

**PACS spectroscopy chop/nod FPG  
verification from line scan maps**

**OD 135-373**

*PICC-KL-TN-043*

*Combining PICC-KL-TN-043A, PICC-KL-TN-042A, PICC-KL-TN-042B & PICC-KL-TN-038*

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Approved by		
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# **PACS spectroscopy chop/nod FPG optimisation from line scan maps**

*PICC-KL-TN-038*

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## Document Change Record

<i>Issue</i>	<i>Date</i>	<i>Description</i>
1.0	18-10-2009	First version

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## 1 Introduction

This document reports on the analysis of OD 155 measurements to finalise the spectroscopy chop/nod FPG parameters

## 2 Reference documents

### 2.1 Applicable documents

<i>Number</i>	<i>Document</i>
[AD1]	

### 2.2 Reference documents

<i>Number</i>	<i>Document</i>
[RD1]	
[RD2]	

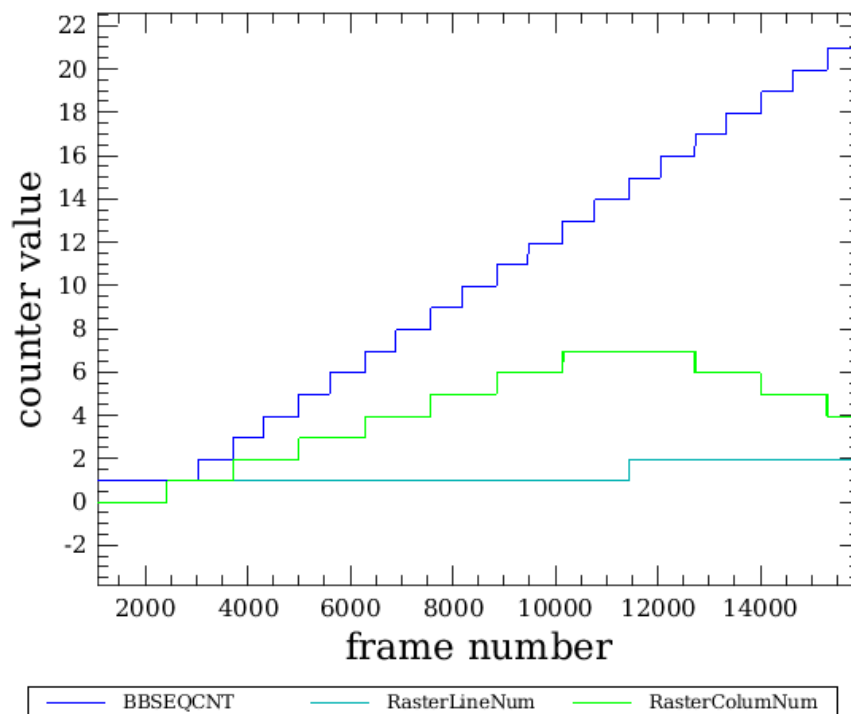
### 3 Data overview

```
obs[1342186064] = "small chop: y offset 31.5, z offset -3.5, skew 1.2,  
nod throw 29.8, chop throw 29.8"  
obs[1342186065] = "small chop: y offset 31.5, z offset +1.5, skew 1.2,  
nod throw 29.8, chop throw 29.8"  
obs[1342186066] = "small chop: y offset 26.5, z offset -3.5, skew 1.2,  
nod throw 29.8, chop throw 29.8"  
obs[1342186067] = "medium chop: y offset 90.5, z offset -3.5, skew  
1.2, nod throw 89.0, chop throw 89.0"  
obs[1342186068] = "large chop: y offset 180, z offset -6.0, skew 1.2,  
nod throw 177.5, chop throw 177.5"  
obs[1342186069] = "large chop: y offset 180, z offset -6.0, skew 1.1,  
nod throw 177.5, chop throw 177.5"
```

Additionally, we use OD141 measurements:

### 4 Line / column raster positions reconstruction

The attitude history file and pointing product for OD155 was not available at the time of processing. From a similar observation on OD141 (obsid 1342184661) we can establish the relation between BBSEQCNT in the status and the rasterline / column.



*Illustration 1: Relation BBSEQCNT and raster line / raster column from OD141 observation*

```
bbseqcnt = frame.getStatus("BBSEQCNT")
lineNum = (bbseqcnt-1) / 2 / 7 + 1
columnNum = (bbseqcnt-1) / 2 % 14 + 1
w = columnNum.where(columnNum > 7)
columnNum[w] = 15 - columnNum[w]
```

In order to find the chop on / off plateaus, specDiffChop needs information on nod position, which is also extracted from the pointing product. This information has been faked with:

```
frame.setStatus("AbPosId", (frame.getStatus("BBSEQCNT")%2 == 0))
frame.setStatus("IsAPosition", (frame.getStatus("BBSEQCNT")%2 == 0))
frame.setStatus("IsBPosition", (frame.getStatus("BBSEQCNT")%2 == 1))
frame.setStatus("OnTarget", frame.getStatus("DMCSEQACTIVE"))
```

## 5 Results

Images and contour maps below are the line flux and continuum maps. Coordinates are the spacecraft raster lines and columns with a step size of 2.5"

### 5.1 Small chopper throw

#### 5.1.1 OBSID 1342186064 (OD155)

Parameters:

y offset 31.5  
 z offset -3.5  
 skew 1.2  
 nod throw 29.8  
 chop throw 29.8"

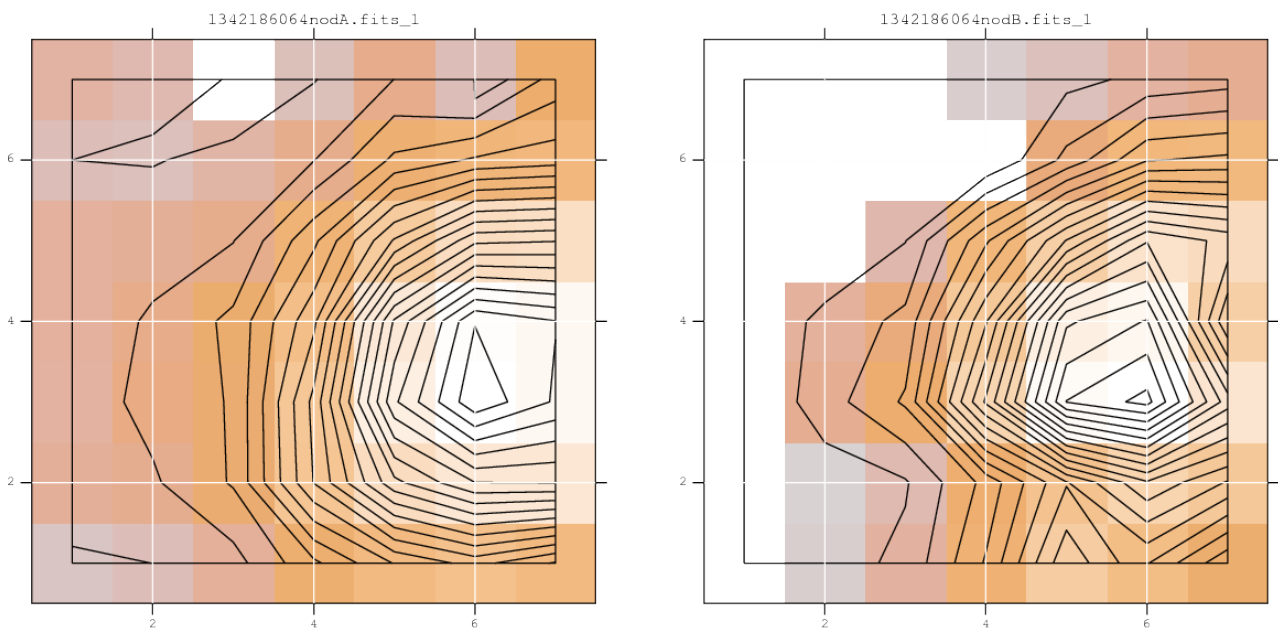


Figure 1: Line flux map obsid 6064

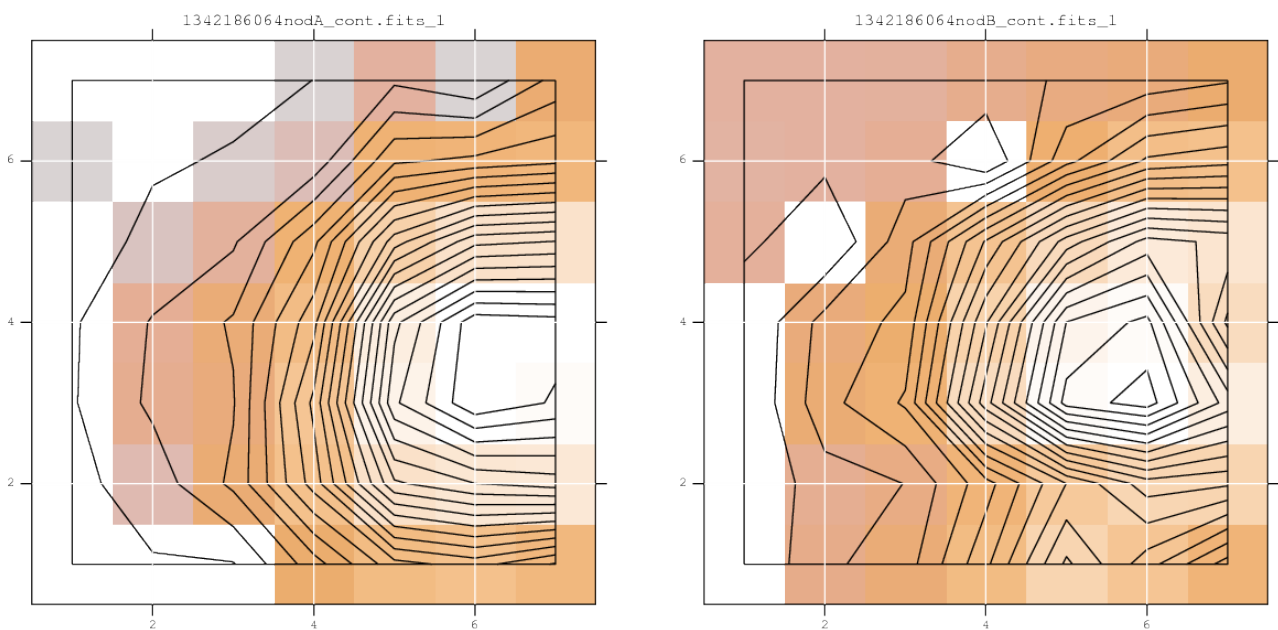


Figure 2: Continuum map obsid 6064

### 5.1.2 OBSID 1342186065 (OD155)

```
y offset 31.5
z offset +1.5
skew 1.2
nod throw 29.8
chop throw 29.8"
```

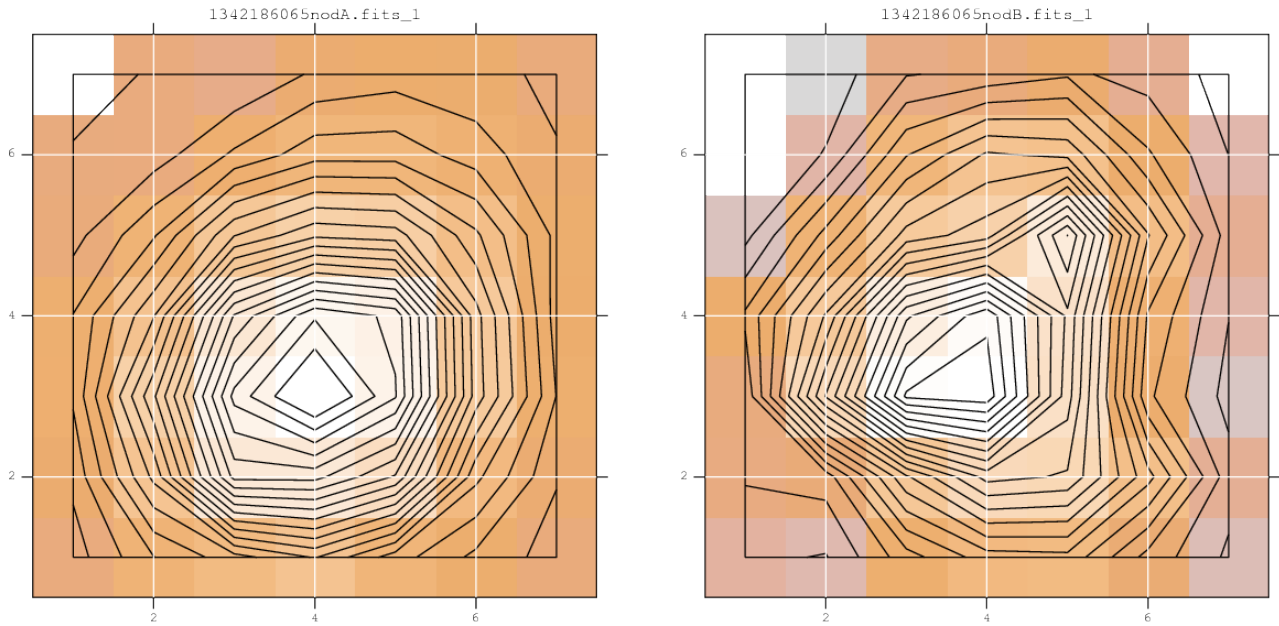


Figure 3: Line Flux map OBSID 6065

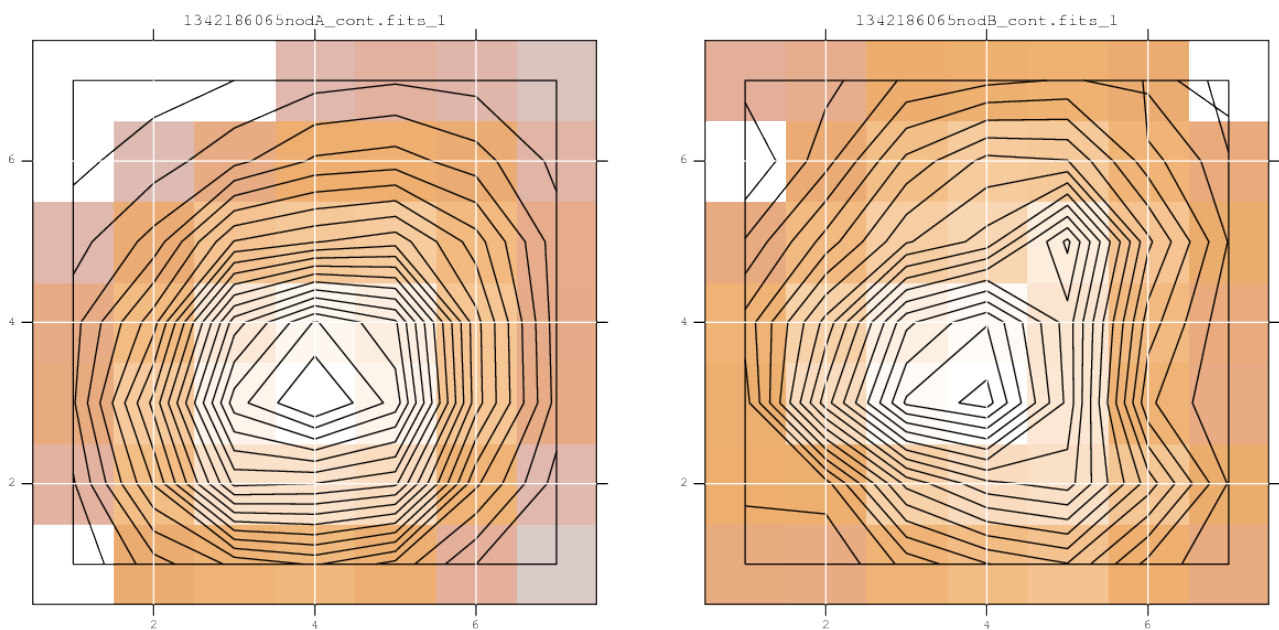


Figure 4: Continuum map OBSID 6065



### 5.1.3 OBSID 1342186066 (OD155)

```
y offset 26.5
z offset -3.5
skew 1.2
nod throw 29.8
chop throw 29.8"
```

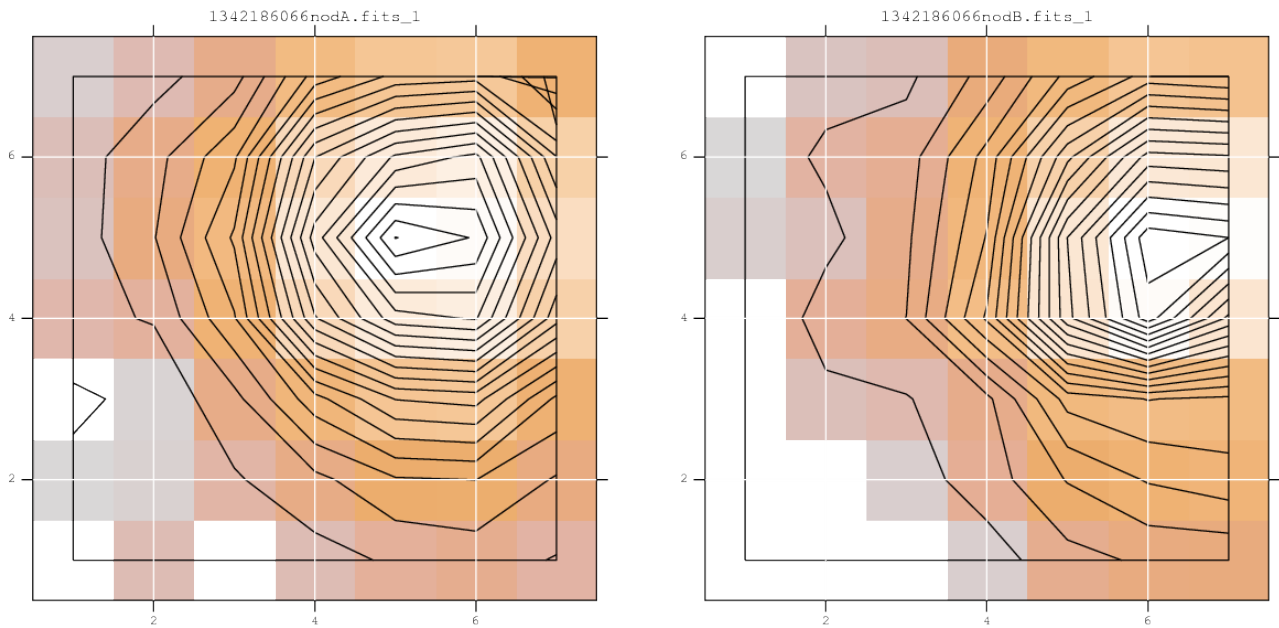


Figure 5: Line Flux map OBSID 6066

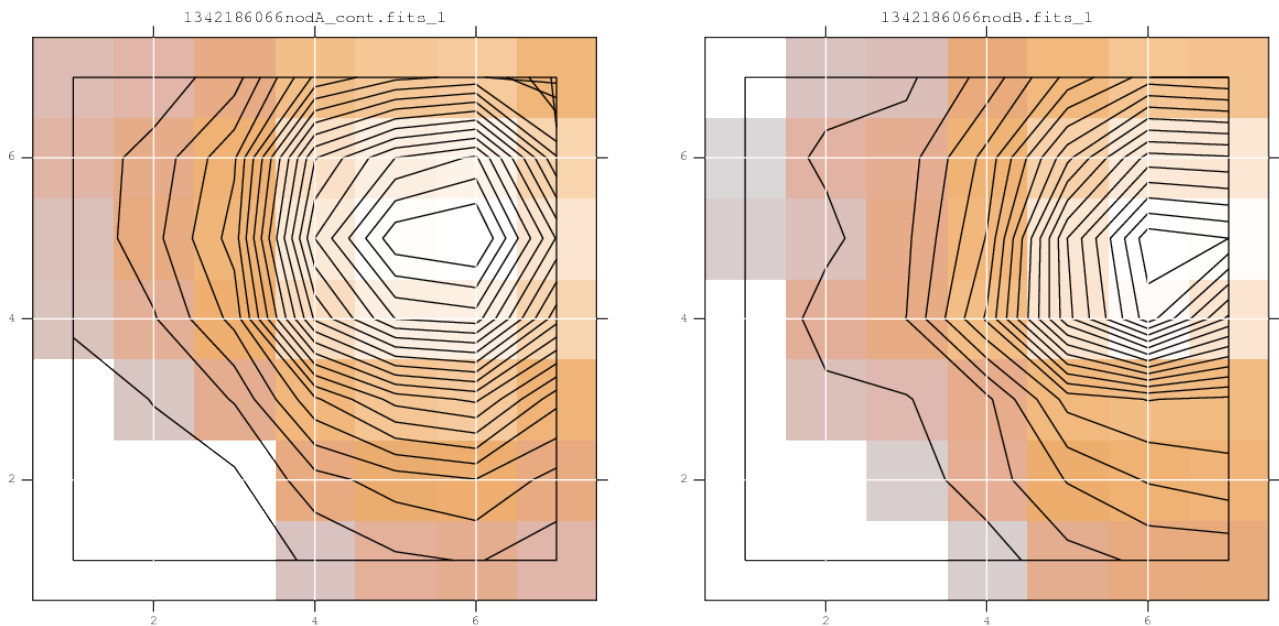


Figure 6: Continuum map OBSID 6066

### 5.1.4 OBSID 1342184663 (OD141)

```
y offset 29.0
z offset -1.0
skew 1.1
nod throw 29.8
chop throw 29.8"
```

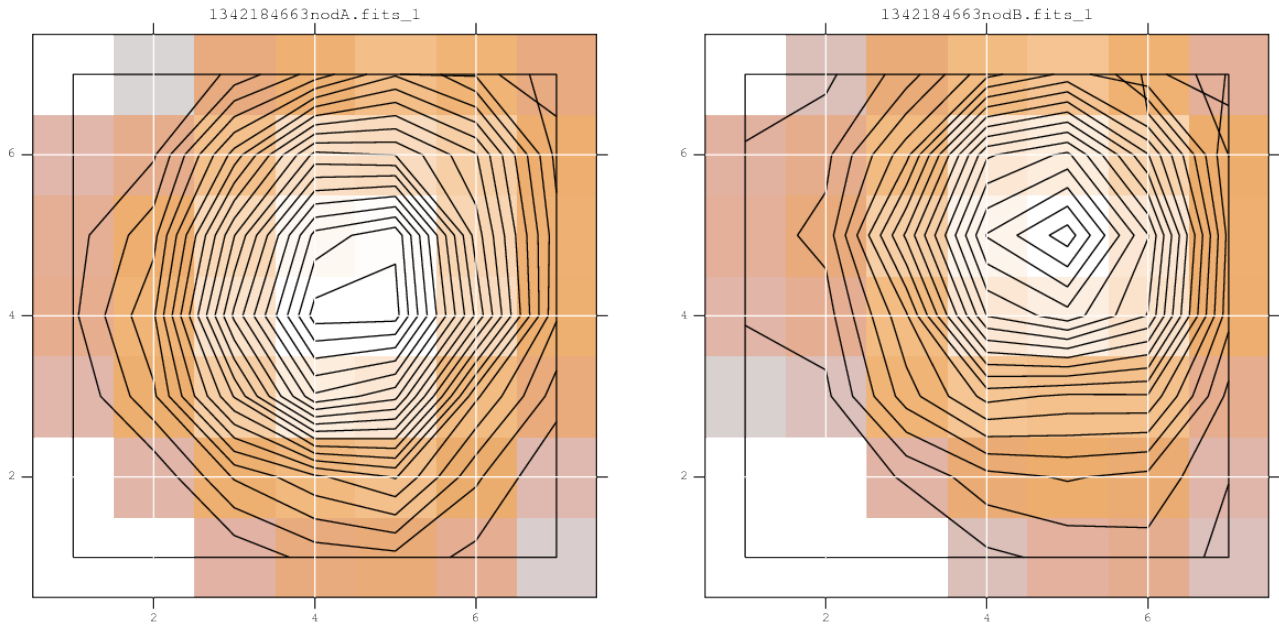


Figure 7: Line Flux map OBSID 4663

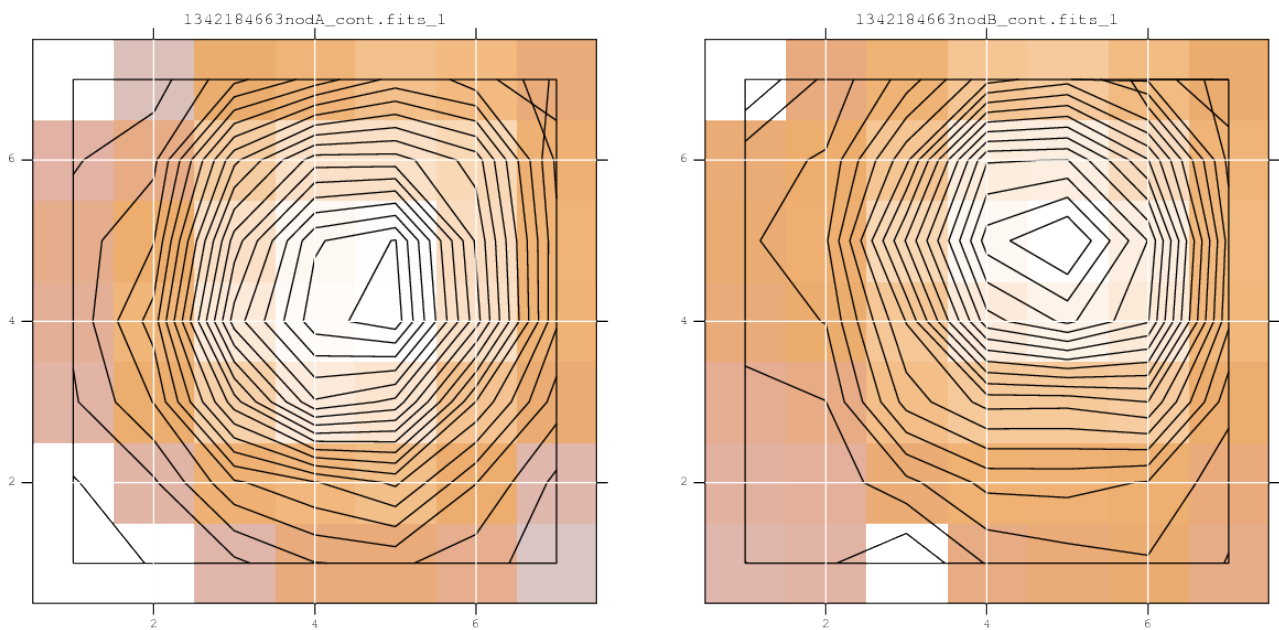


Figure 8: Continuum map OBSID 4663

### 5.2 Medium chopper throw

#### 5.2.1 OBSID 1342186067 (OD155)

```
y offset 90.5
z offset -3.5
skew 1.2
nod throw 89.0
chop throw 89.0"
```

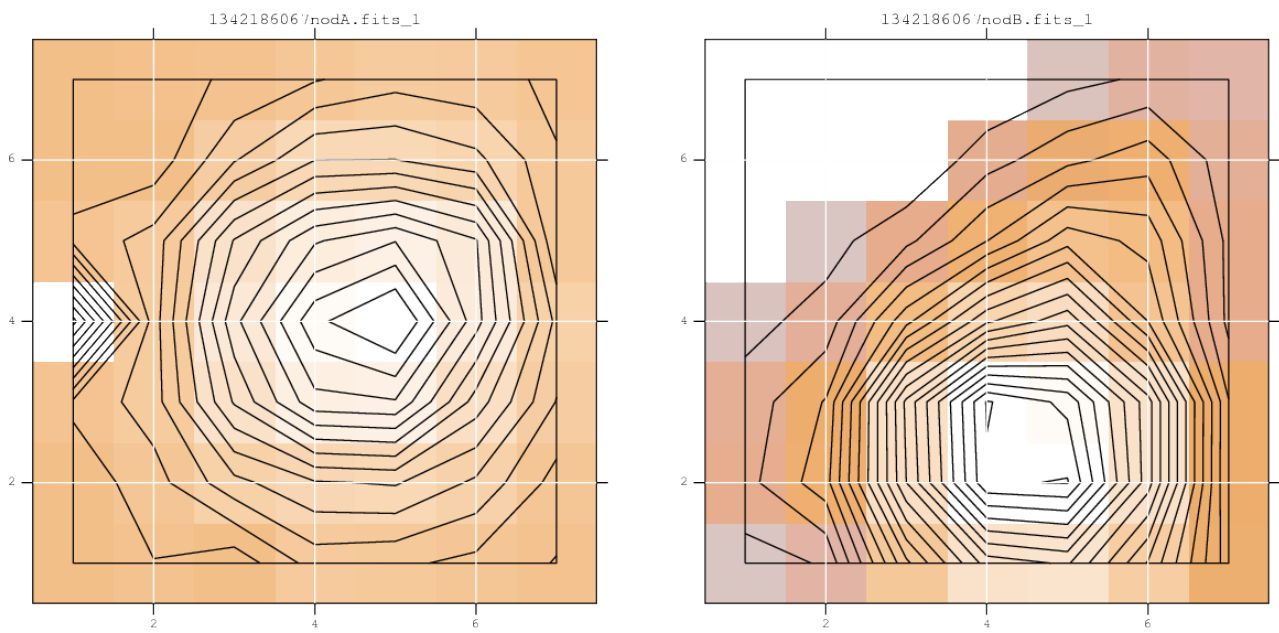


Figure 9: Line Flux map OBSID 6067

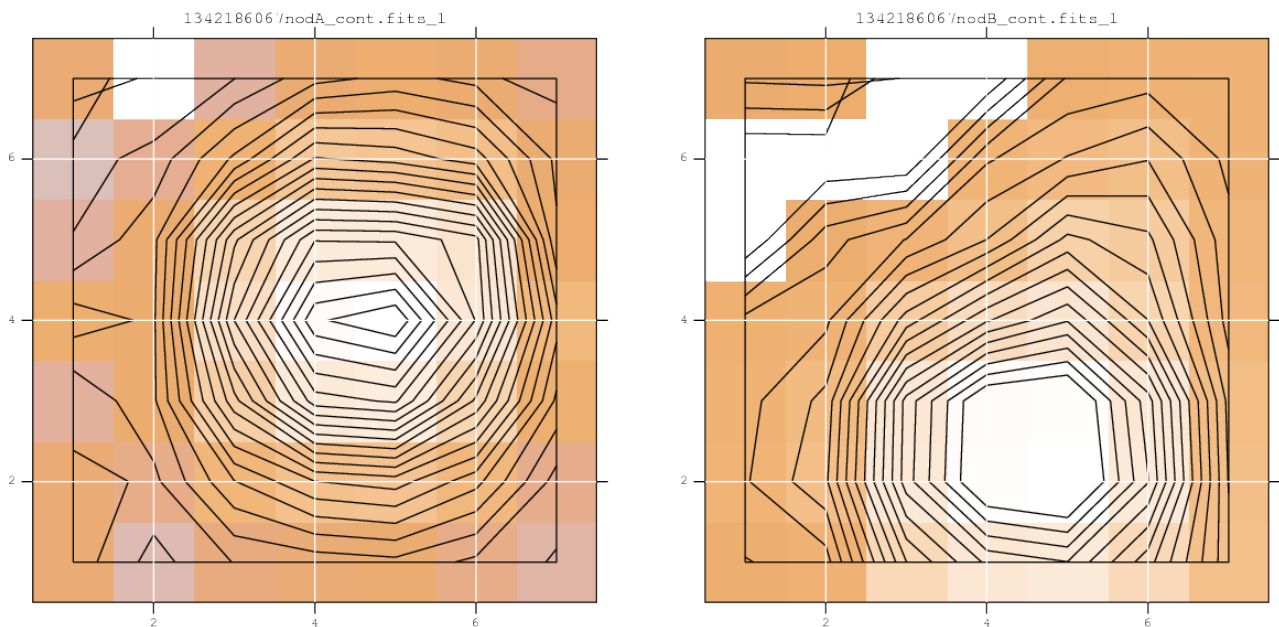


Figure 10: Continuum map OBSID 6067

### 5.2.2 OBSID 1342186662 (OD141)

```

y offset 89.0
z offset -1.4
skew 1.1
nod throw 89.0
chop throw 89.0"
  
```

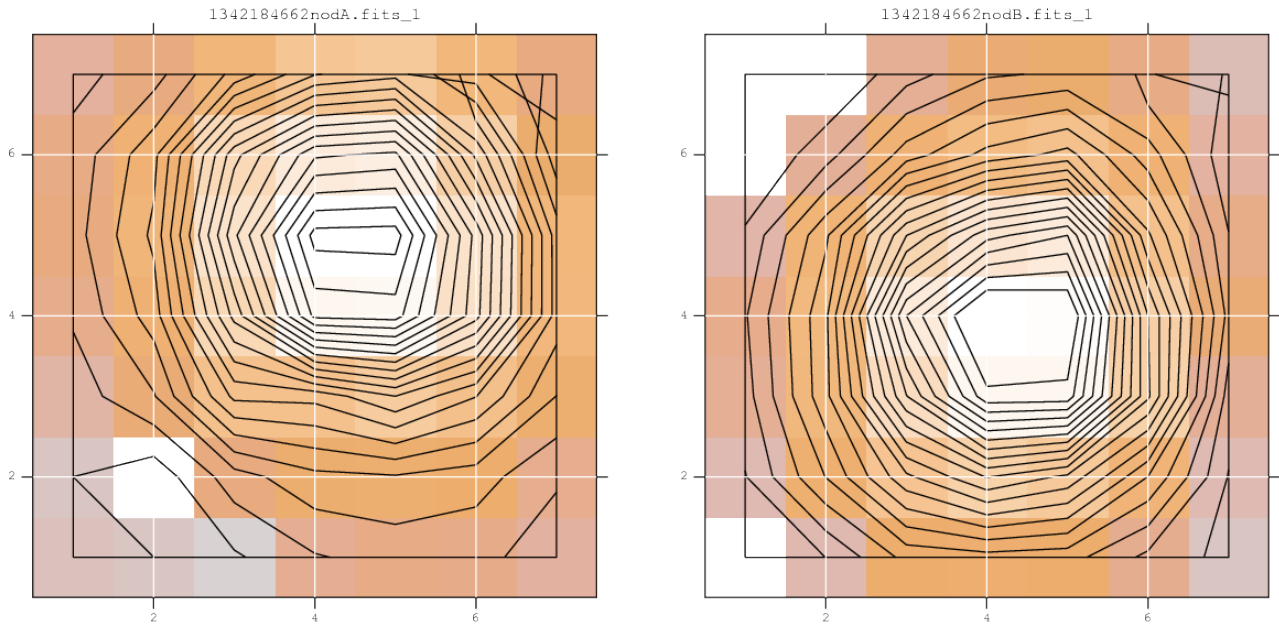


Figure 11: Line Flux map OBSID 4662

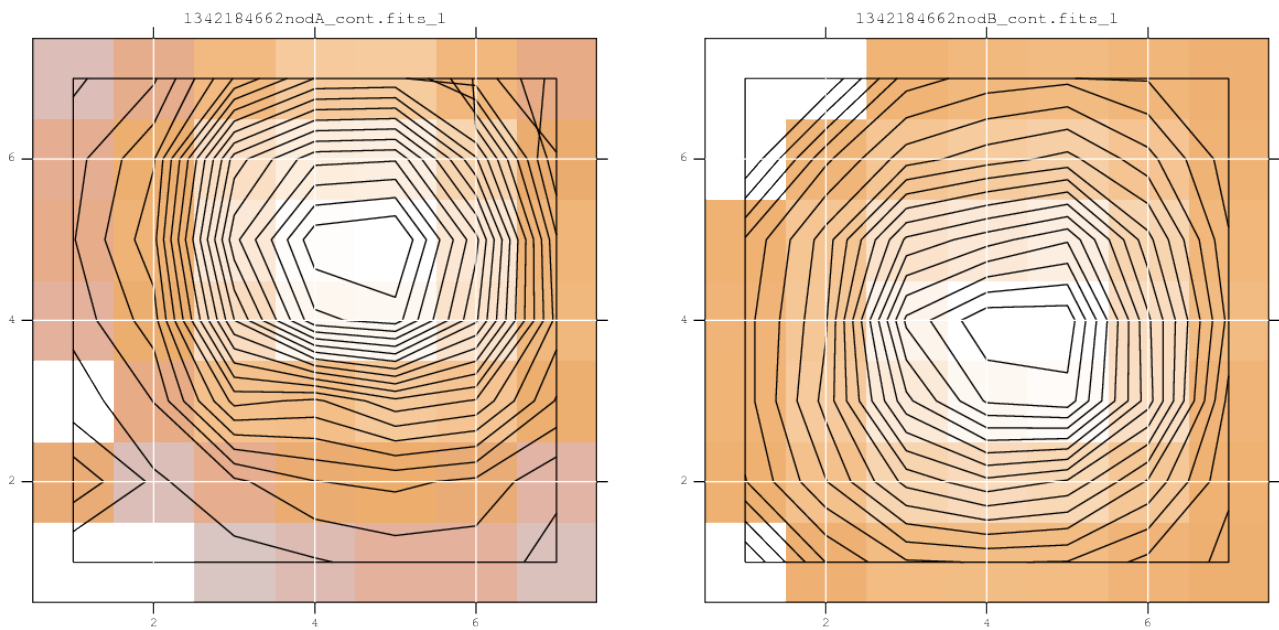


Figure 12: Continuum map OBSID 4662

### 5.3 Large Chopper throw

#### 5.3.1 OBSID 1342186068 (OD155)

y offset 180  
 z offset -6.0  
 skew 1.2  
 nod throw 177.5  
 chop throw 177.5"

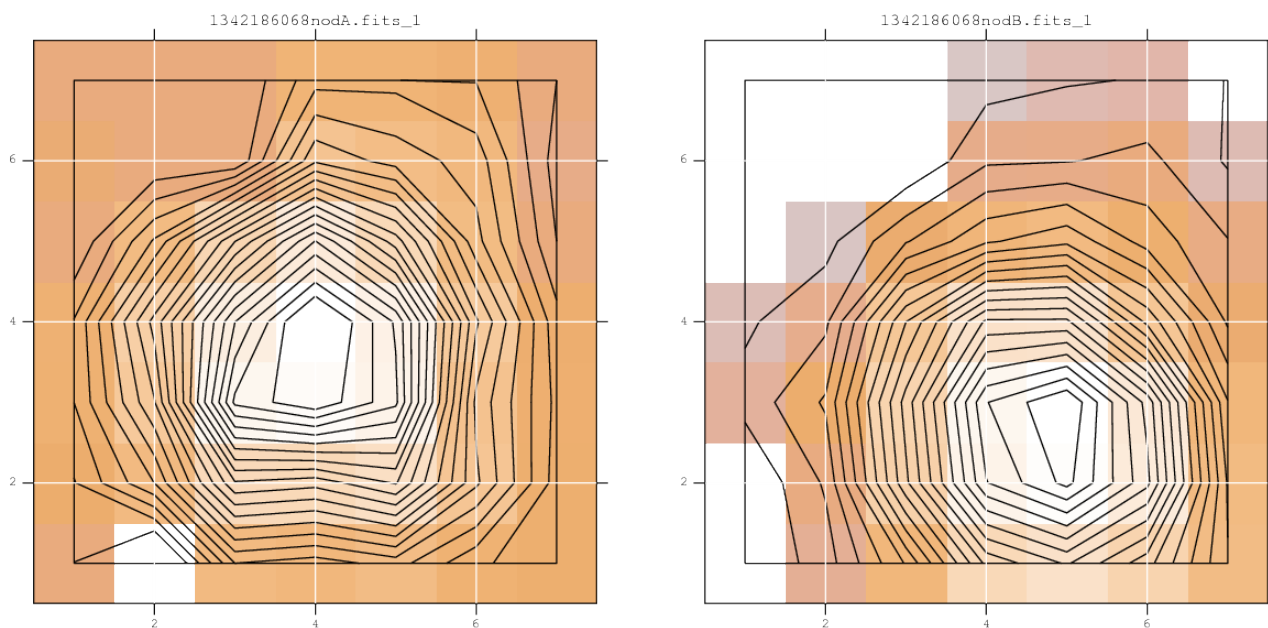


Figure 13: Line flux map obsid 6068

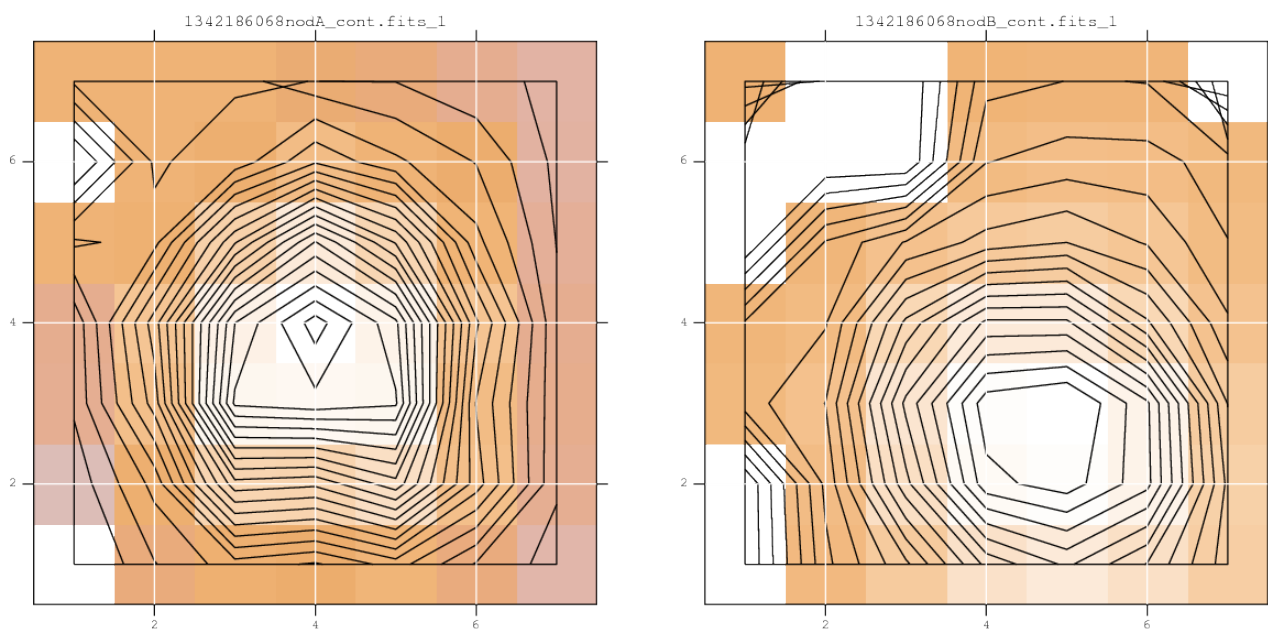


Figure 14: Continuum map obsid 6068

### 5.3.2 OBSID 1342186069 (OD155)

```
y offset 180
z offset -6.0
skew 1.1
nod throw 177.5
chop throw 177.5"
```

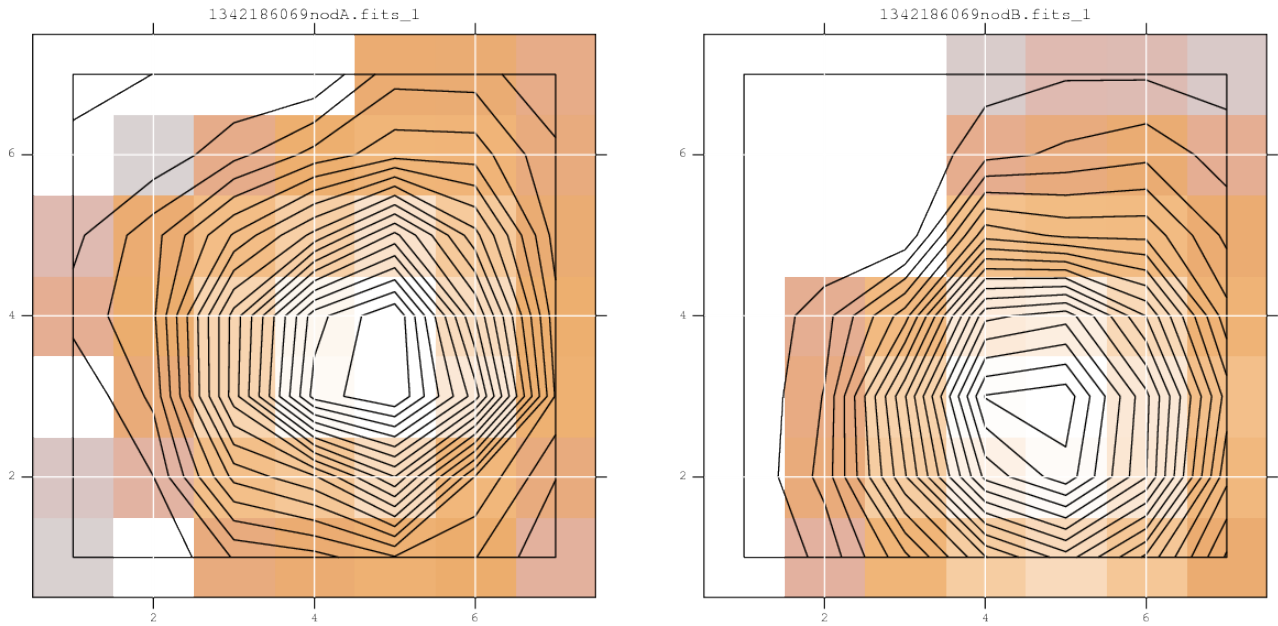


Figure 15: Line flux map obsid 6069

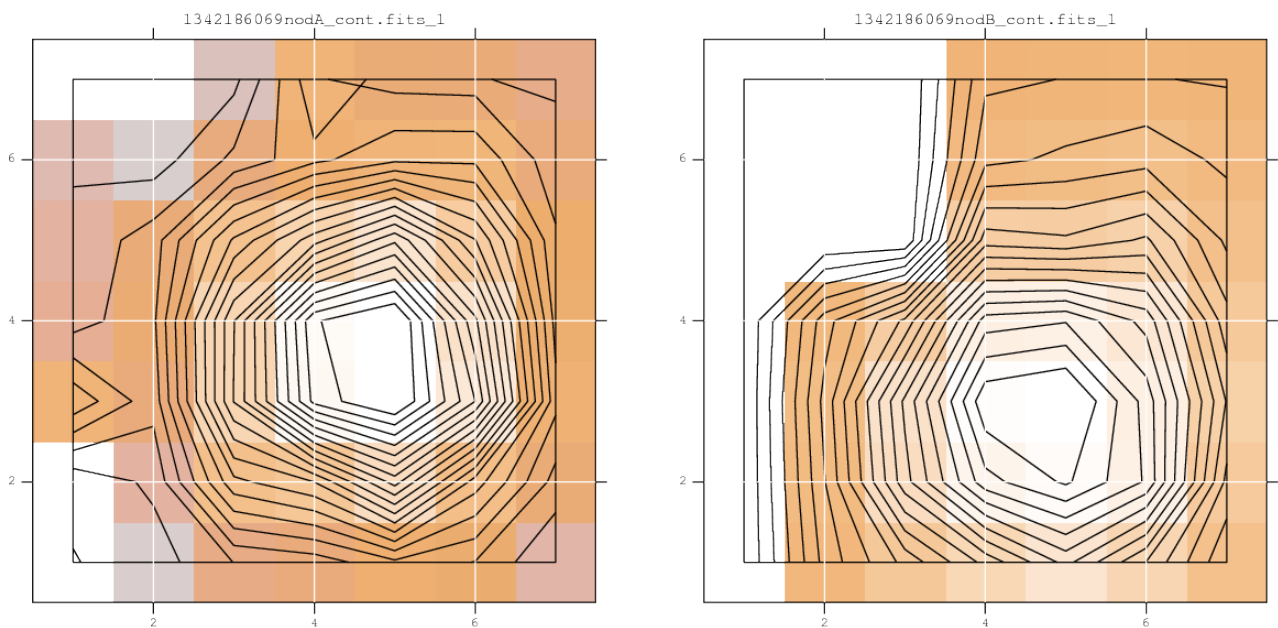


Figure 16: Continuum map obsid 6069

### 5.3.3 OBSID 1342184661 (OD 141)

```
y offset 178.6
z offset -3.8
skew 1.1
nod throw 177.5
chop throw 177.5"
```

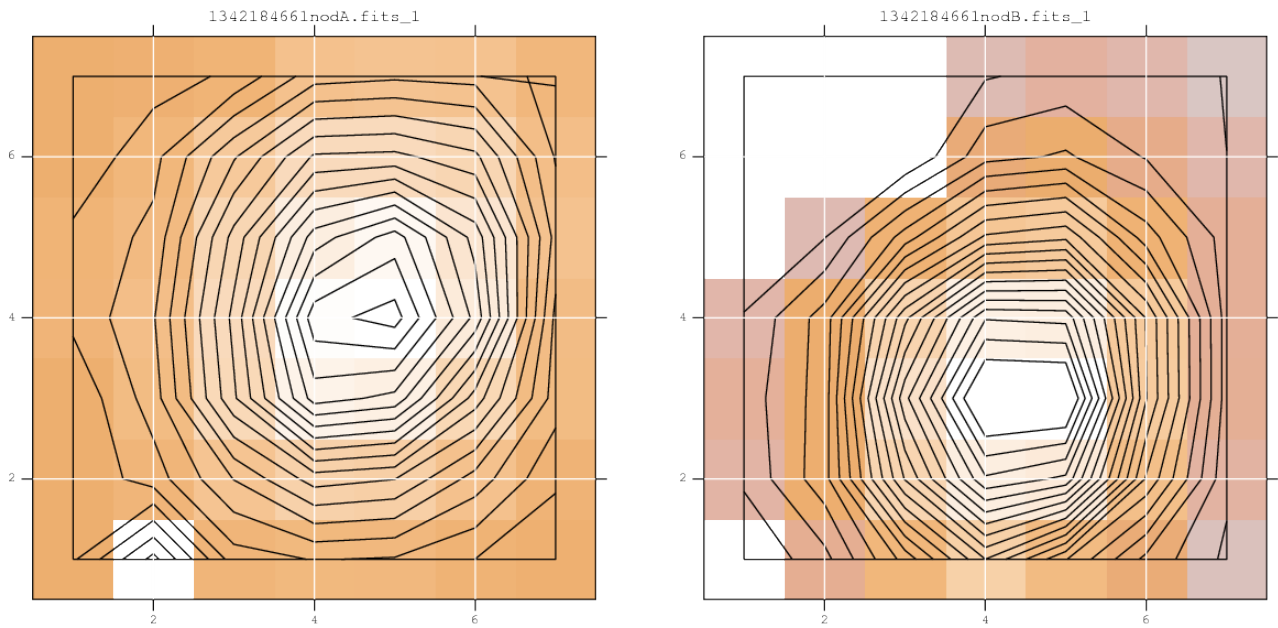


Figure 17: Line Flux map OBSID 4661

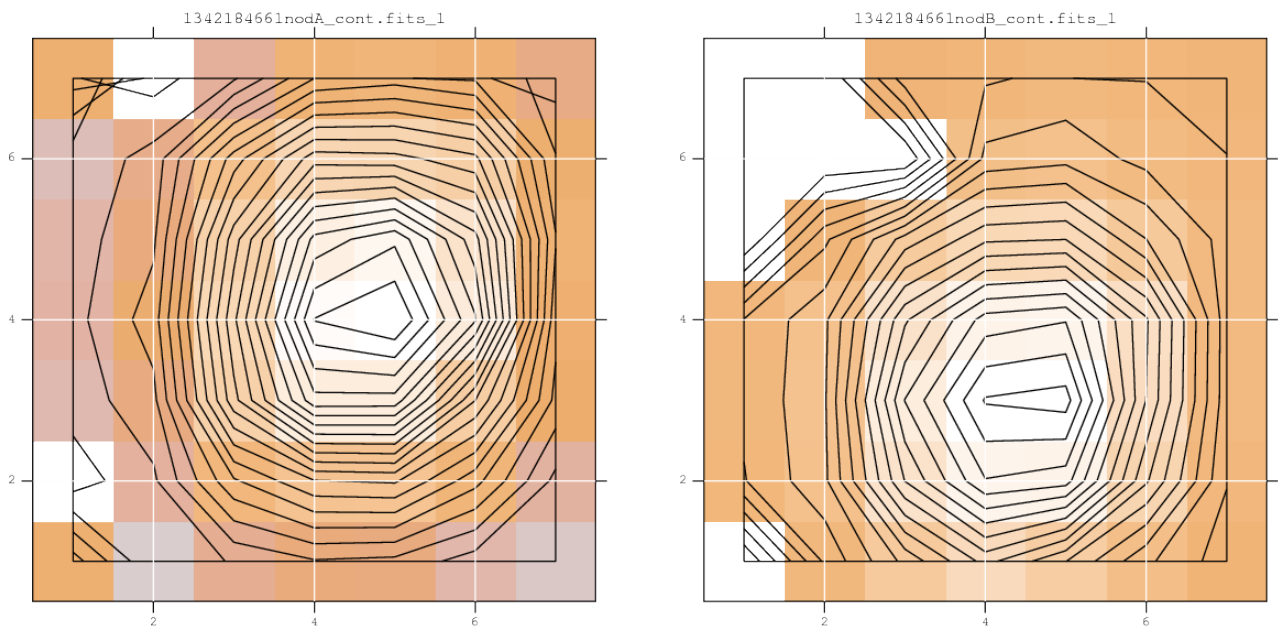


Figure 18: Continuum map OBSID 4661

**PACS spectroscopy chop/nod FPG  
verification from line scan maps**

**OD 135**

*PICC-KL-TN-042*

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## Document Change Record

<i>Issue</i>	<i>Date</i>	<i>Description</i>
1.0	19-04-2010	First version

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## 1 Introduction

This document reports on the analysis of OD 335 measurements to verify the spectroscopy chop/nod FPG parameters after the SIAM update for the new star tracker CCD operating temperature.

## 2 Reference documents

### 2.1 Applicable documents

<i>Number</i>	<i>Document</i>
[AD1]	

### 2.2 Reference documents

<i>Number</i>	<i>Document</i>
[RD1]	PICC-KL-TN-038 PACS Spectroscopy chop/nod FPG optimisation from line scan maps
[RD2]	

### 3 Data overview

```
# OD335  
obsids = {}  
obsids["HIP21479"] = 1342194661
```

### 4 Results

Images and contour maps below are the line flux and continuum maps. Coordinates are the spacecraft raster lines and columns with a step size of 2.5"

## 4.1 Large chopper throw

### 4.1.1 OBSID 134219661 (OD335)

Source: HIP21479

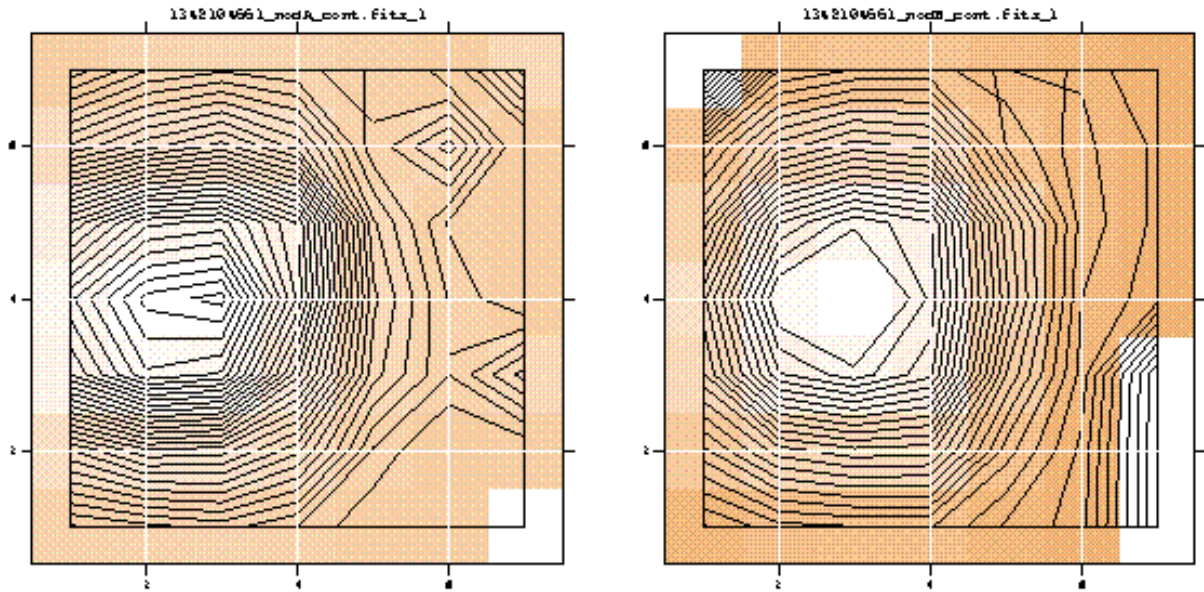


Figure 1: Continuum flux obs 134219661

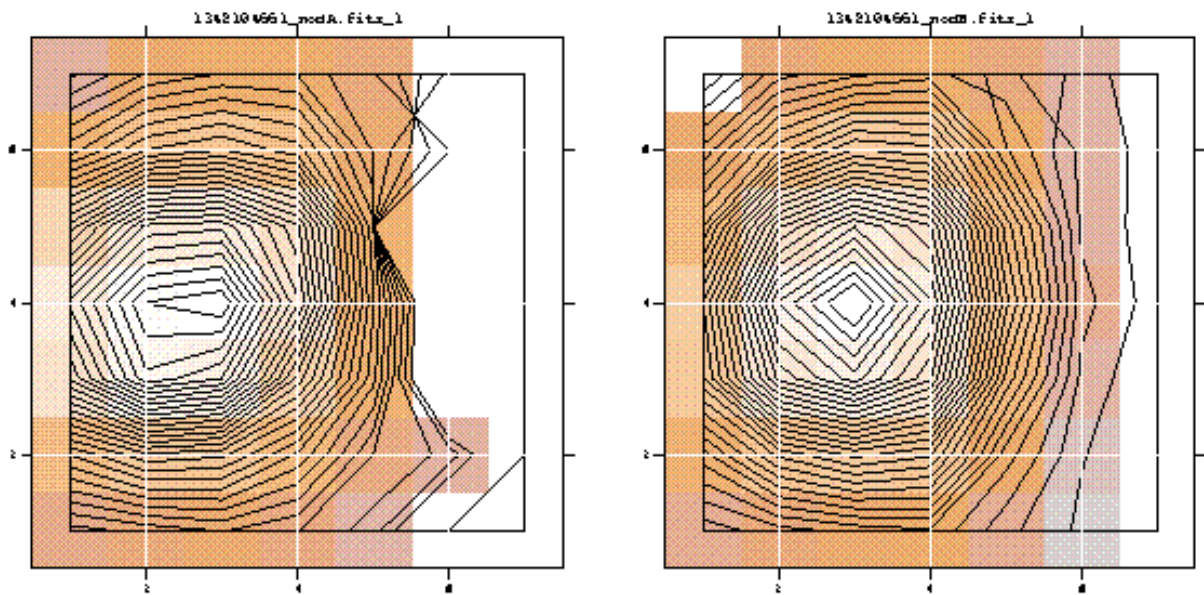


Figure 2: Line flux Obs 134219661

## 5 Discussion

The line and continuum maps of R Dor (HIP21479) obtained on OD 335 show an offset of 2.5" in z direction, both in nod A and nod B. If confirmed on OD 145 this can be corrected for by

- a) an update to the PACSyzoffsets CALU file: Apply a negative correction to the z offset from -3.0 to -5.5 for all 'large' lines in PACSyzoffsets
- b) an update to the SIAM.

For OD 335, uplink SIAM 0320\_0002 was used. The average offsets seen in the photometer using this SIAM are (Email UK 12/04/2010):

$$\text{delta\_Y} = (0.536 - 0.322) - 0.635 = -0.421''$$

$$\text{delta\_Z} = (3.764 + 1.551) - 2.552 = +2.763''$$

This offset could not be confirmed from the chopped raster observations on OD330, and therefore the correction to the SIAM for these offsets seen in the photometer (uplink SIAM 0341\_0001) has not yet been confirmed to be applicable for the spectrometer. The results presented here, however are compatible with the offset observed in the photometer.

The OD 345 observations (repetition of this raster at large, medium and small chopper throw) will be executed using SIAM 0320\_0002. If the same offset is confirmed for all three chopper throws, the only conclusion of this exercise is that we should apply SIAM 0341\_0001.

**PACS spectroscopy chop/nod FPG  
verification from line scan maps**

**OD 335, OD345**

*PICC-KL-TN-042*

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## Document Change Record

<i>Issue</i>	<i>Date</i>	<i>Description</i>
1.0	19-04-2010	First version data R Dor OD 335
2.0	25-04-2010	Added alfa ori data + neptune data OD 345
3.0	28-04-2010	Added R Dor data OD 348

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## 1 Introduction

This document reports on the analysis of OD 335 and OD345 measurements to verify the spectroscopy chop/nod FPG parameters after the SIAM update for the new star tracker CCD operating temperature.

## 2 Reference documents

### 2.1 Applicable documents

<i>Number</i>	<i>Document</i>
[AD1]	

### 2.2 Reference documents



<b>PACS ICC</b>	<b>PACS spectroscopy chop/nod FPG verification from line scan maps OD 335, 345, 348</b>	Doc ID: PACC-KL-TN-042 Issue: 3.0 Date: 28. Apr. 2010 Page: 4 of 9
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<i>Number</i>	<i>Document</i>
[RD1]	PACC-KL-TN-038 PACS Spectroscopy chop/nod FPG optimisation from line scan maps
[RD2]	

### 3 Data overview

```
# OD335
obsids["RDorLarge"] = 1342194661
obsids["AlphaOriLarge"] = 1342194662
```

```
#OD345
obsids["NeptuneLarge"] = 1342195490
obsids["NeptuneMedium"] = 1342195491
obsids["NeptuneSmall"] = 1342195492
```

```
# OD348
obsids["HIP21479Large"] = 1342195638
obsids["HIP21479Medium"] = 1342195639
obsids["HIP21479Small"] = 1342195640
```

### 4 Results

Images and contour maps below are the blue continuum maps. Coordinates are the spacecraft raster lines and columns with a step size of 2.5"

## 4.1 Large chopper throw

### 4.1.1 OBSID 1342194661 (OD335)

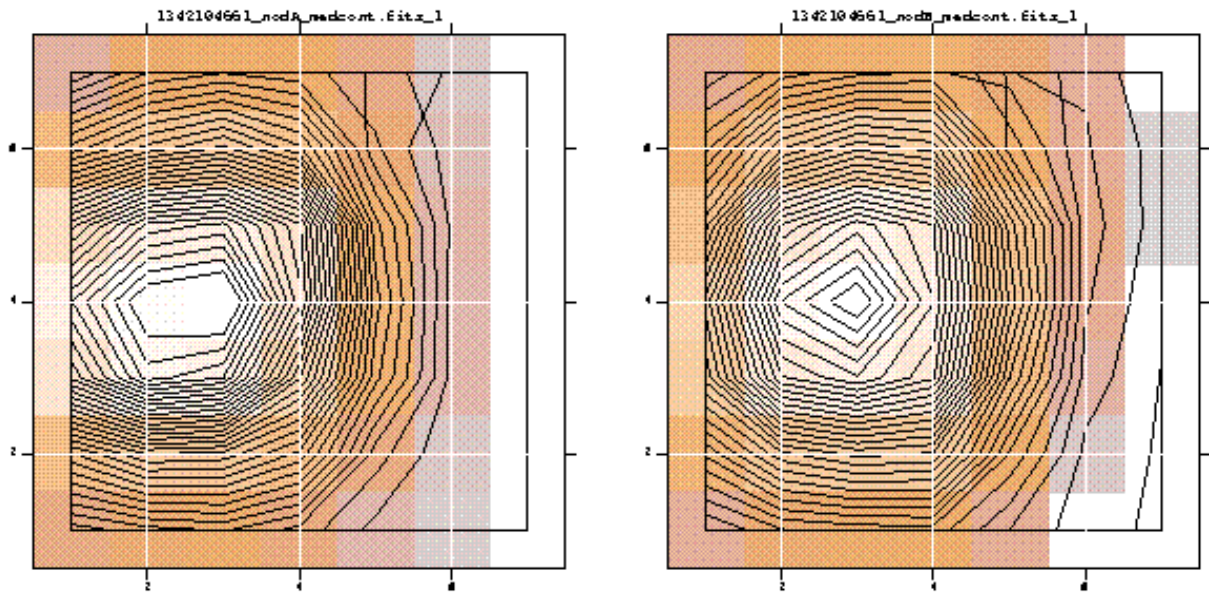


Figure 1: HIP 21479 – R Dor - large chop/nod

### 4.1.2 OBSID 1342194662 (OD335)

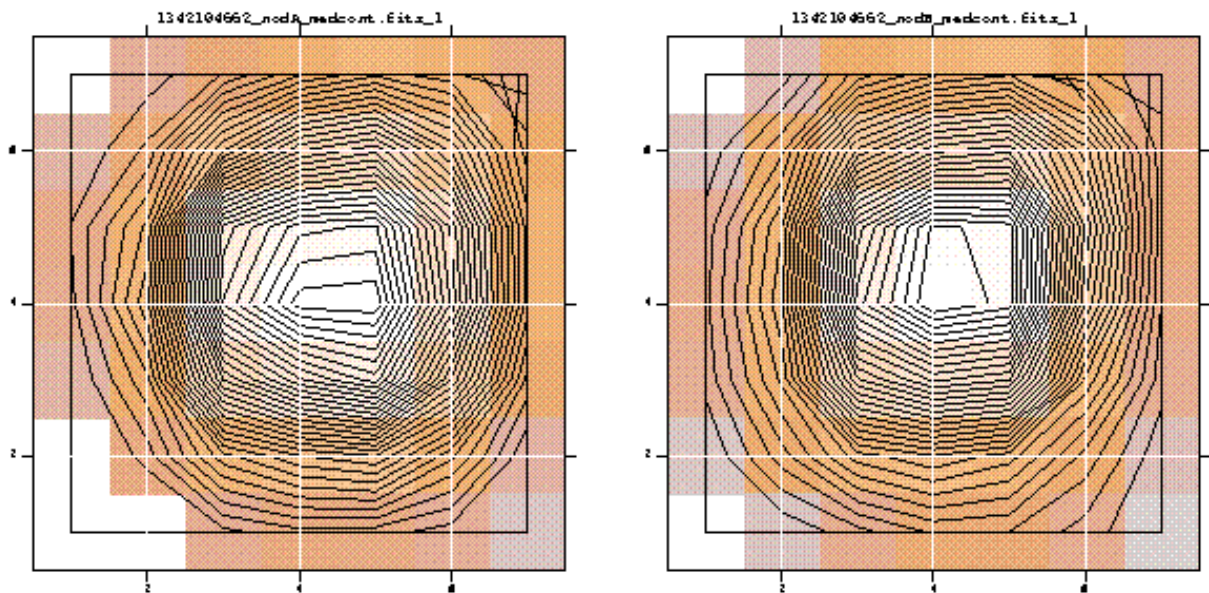


Figure 2: HIP 27989 - Alpha Ori - large chop/nod

### 4.1.3 OBSID 1342195490 (OD345)

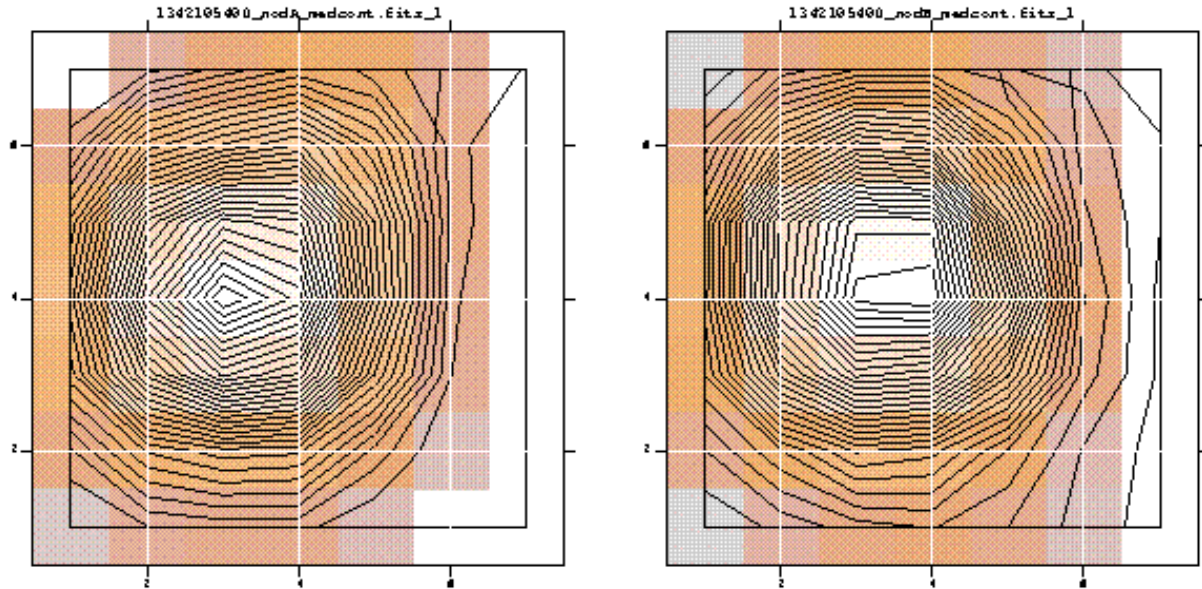


Figure 3: Neptune - large chop/nod

### 4.1.4 OBSID 1342195638 (OD348)

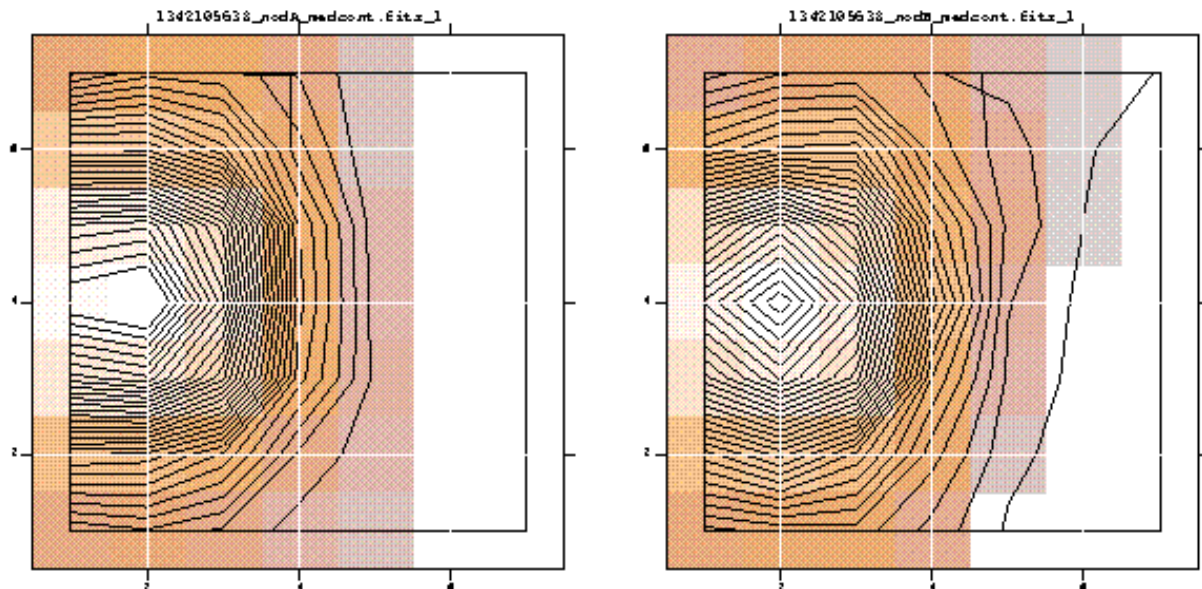


Figure 4: R Dor large chop/nod

### 4.2 Medium chopper throw

#### 4.2.1 OBSID 1342195491 (OD345)

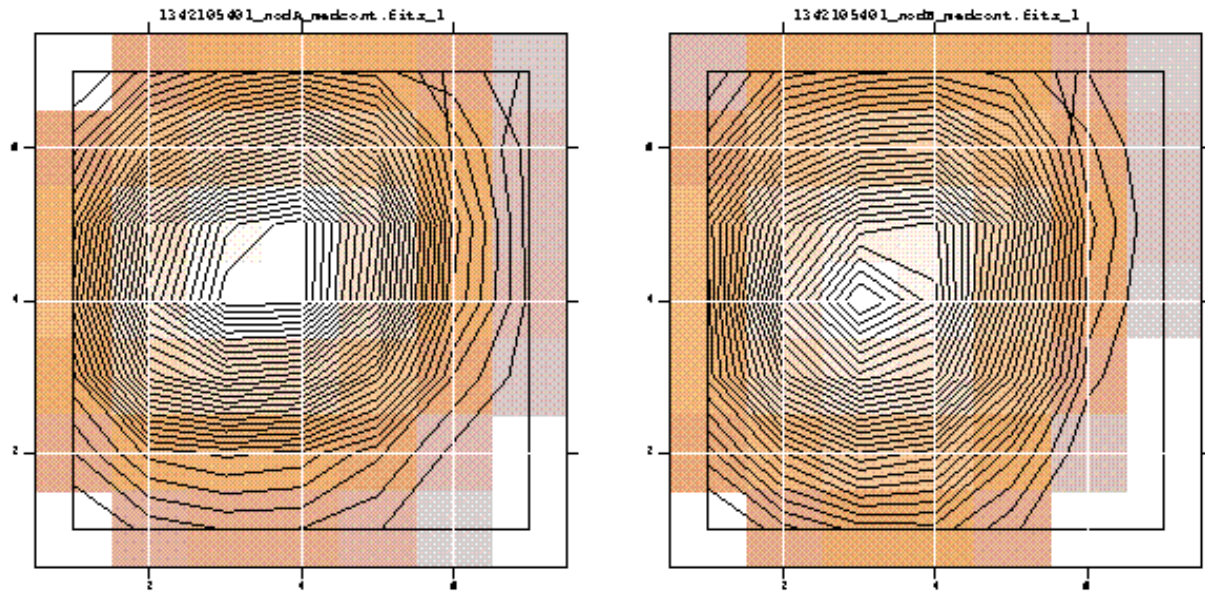


Figure 5: Neptune - medium chop/nod

#### 4.2.2 OBSID 1342195639 (OD348)

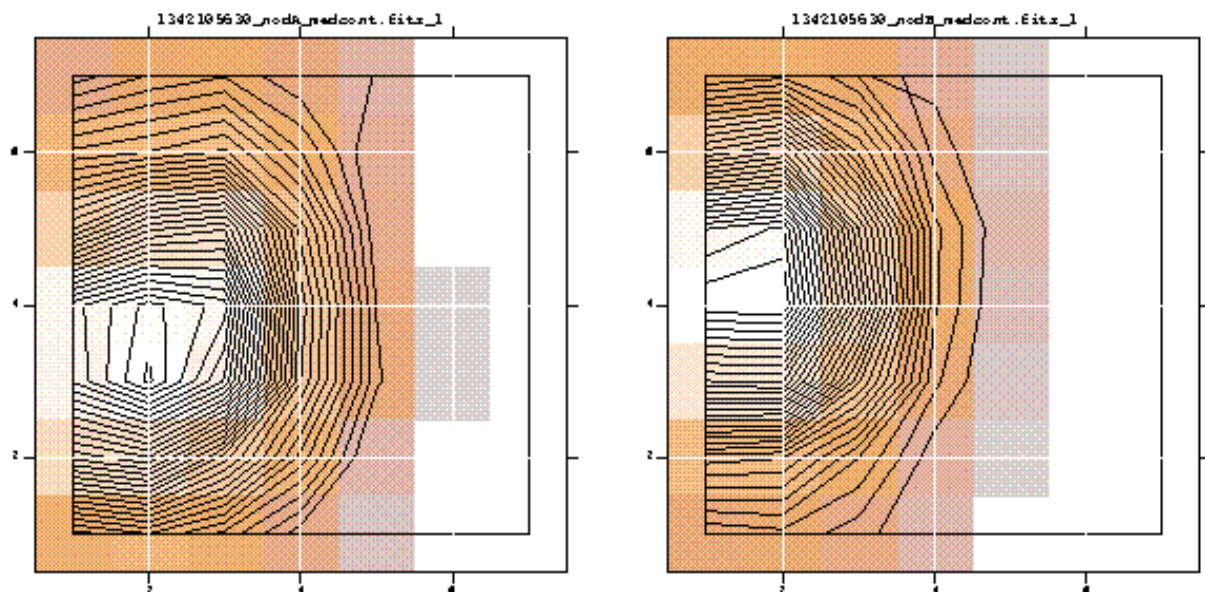


Figure 6: R Dor, medium chopper throw (OD 348)

### 4.3 Small chopper throw

#### 4.3.1 OBSID 1342195492 (OD345)

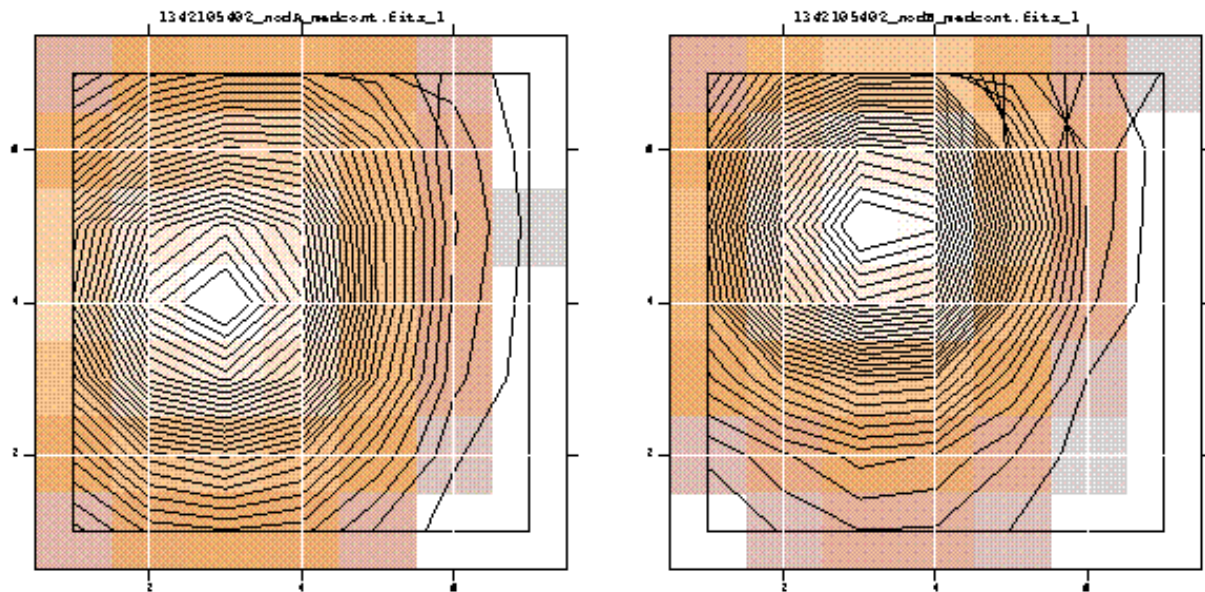


Figure 7: Neptune - small chop/nod

#### 4.3.2 OBSID 1342195640 (OD348)

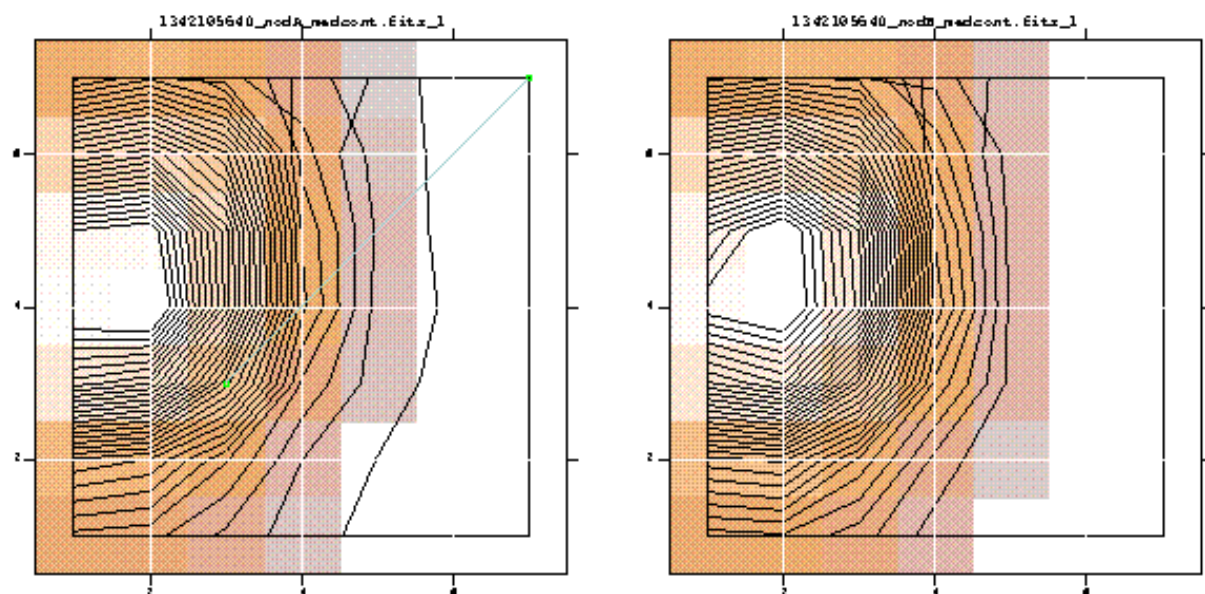


Figure 8: R Dor, small chop/nod (OD 348)

## **5 Discussion**

**PACS spectroscopy chop/nod FPG  
verification from line scan maps**

**OD 370-373**

*PICC-KL-TN-043*

Prepared by	Bart Vandebussche	
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## Document Change Record

<i>Issue</i>	<i>Date</i>	<i>Description</i>
1.0	31-05-2010	First version

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## 1 Introduction

This document reports on the analysis of OD 370 and 373 measurements to verify the spectroscopy chop/nod FPG parameters

## 2 Reference documents

### 2.1 Applicable documents

<i>Number</i>	<i>Document</i>
[AD1]	

### 2.2 Reference documents

<i>Number</i>	<i>Document</i>
[RD1]	PICC-KL-TN-038 PACS Spectroscopy chop/nod FPG optimisation from line scan maps
[RD2]	

### 3 Data overview

OD 370:

```

obsids["CWLeoLarge"] = 1342196698
obsids["CWLeoMedium"] = 1342196697
obsids["CWLeoSmall"] = 1342196696
obsids["VYCMaLarge"] = 1342196693
obsids["VYCMaMedium"] = 1342196692
obsids["VYCMaSmall"] = 1342196691
obsids["HIP21479Large"] = 1342196690
obsids["HIP21479Medium"] = 1342196689
obsids["HIP21479Small"] = 1342196688

```

OD 373:

```

obsids["AFGL3068Large"] = 1342196880
obsids["AFGL3068Medium"] = 1342196879
obsids["AFGL3068Small"] = 1342196878
obsids["NeptuneLarge"] = 1342196874
obsids["NeptuneMedium"] = 1342196873
obsids["NeptuneSmall"] = 1342196872
obsids["IRAS19343Large"] = 1342196871
obsids["IRAS19343Medium"] = 1342196870
obsids["IRAS19343Small"] = 1342196869

```

### 4 Results

Images and contour maps below are the line flux and continuum maps. Coordinates are the spacecraft raster lines and columns with a step size of 2.5"

## 4.1 Large chopper throw

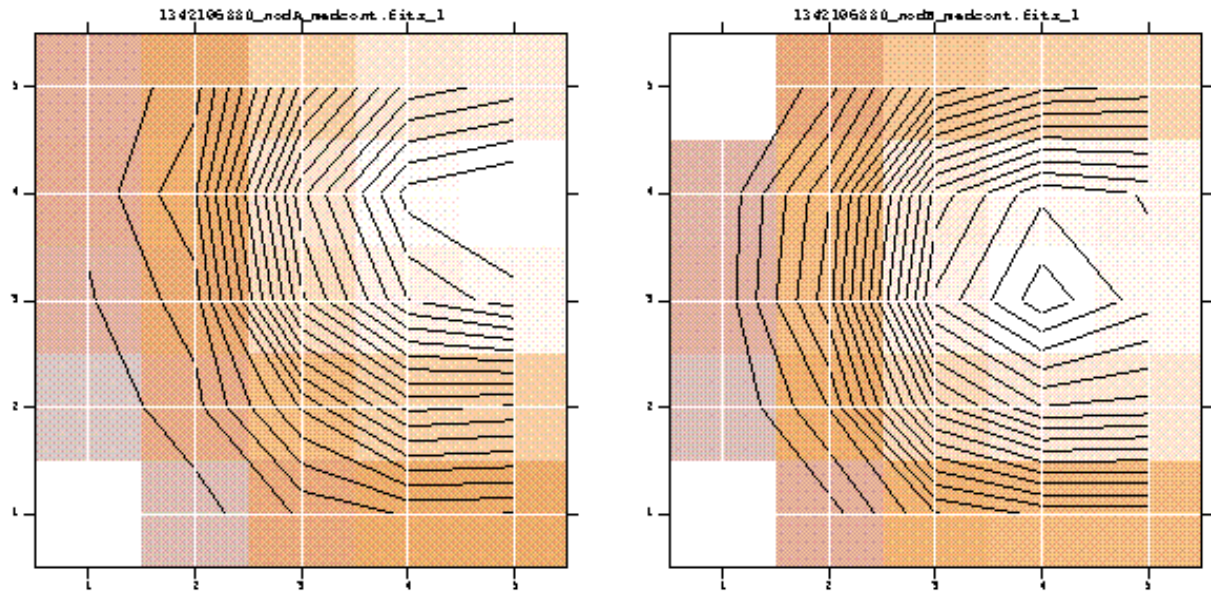


Illustration 1: AFGL3068 Large chop OBSID 1342196880 OD 373

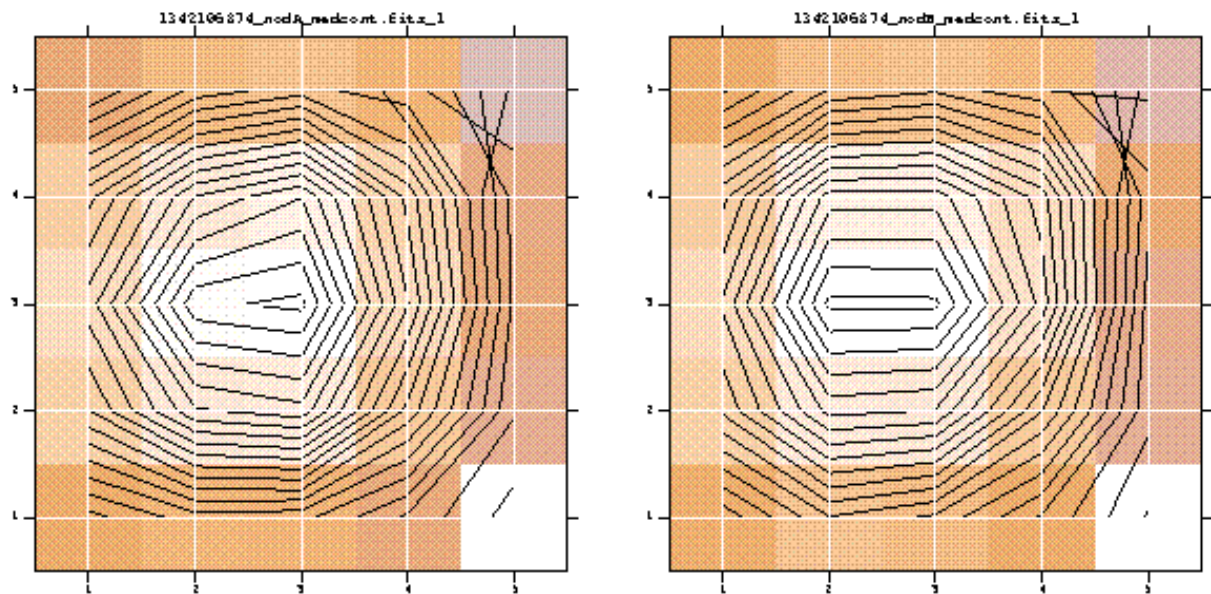


Illustration 2: Neptune Large chop OBSID 1342196874 OD 373

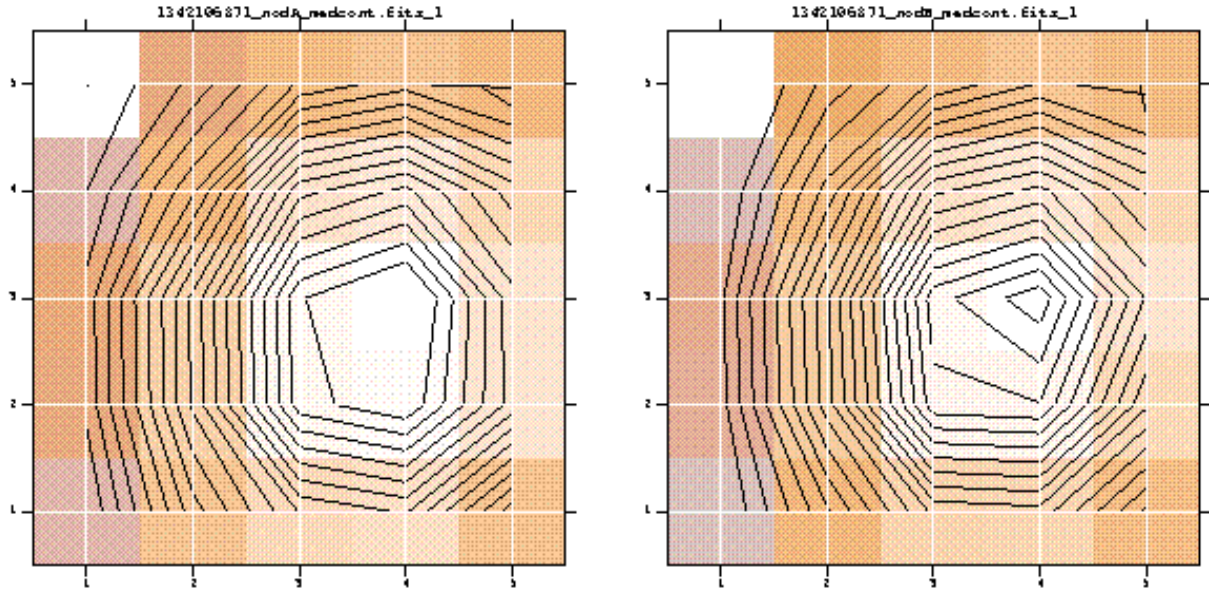


Illustration 3: IRAS19343 Large chop OBSID 1342196871 OD 373

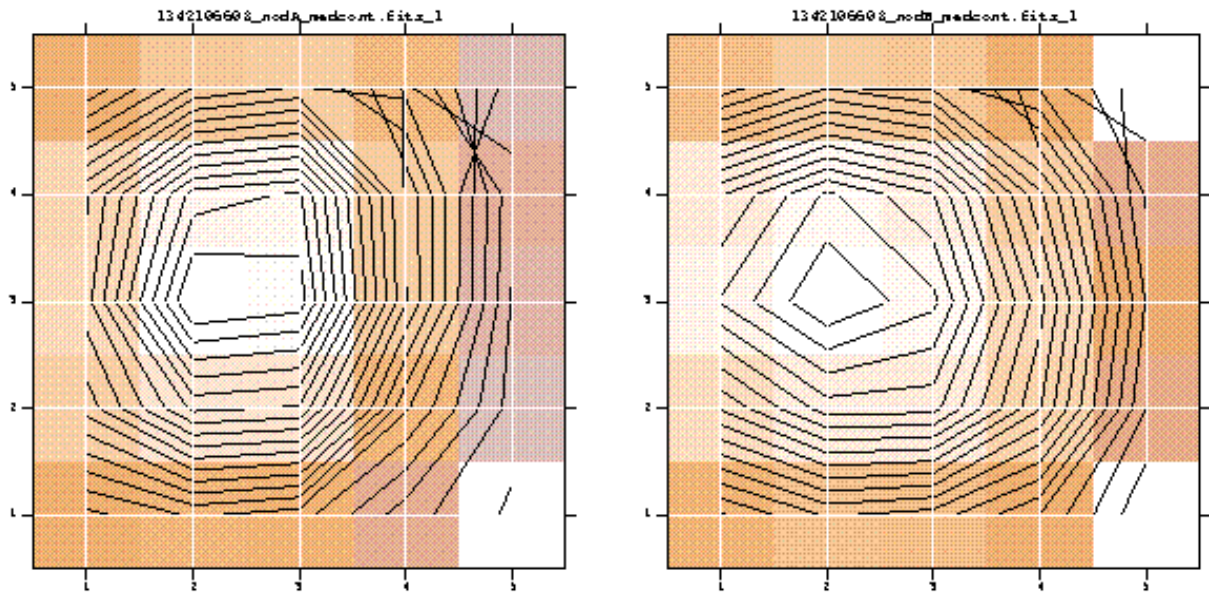


Illustration 4: CWLeo Large chop OBSID 1342196698 OD 370

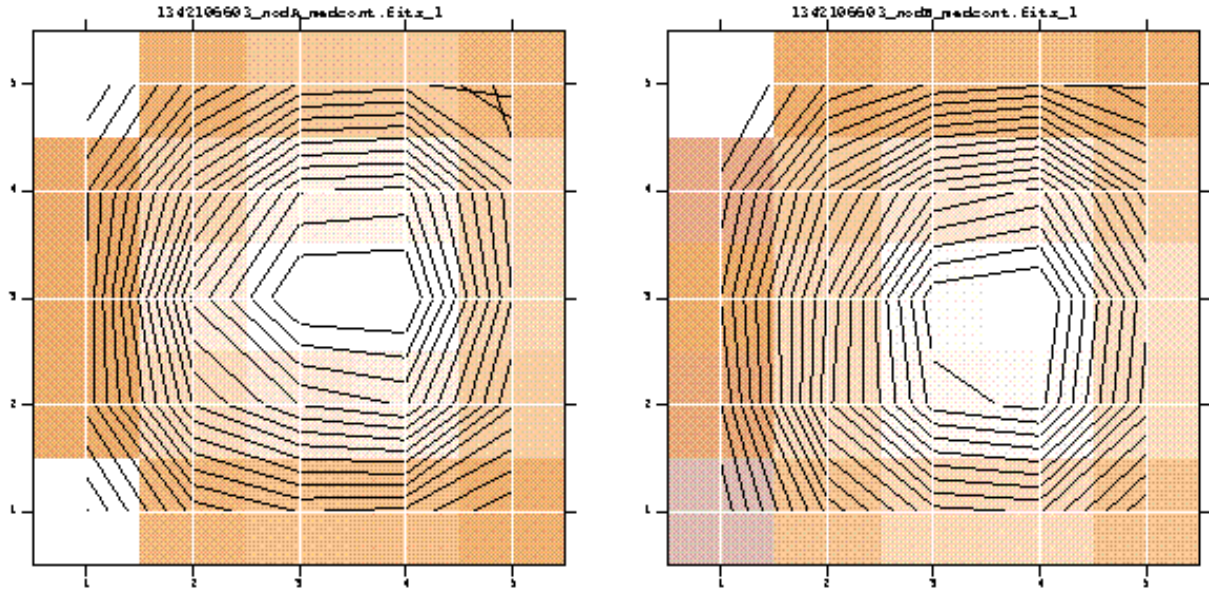


Illustration 5: VYCMa Large chop OBSID 1342196693 OD 370

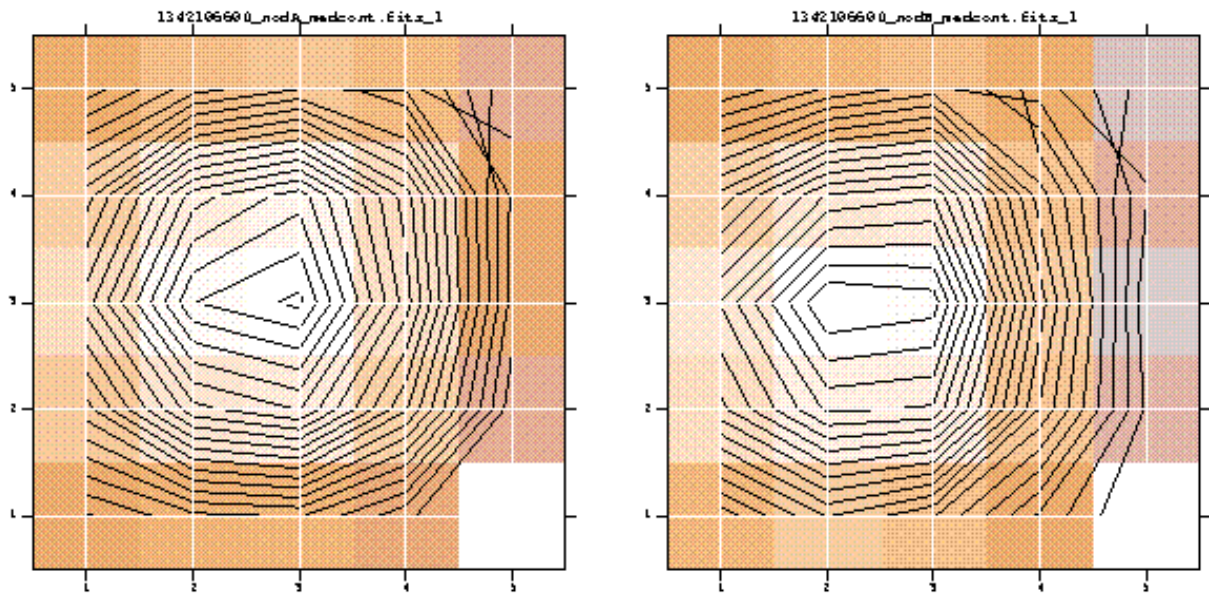


Illustration 6: HIP21479 Large chop OBSID 1342196690 OD 370

### 4.2 Medium chopper throw

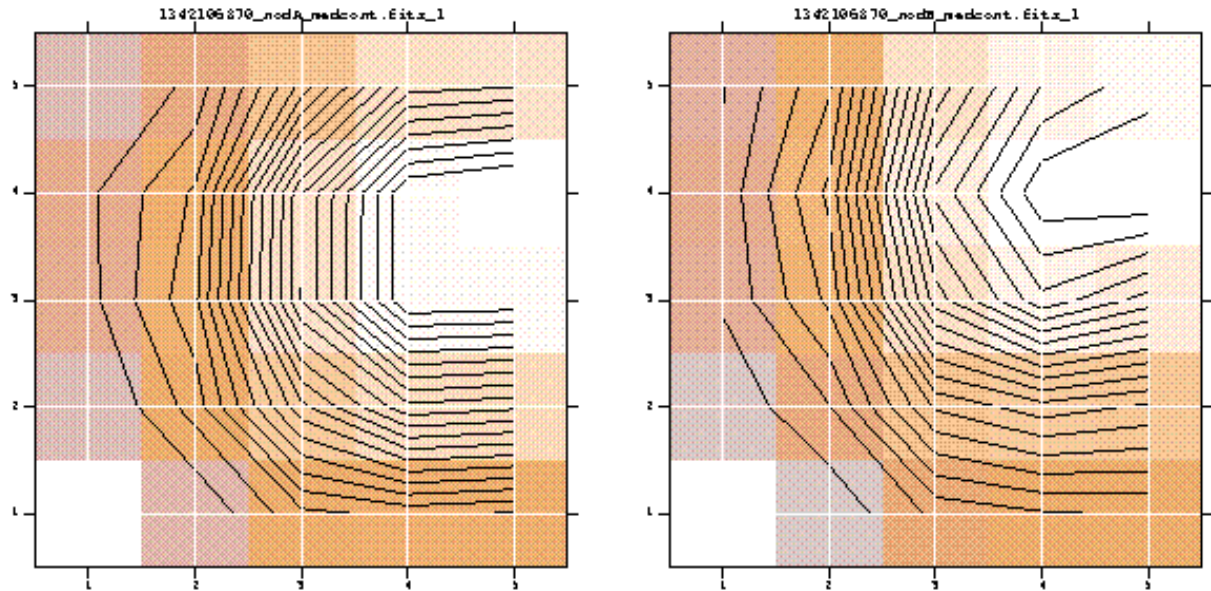


Illustration 7: AFGL3068 Medium chop OBSID 1342196879 OD 373

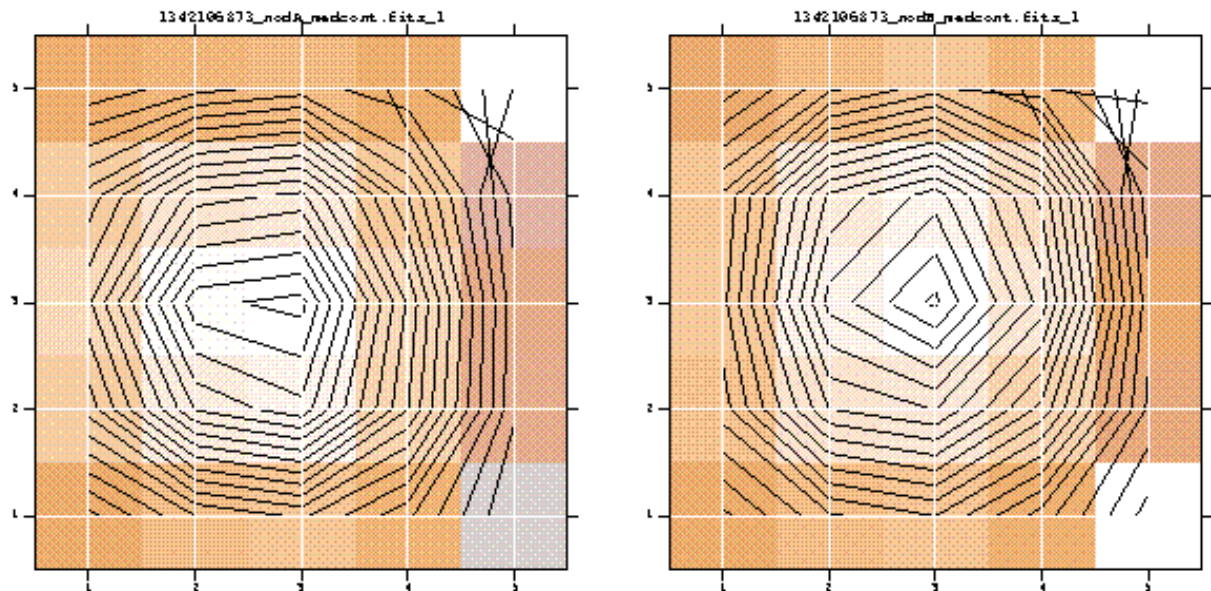


Illustration 8: Neptune Medium chop OBSID 1342196873 OD373

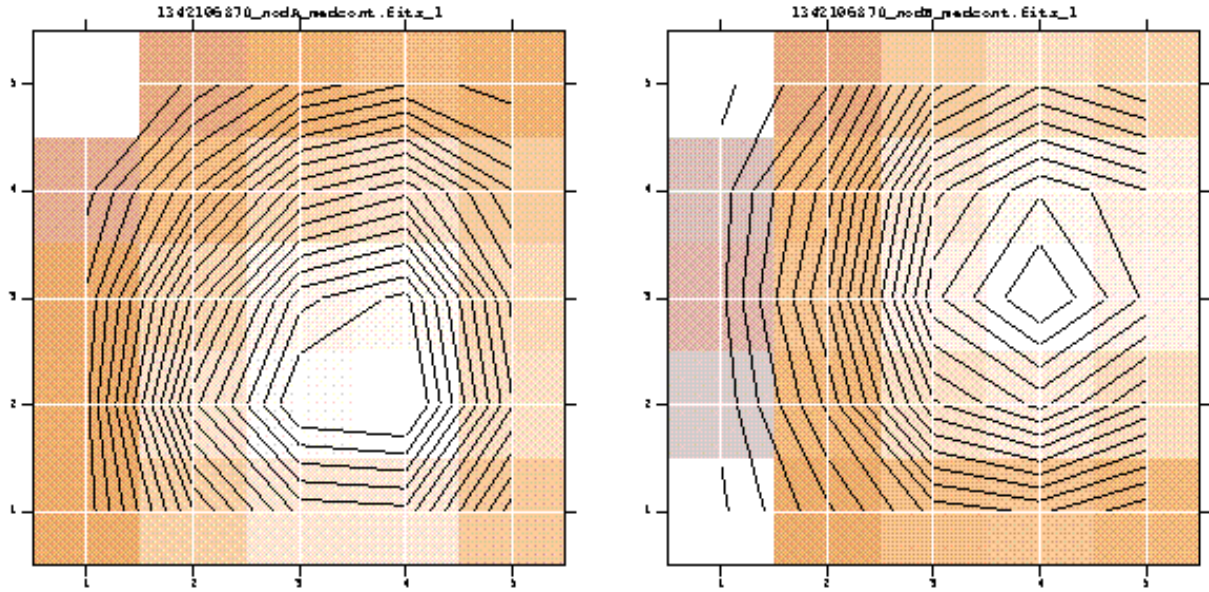


Illustration 9: IRAS19343 Medium chop OBSID 1342196870 OD 373

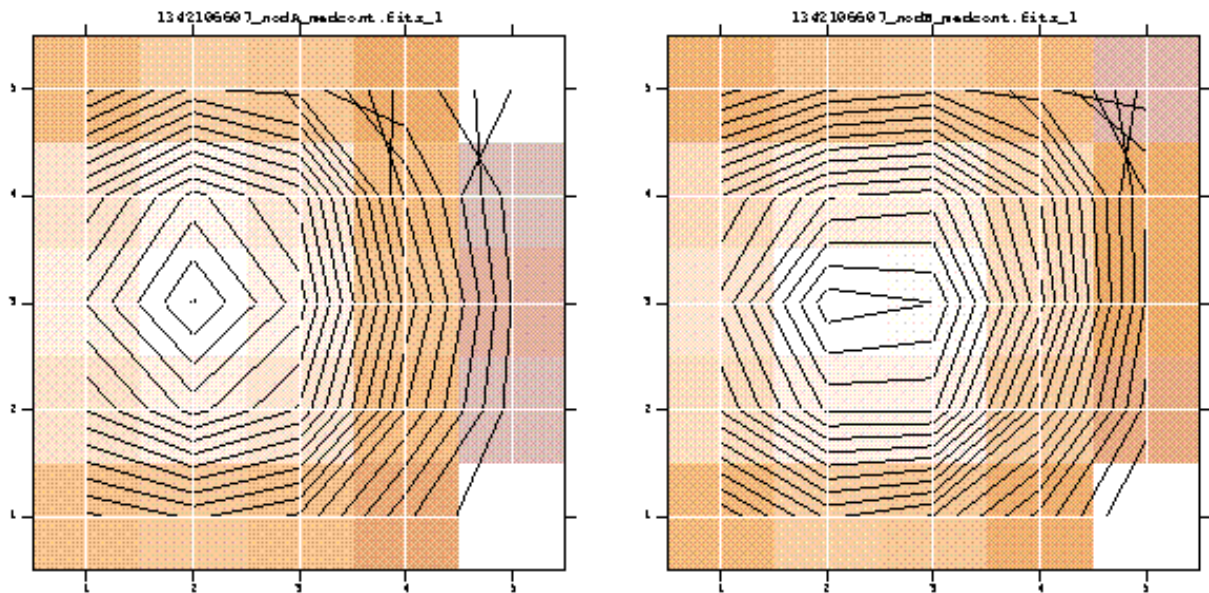


Illustration 10: CWLeo Medium chop OBSID 1342196697 OD 370

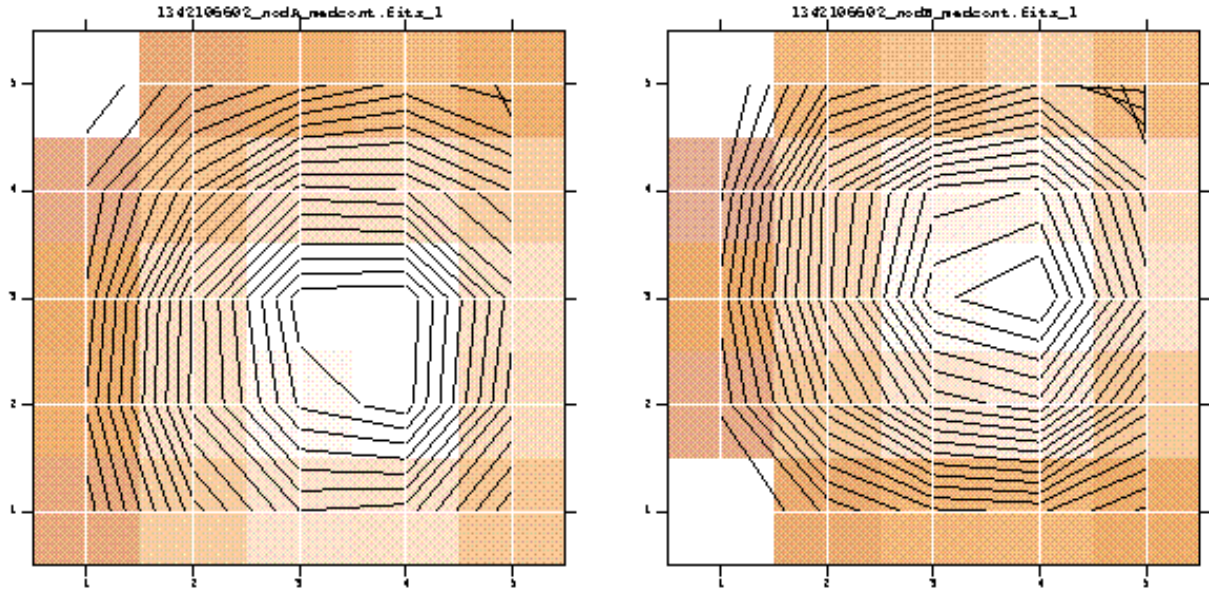


Illustration 11: VYCMa Medium chop OBSID 1342196692 OD 370

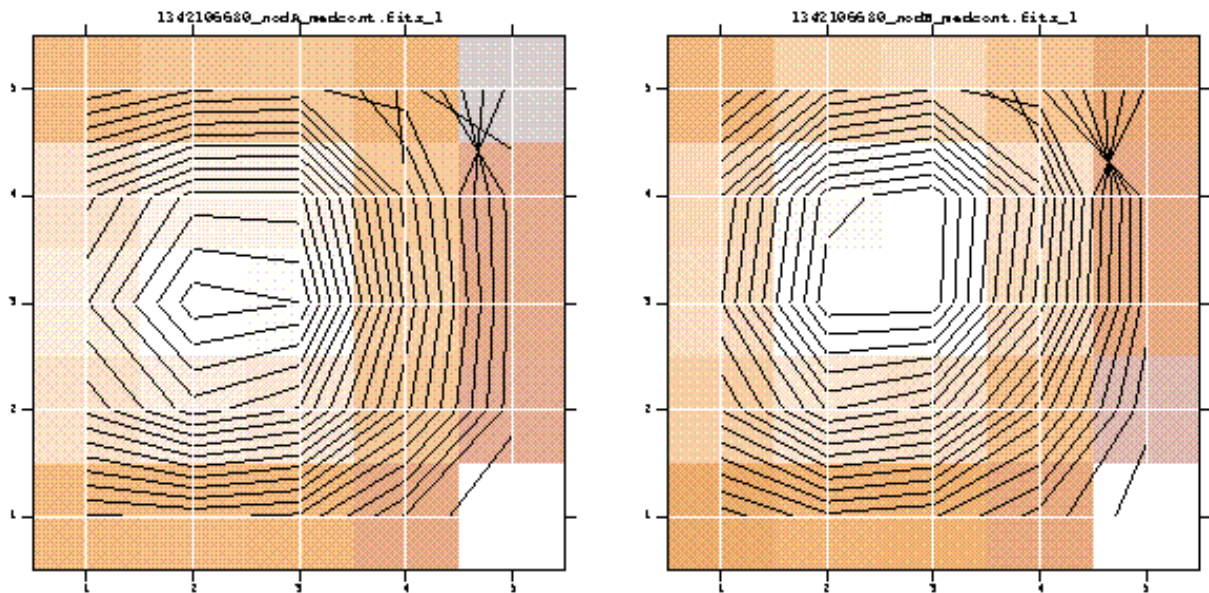


Illustration 12: HIP21479 Medium chop OBSID 1342196689 OD 370



### 4.3 Small chopper throw

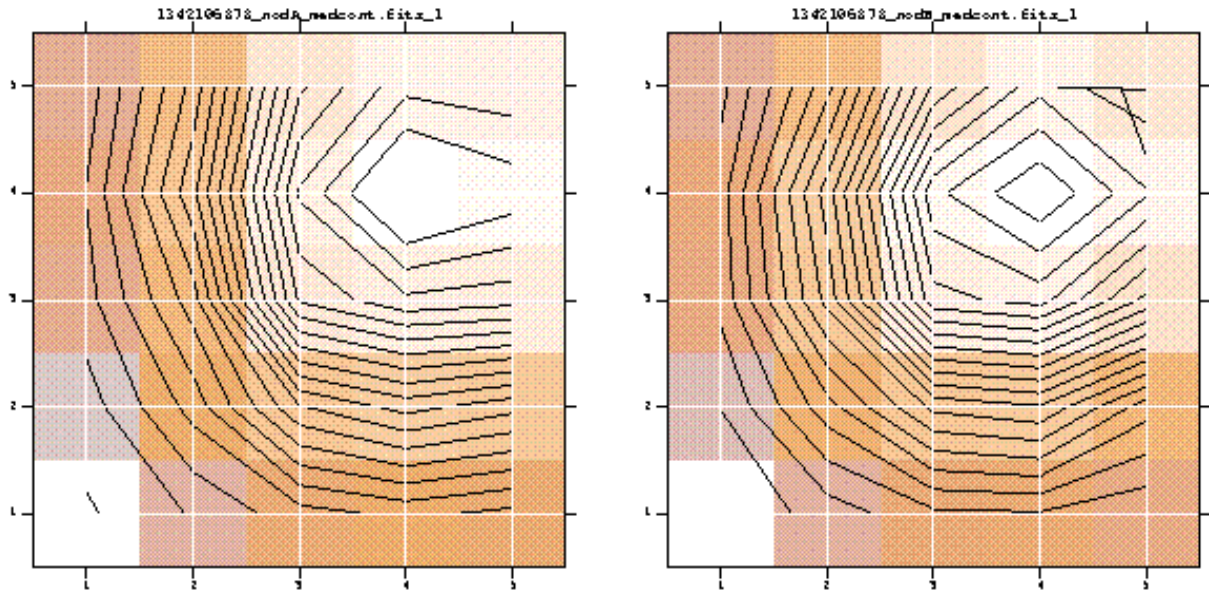


Illustration 13: AFGL3068 Small chop OBSID 1342196878 OD 373

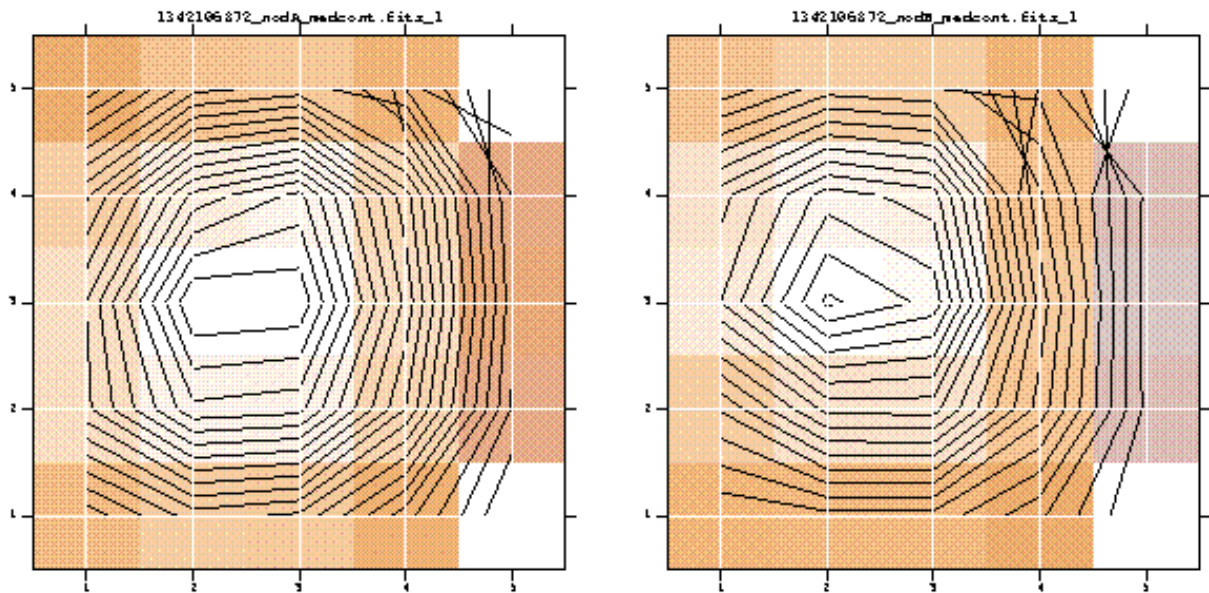


Illustration 14: Neptune Small chop OBSID 1342196872 OD 373

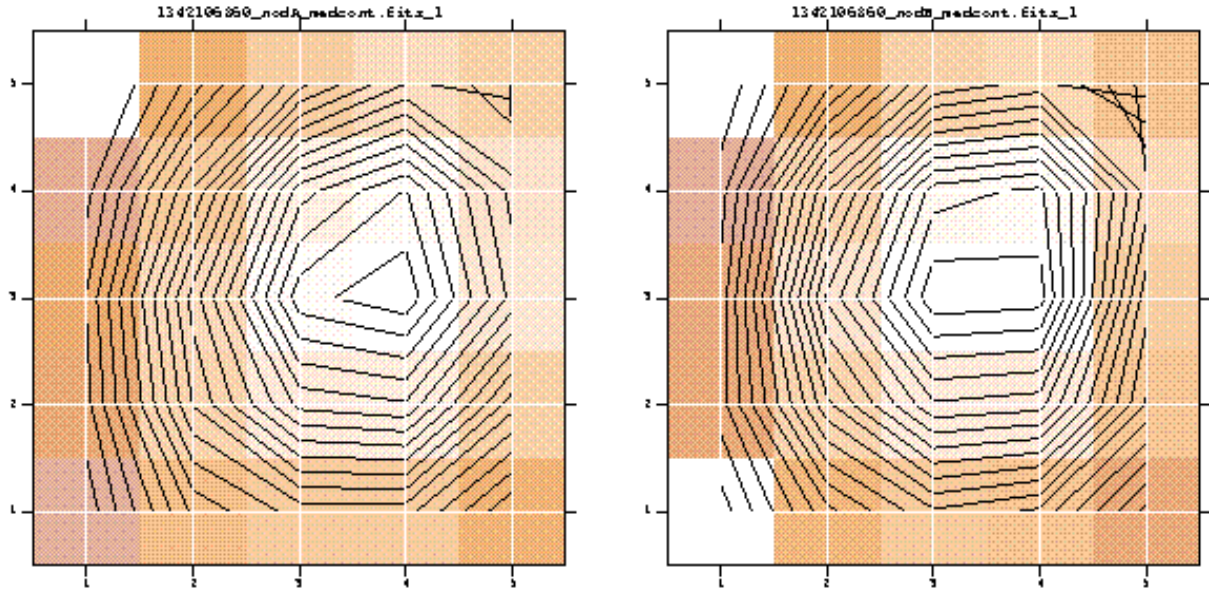


Illustration 15: IRAS19343 Small chop OBSID 1342196869 OD 373

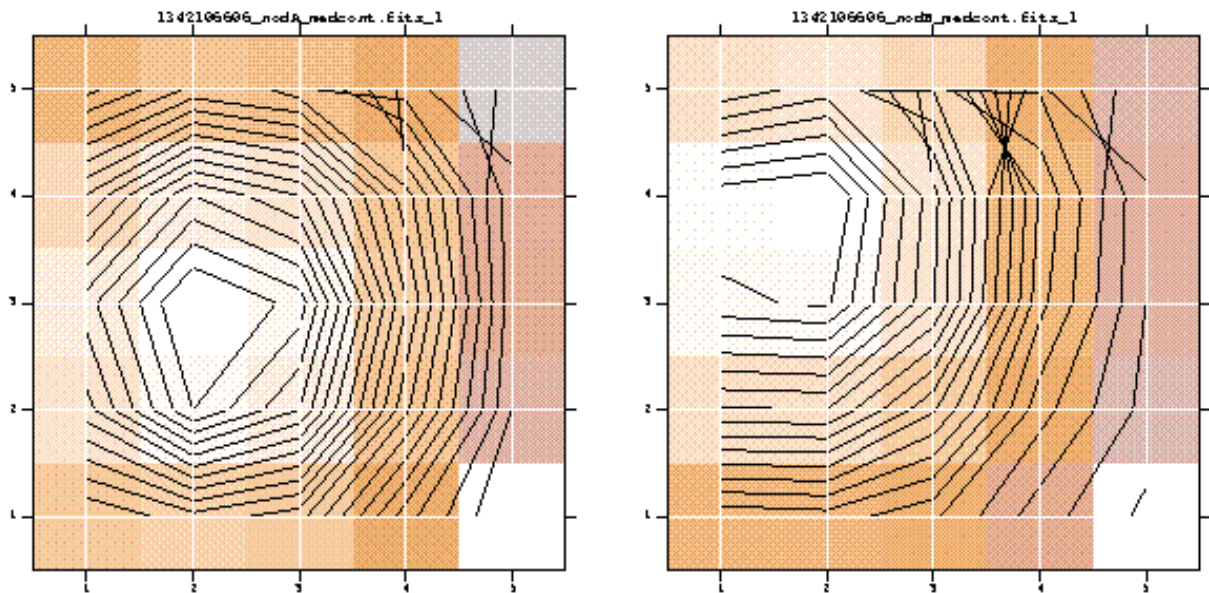


Illustration 16: CWLeo Small chop OBSID 1342196696 OD 370

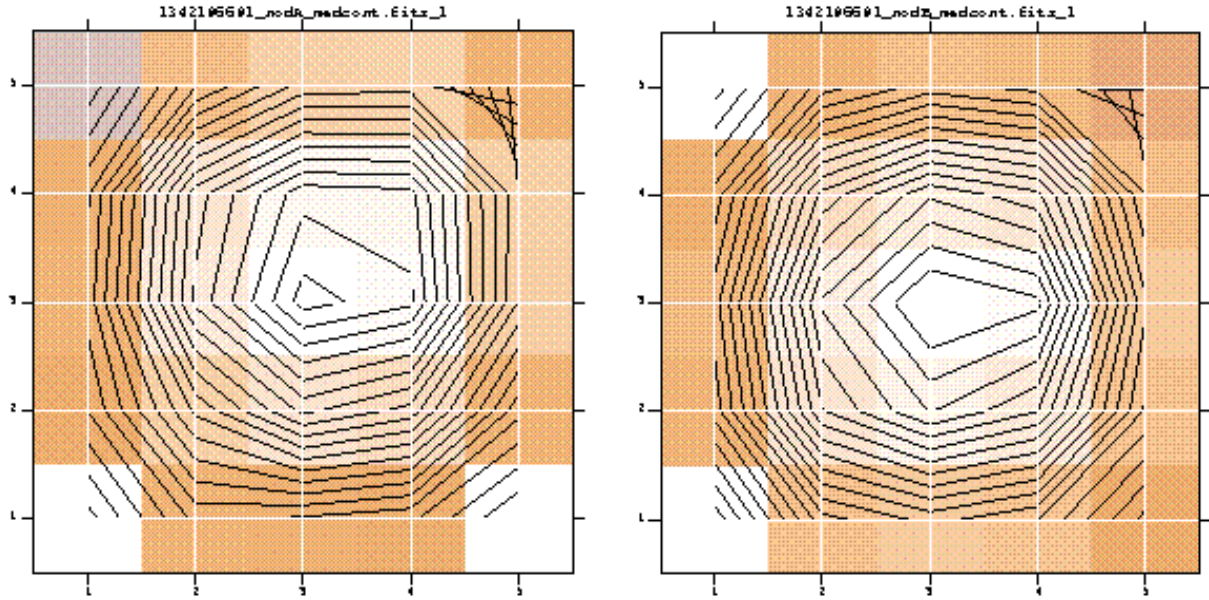


Illustration 17: VYCMa Small chop OBSID 1342196691 OD 370

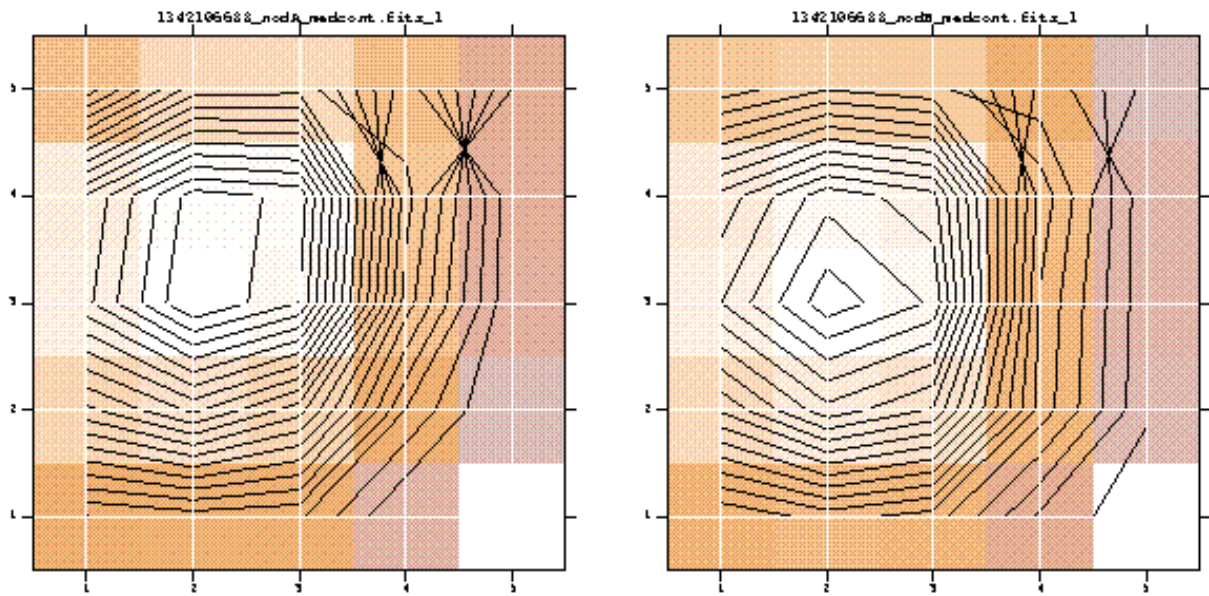


Illustration 18: HIP21479 Small chop OBSID 1342196688 OD 370

### 5 Summary

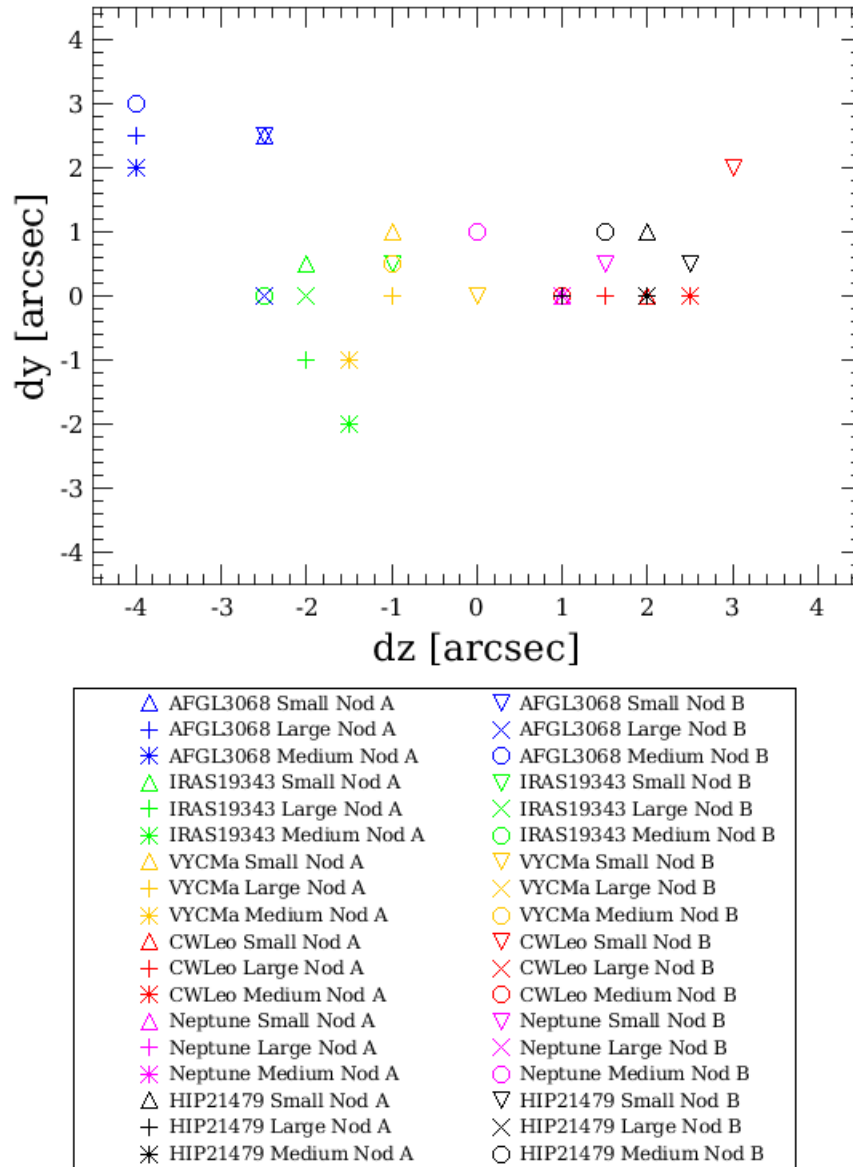


Illustration 19: Summary of offsets measured in OD 370 and OD 373

The approximate offsets are summarised in Figure 19. There is a clear clustering per source, showing that random -source related- offsets are dominating over systematics for offsets / skew angles for every chopper throw. The offsets are also centered around (0,0), indicating that no SIAM update can be concluded from these measurements. As expected, the offsets are more widely spread in z direction.