

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



SPIRE Metrics: Deviation from the truth

Vera Könyves

IAS/Orsay – CEA/Saclay

Andreas Papageorgiou

School of Physics and Astronomy, Cardiff University

On behalf of the SPIRE map-making test team

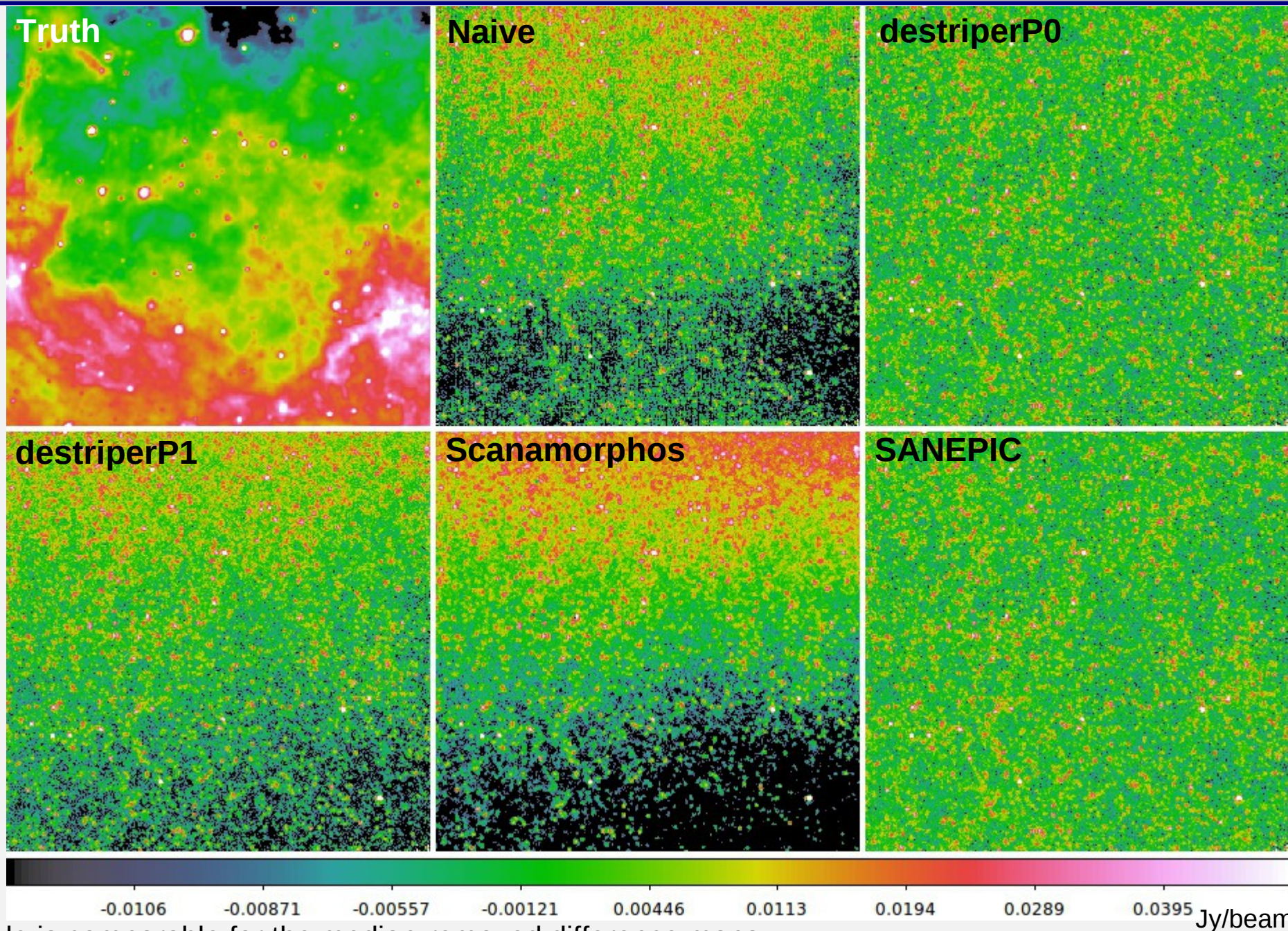
SPIRE metrics (Deviation from the truth)

- The analysis was carried out for cases: 2, 4, 6, 9, 10, PSW and PLW (PMW only in case 4).
- For each case and each map made by a given mapmaker:
 - a scatter plot of $(S - S_{\text{true}})$ vs S_{true} for individual pixels
 - absolute deviation: mean and standard deviation of $(S - S_{\text{true}})$
 - linear regression of $(S - S_{\text{true}})$ vs S_{true}

Calculations, plots done both in IDL and HIPE.

SPIRE: Deviation from the truth

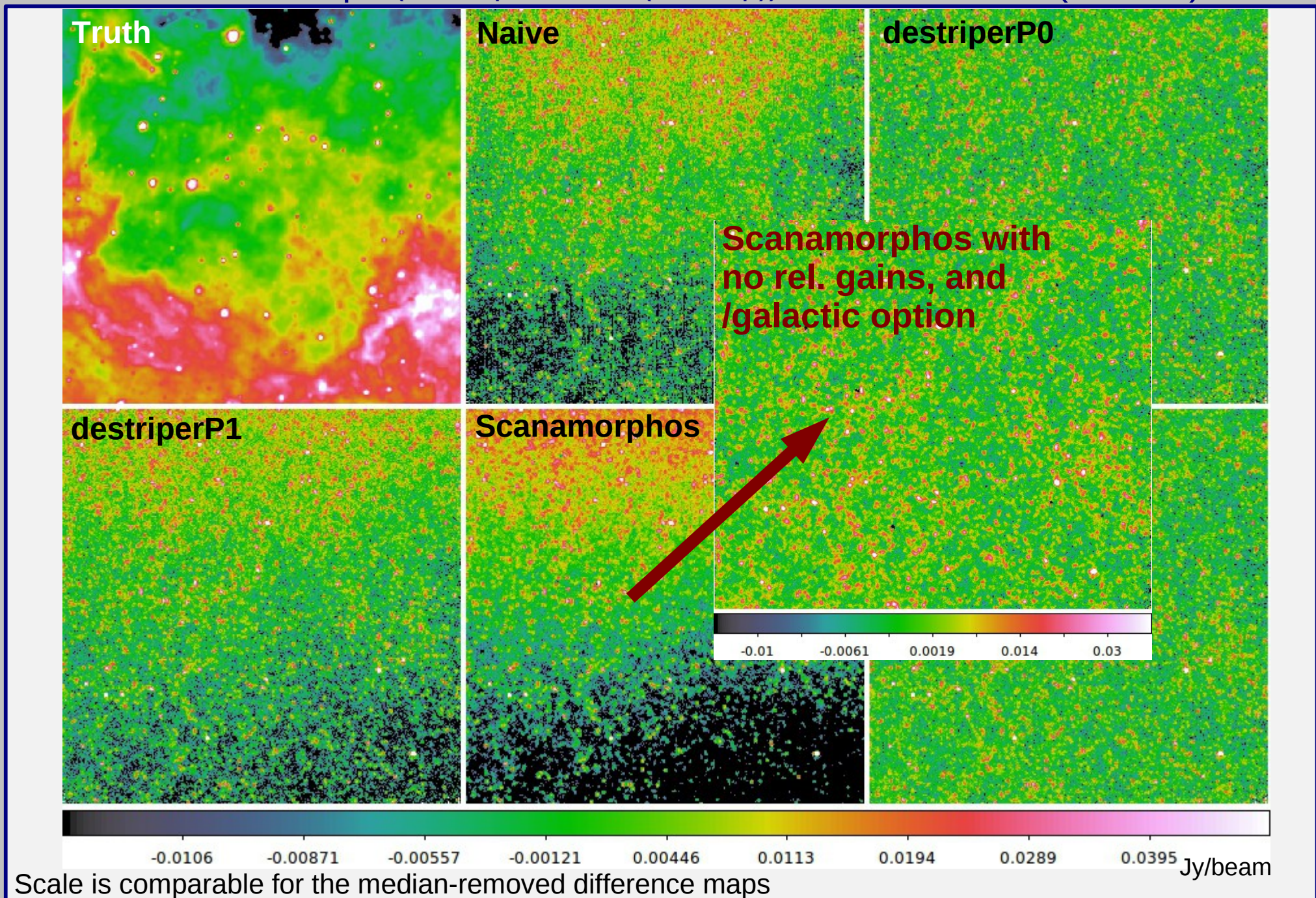
Difference maps ($\text{Diffmap} - \text{median}(\text{Diffmap})$), Nominal cirrus (Case 2), PSW

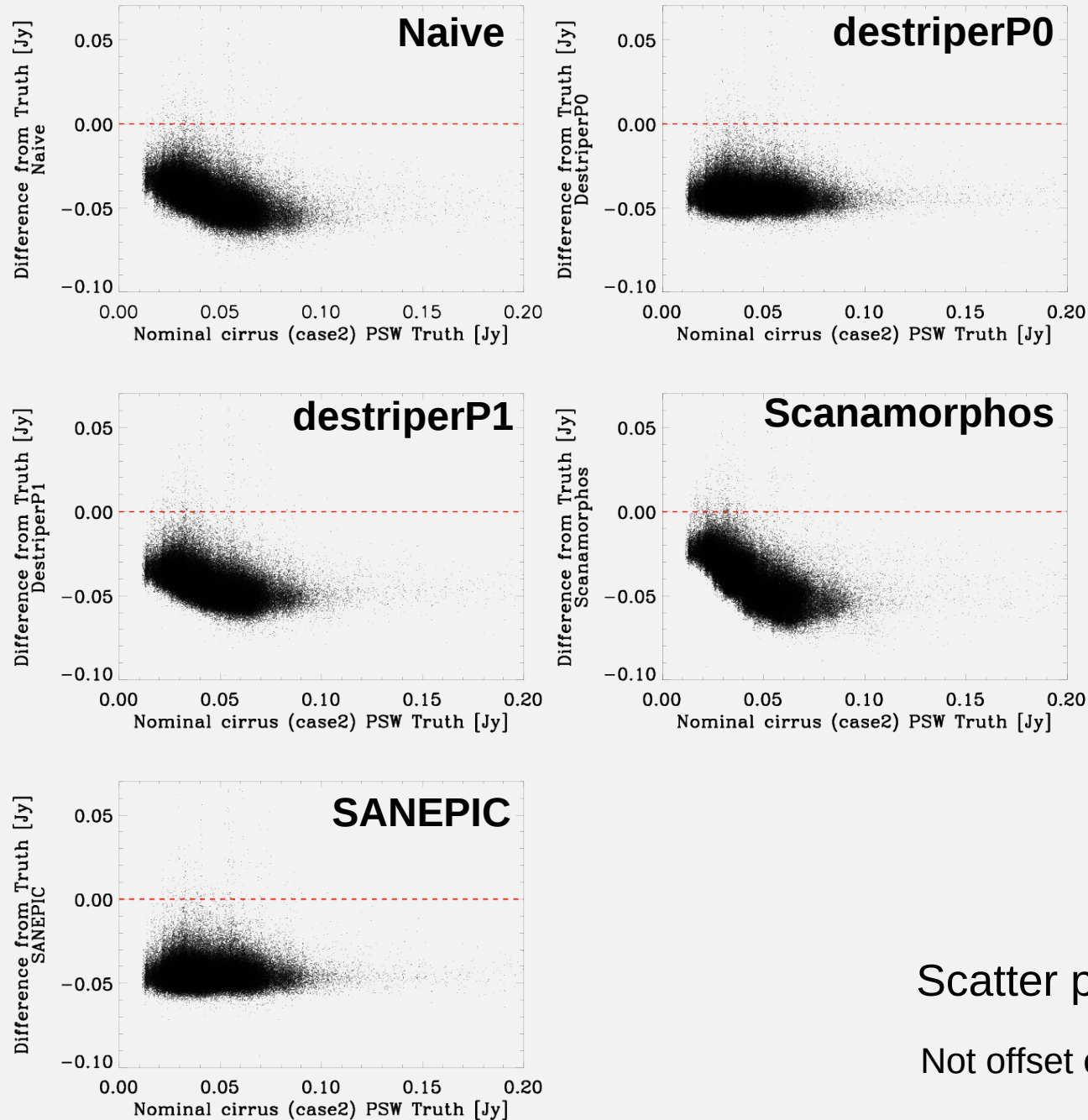


Scale is comparable for the median-removed difference maps

SPIRE: Deviation from the truth

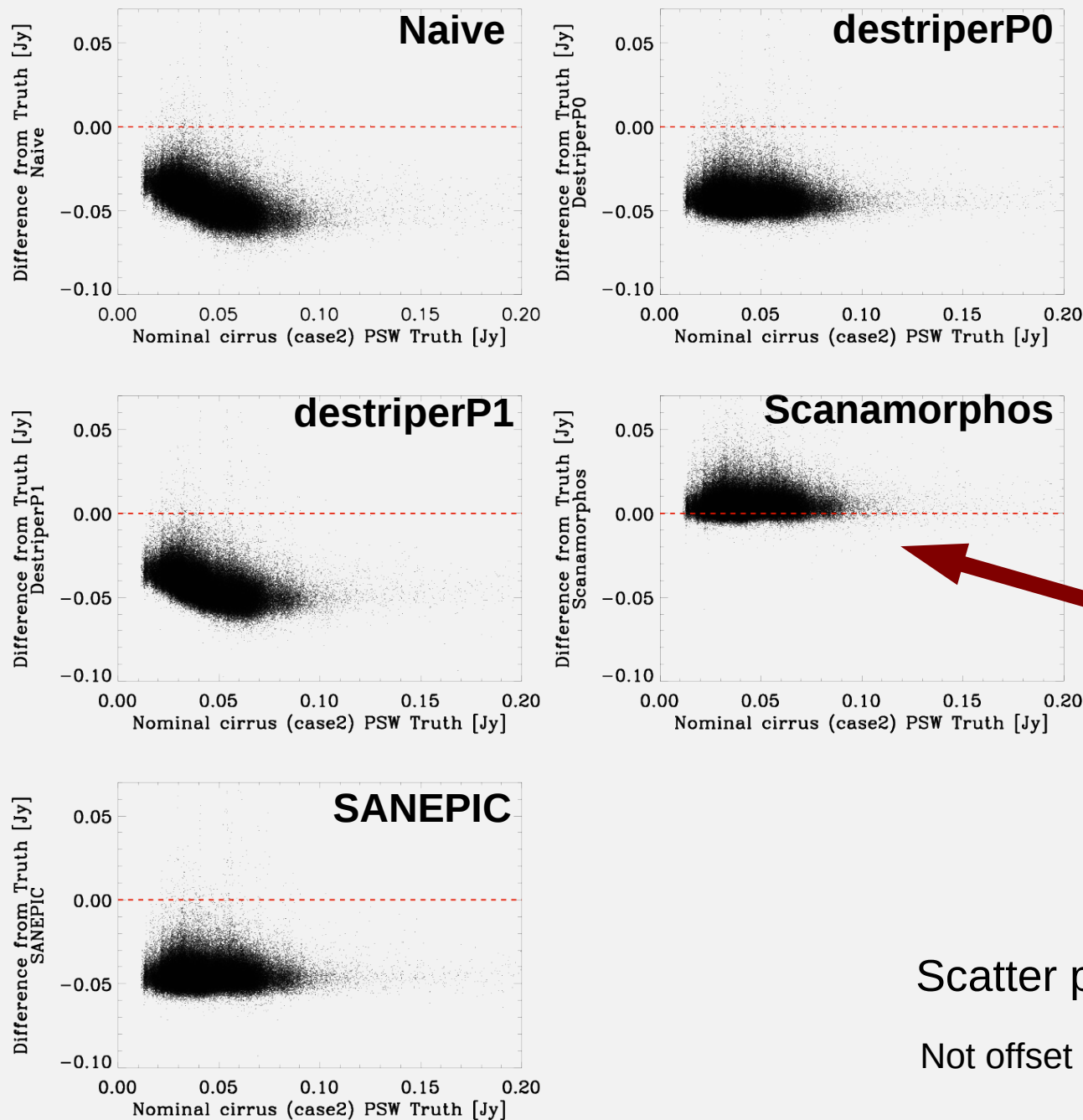
Difference maps ($\text{Diffmap} - \text{median}(\text{Diffmap})$), Nominal cirrus (Case 2), PSW





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

Not offset corrected

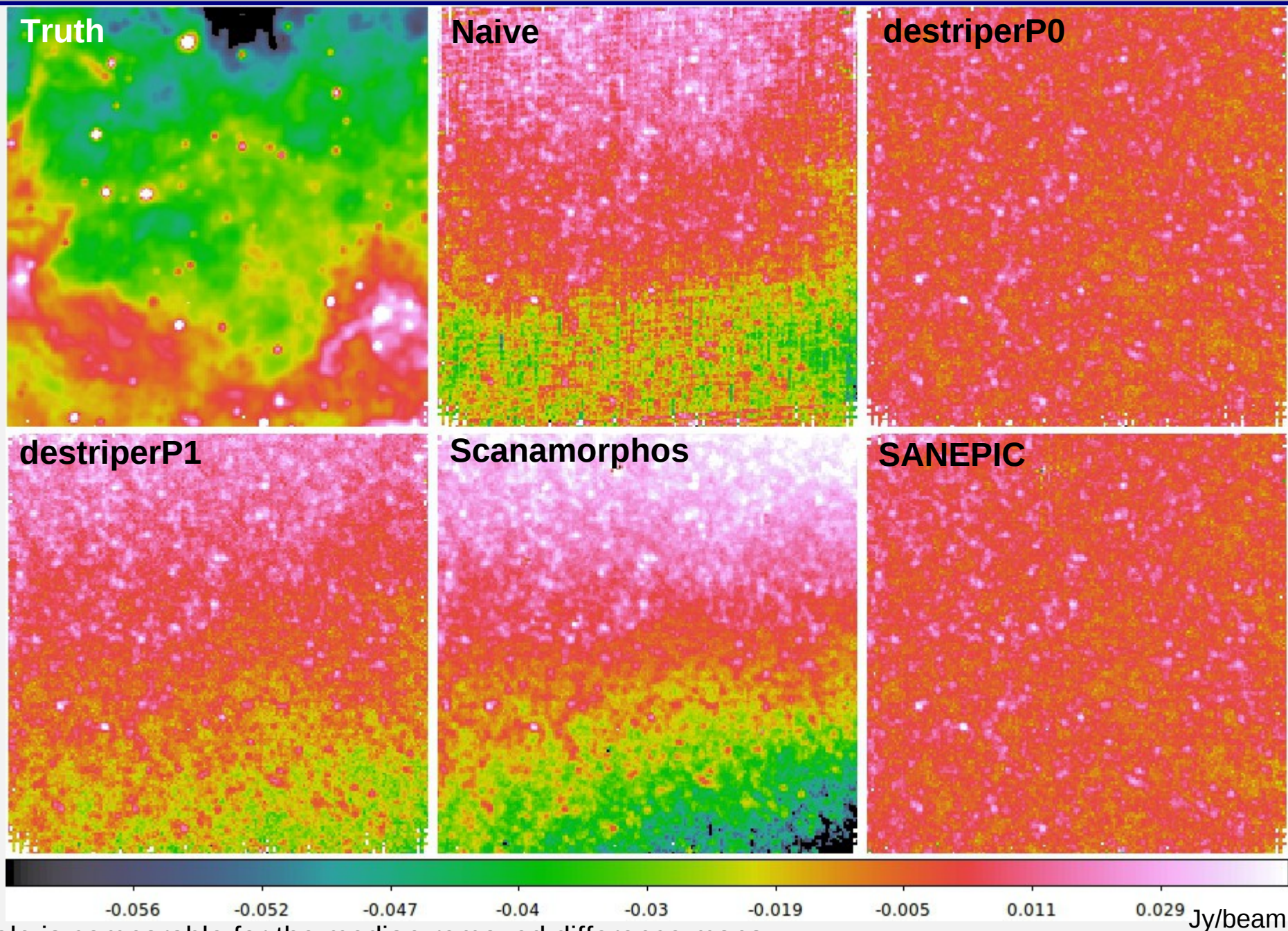


Scatter plots of $(S - S_{\text{true}})$ vs S_{true}

Not offset corrected

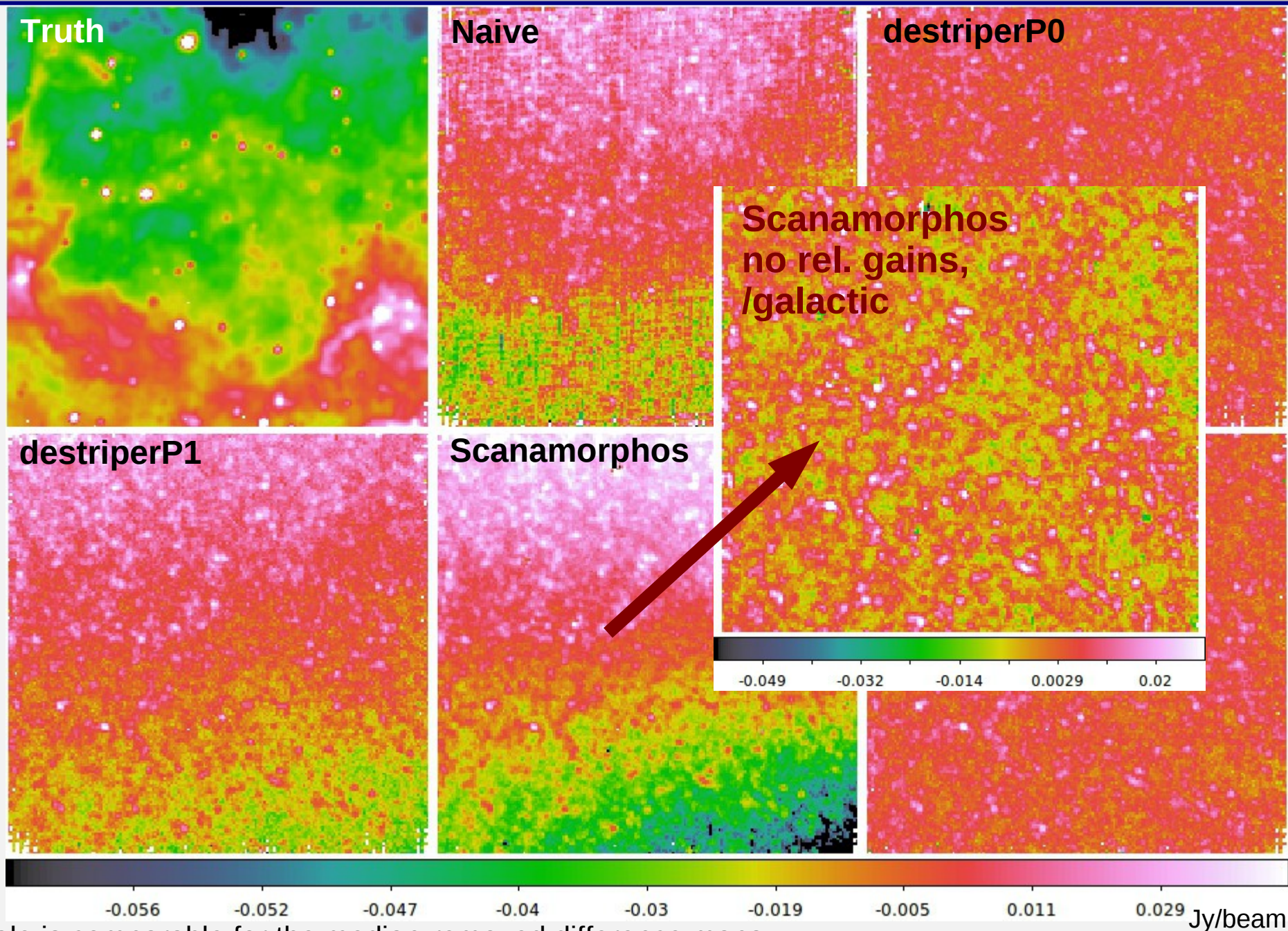
SPIRE: Deviation from the truth

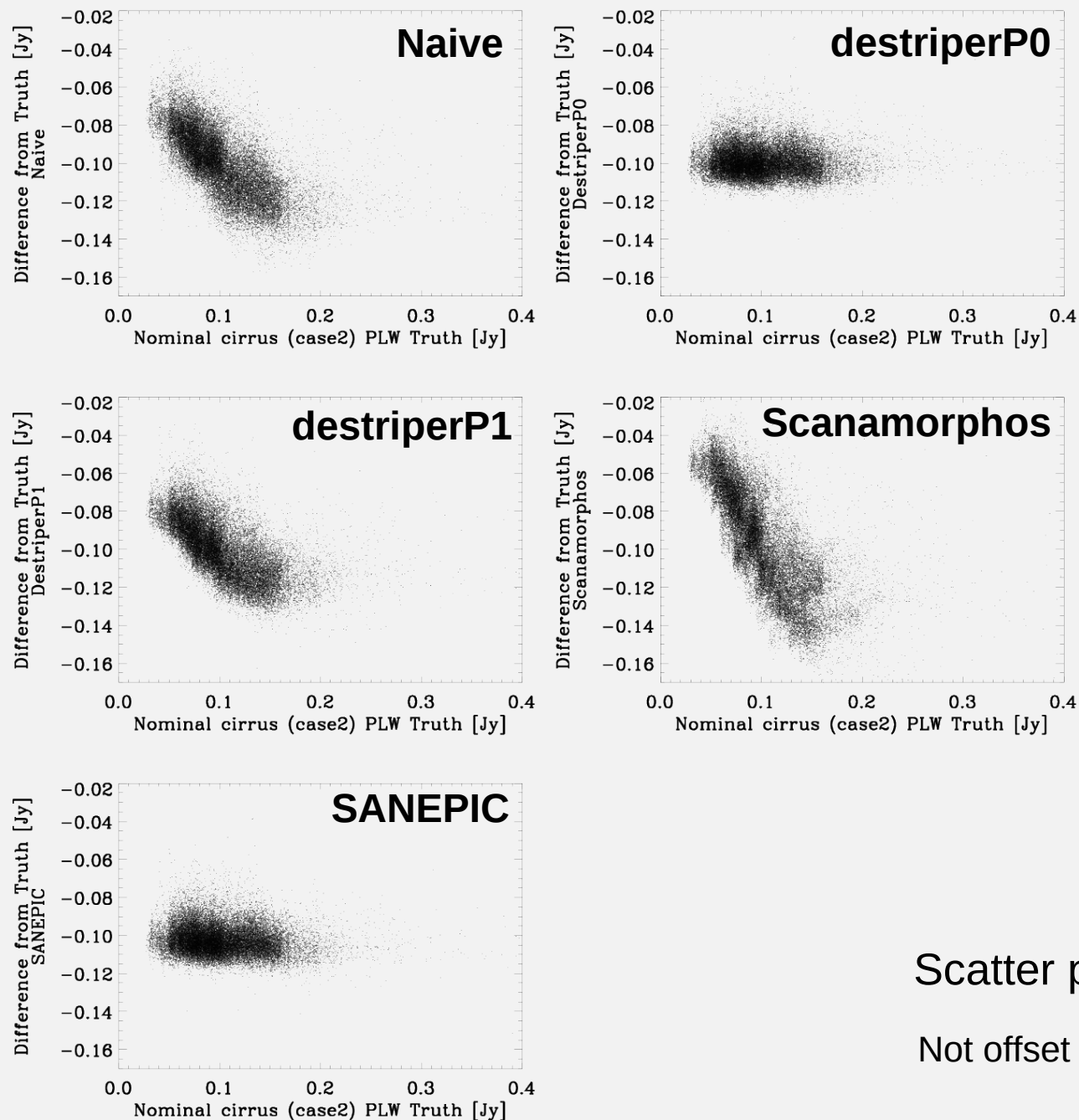
Difference maps ($\text{Diffmap} - \text{median}(\text{Diffmap})$), Nominal cirrus (Case 2), PLW



SPIRE: Deviation from the truth

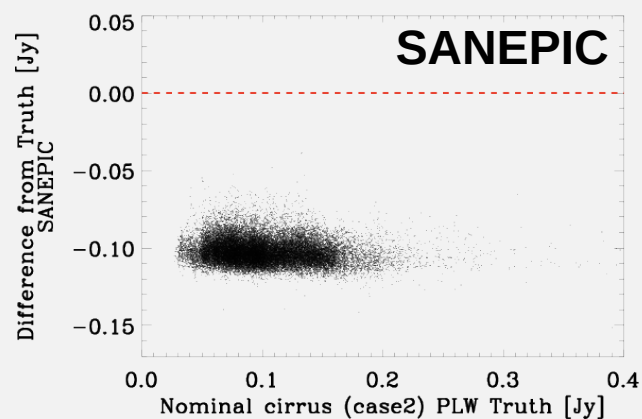
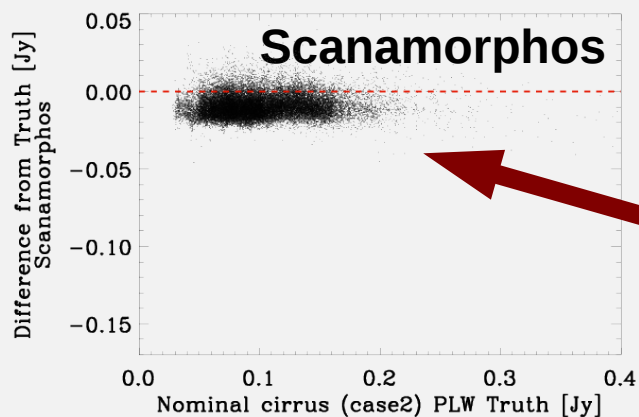
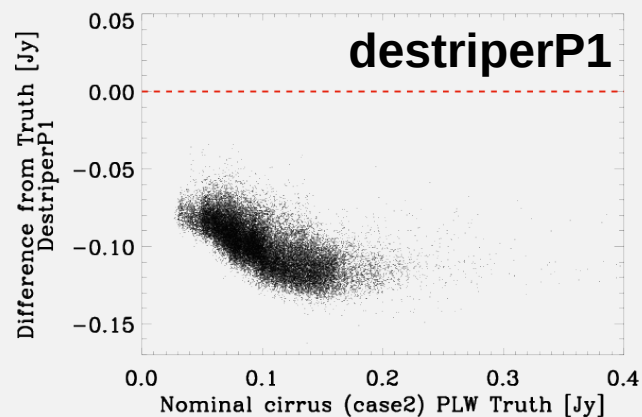
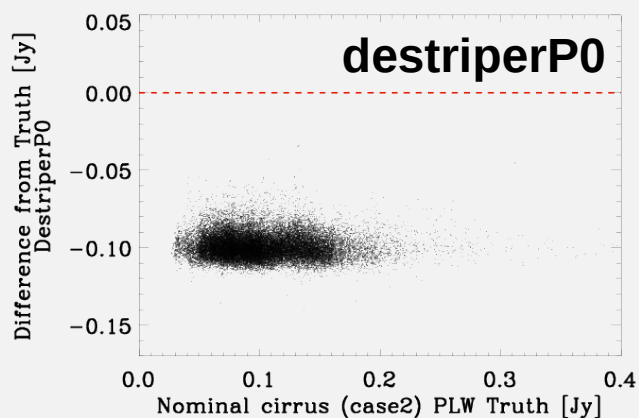
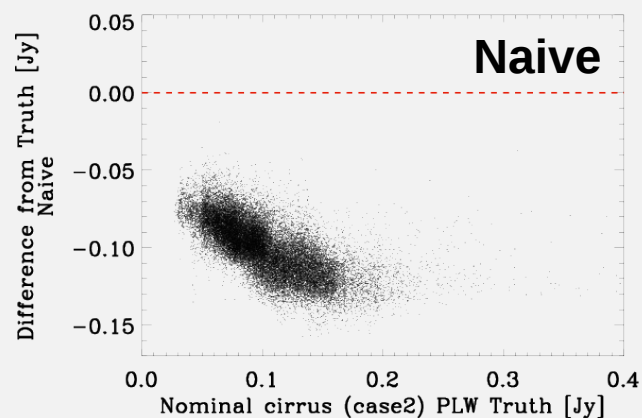
Difference maps ($\text{Diffmap} - \text{median}(\text{Diffmap})$), Nominal cirrus (Case 2), PLW





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

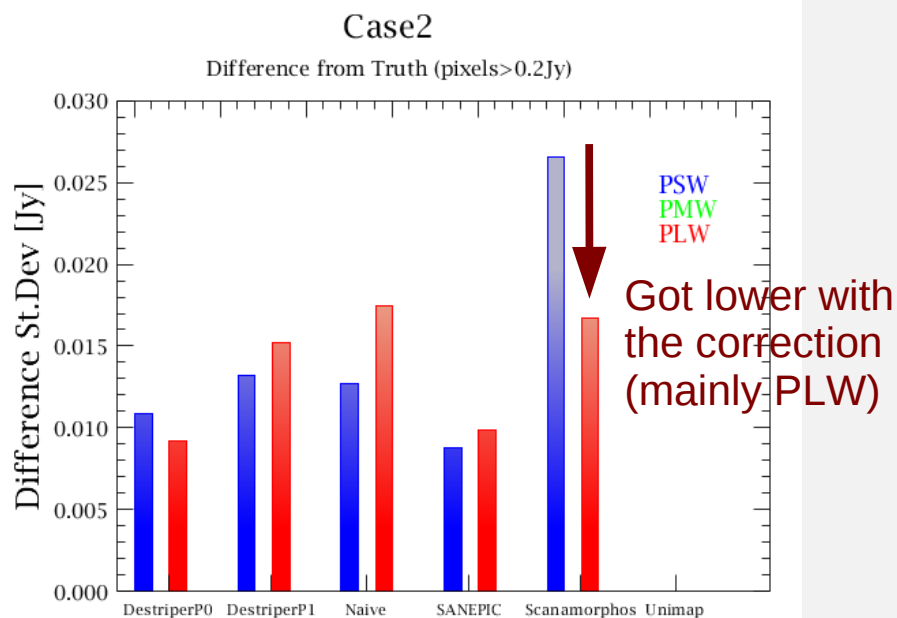
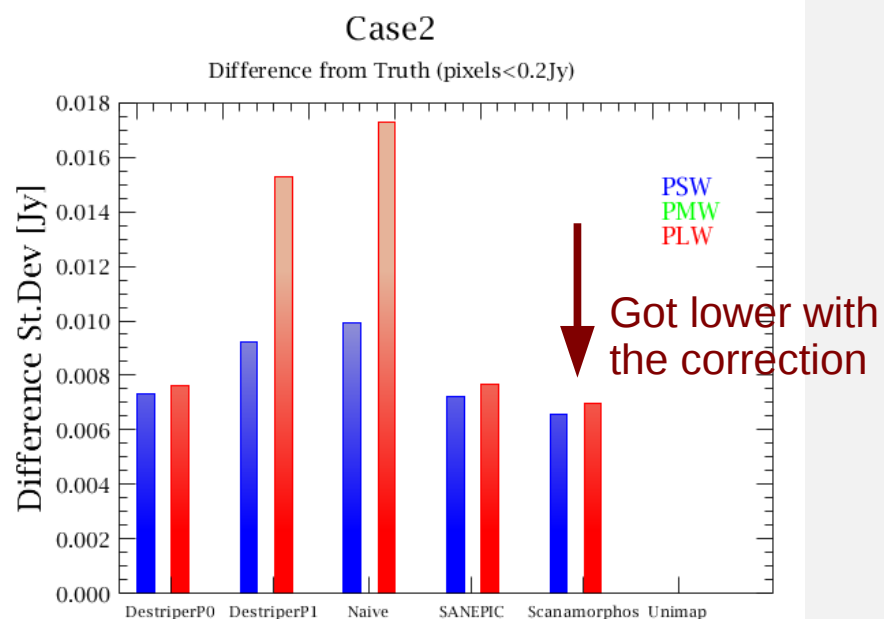
Not offset corrected



**Scanamorphos with
no rel. gains, and
/galactic option**

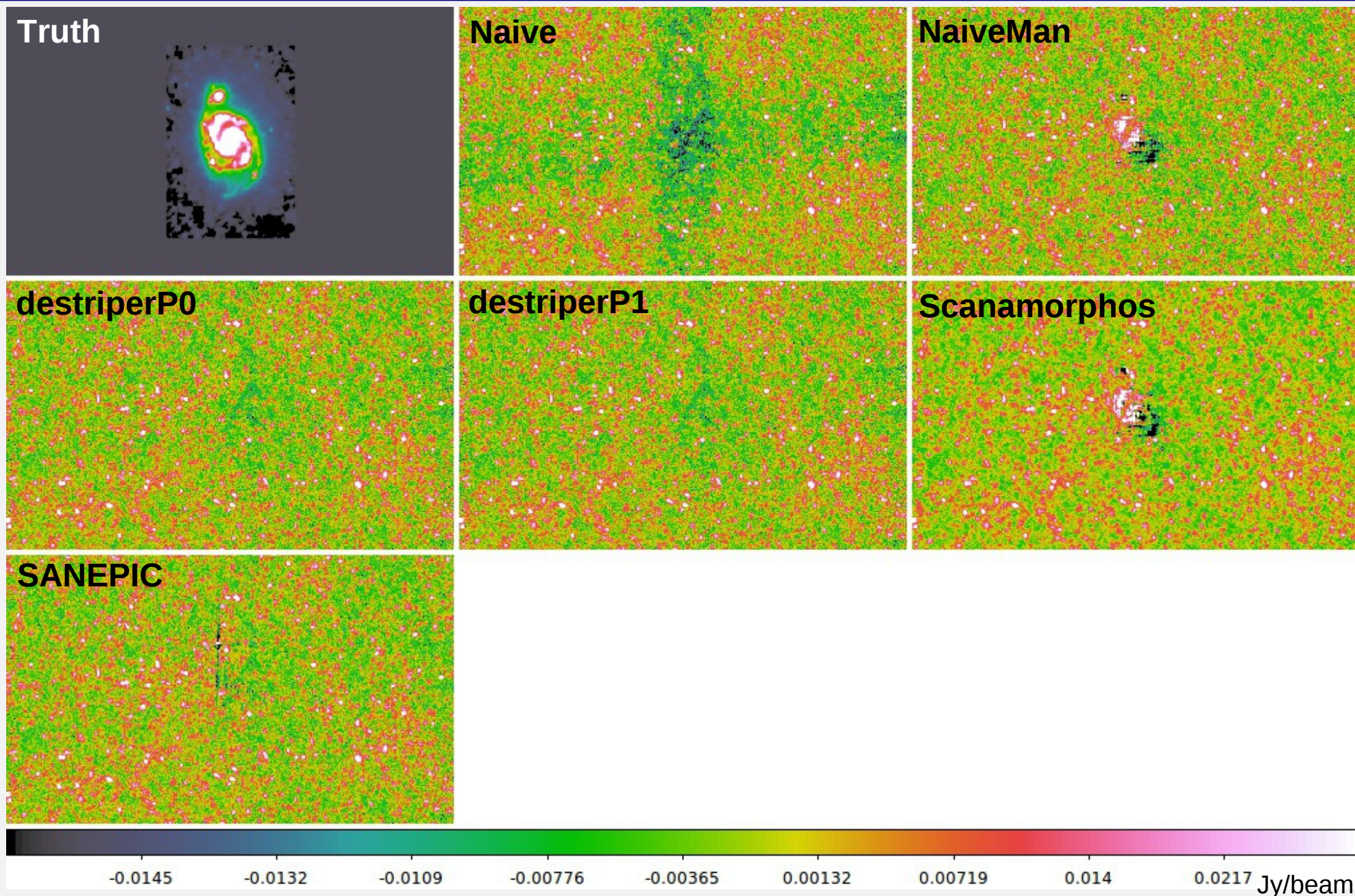
Scatter plots of $(S - S_{\text{true}})$ vs S_{true}

Not offset corrected



SPIRE: Deviation from the truth

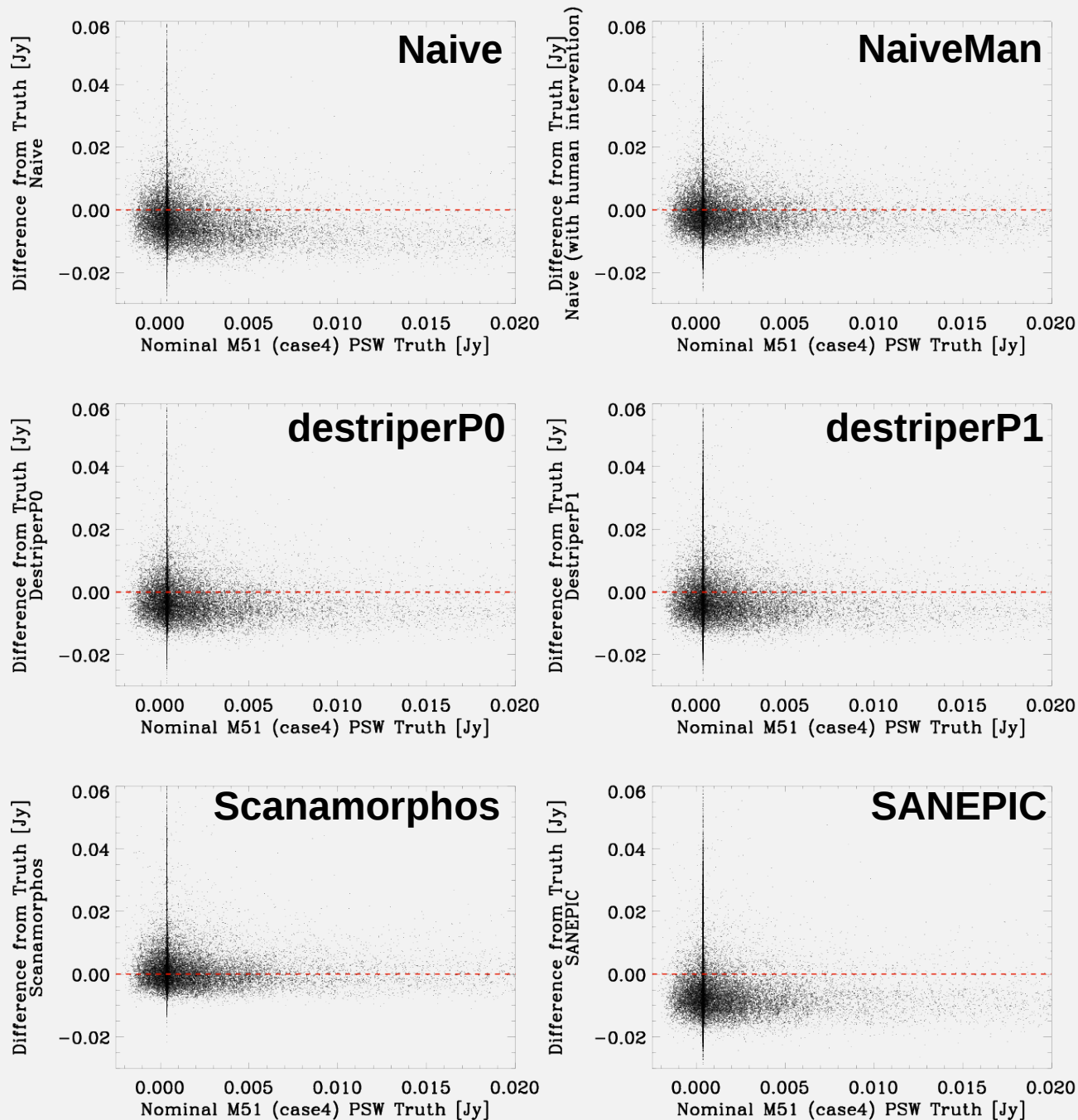
Difference maps ($\text{Diffmap} - \text{median}(\text{Diffmap})$), Nominal M51 (Case 4), PSW



Scale is comparable for the median-removed difference maps

SPIRE: Deviation from the truth

Nominal M51 (Case 4), PSW

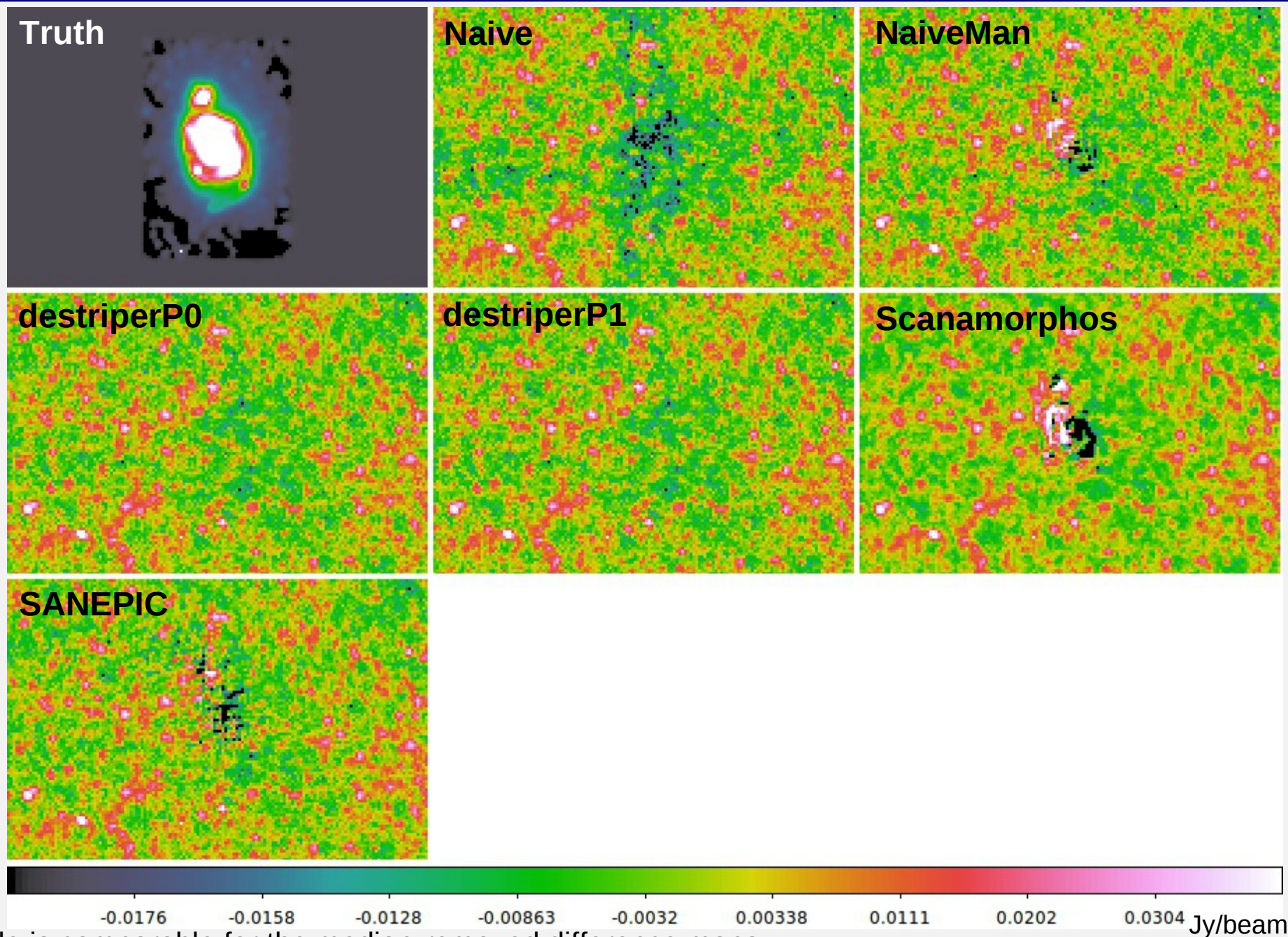


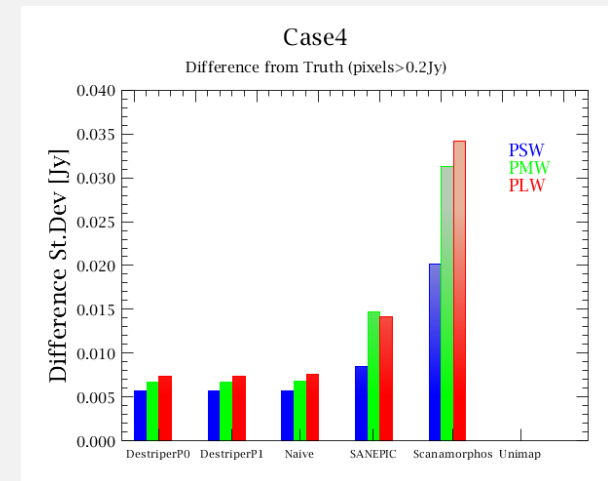
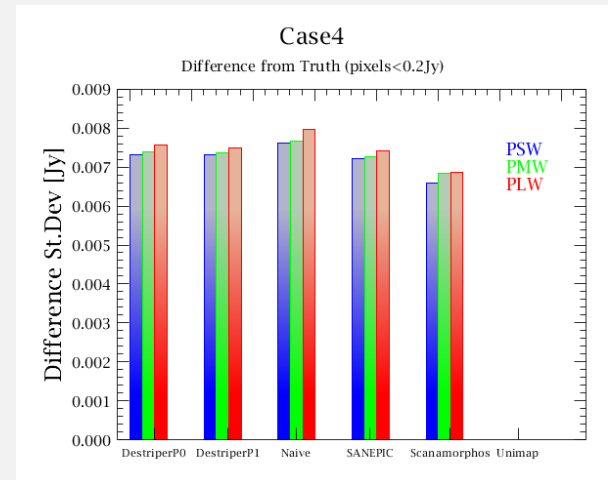
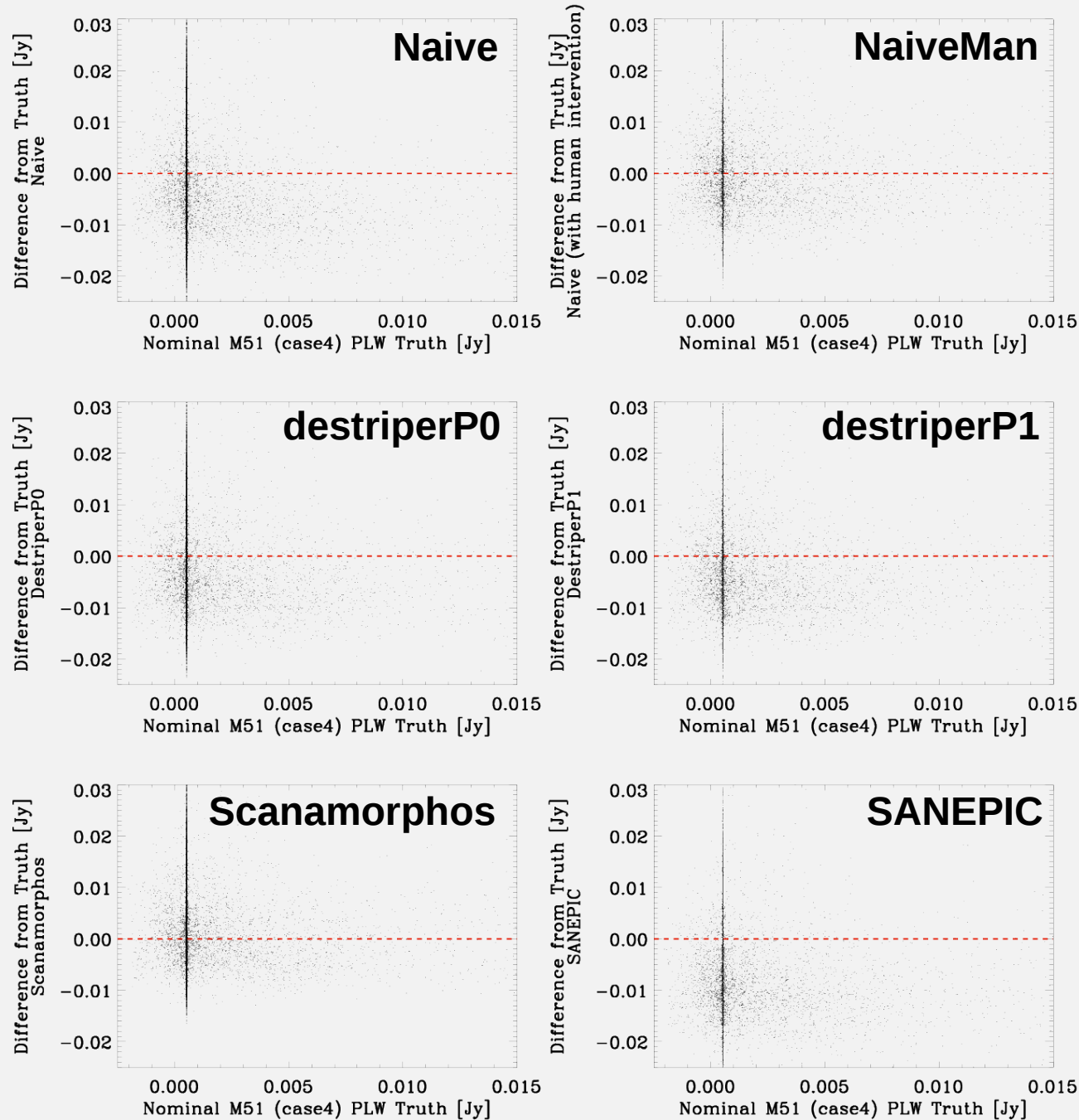
Scatter plots of
 $(S - S_{\text{true}})$ vs S_{true}

Not offset corrected

SPIRE: Deviation from the truth

Difference maps ($\text{Diffmap} - \text{median}(\text{Diffmap})$), Nominal M51 (Case 4), PLW



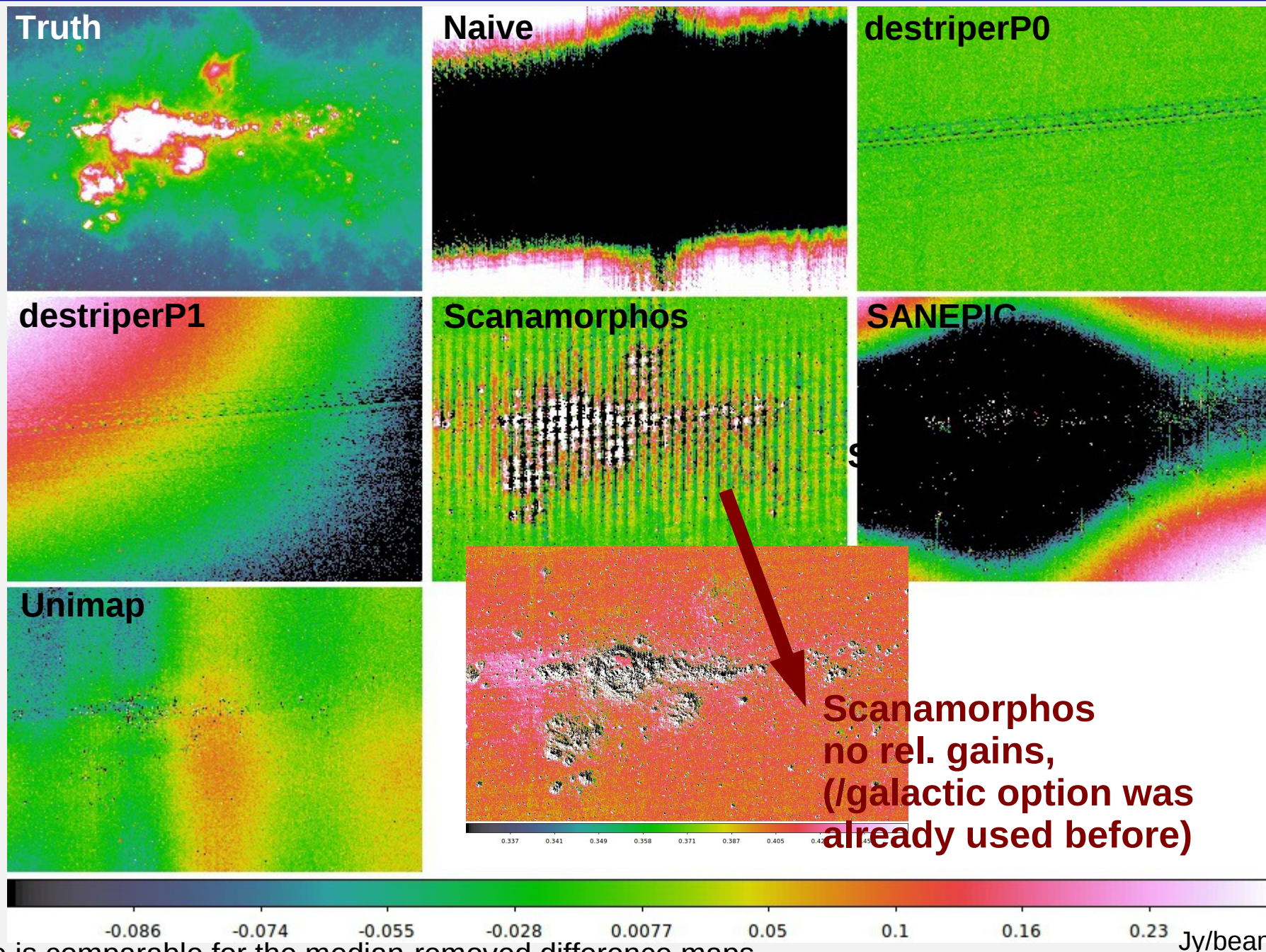


Scatter plots of
 $(S - S_{\text{true}})$ vs S_{true}

Not offset corrected

SPIRE: Deviation from the truth

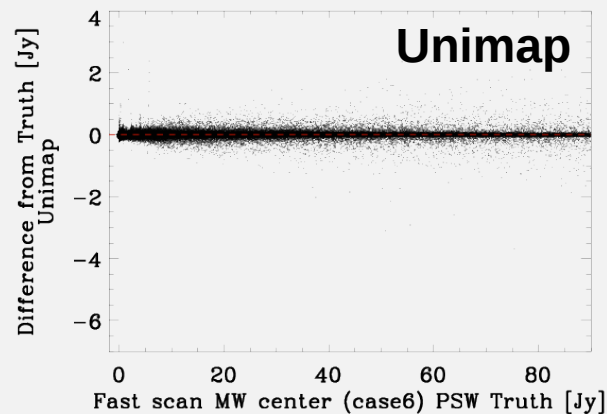
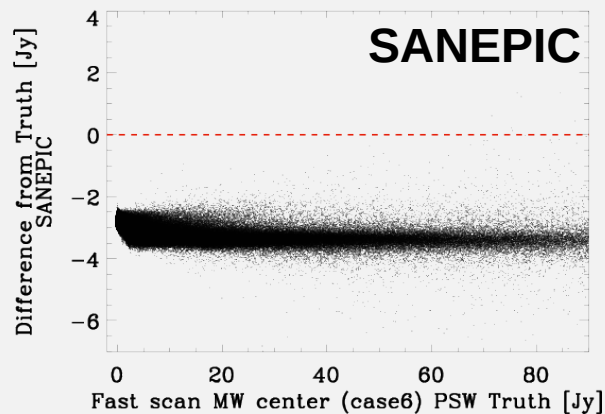
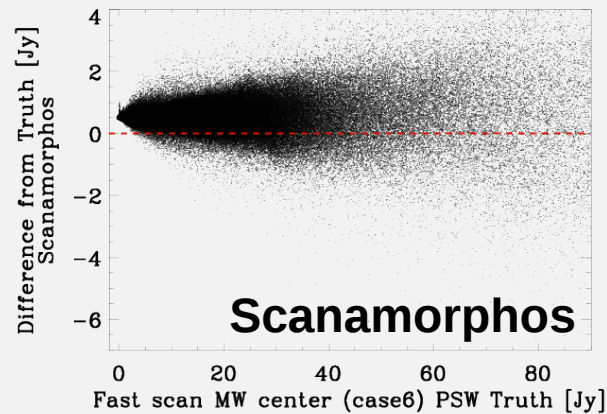
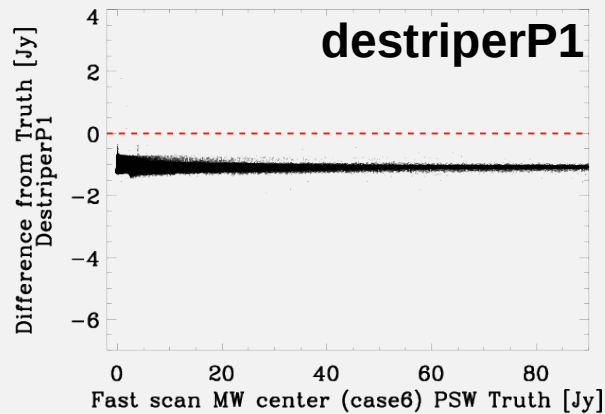
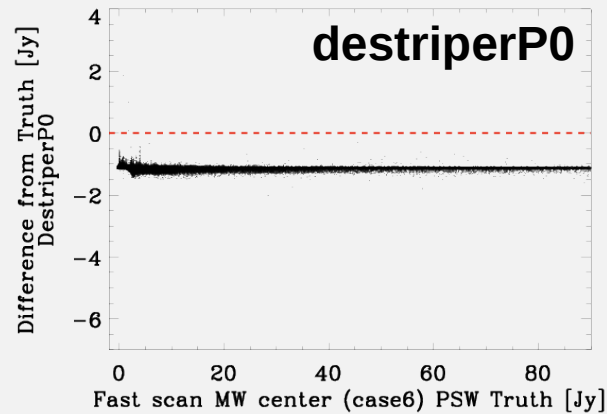
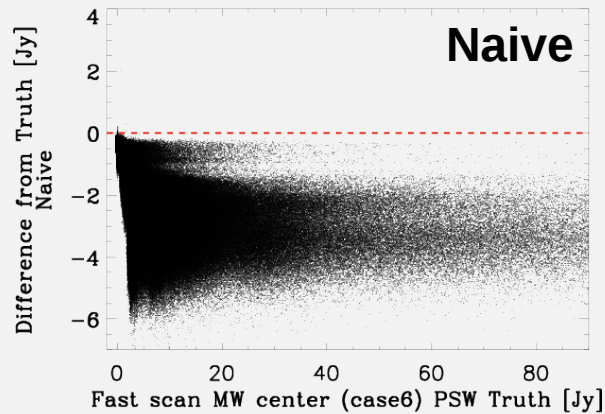
Difference maps ($\text{Diffmap} - \text{median}(\text{Diffmap})$), Fast scan MW center (Case 6), PSW



Scale is comparable for the median-removed difference maps

SPIRE: Deviation from the truth

Fast scan MW center (Case 6), PSW

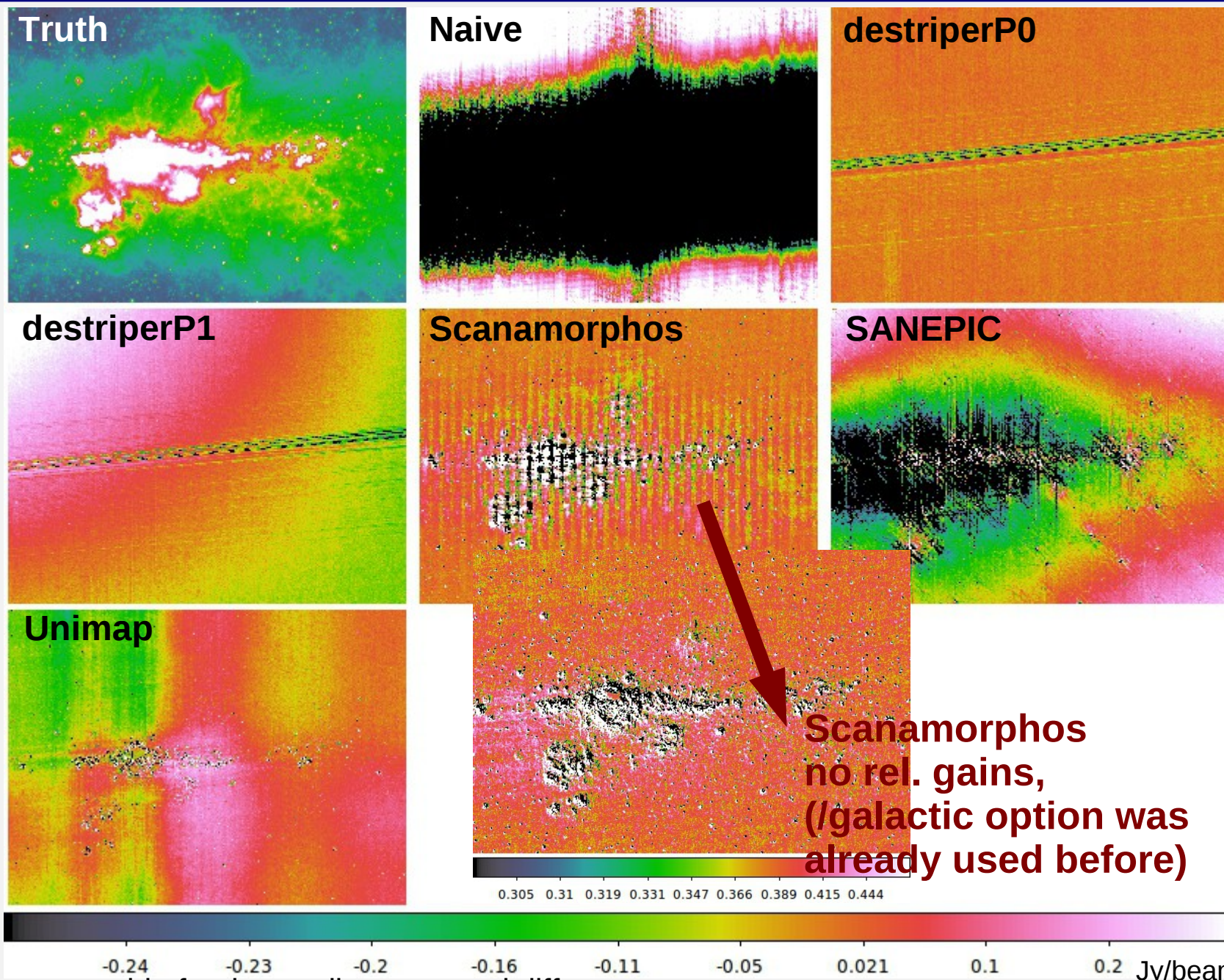


Scatter plots of
 $(S - S_{\text{true}})$ vs S_{true}

Not offset corrected

SPIRE: Deviation from the truth

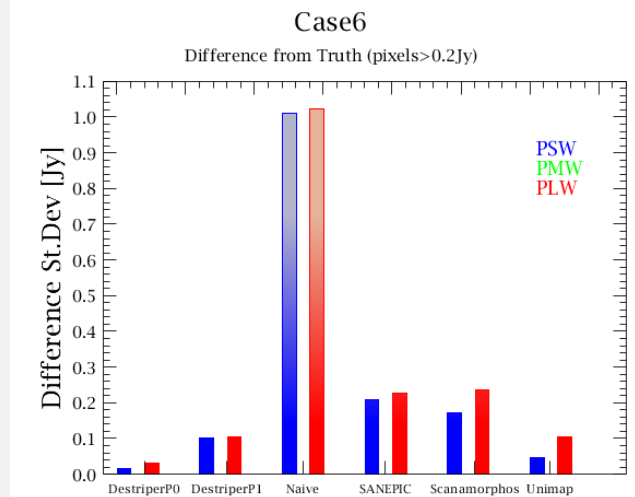
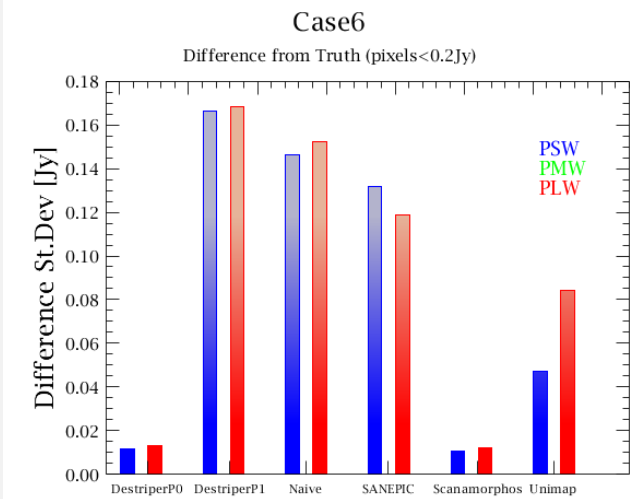
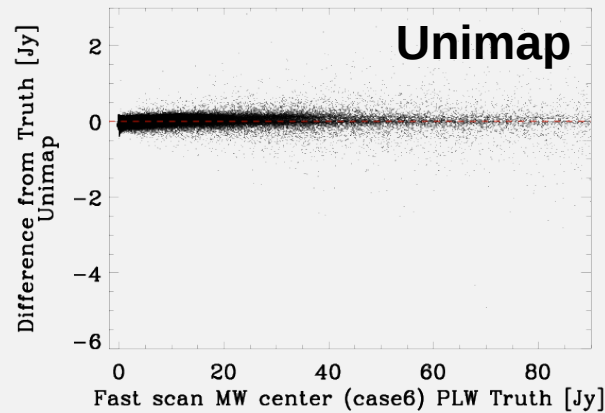
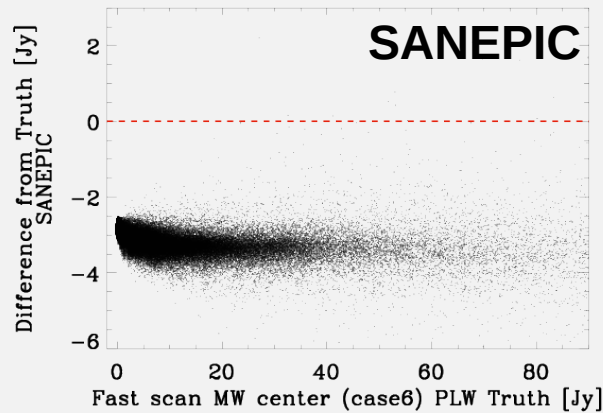
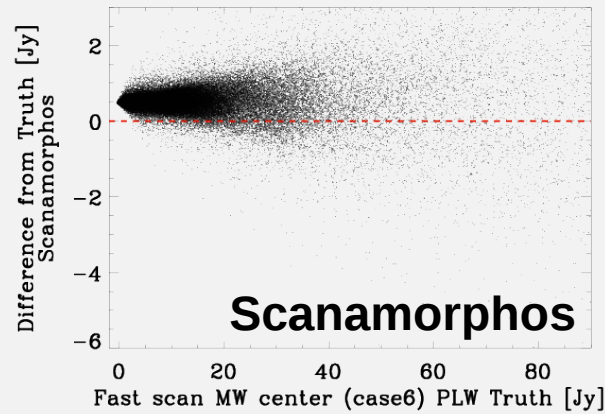
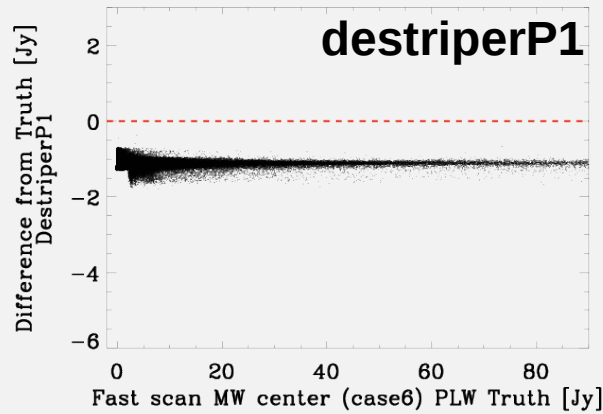
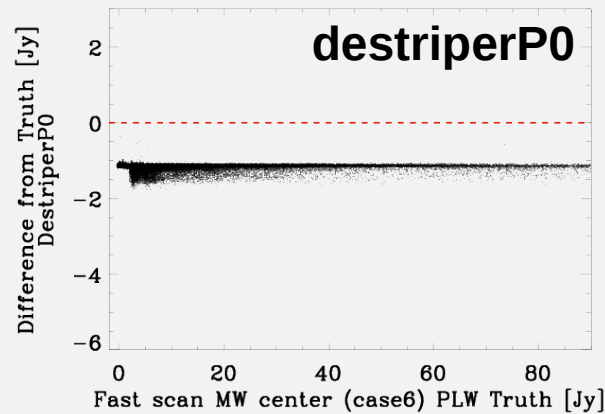
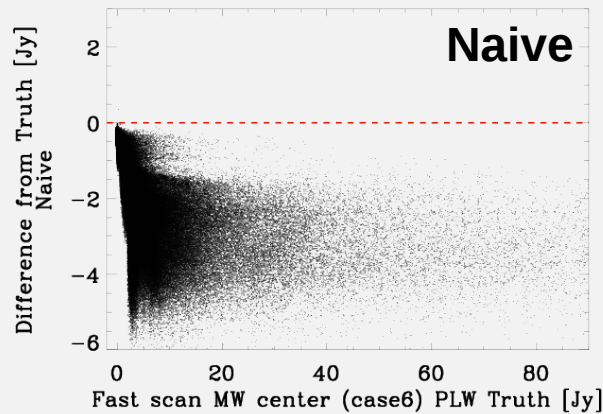
Difference maps ($\text{Diffmap} - \text{median}(\text{Diffmap})$), Fast scan MW center (Case 6), PLW



Scale is comparable for the median-removed difference maps

SPIRE: Deviation from the truth

Fast scan MW center (Case 6), PLW

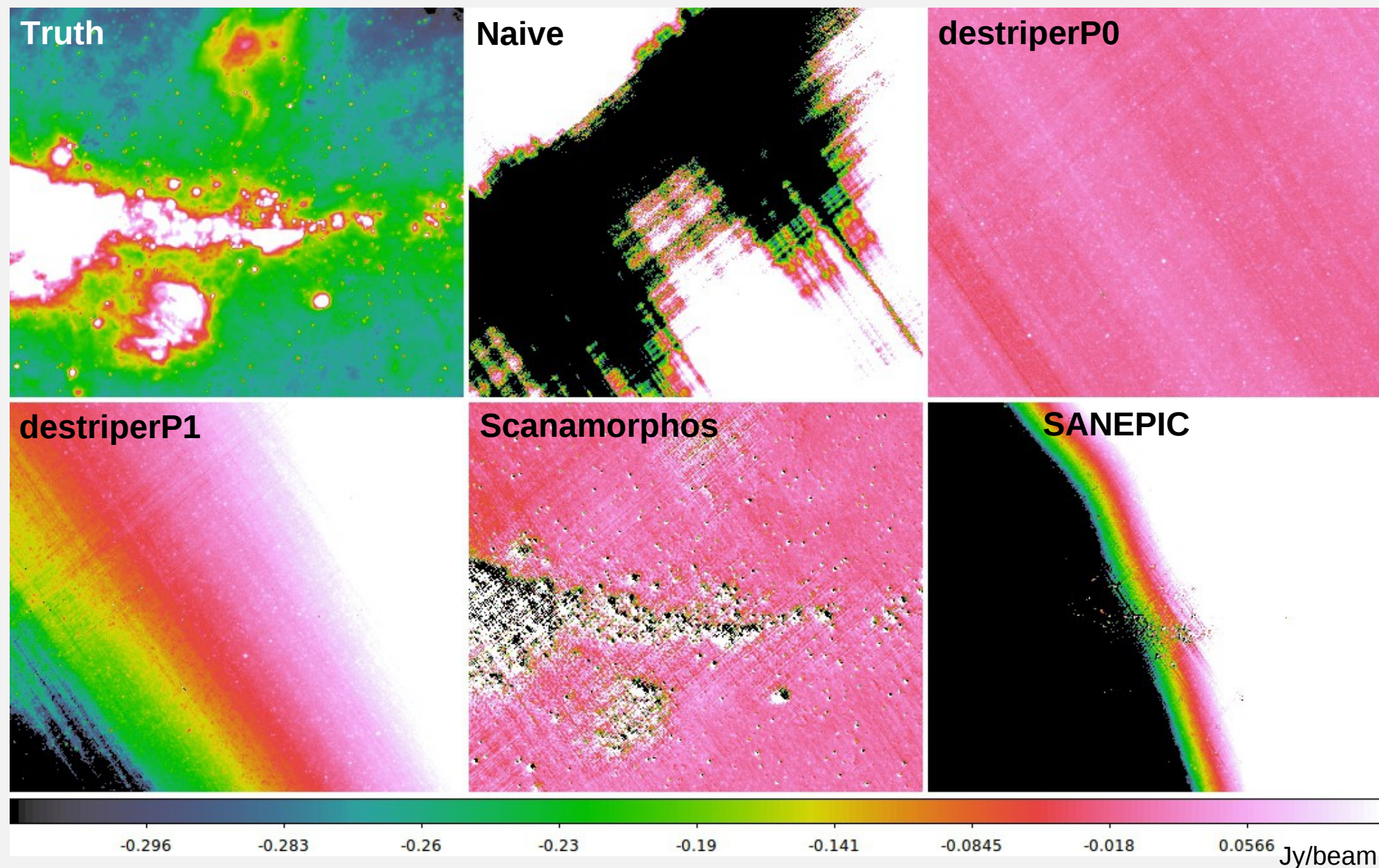


Scatter plots of
 $(S - S_{\text{true}})$ vs S_{true}

Not offset corrected

SPIRE: Deviation from the truth

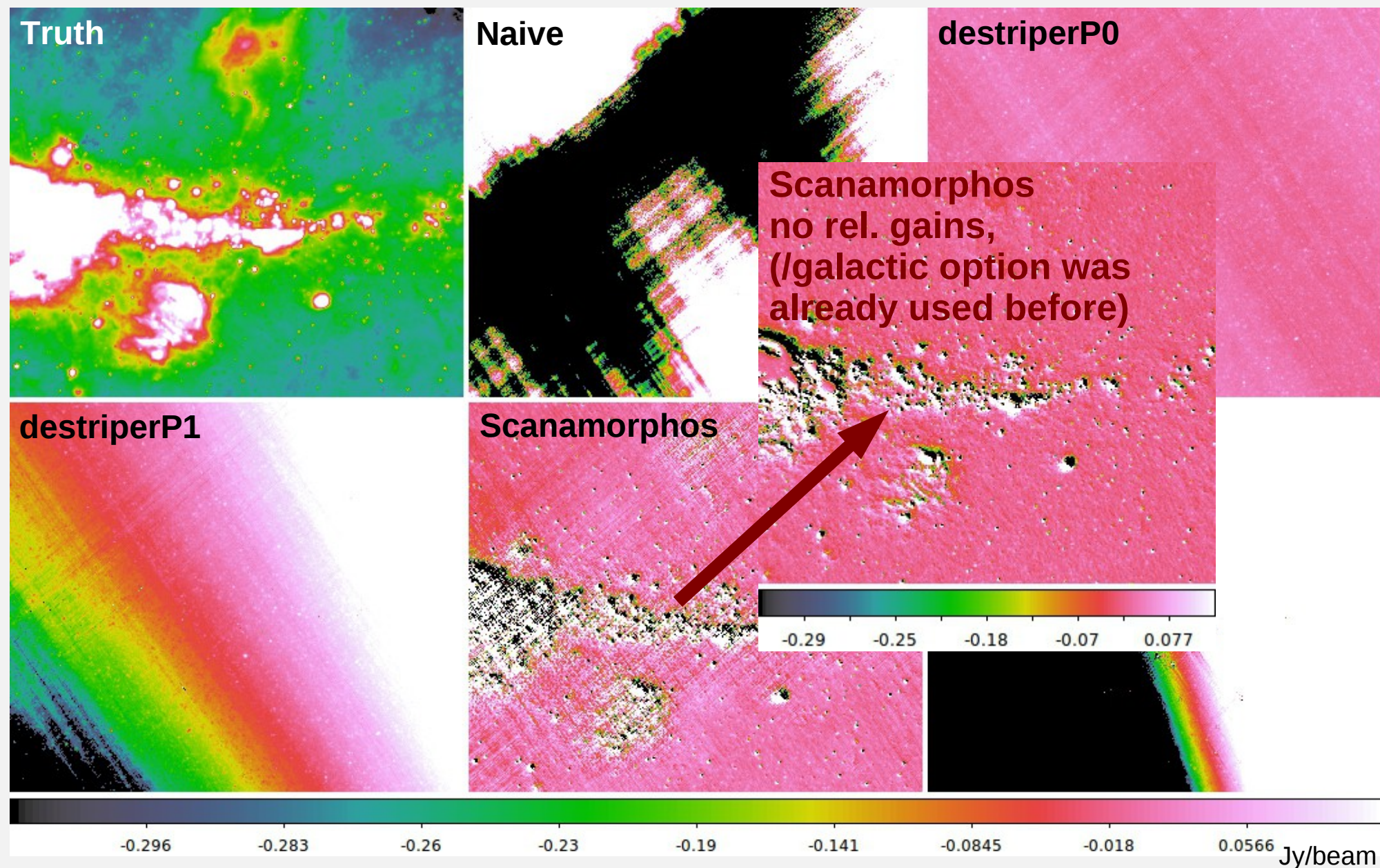
Difference maps ($\text{Diffmap} - \text{median}(\text{Diffmap})$), Parallel MW center (Case 9), PSW



Scale is comparable for the median-removed difference maps

SPIRE: Deviation from the truth

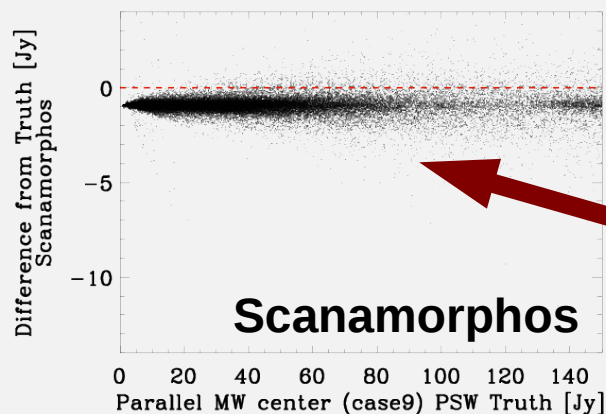
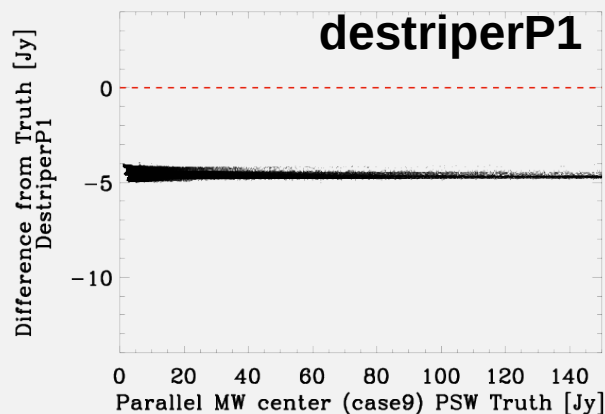
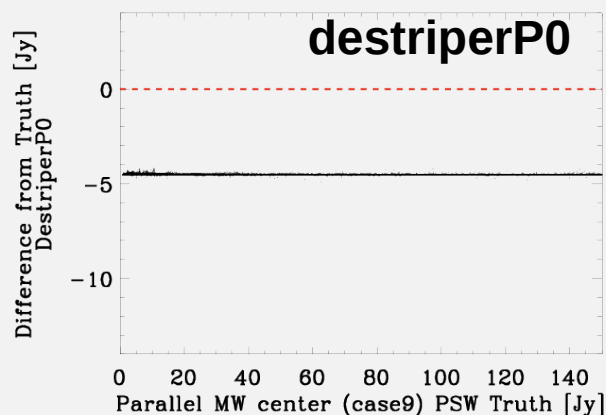
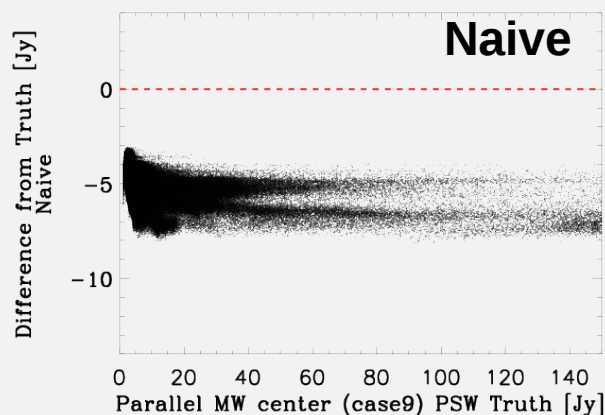
Difference maps ($\text{Diffmap} - \text{median}(\text{Diffmap})$), Parallel MW center (Case 9), PSW



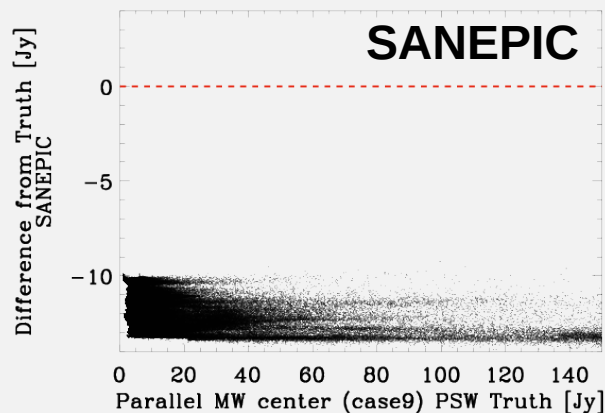
Scale is comparable for the median-removed difference maps

SPIRE: Deviation from the truth

Parallel MW center (Case 9), PSW



Scanamorphos
no rel. gains,
(/galactic option was
already used before)

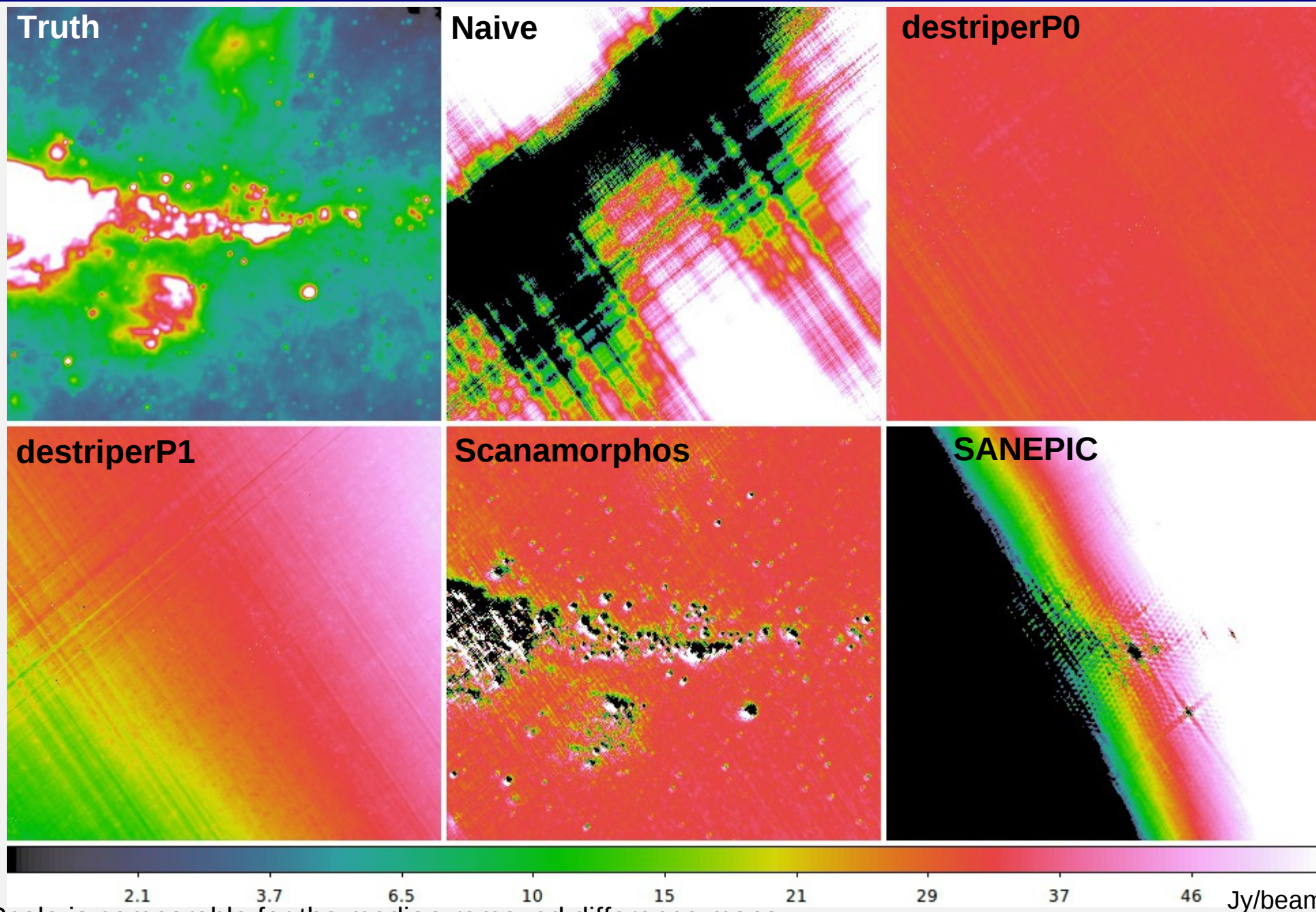


Scatter plots of $(S - S_{\text{true}})$ vs S_{true}

Not offset corrected

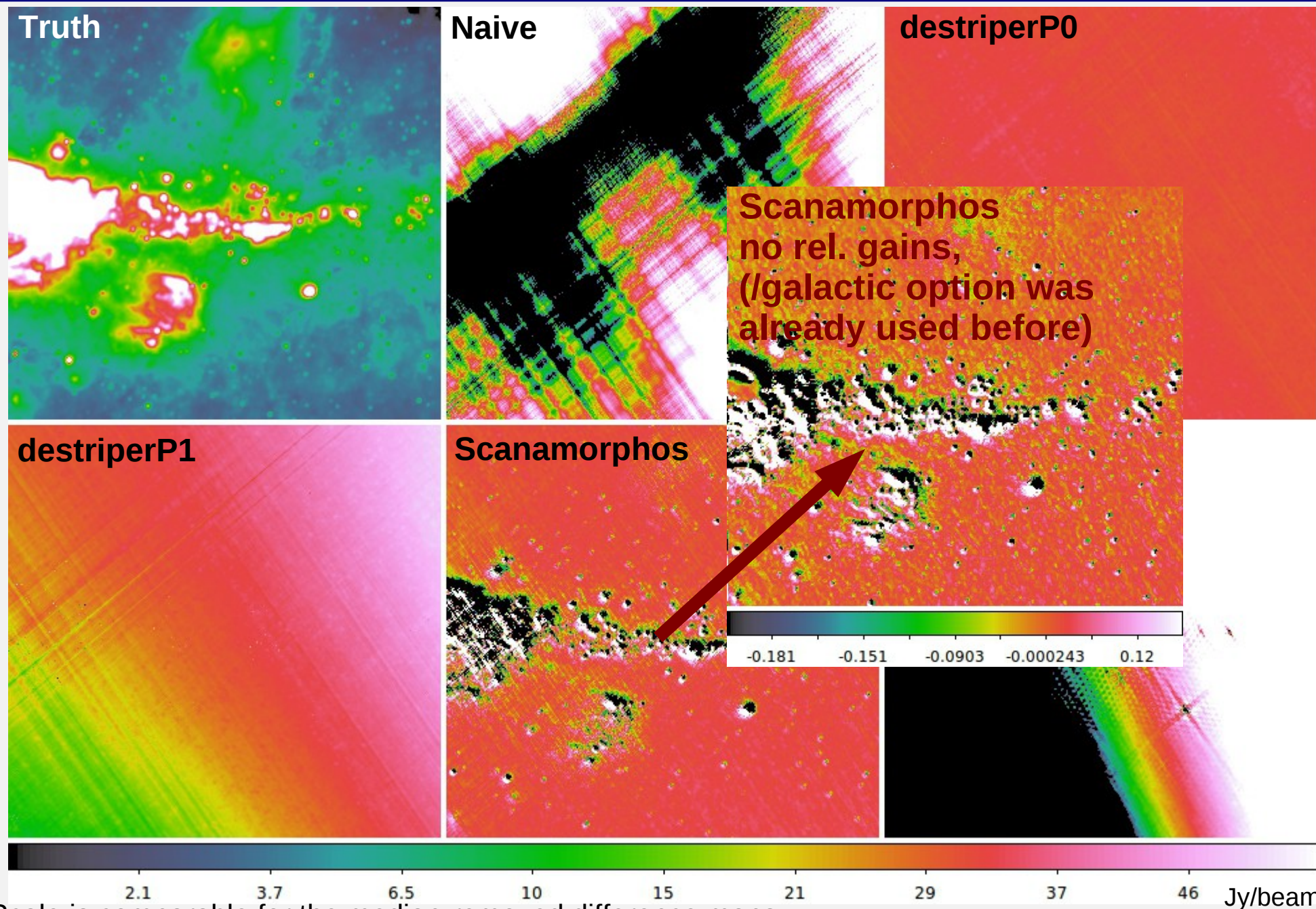
SPIRE: Deviation from the truth

Difference maps ($\text{Diffmap} - \text{median}(\text{Diffmap})$), Parallel MW center (Case 9), PLW

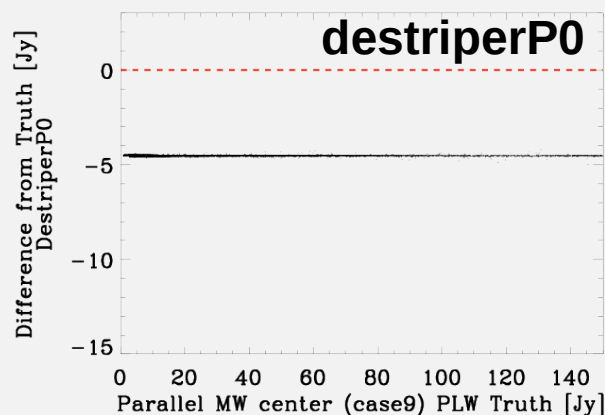
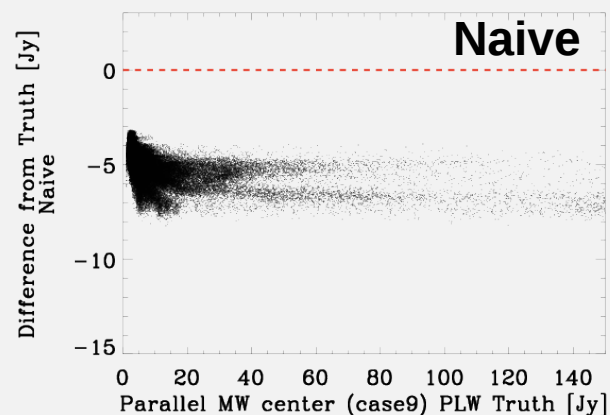


SPIRE: Deviation from the truth

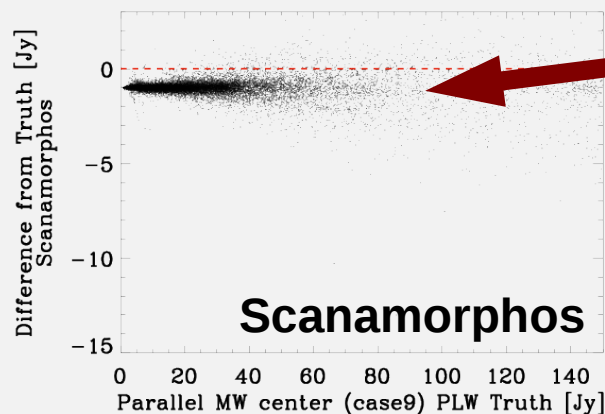
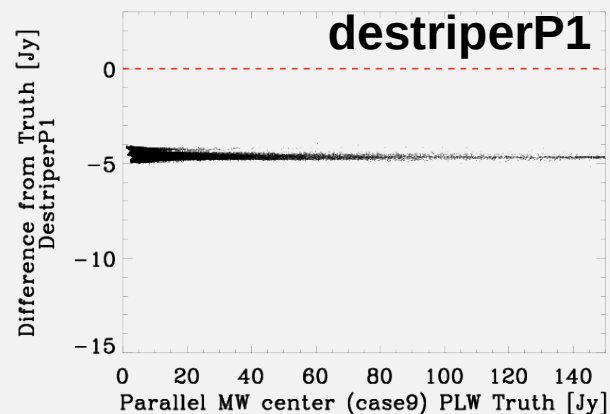
Difference maps ($\text{Diffmap} - \text{median}(\text{Diffmap})$), Parallel MW center (Case 9), PLW



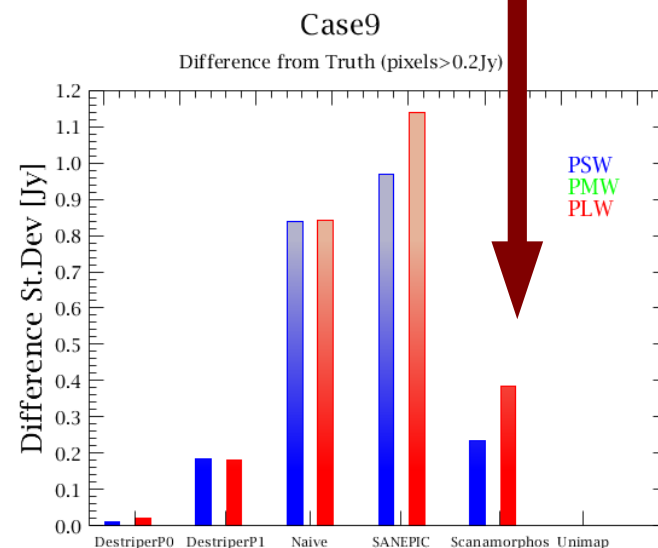
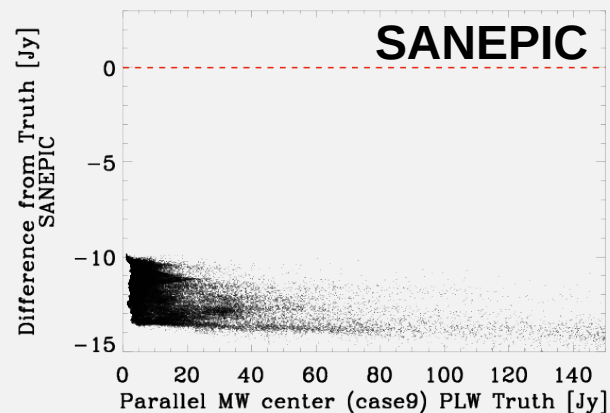
Scale is comparable for the median-removed difference maps



Scatter plots of
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 Not offset corrected

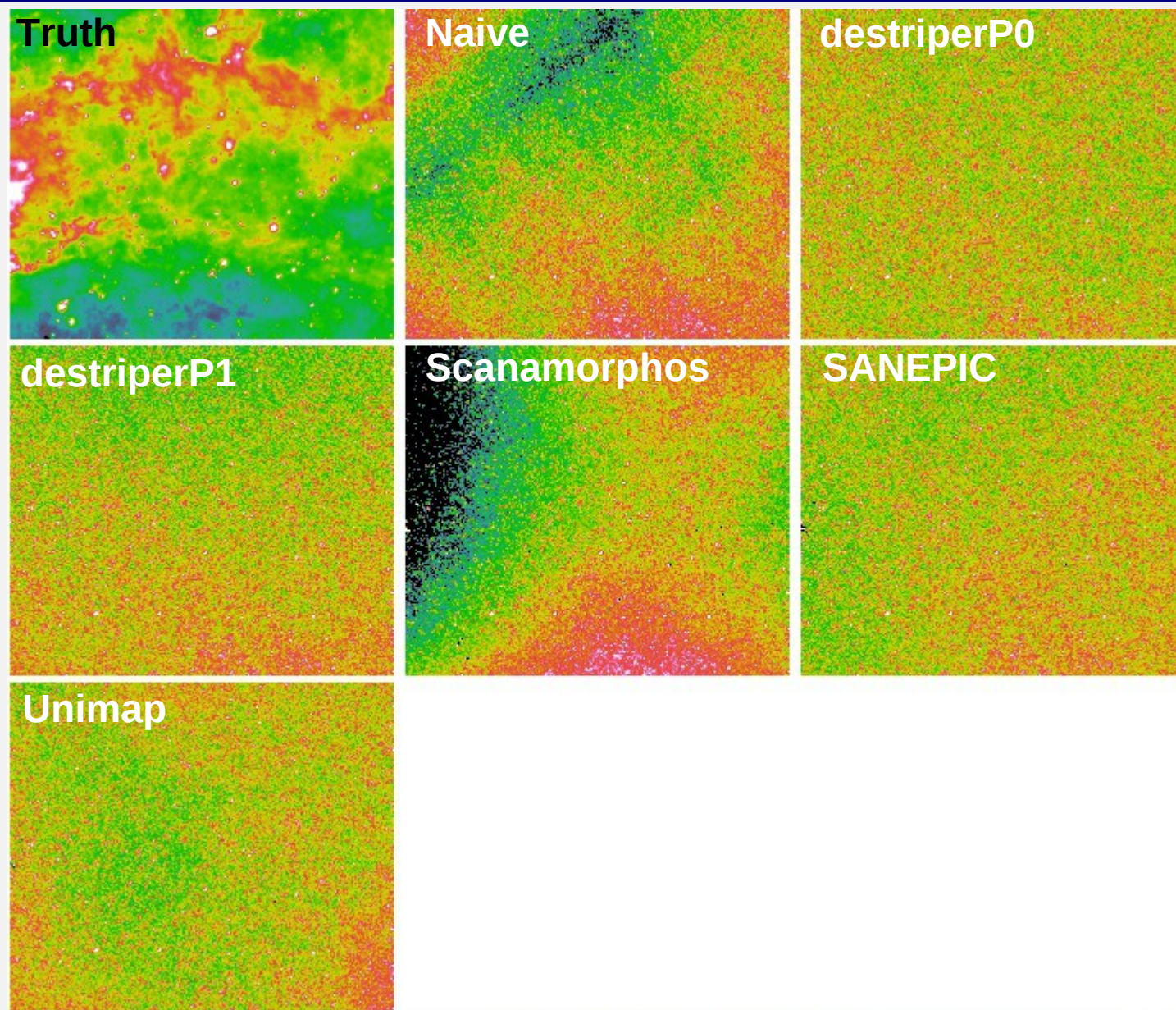


Scanamorphos
 no rel. gains,
 (/galactic option was
 already used before)



SPIRE: Deviation from the truth

Difference maps ($\text{Diffmap} - \text{median}(\text{Diffmap})$), Parallel cirrus (Case 10), PSW

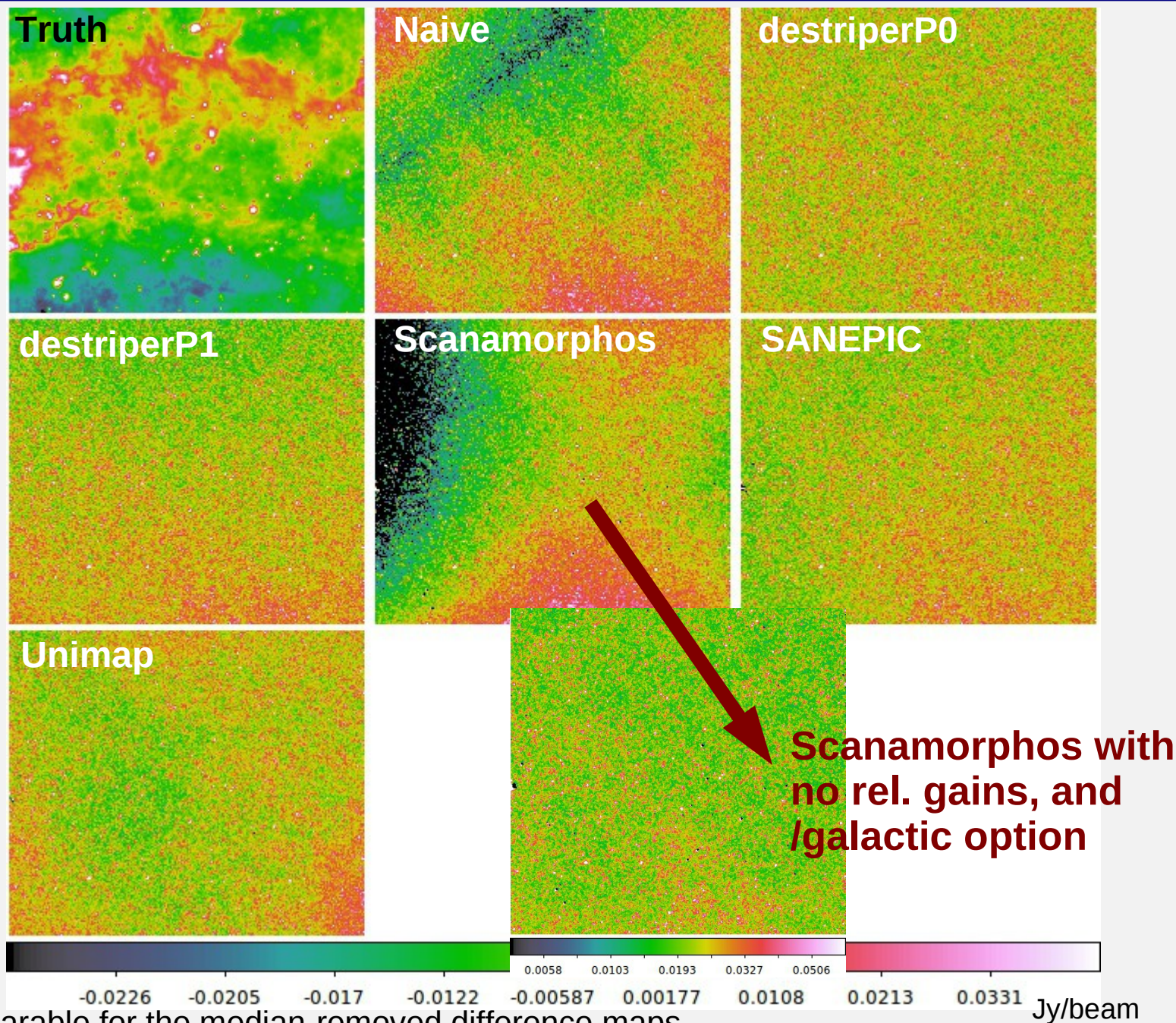


Scale is comparable for the median-removed difference maps

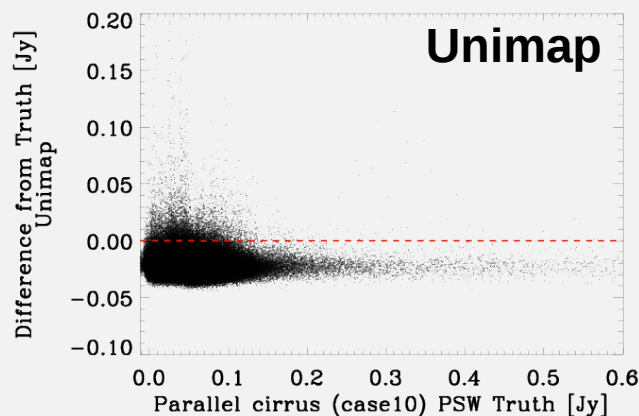
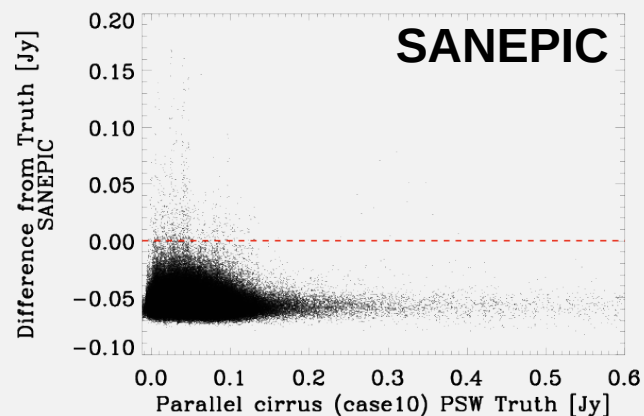
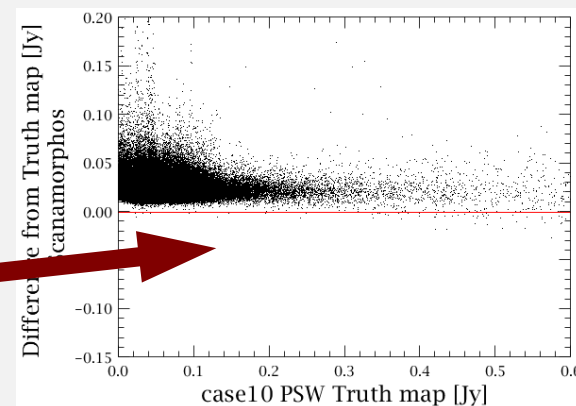
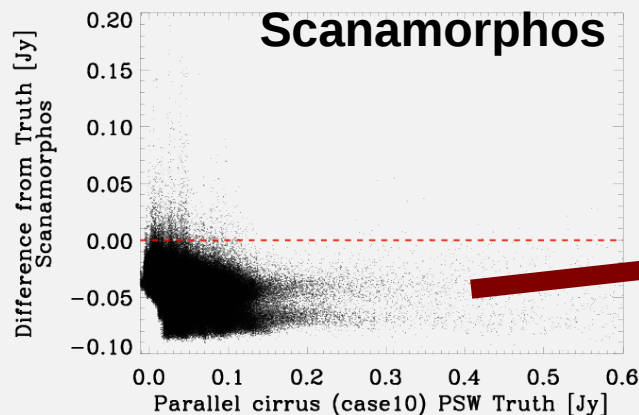
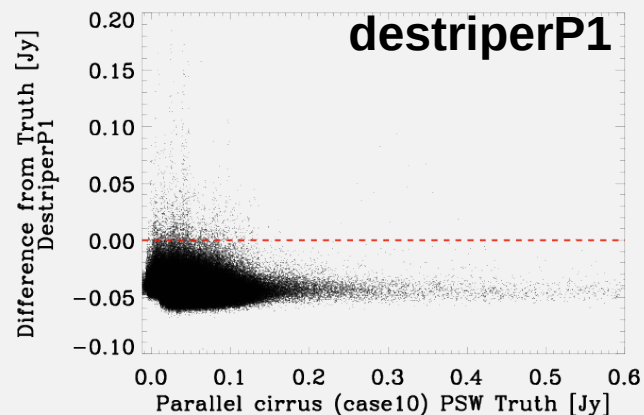
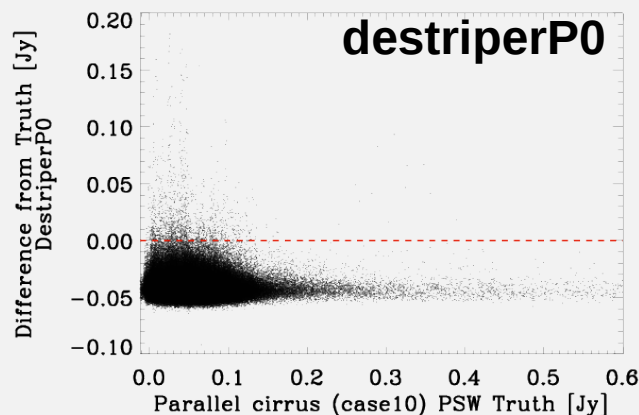
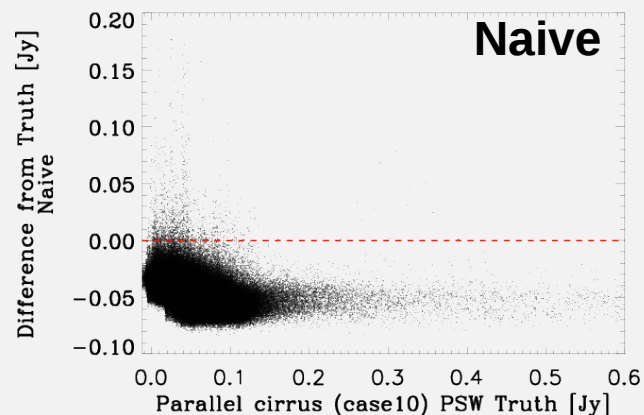
Jy/beam

SPIRE: Deviation from the truth

Difference maps (Diffmap - median(Diffmap)), Parallel cirrus (Case 10), PSW



Scale is comparable for the median-removed difference maps



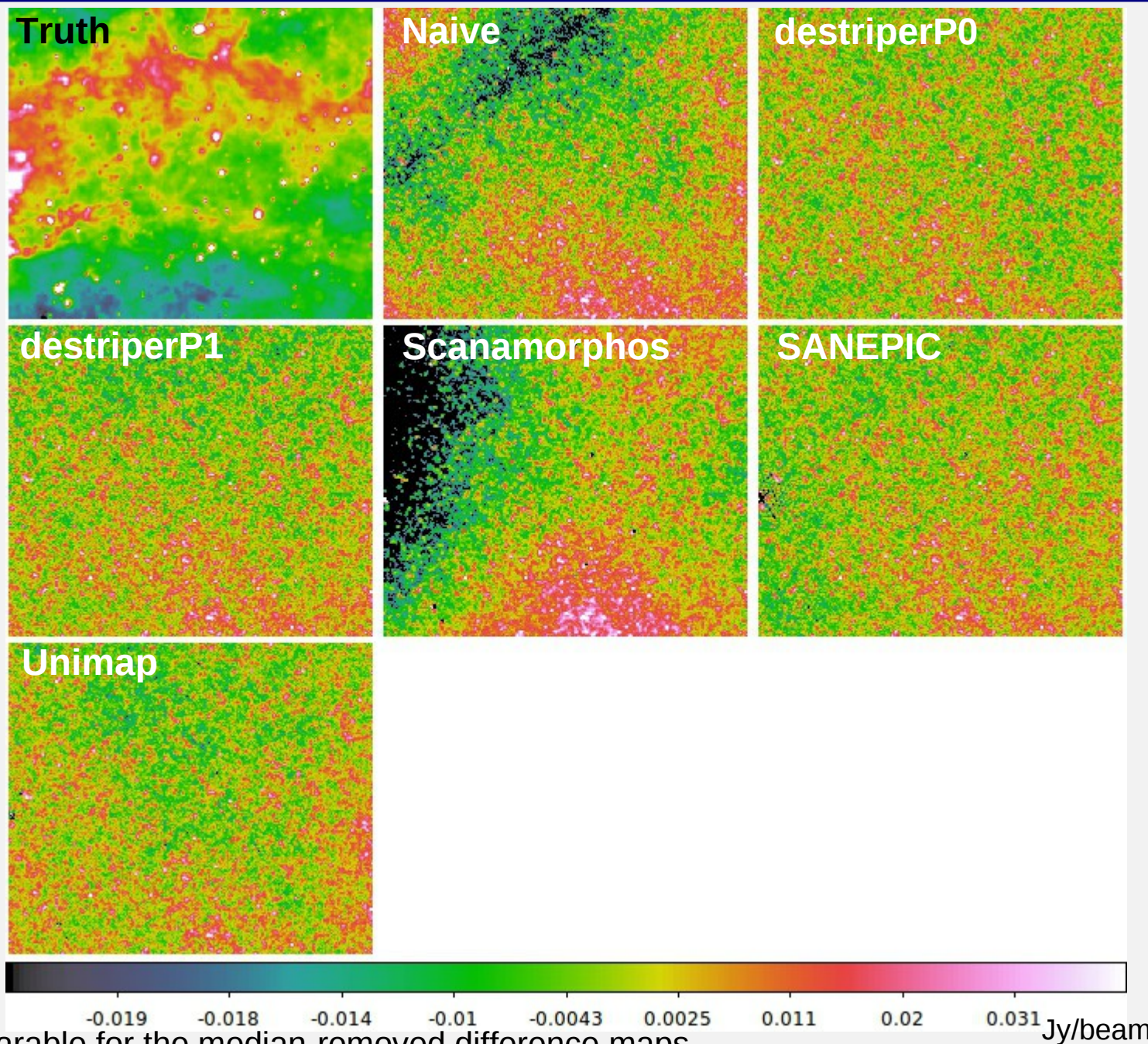
Scatter plots of
 $(S - S_{\text{true}})$ vs S_{true}

Not offset corrected

**Scanamorphos with
no rel. gains, and
/galactic option**

SPIRE: Deviation from the truth

Difference maps ($\text{Diffmap} - \text{median}(\text{Diffmap})$), Parallel cirrus (Case 10), PLW

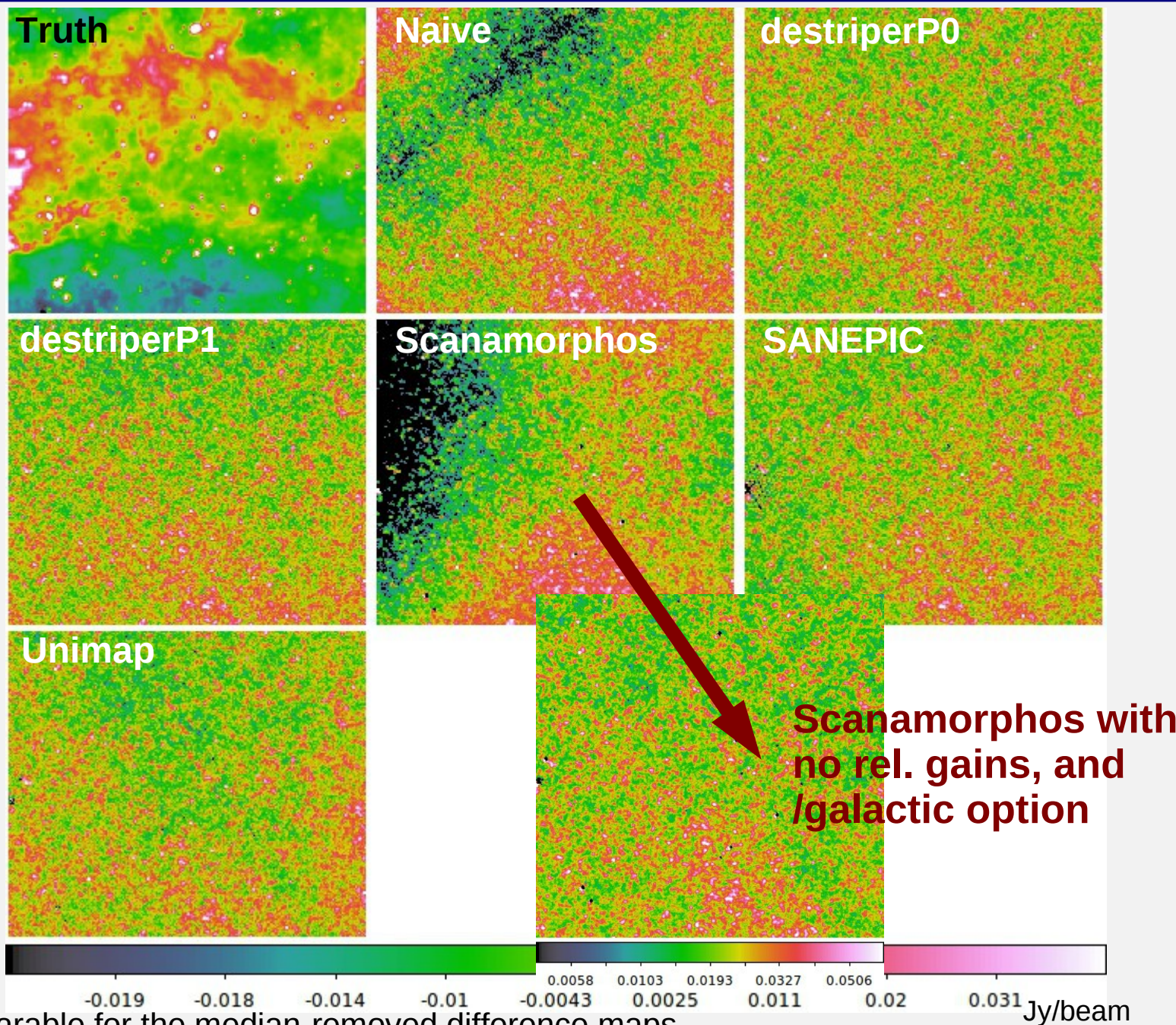


Scale is comparable for the median-removed difference maps

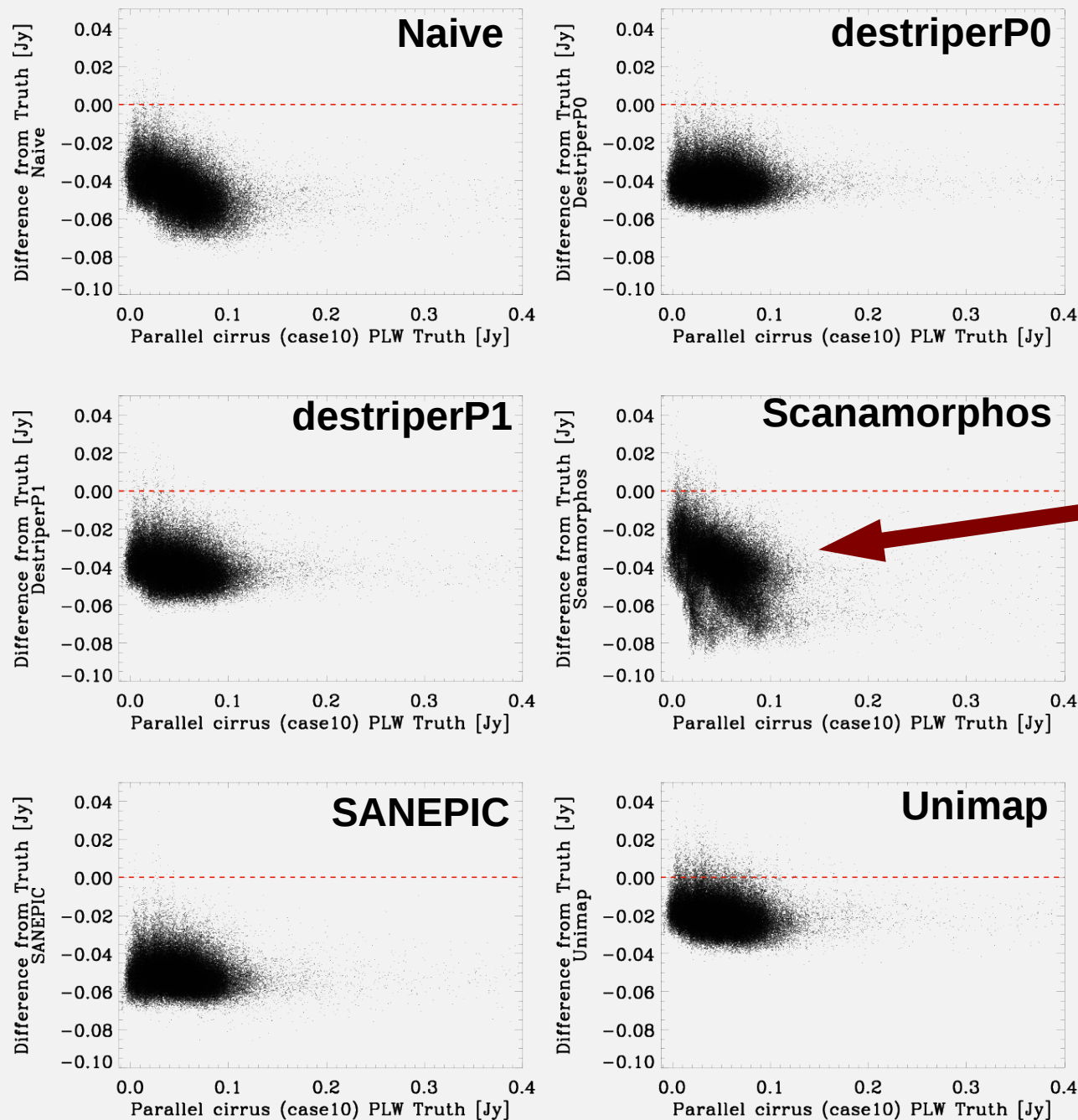
Jy/beam

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Difference maps (Diffmap - median(Diffmap)), Parallel cirrus (Case 10), PLW



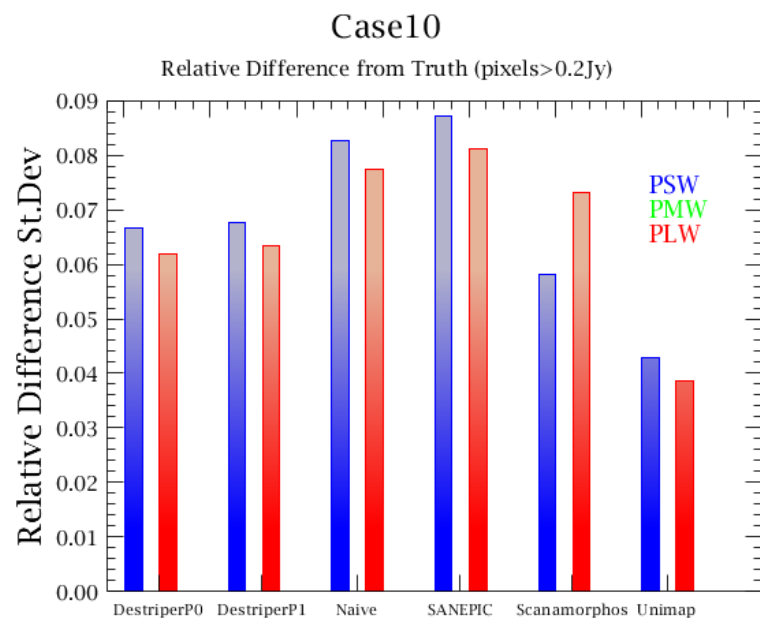
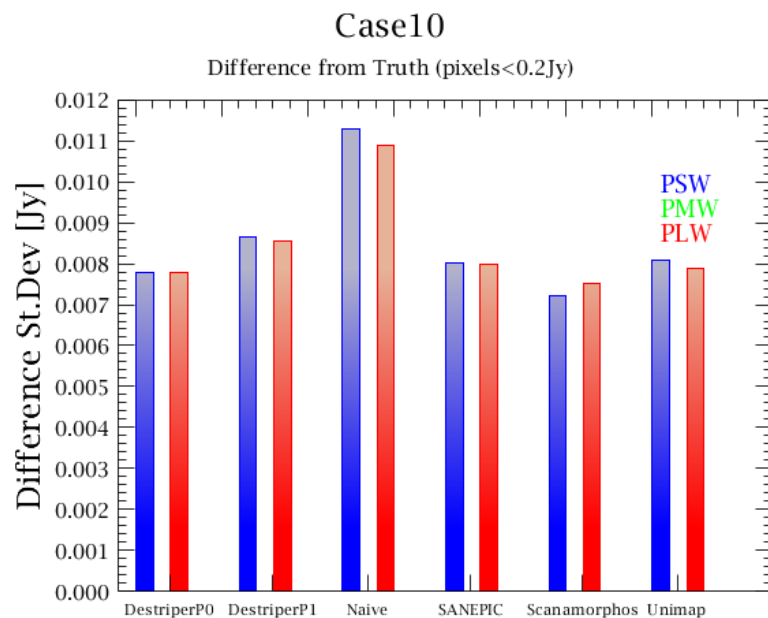
Scale is comparable for the median-removed difference maps



Also flattens
 - with no rel. gains used
 - and /galactic option
 (the latter does the flattening!)

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

Not offset corrected



Conclusions - General

- Data treatment is not optimal if map-maker's hypothesis does not meet the conditions of the simulations ([SANEPIC/case9](#), [Scanamorphos/cases6, 9](#)).

Conclusions I

- In low dynamic range cases (2, 4, 10):
 - [DestriperP0](#), and [SANEPIC](#) produces similar results.
 - [Scanamorphos](#) produces a larger scatter which is only due to a large scale slope introduced by the mapper.
 - Running [Scanamorphos](#) with [/galactic option](#) (preserves large scales)
 - ⇒ residual slope is avoided, and Scanamorphos scatter plots are comparable to the [SANEPIC](#) and [DestriperP0](#) and overall display slightly smaller stdev to the other two mappers.
 - Running the Destriper with a 1st order polynomial baseline removal ([DestriperP1](#))
 - ⇒ introduce residual slopes in the map.

Conclusions II

- In high dynamic range cases (6, 9):
 - DestriperP1, SANEPIC, Unimap introduce different types of large spacial scale noise.
 - DestriperP0 avoids introducing large spacial scales.
However, for specific scans the baseline is not properly removed. Due to the inability of the DestriperP0 to deal with the SPIRE "cooler-burps"?
 - Scanamorphos, also avoids introducing any large spatial scale noise.
However, it introduced striping which is attributed to the unnecessary application of Relative Gains corrections (the simulated timelines did not account for this effect).
 - Running Scanamorphos without Relative Gains correction \Rightarrow removes striping, However, the scatter plots still display larger standard deviation. Likely due to a slight positional offset introduced by the mapper (e.g., Scanamorphos diffMap, Case9, PLW), and a slight change in the beam size.