KATHOLIEKE UNIVERSITEIT LEUVEN

Belgian Contribution:

Calibration of CoRoT lightcurves

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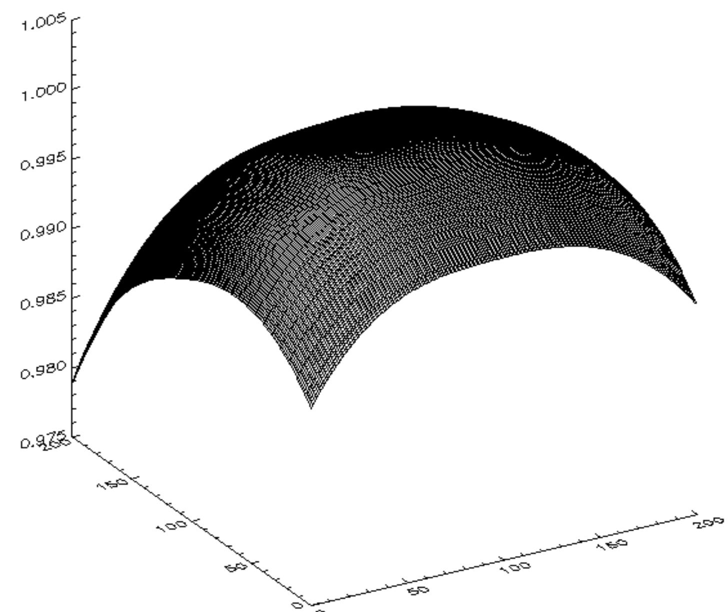
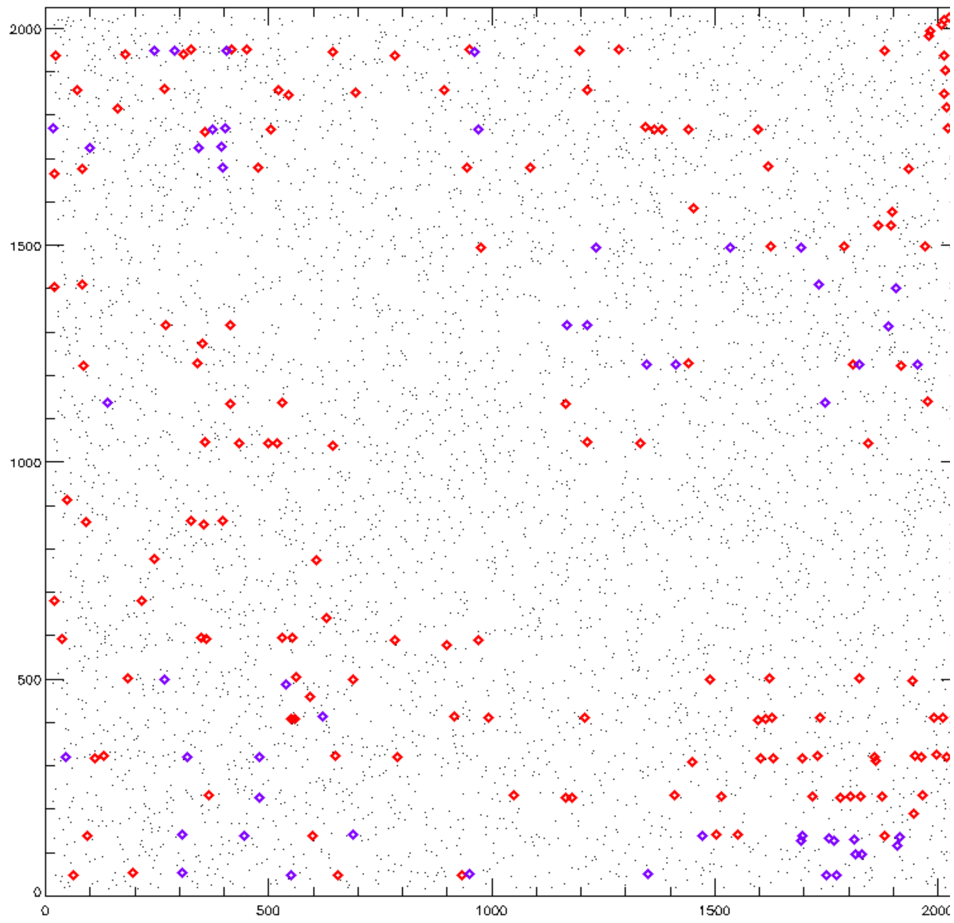
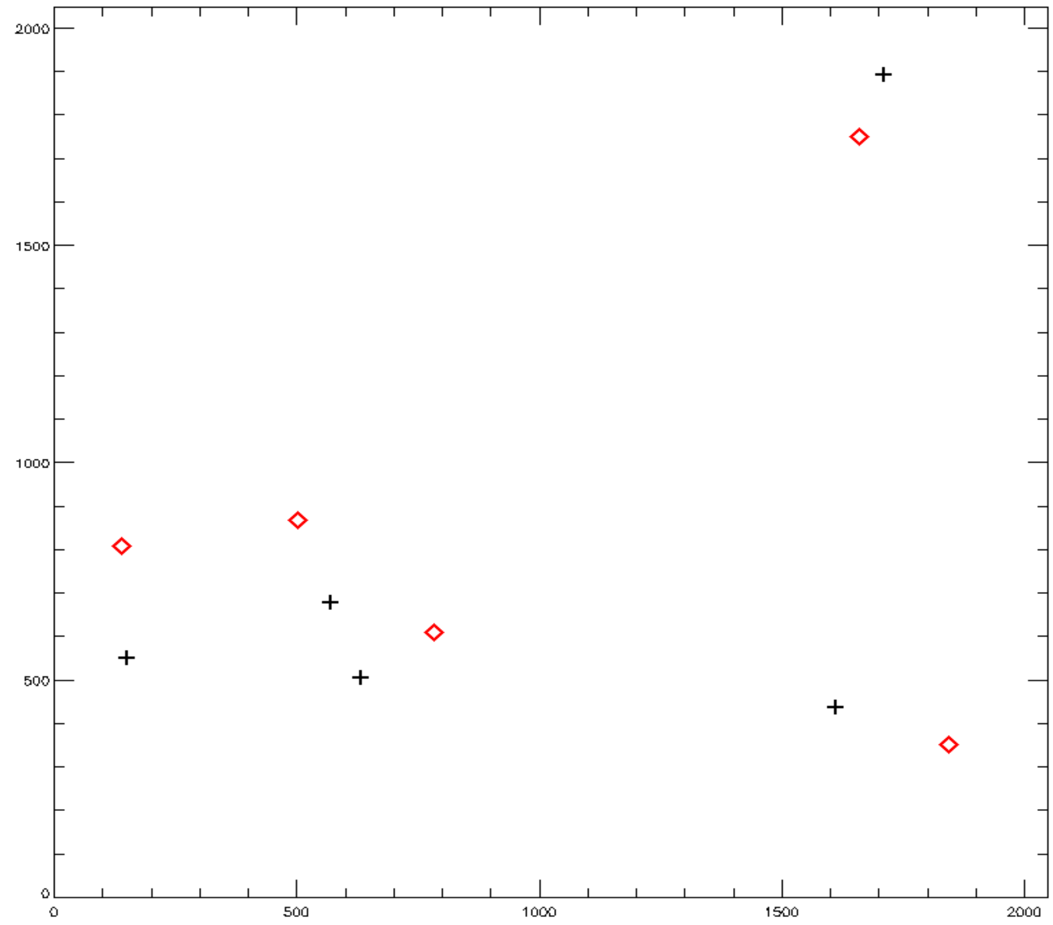


Exoplanets and Asteroseismology

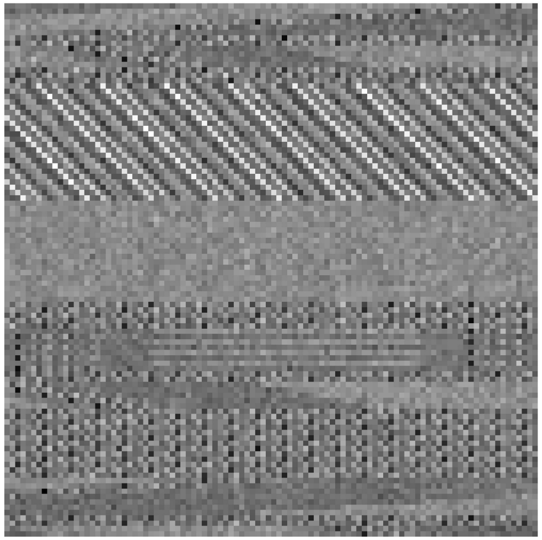




N0 to N1 corrections

N0 star

Electro-Magnetic Interference



Offset and gain

Background

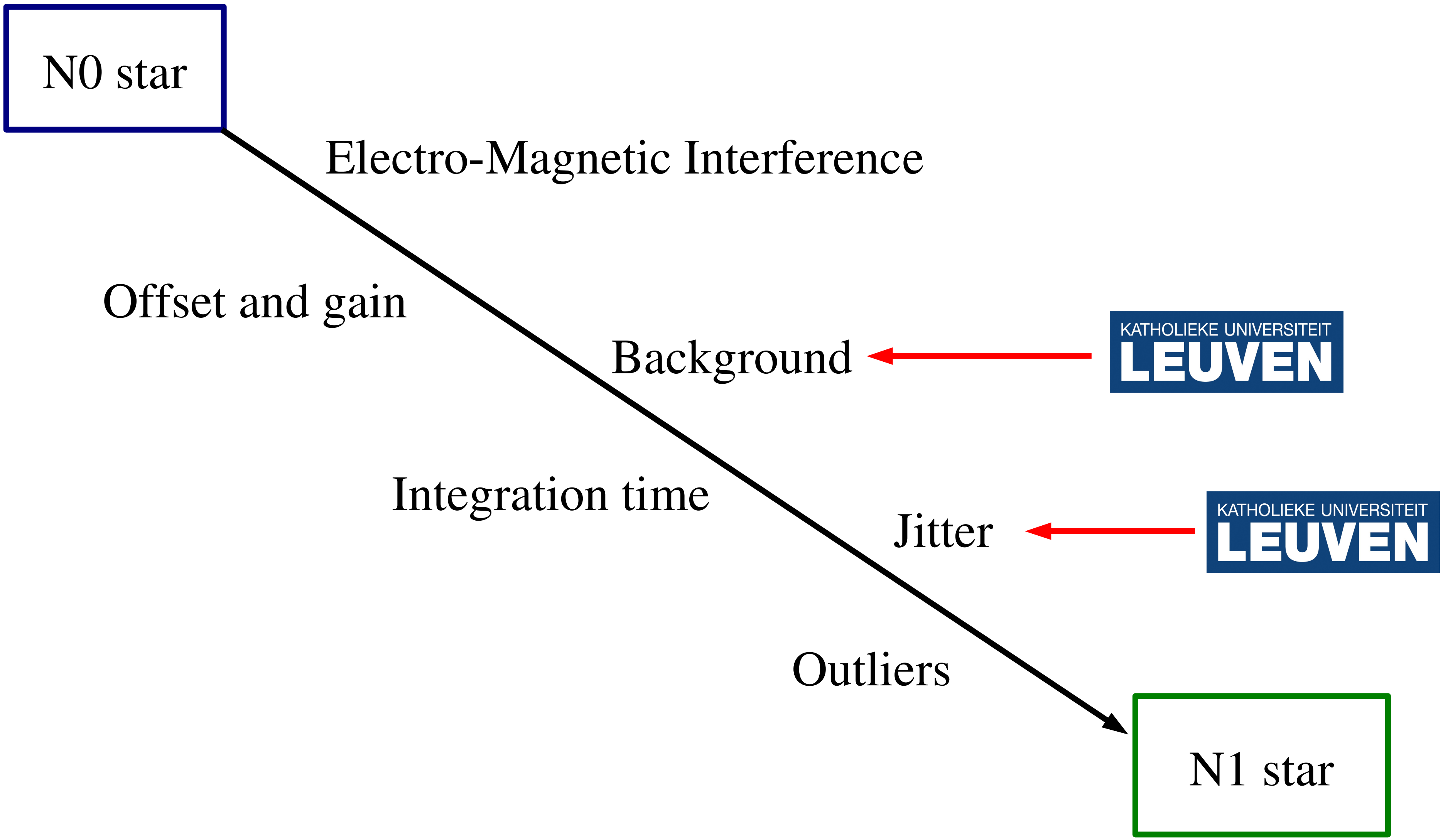
Integration time

Jitter

Outliers

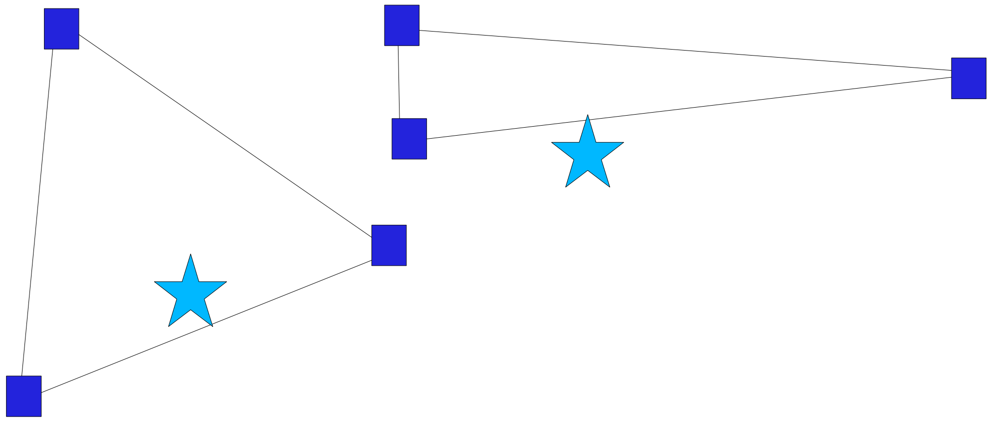
N1 star

N0 to N1 corrections



Exoplanet background correction

- Current pipeline uses closest background window
- Looking at using

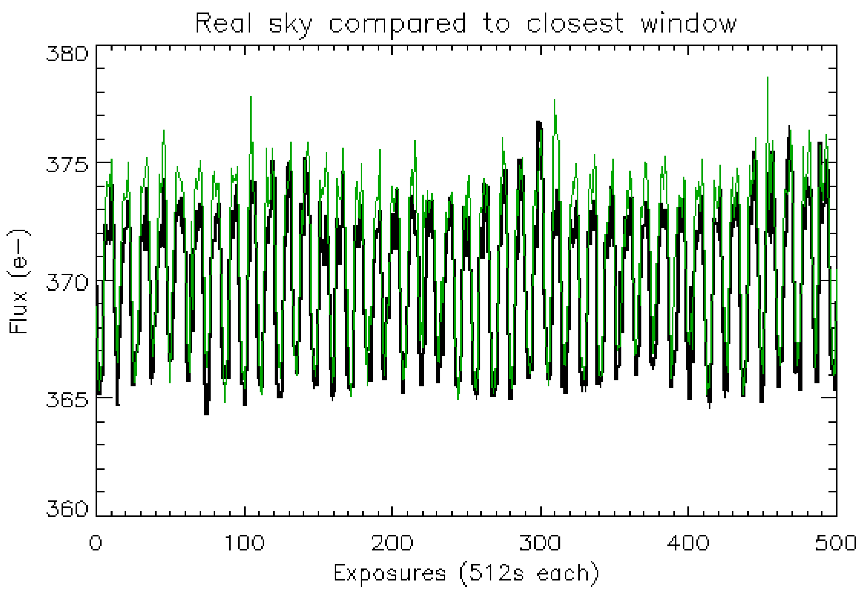


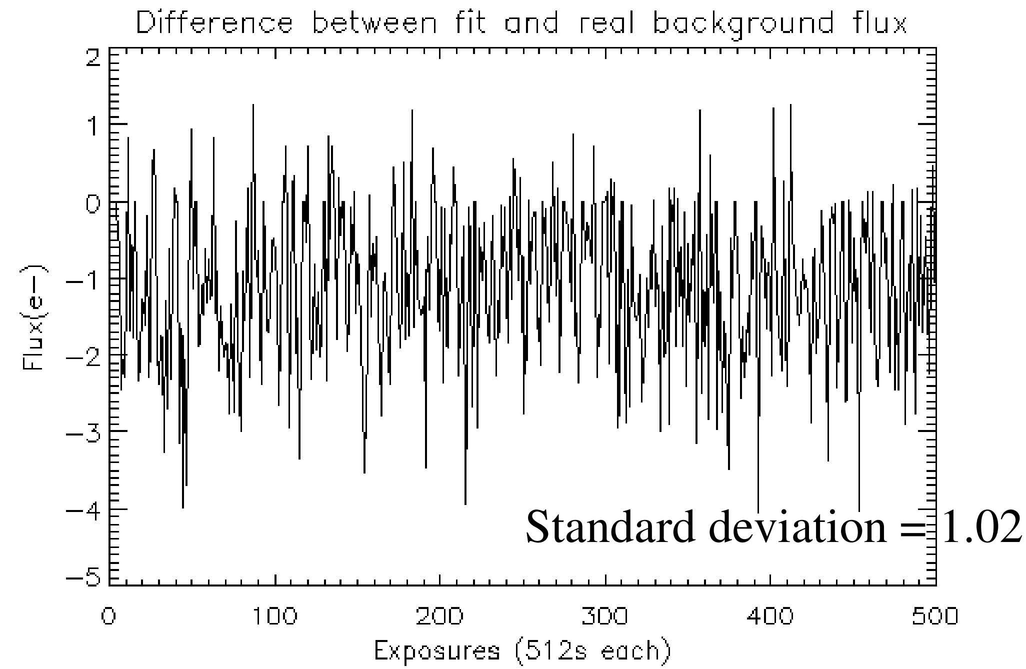
  - 3 closest windows (triangularisation)

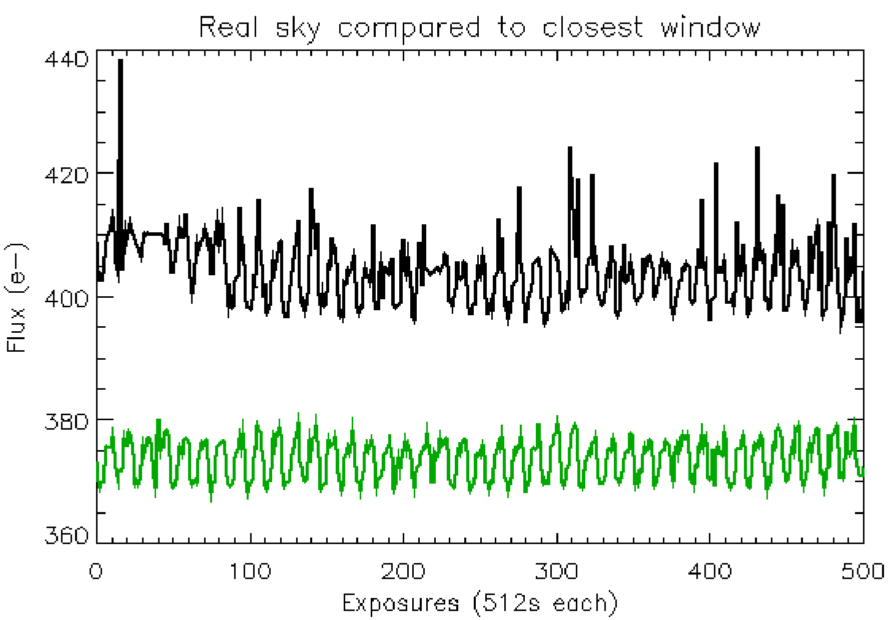
  - Polynomial fit of all windows (32s or 512s)

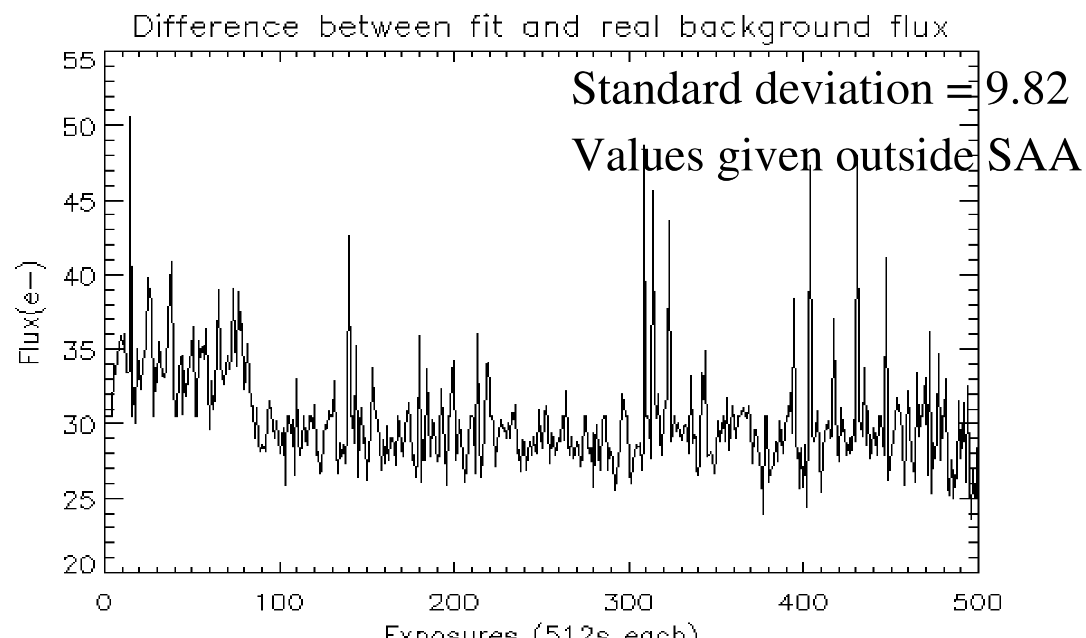
Asteroseismology background correction: uses assigned close background window

Quality of correction: closest window

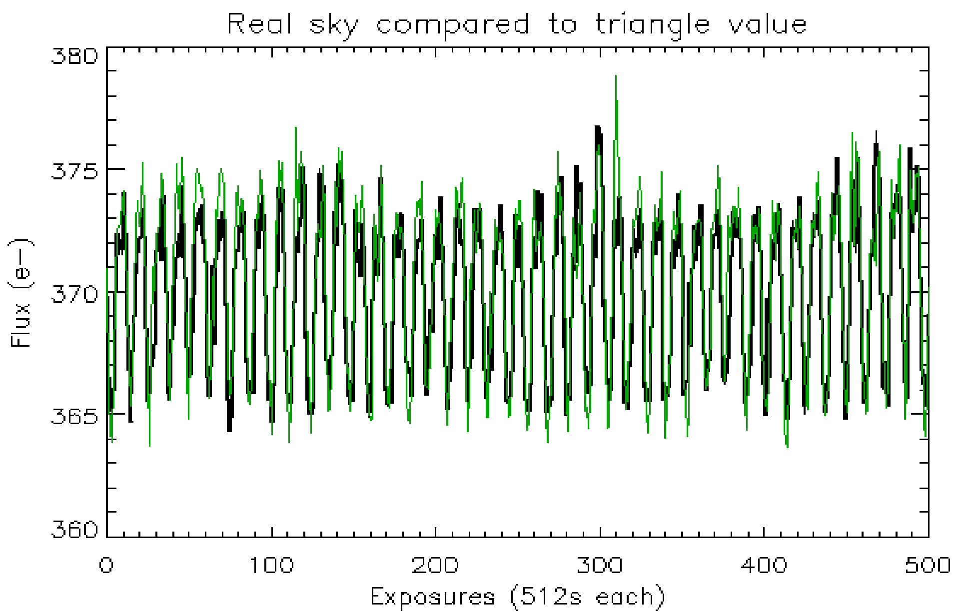


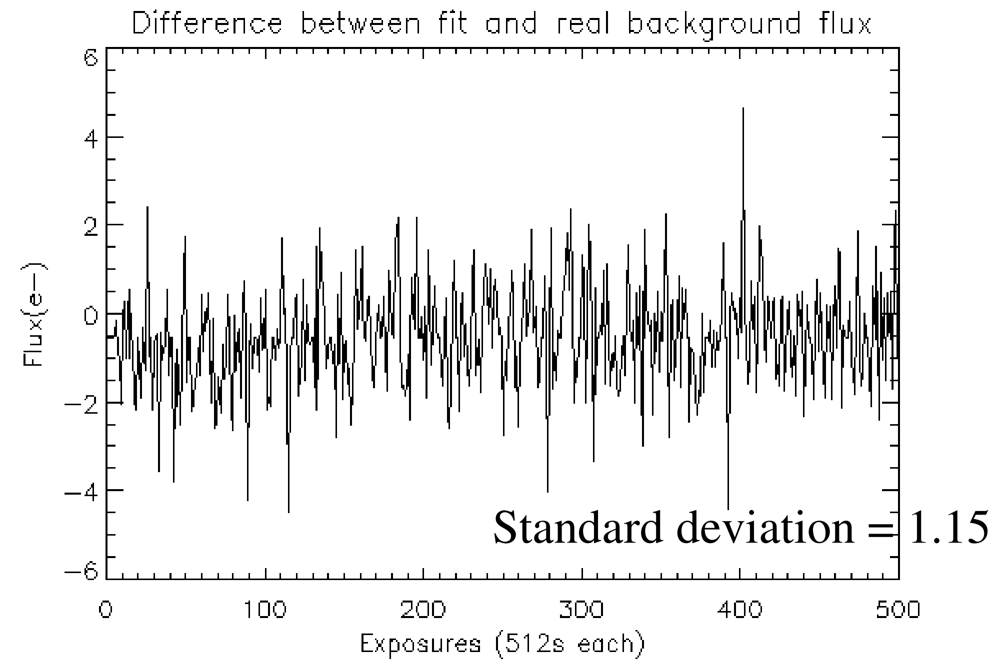


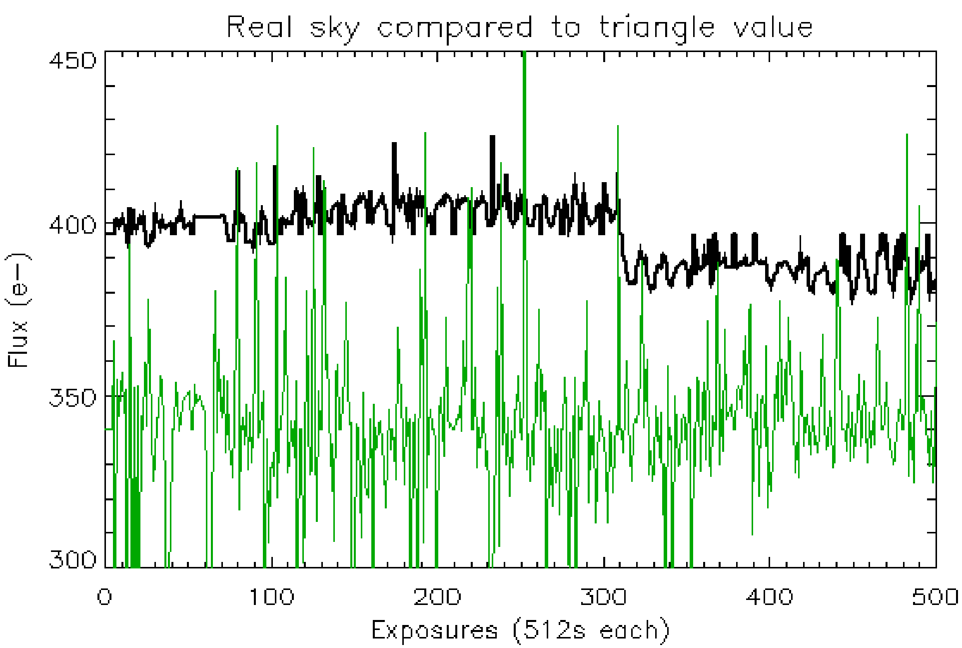


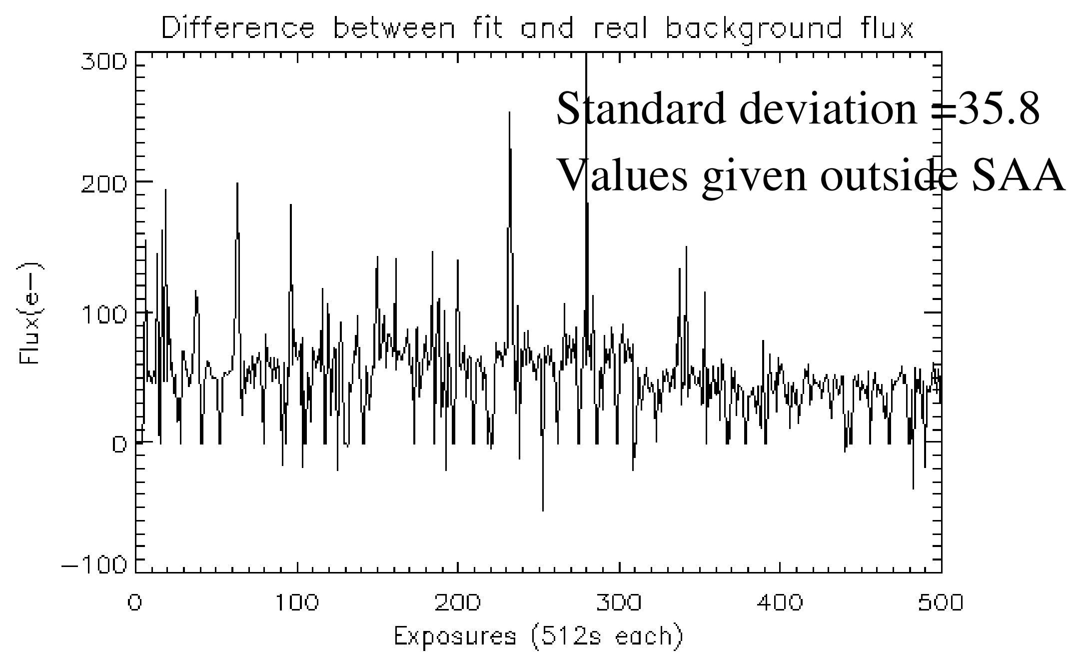


Quality of correction: 'triangularisation'

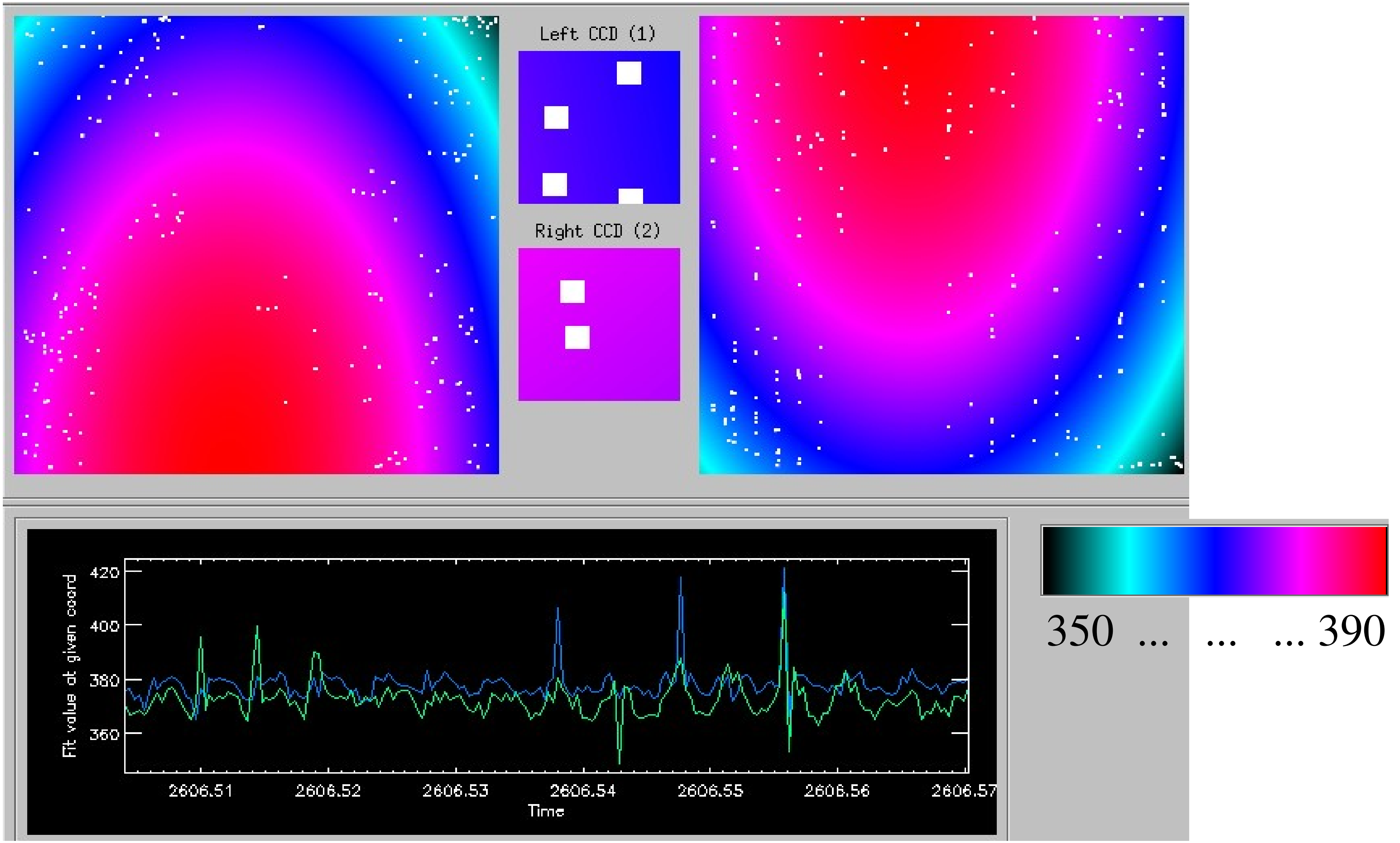




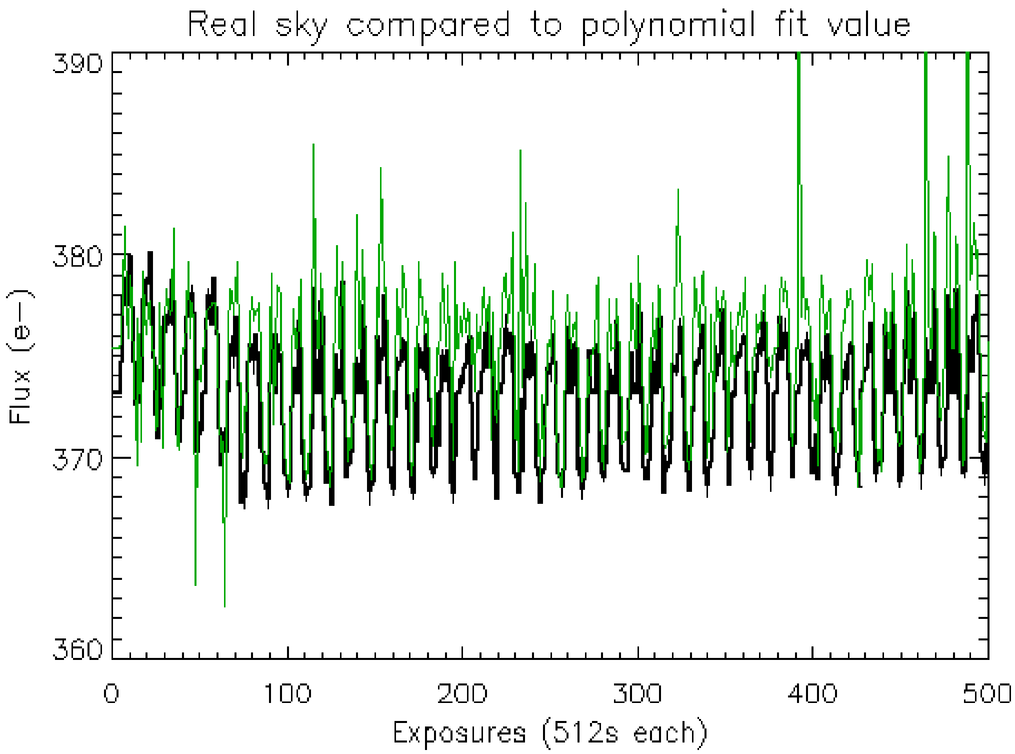




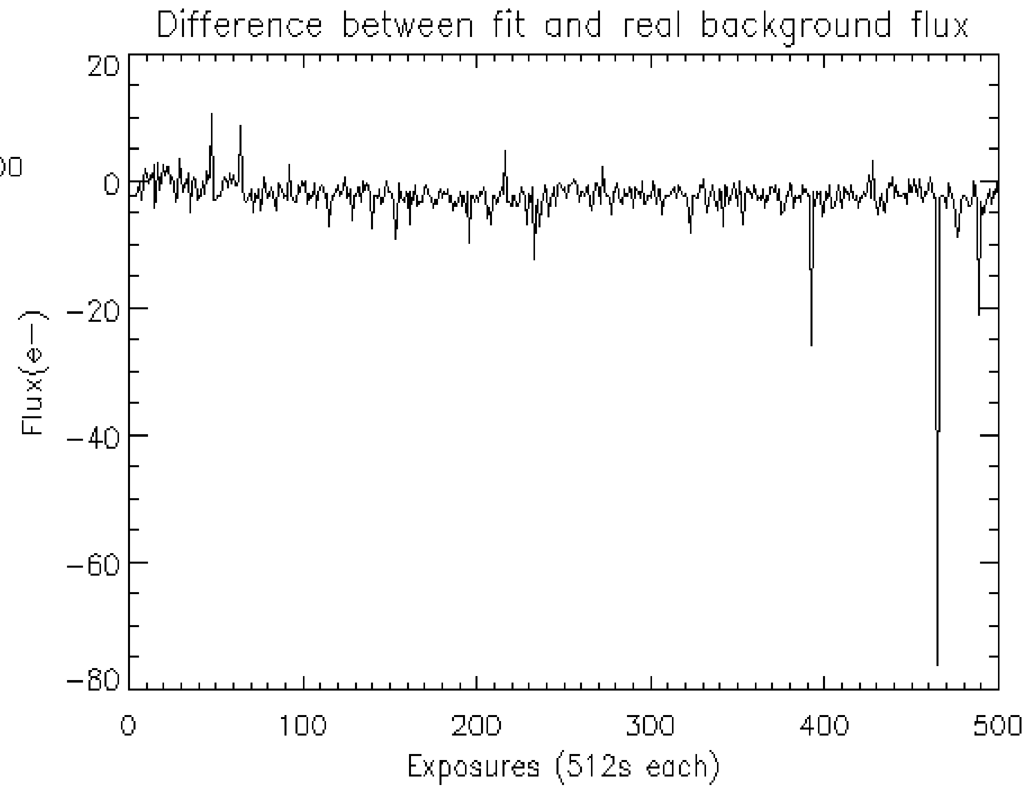
Quality of correction: polynomial fit



Quality of correction: polynomial fit



Standard deviation = 5.78



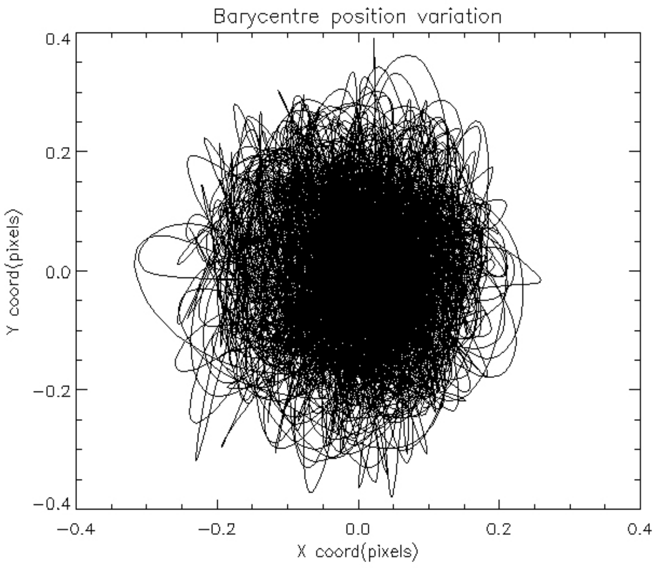
Background correction: conclusions

	Closest	Triang.	Poly fit 2 CCDs	CCD1	CCD2
Std dev	4.5	9	7.2	5	3.8

- Closest window is the simplest correction, but of variable quality – care should be taken
- Triangularisation doesn't improve the quality in this test group, but window placement was not optimal
- Polynomial fit is of comparable quality when all windows are used (512 s fit) - beneficial in cases where nearest background window has a bright pixel

Jitter correction: asteroseismology channel

- Small satellite motion is a problem due to CoRoT's aperture photometry
- Each star has a fixed 'mask' assigned and flux moves outside this mask as the satellite moves

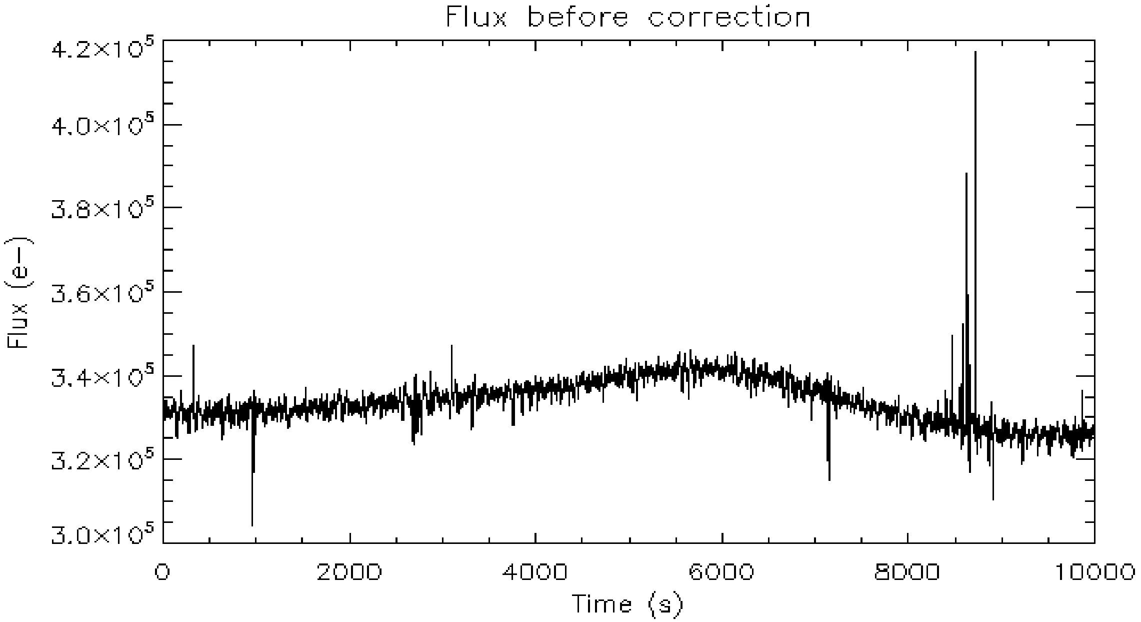


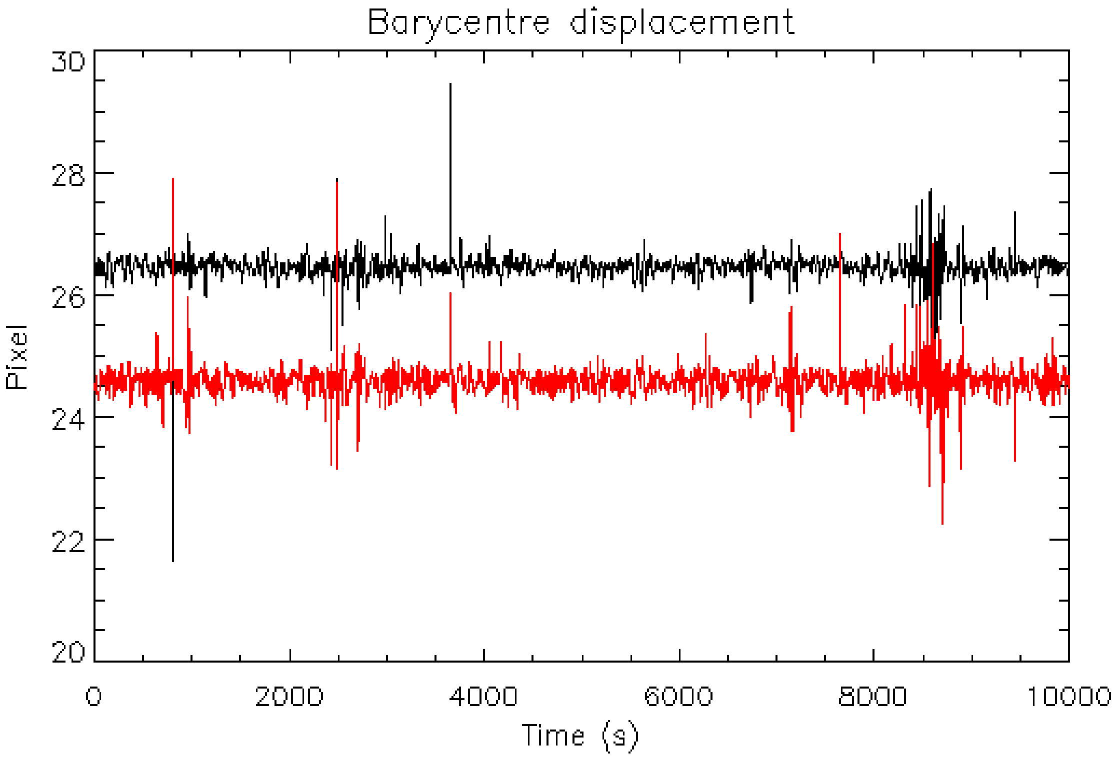
Two correction methods

Use an oversampled imagette to generate a high resolution PSF which we use to model flux loss

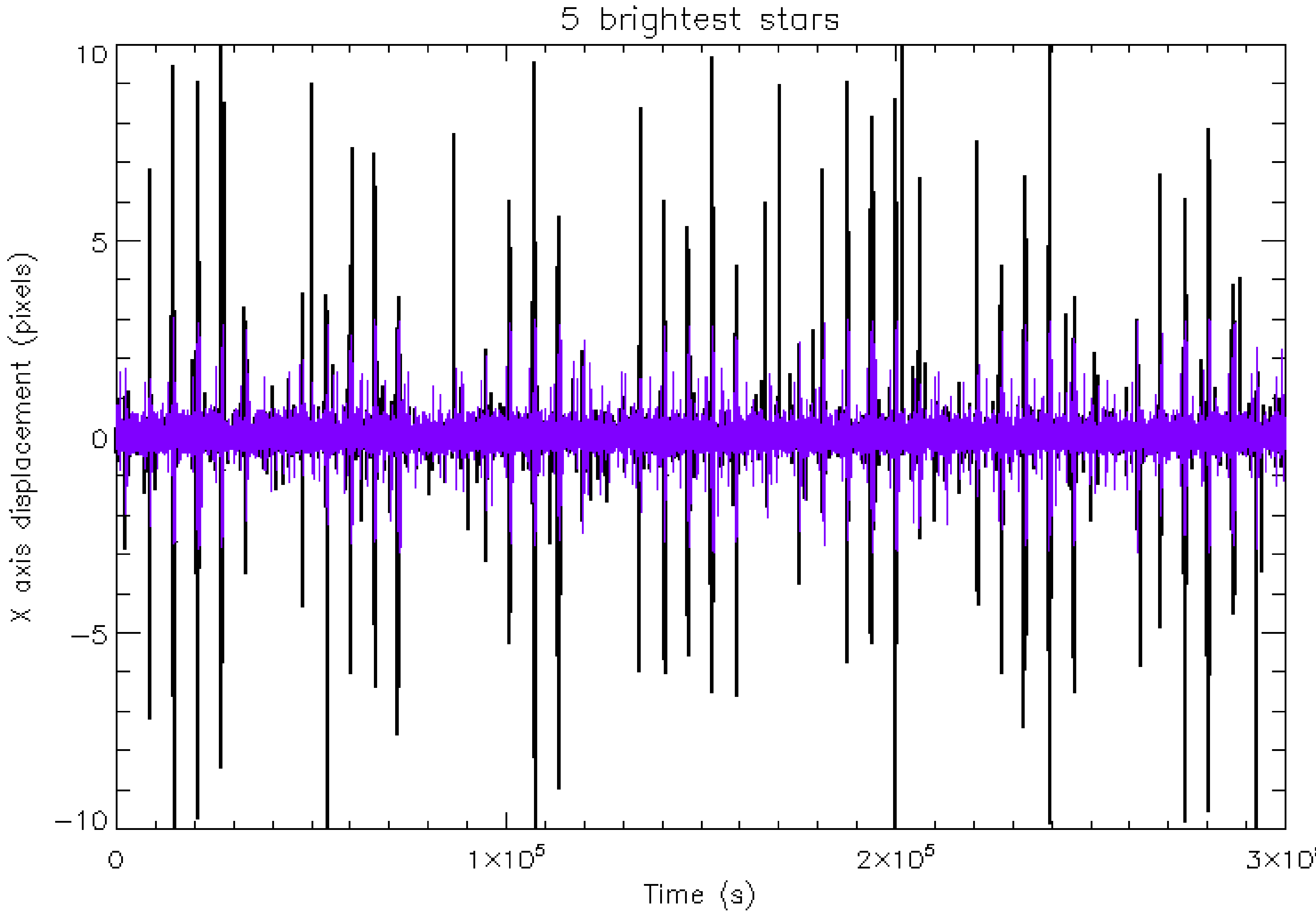
Use CoRoT's onboard barycentre calculation and flux data to create a correction surface

Flux variation related to displacement

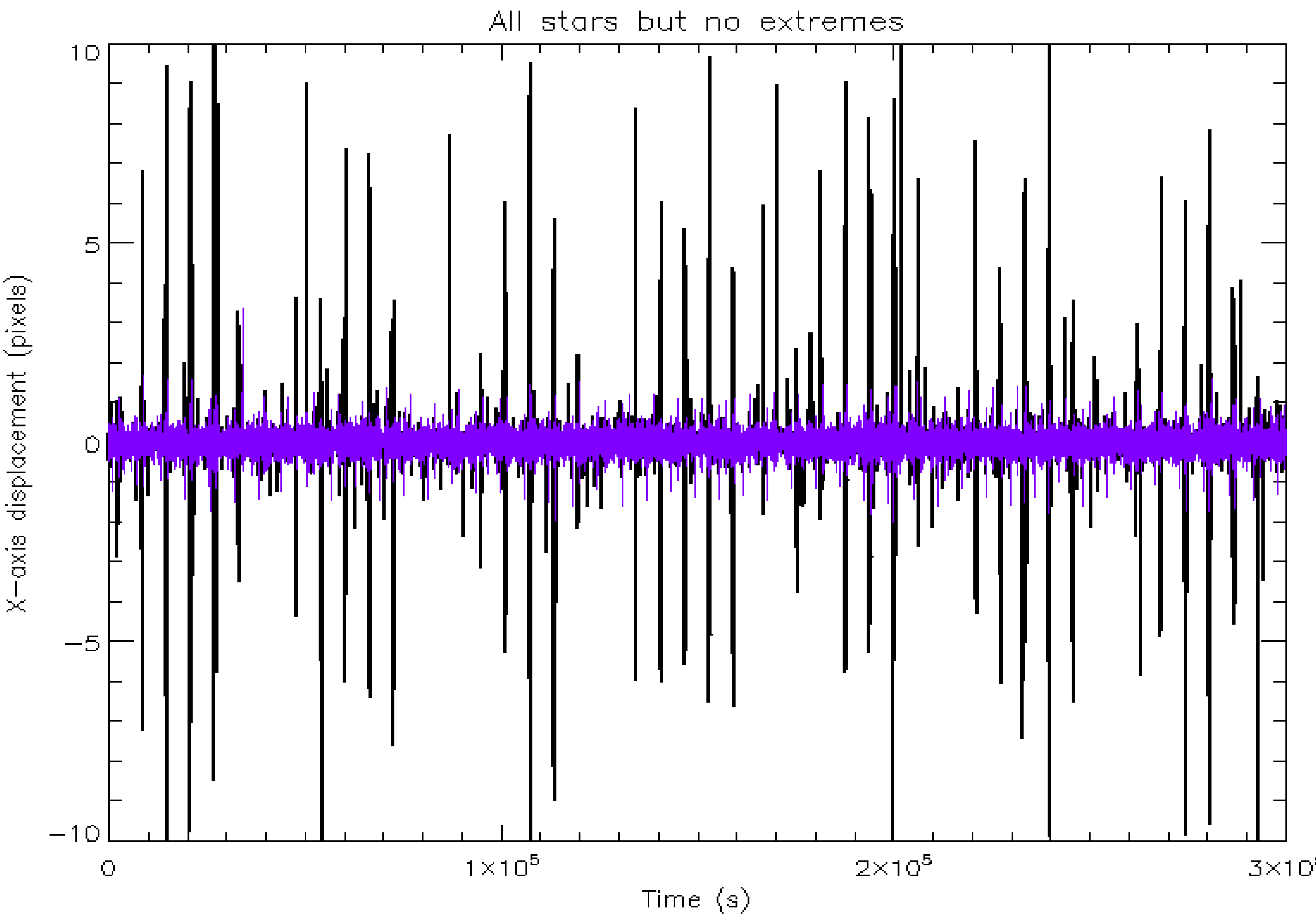




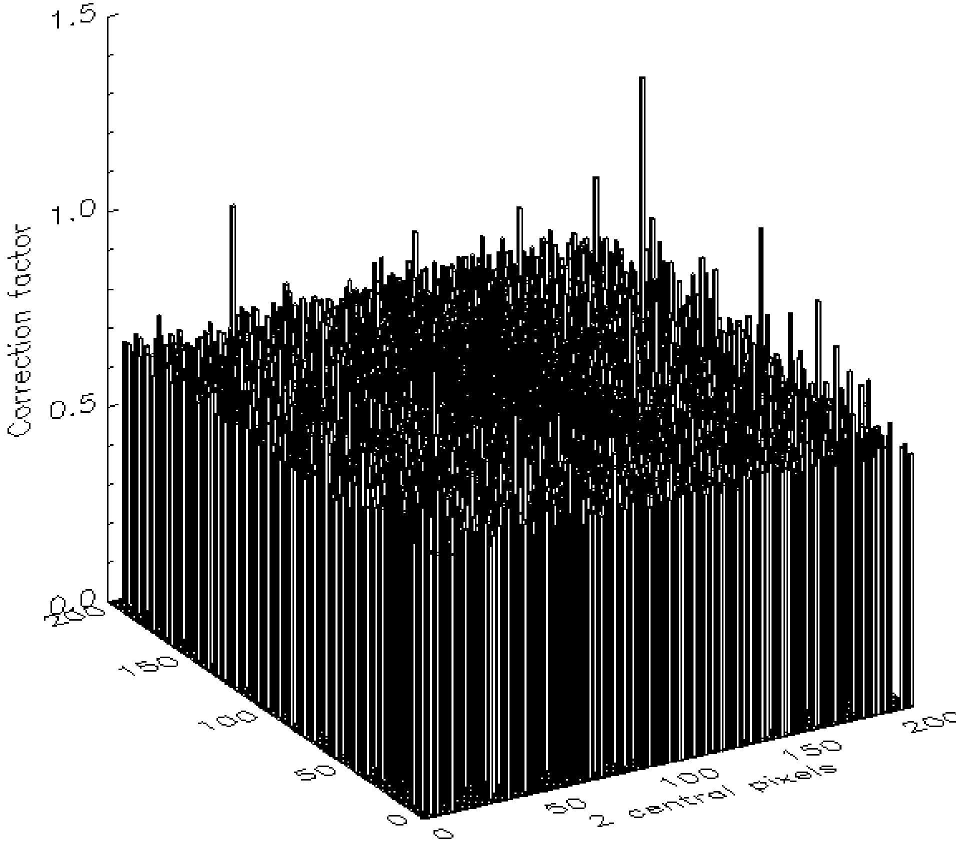
Angle fitting

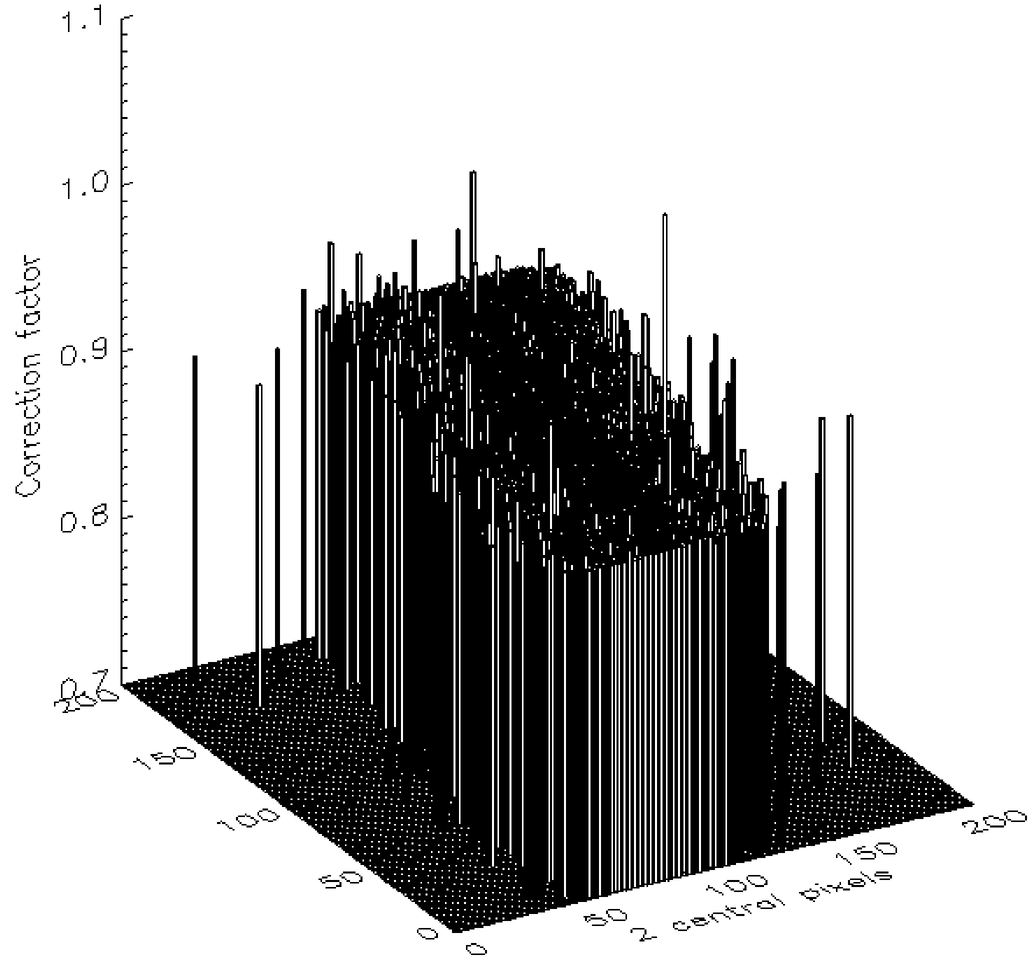


Angle fitting

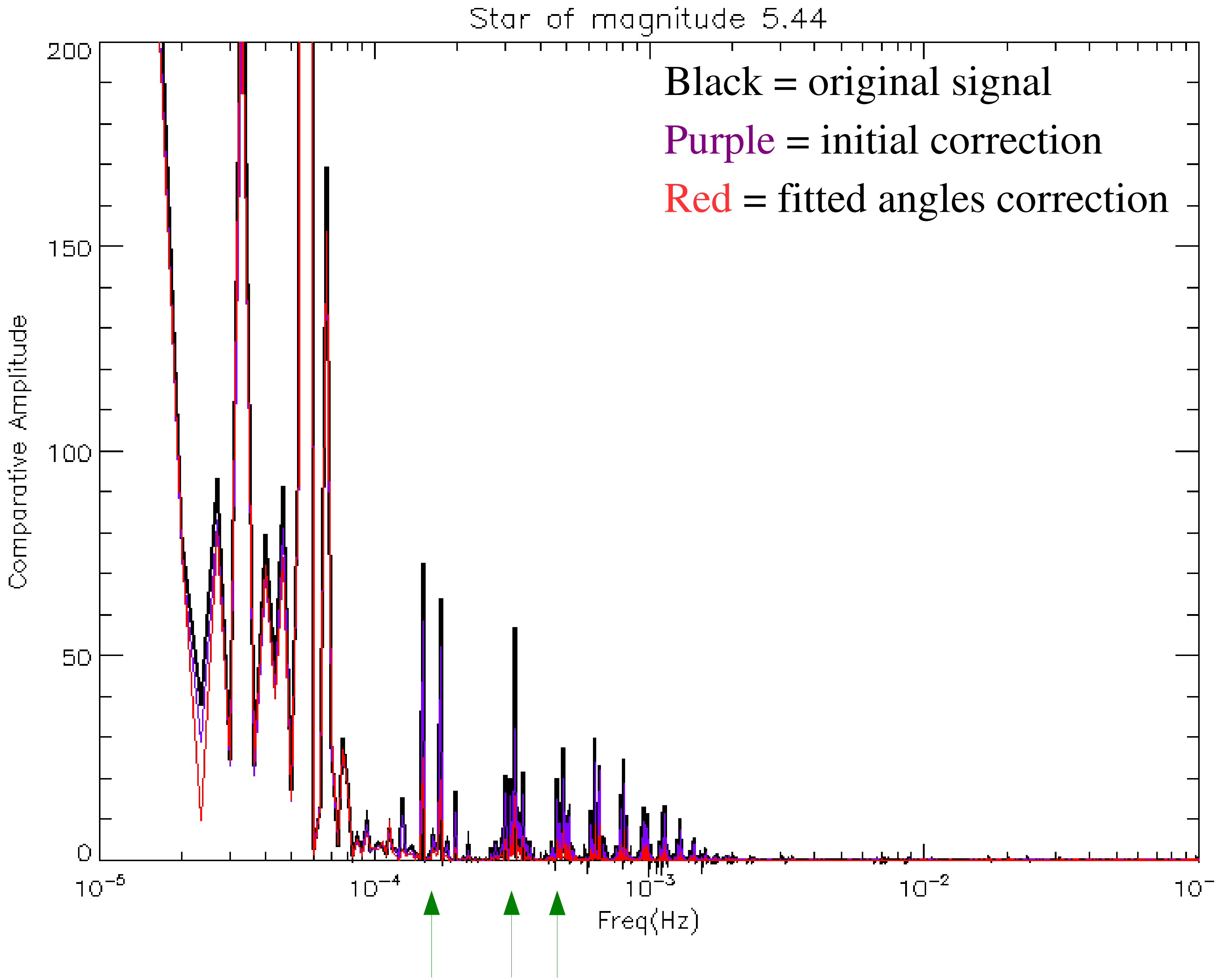


Correction Surfaces

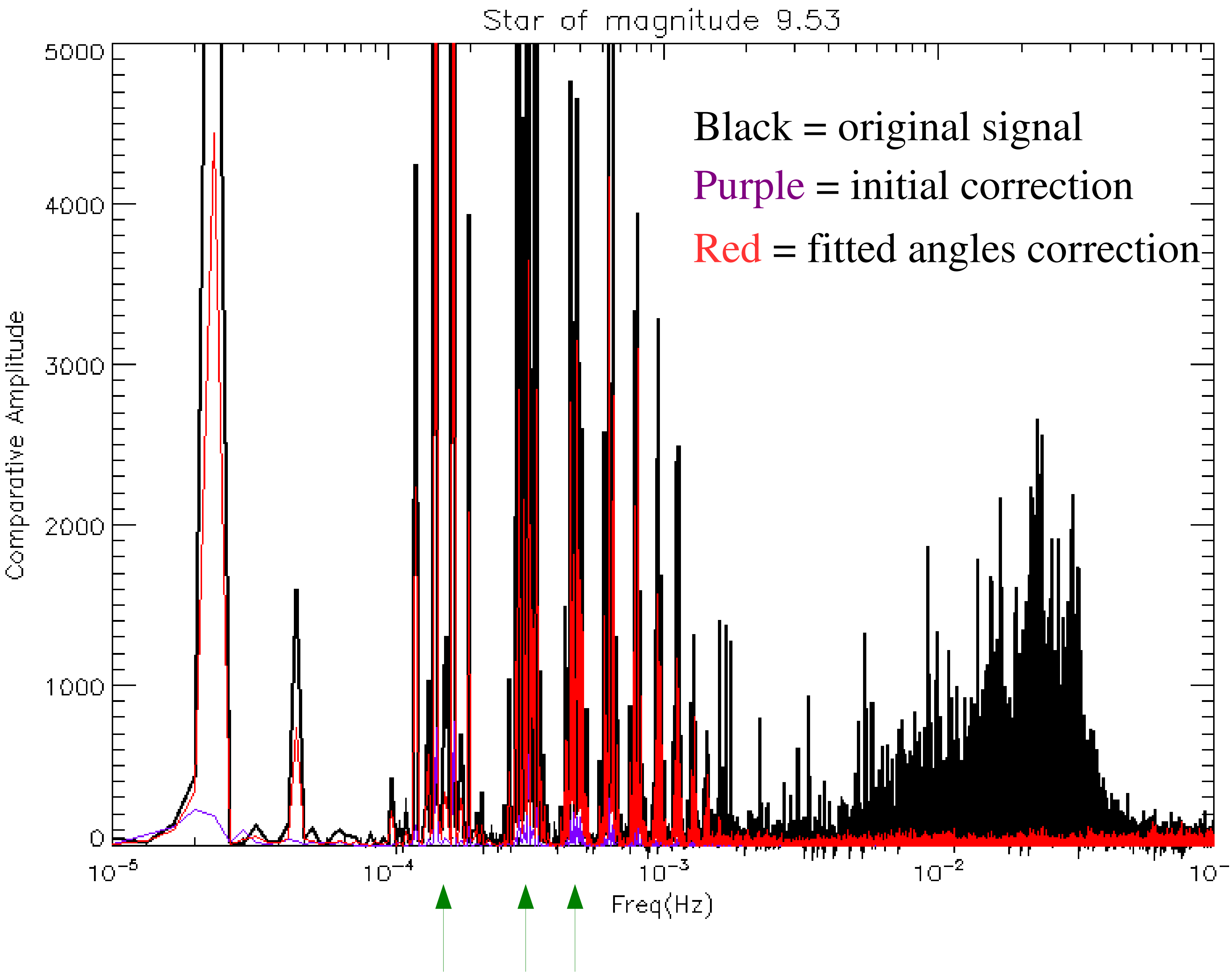




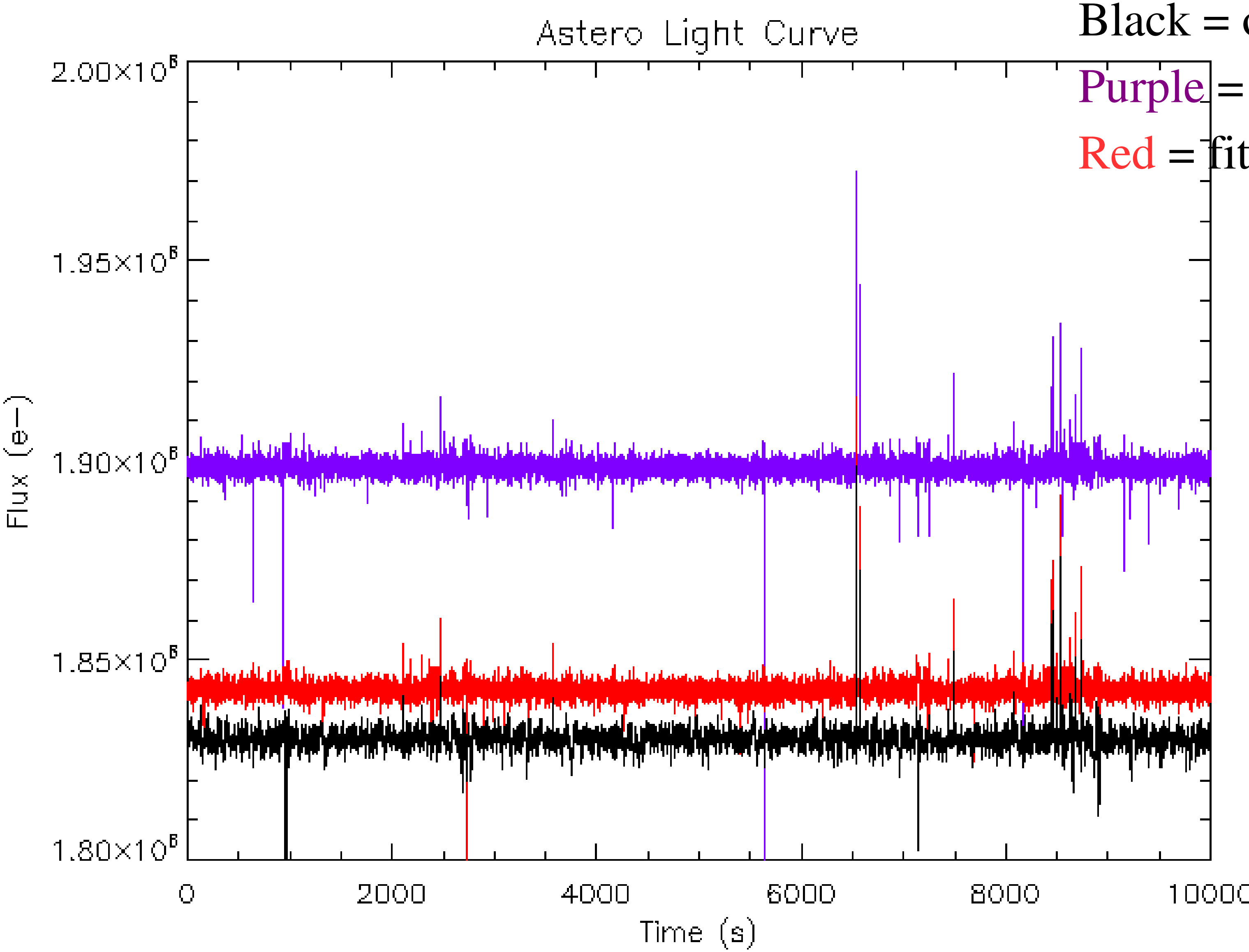
Jitter correction : bright star



Jitter correction : faint star



Example asteroseismology LC



Black = original signal
Purple = initial correction
Red = fitted angles correction

Jitter correction: conclusions

- Works well - is especially interesting for faint stars
- Increased accuracy for angle reconstitution using more then 2 stars (on board ecartometry)
- Current pipeline method - high resolution PSF correction is comparable and quicker
- Signal correlation method can correct for photo response non-uniformity of the CCDs

Conclusions and Ongoing Work

- The algorithms prepared before launch function as expected
- Corrections have been extended to compensate for new challenges – e.g. Bright pixels in some background windows
- Further tests on new CoRoT runs with different window placement
- Extension of background bright pixel correction to asteroseismology channel data