PACS-S SpecInterpolate Validation and Testing

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Gridding Algorithm: Weighted Averaging

- PacsRebinnedCube is an irregularly gridded collection of spectra.
- SpecProject: projection algorithm that for undersampled maps has the effect of:
  - Nearest Neighbour spectrum for output map pixels inside the area of input map pixels
  - Weighted Averaged spectrum for output map pixels that overlap with adjacent input map pixels (weights are the overlap area between the input and output pixel area)

$$I_{x_o y_o} = \frac{\sum_i \sum_{x_i} \sum_{y_i} d_{x_i y_i} a_{x_i y_i x_o y_o} s_i^2}{\sum_i \sum_{x_i} \sum_{y_i} a_{x_i y_i x_o y_o}}$$

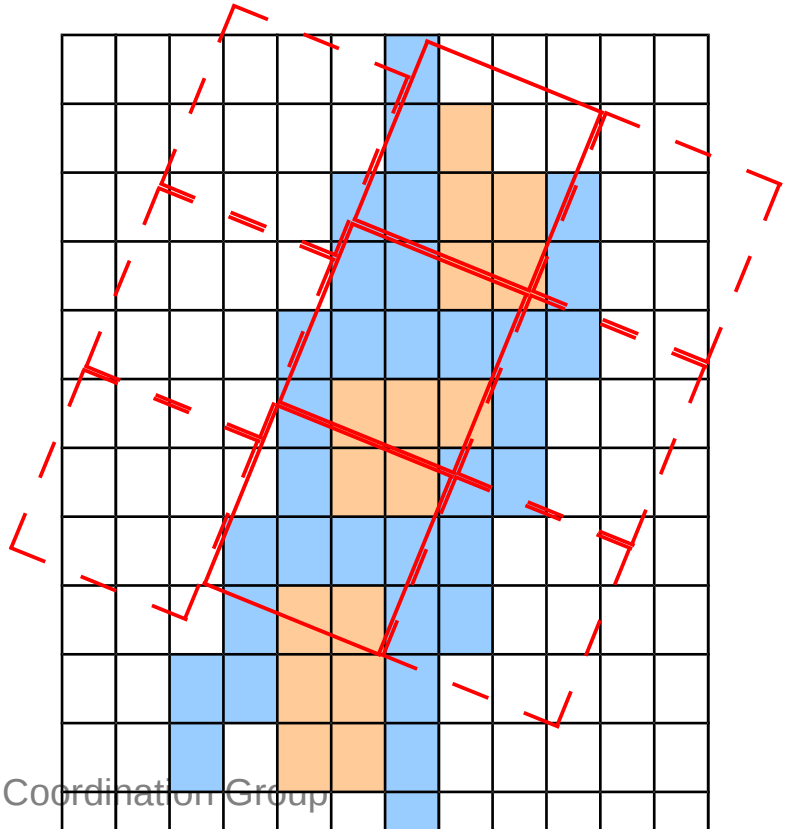
$$d_{x_i y_i} = intensity\ of\ input\ pixel\ (x_i, y_i)$$

$$a_{x_i y_i x_o y_o} = overlap\ area : input\ pixel\ (x_i, y_i) \wedge output\ pixel\ (x_o, y_o)$$

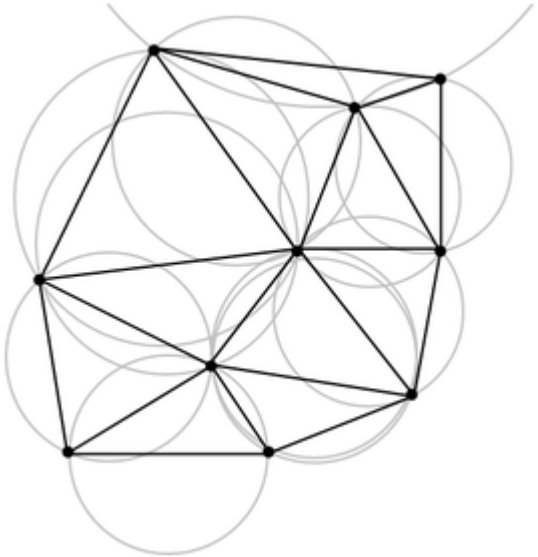
Calculated using Hardy Blackwell algorithm

Flux conservation term can be
- On
- Off (PACS#5018)

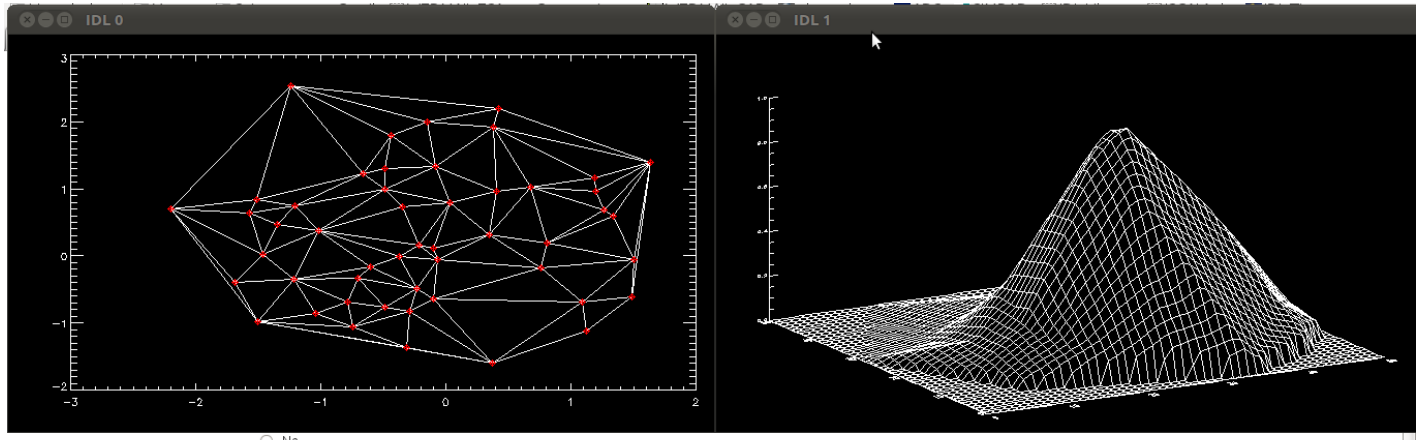
$$s_i^2 = \frac{pixel\ area\ input\ image}{pixel\ area\ output\ image} = \frac{9.26^2}{cdelt_o^2}$$



Gridding Algorithm: Delaunay Interpolation



- Delaunay Triangulation
- Interpolation on a regular grid
- Flux conservation?
- Grid size?
- Error propagation?

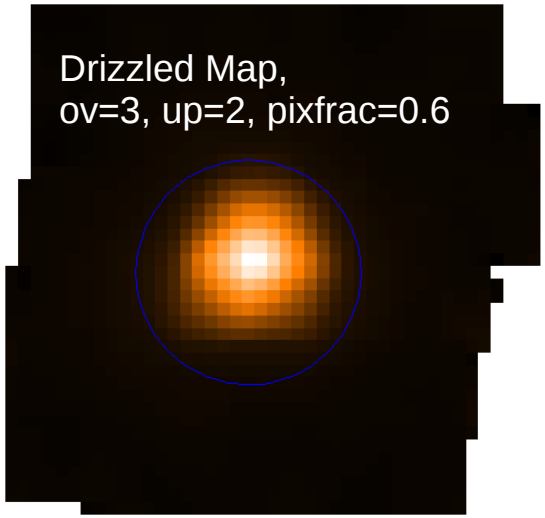


- Comparison for oversampled maps:
  - Drizzle (reference for map pixel grid)
  - SpecProject
  - SpecInterpolate
- Comparison for undersampled maps:
  - Drizzle (reference from oversampled map)
  - SpecProject (pixel grid size= 4.7”)
  - SpecInterpolate (pixel grid size=4.7”)
  - Central spaxel spectrum + PSC

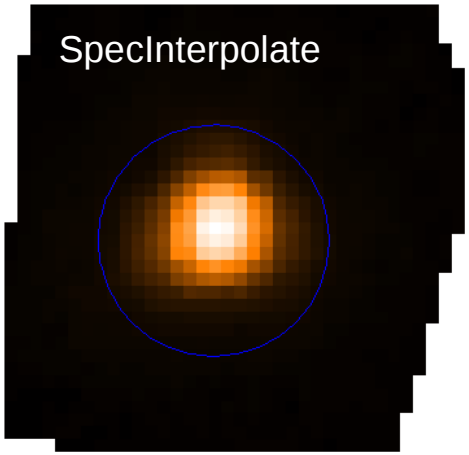
Footprints

- The footprint from specInterpolate is generally smaller than specProject and drizzle because the Delaunay interpolation algorithm does not allow for extrapolation outside of the irregular triangles created spatially.
- This is not much of a problem for oversampled maps, but it is for undersampled (pacsRebinnedCube)

Integrated maps in band B3A



Oversampled
PixSize=1.38”



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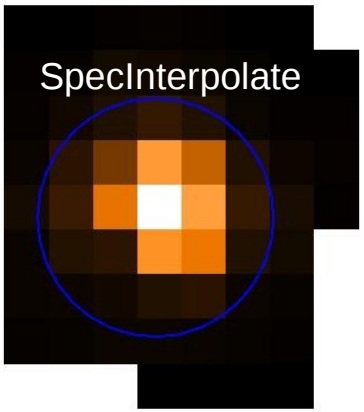
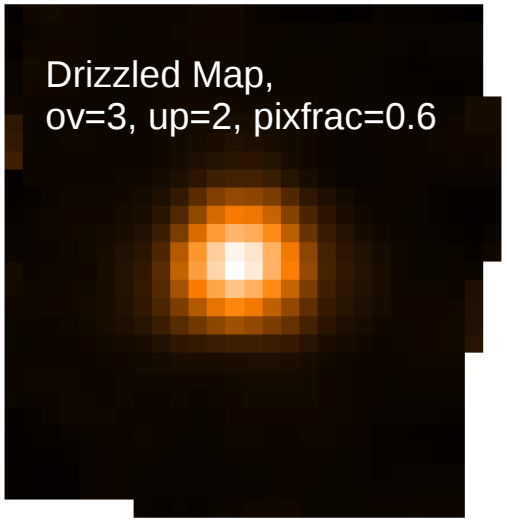


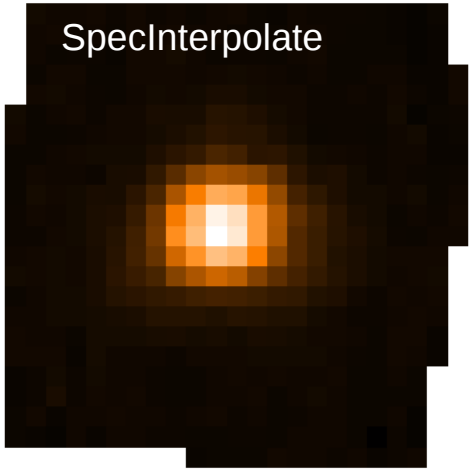
Undersampled
PixSize=4.7”

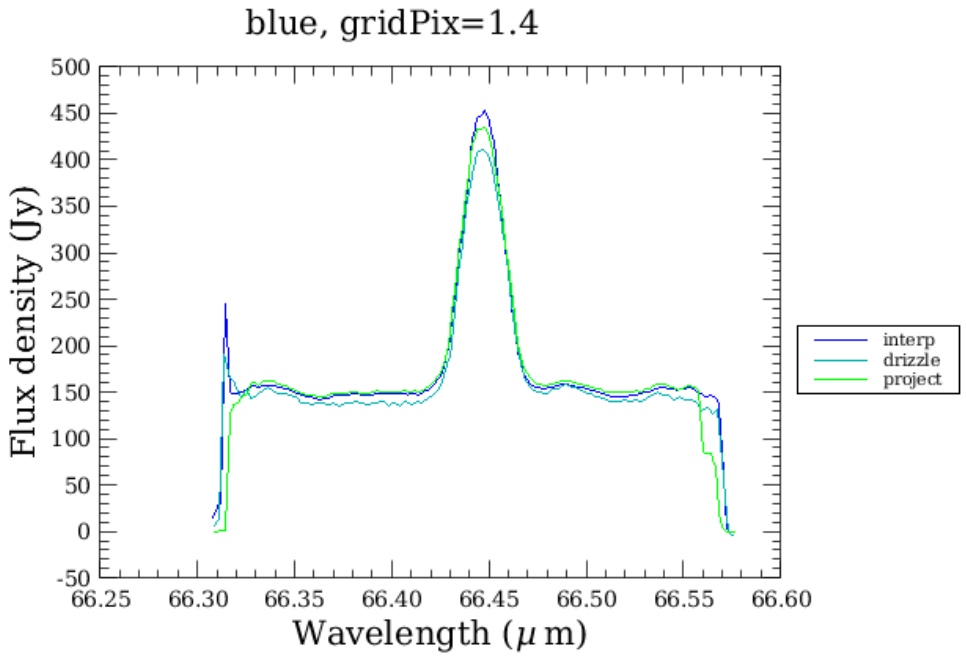
Flux Conservation

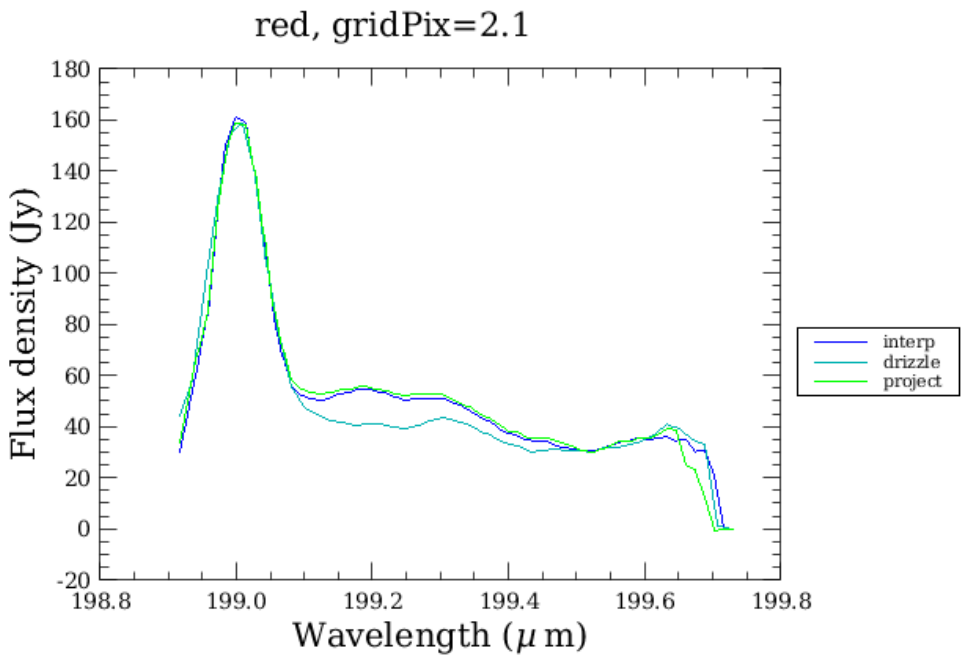
Oversampled Maps + Sum(Map)

PixelSize=2.1”

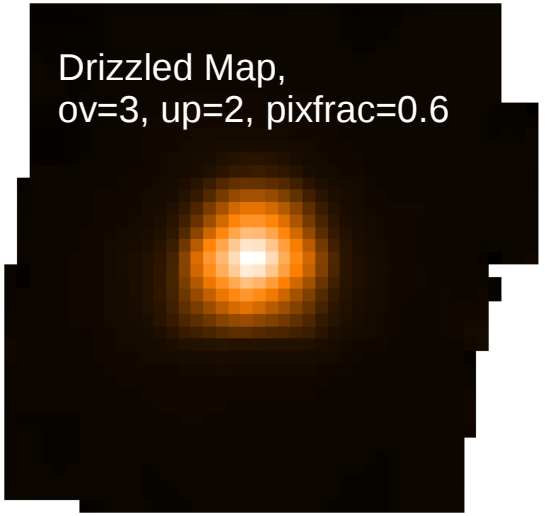








Undersampled Maps + SUM(Map)



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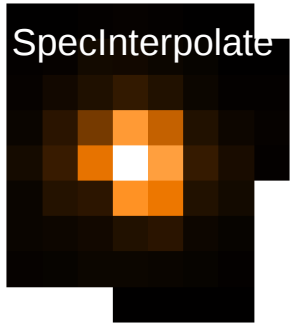

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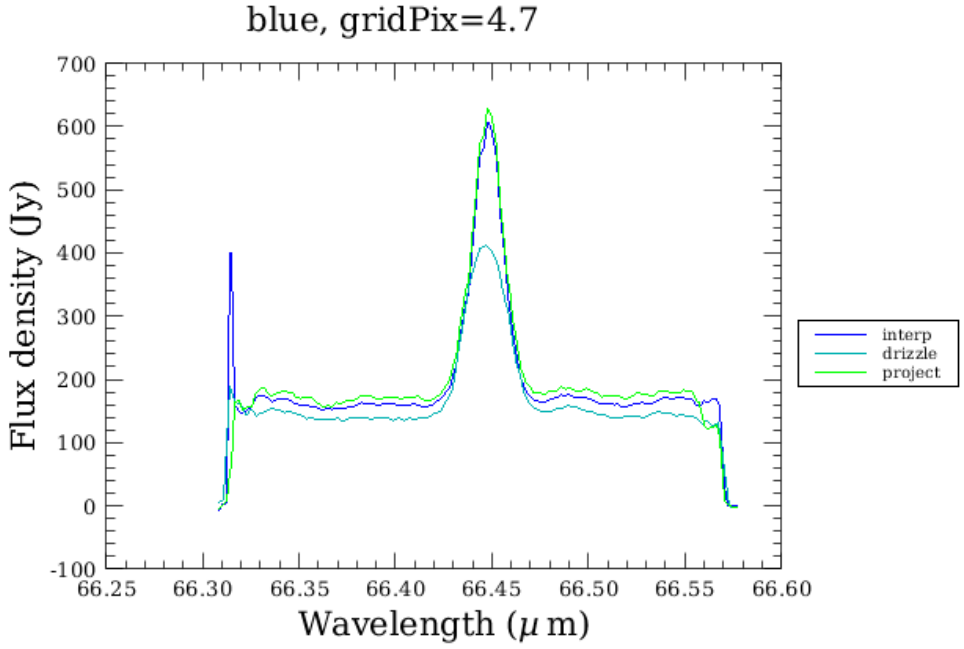
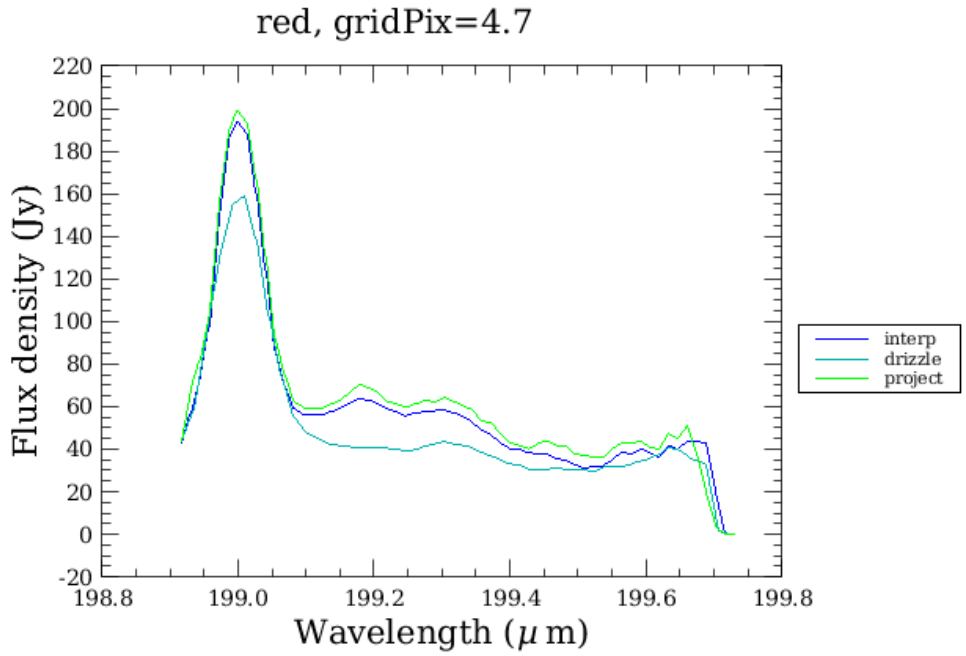
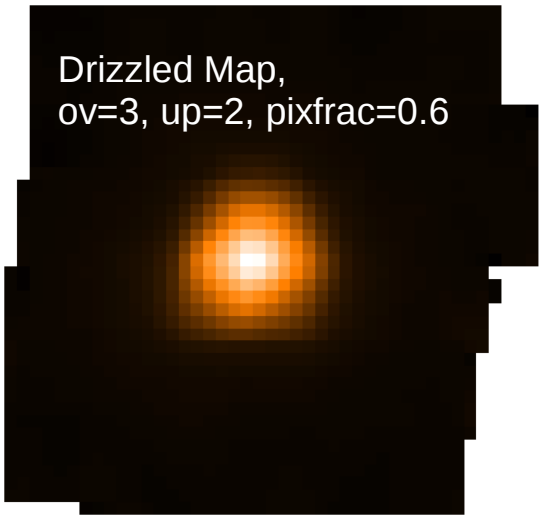
PixelSize interp, project = 4.7”





Undersampled Maps + SUM(Map)



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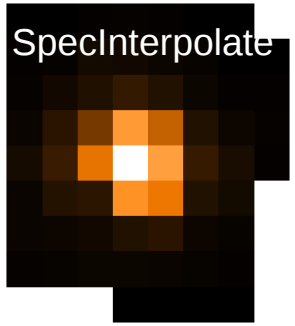

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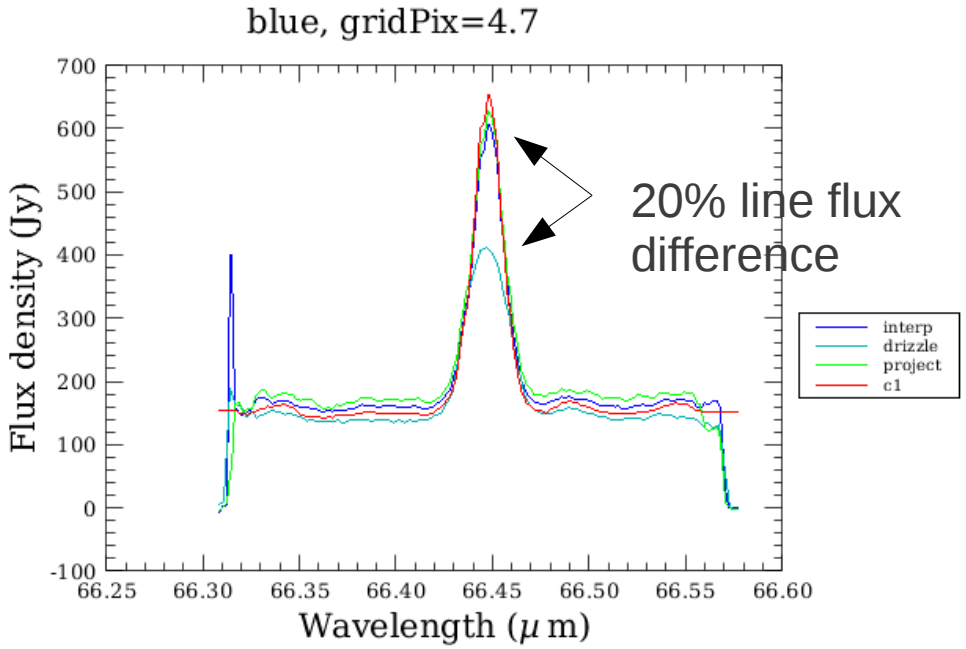

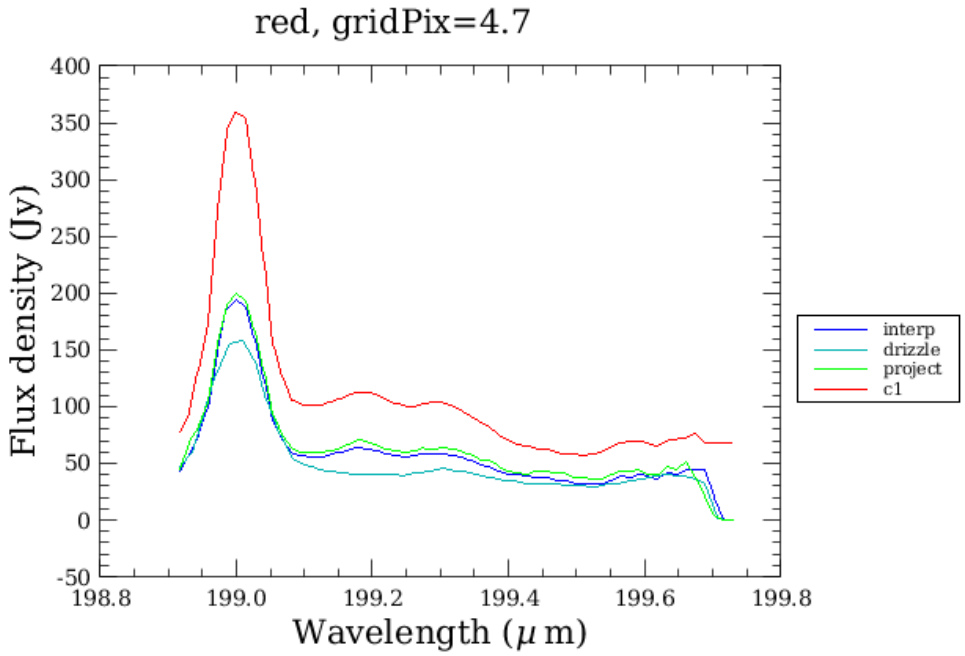

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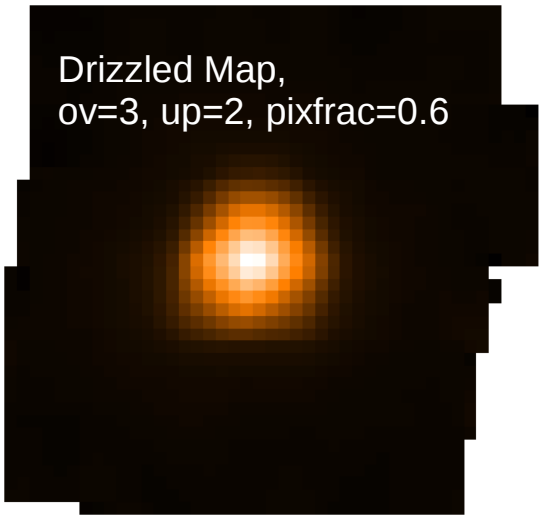
Undersampled Maps + SUM(Map)



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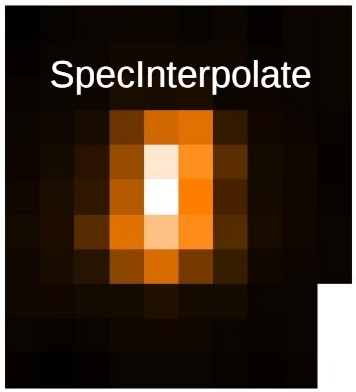

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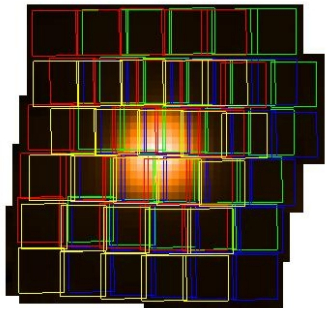

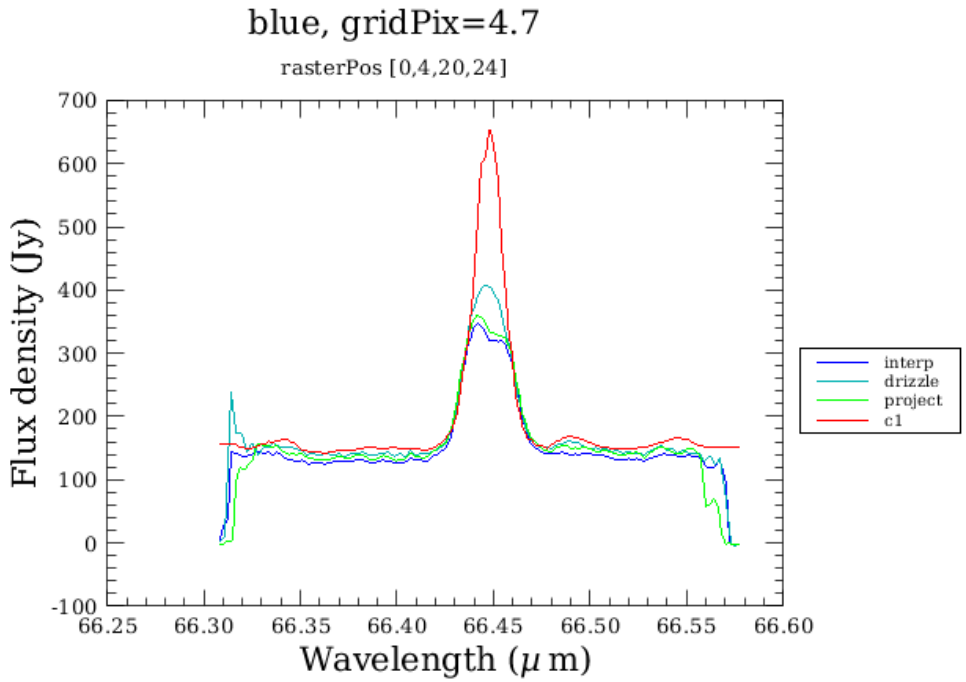

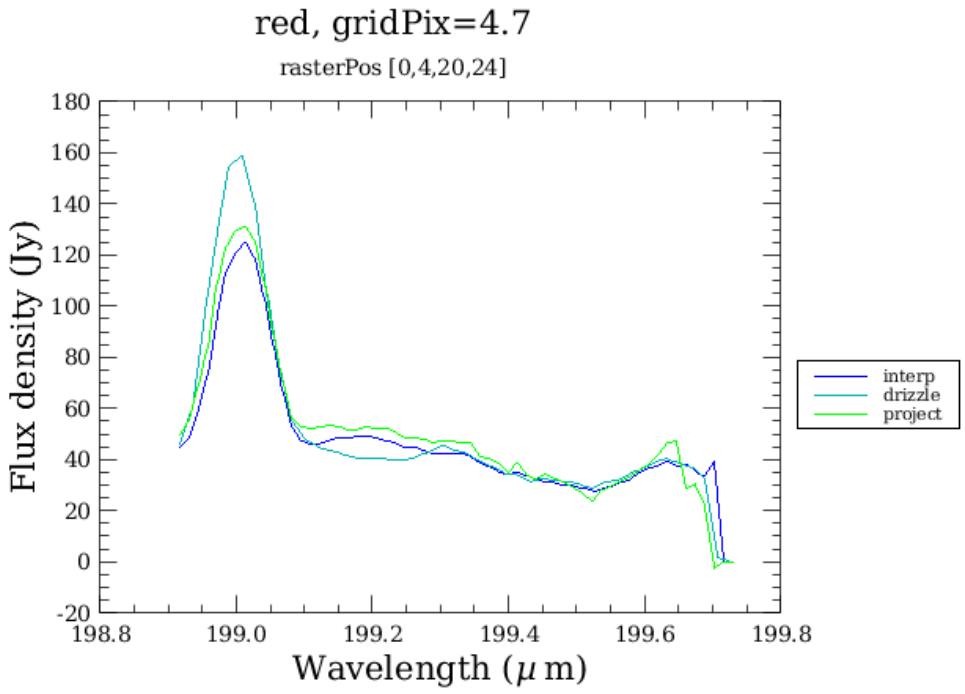

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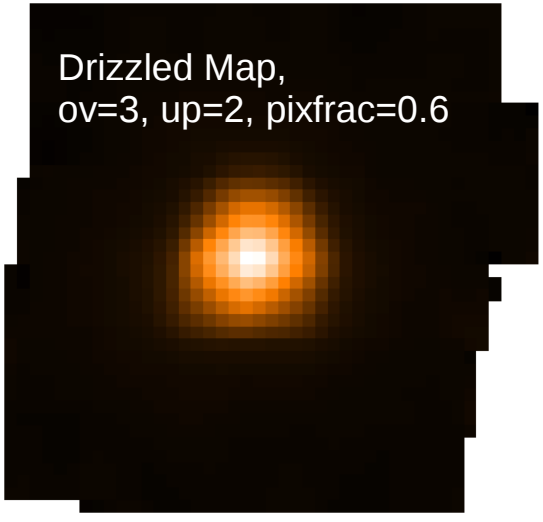
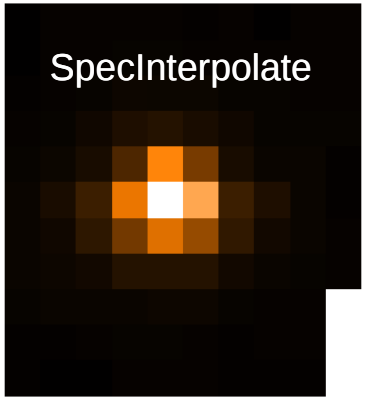
Undersampled Maps + SUM(Map)

RasterPos=[0,4,12,20,24]





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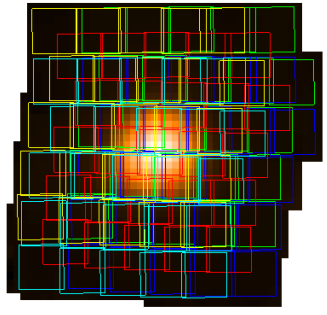
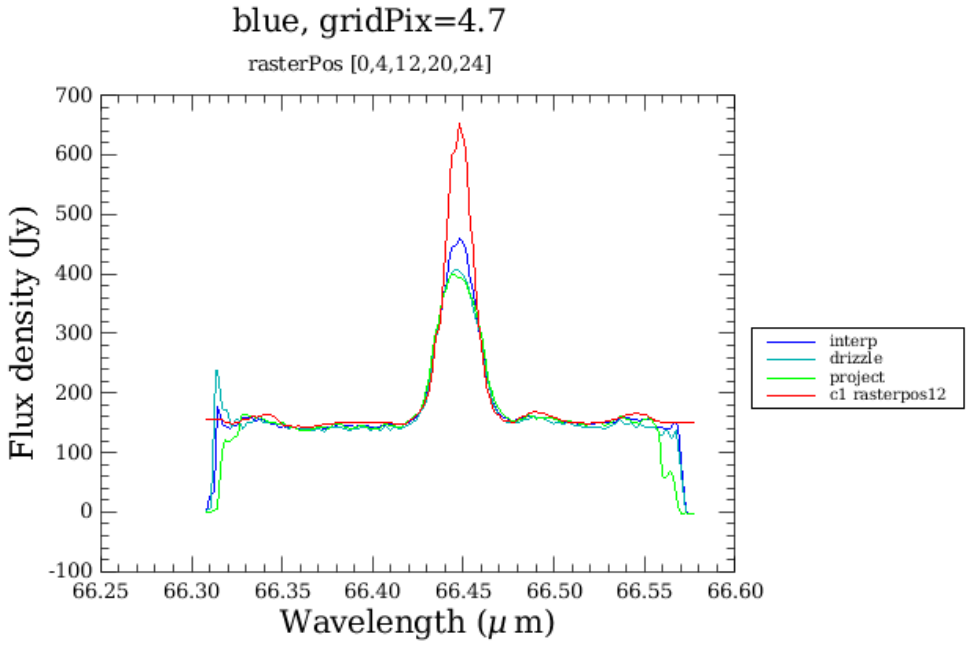
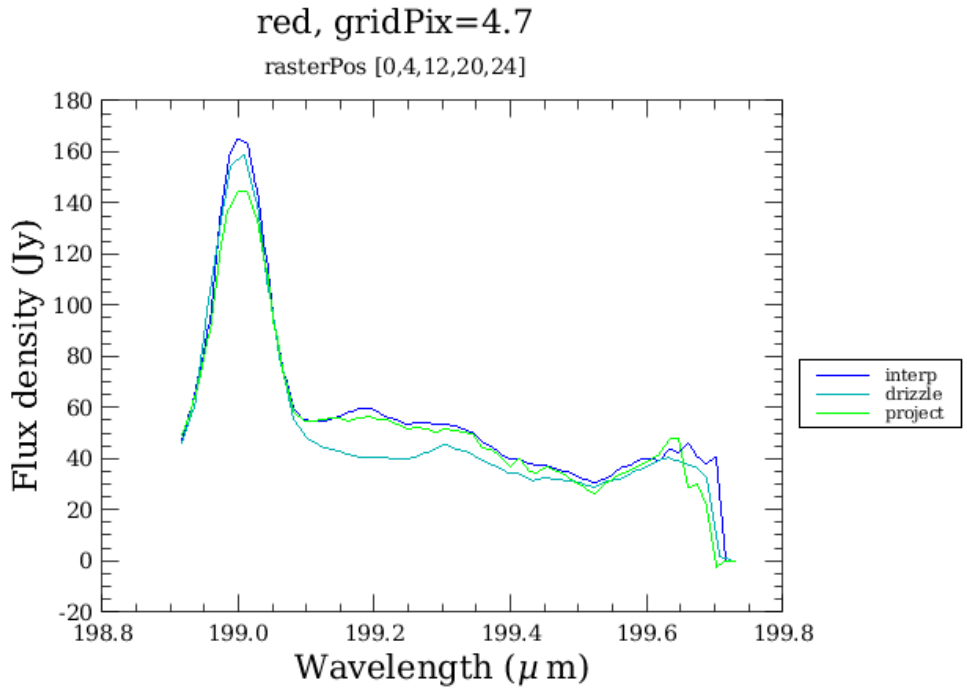
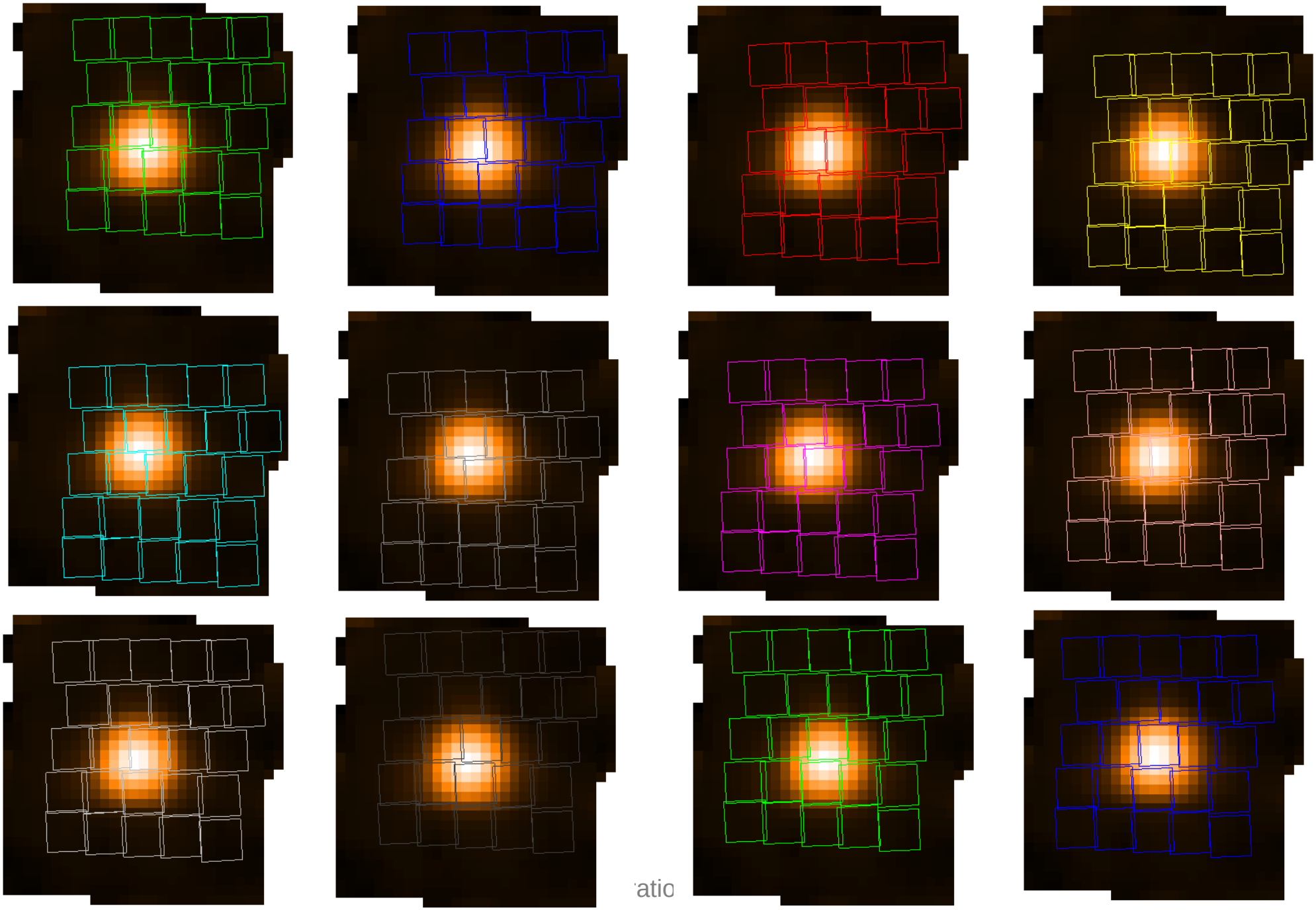


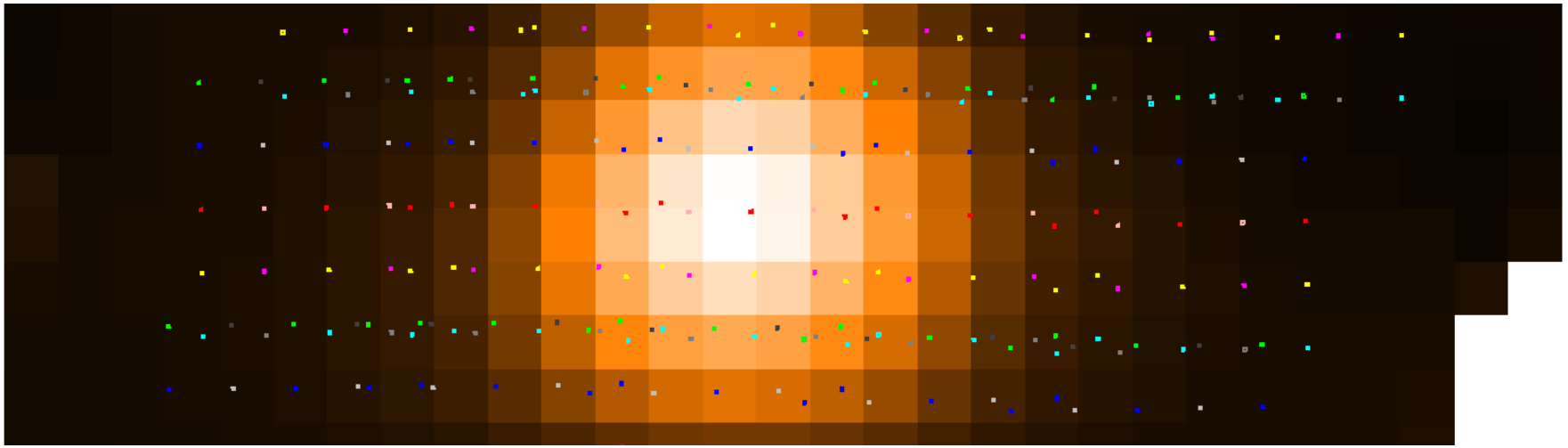




Rdor Oversampled Map



Rdor Oversampled Map



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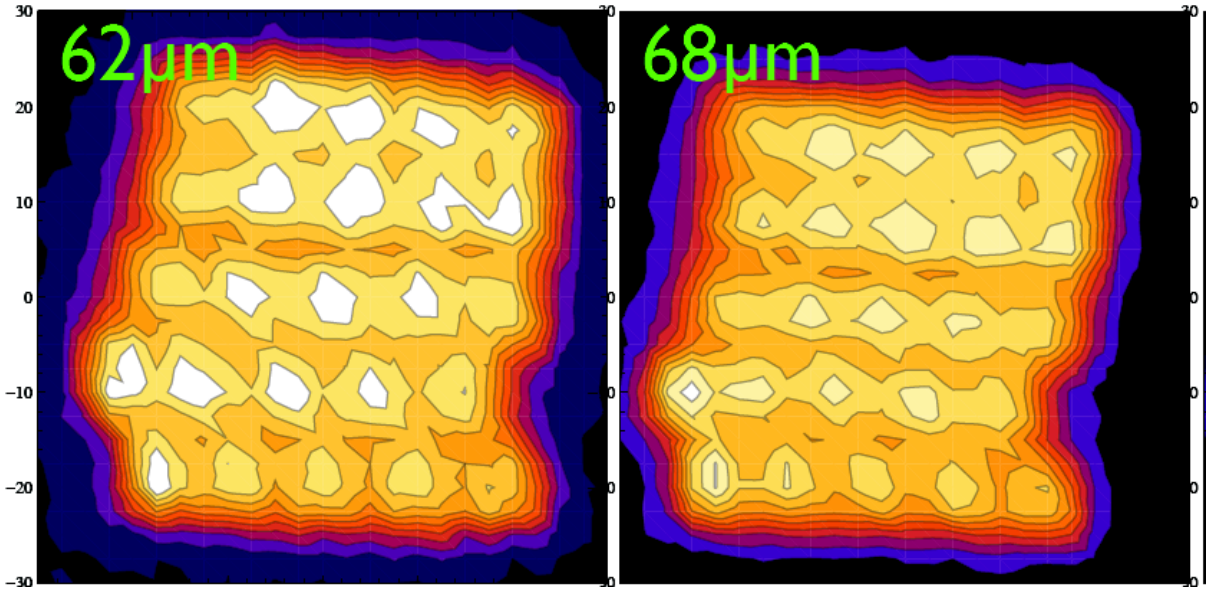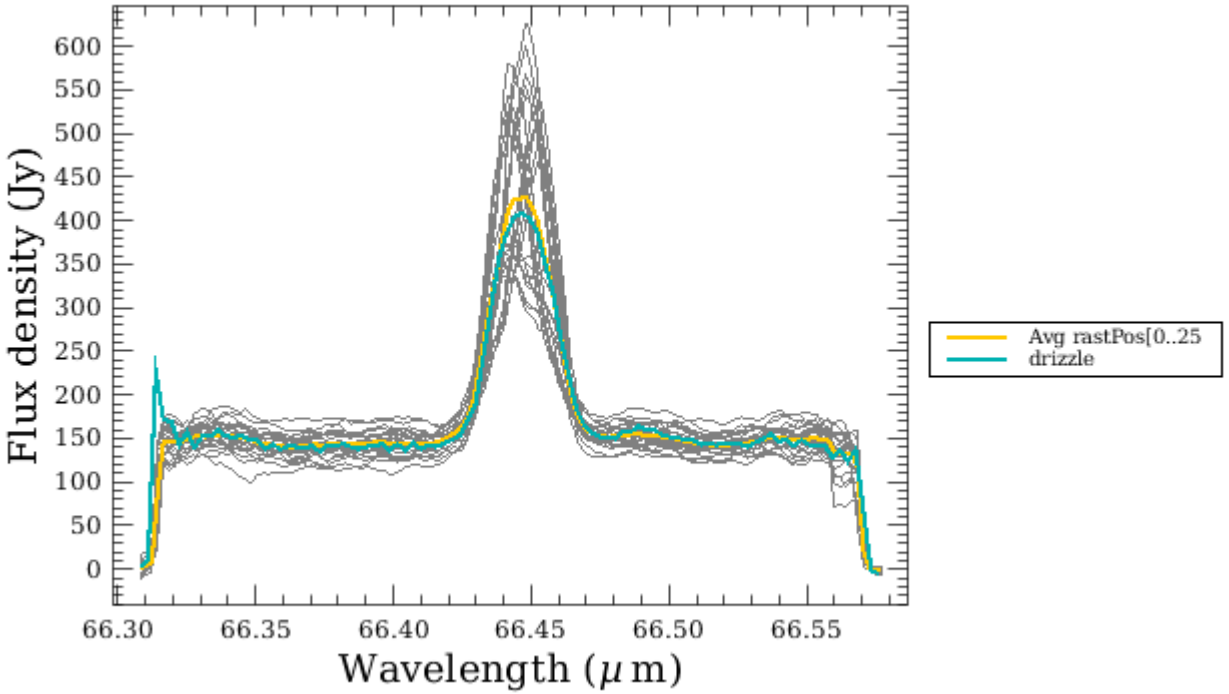
FoV Uniformity