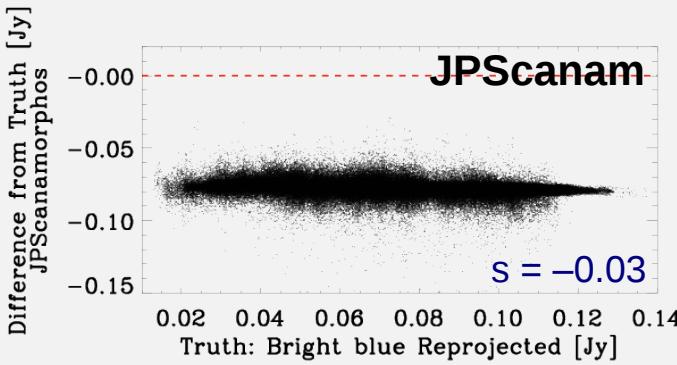
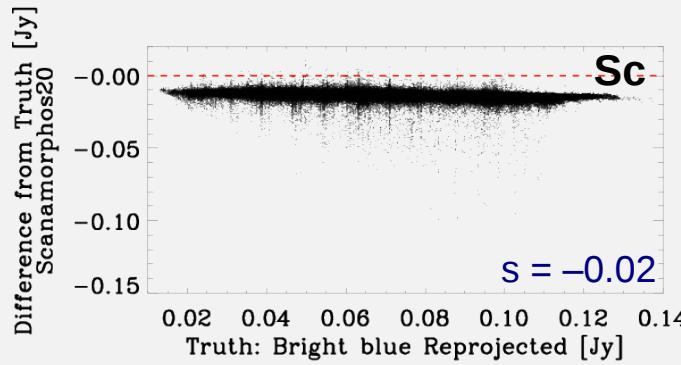
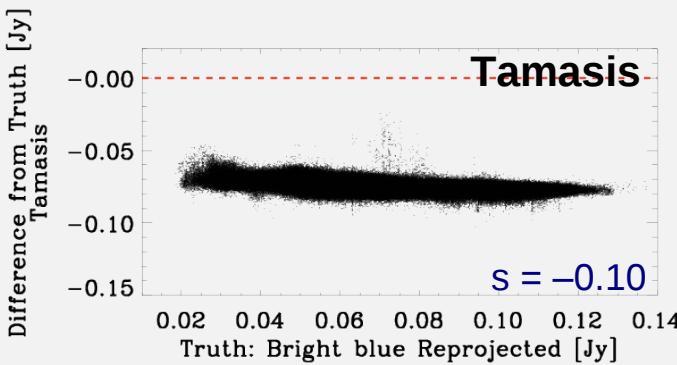
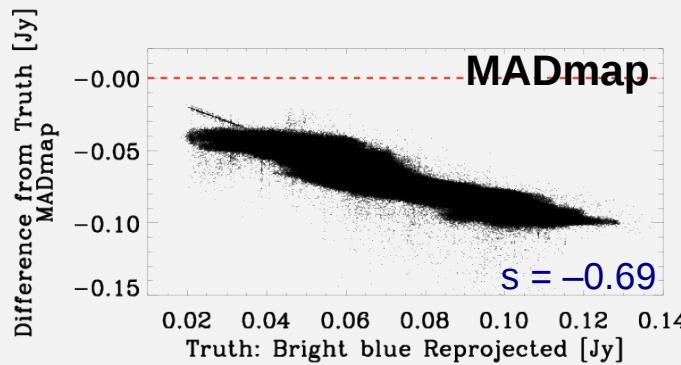
PACS: Difference maps – v3 simulations

$(S - S^{\text{true}}) - \text{median}(S - S^{\text{true}})$, “Bright” blue



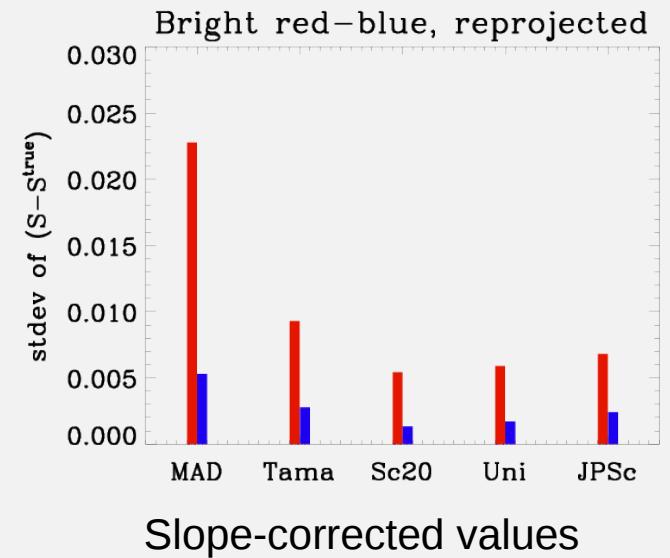
PACS: Difference maps – v3 simulations

“Bright” blue case



Scatter plots of
 $(S - S_{\text{true}})$ vs S_{true}

Not offset corrected



Conclusions

- Slope of $(S - S_{\text{true}})$ indicates that there's a gain in the flux calibration which is corrected differently by the map makers.
 - Faint/Bright, red/blue cases: Strongest slopes with MADmap, slight slopes with the other mappers.
 - Slight slope of Scanam20 changes from correlation (red) to anticorrelation (blue).
- The slope/gain corrected standard deviation of $(S - S_{\text{true}})$ gives the high-frequency (pix2pix) noise. (This should appear in the power spectra analysis too.):
 - Faint red: highest for MADmap (± 0.008 Jy) and lower for Scanam20 and Unimap (± 0.0035 Jy). Tamasis and JPScanamorphos are in between.
 - Faint blue: MADmap, JPScanam, and Tamasis: ± 0.002 Jy, and half of this pix2pix noise with Scanamorphos20 and Unimap.
 - Bright red: highest for MADmap (± 0.023 Jy) and lowest for Scanam20 (± 0.005 Jy).
 - Bright blue: highest for MADmap (± 0.005 Jy), lowest for Scanam20 (± 0.001 Jy).