Level 3 Fitting

Stephen Doe, Ian Evans

Purpose: For each ObsID, many sources are detected. For each source detected, the goal is to:

- Confirm source is real
- Refine source positions
- Derive source properties

Scripts:

- lev3_fit_psf.sh (Spatial)
- lev3_fit_spectrum.sh (Spectral)

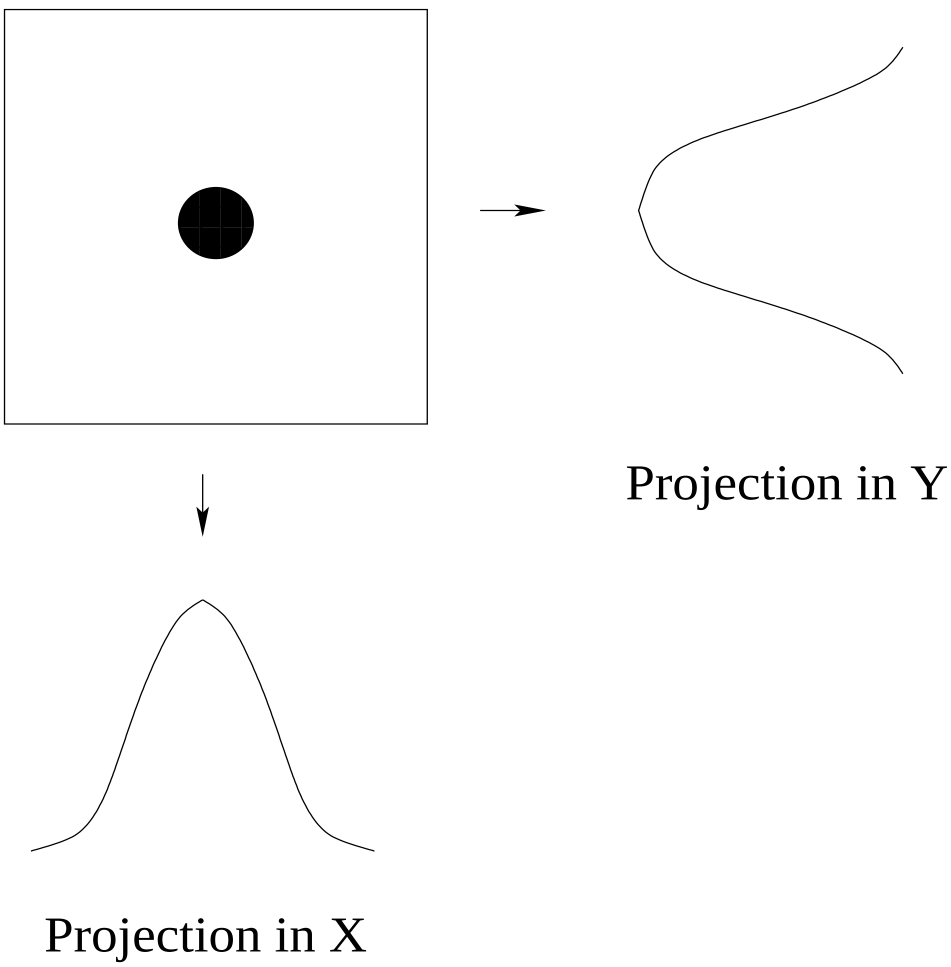
Spatial Fitting

For each source, the detect pipeline delivers several data files to be used in spatial fitting. These include:

- "Postage stamp" image of the data
- PSF image
- Exposure map
- Source region
- Background region

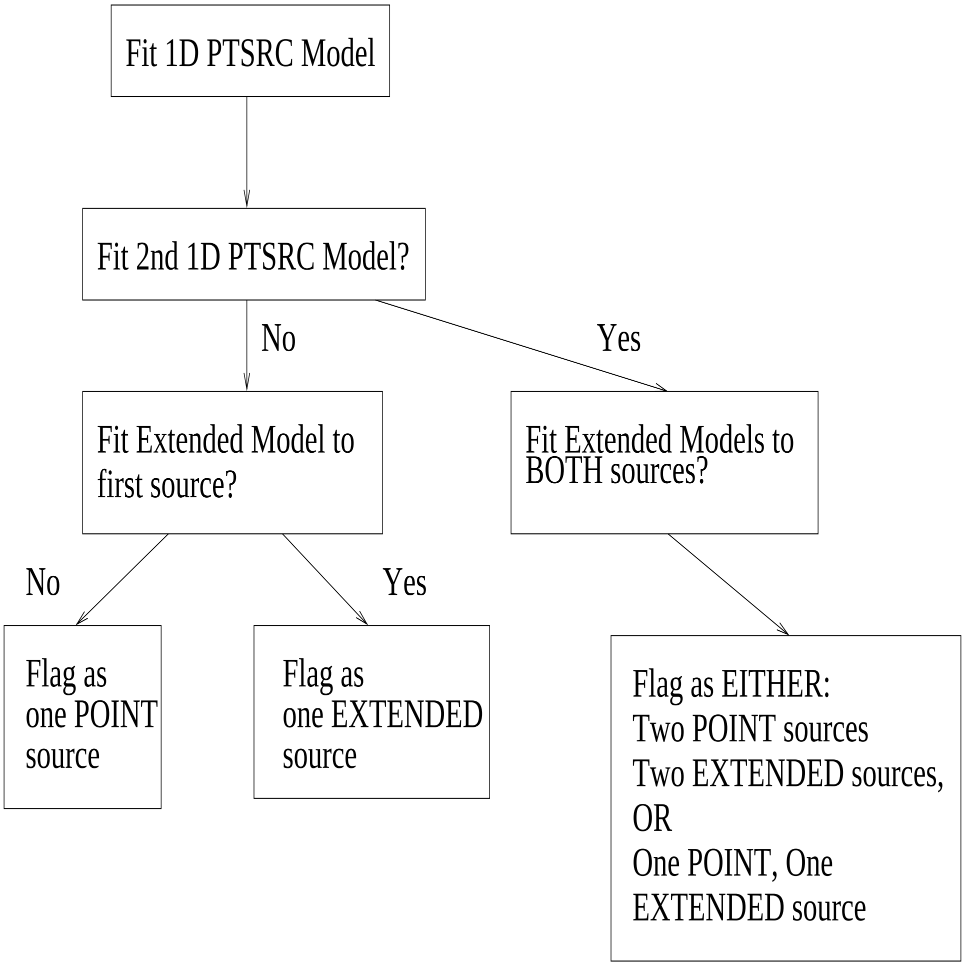
Spatial Fitting

1) Marginalize postage stamp, PSF and exposure map



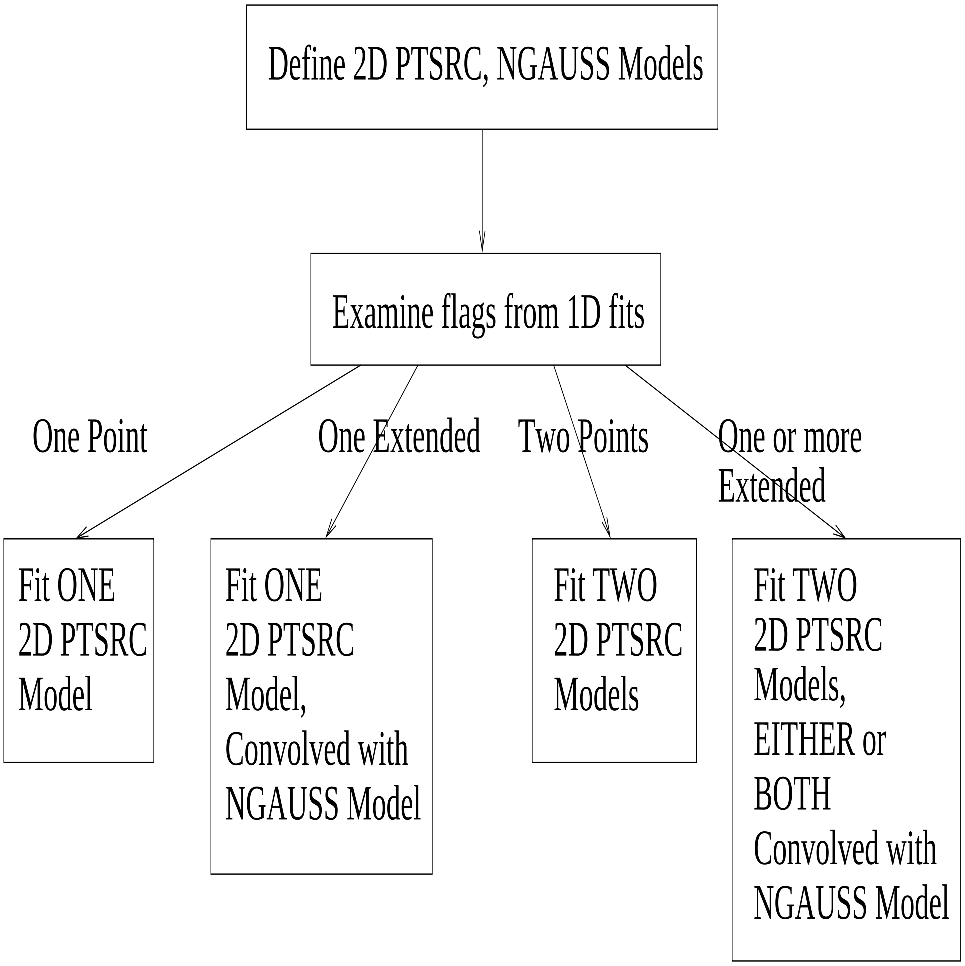
Spatial Fitting

2) Define 1-D models, perform fits to X, Y marginals



Spatial Fitting

3) Define 2-D models, perform fits



Spatial Fitting

4) For each source, write characteristics to output parameter file

- X, Y positions, with errors, in physical coordinates
- Normalizations of source, background models
- If extended, extent in X, Y
- Goodness of fit
- Q-Value (statistical significance of fit)

If two sources were found, characteristics of both sources are written to the same parameter file.

Spectral Fitting

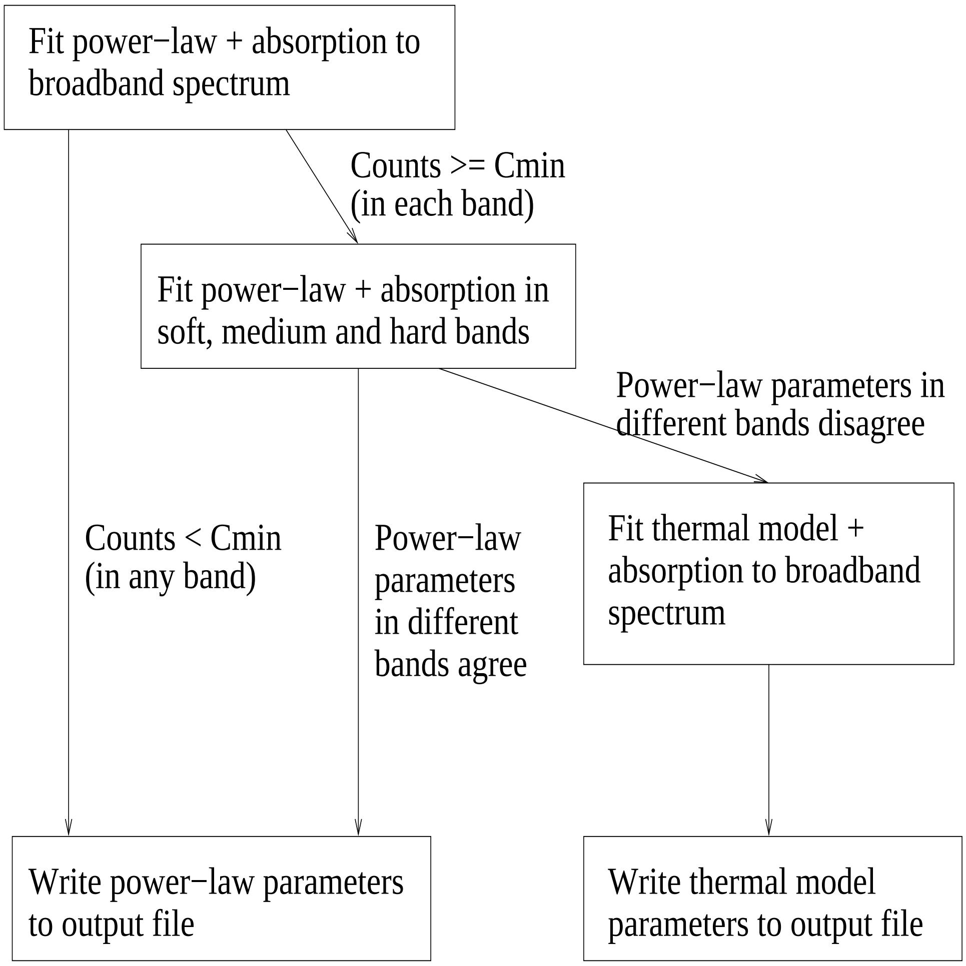
For each source, we are also given data that can be used in spectral fitting. These are:

- PHA file
- RMF (response) file
- ARF file
- Value of galactic N_H (from colden)
- High, low energy bounds for soft, medium and hard bands

The spectrum is fit with a power–law model, with absorption. If warranted, a thermal model can also be fit.

Spectral Fitting

1) Fit spectral model(s) to source spectrum



Spectral Fitting

2) For the spectrum, write characteristics to output parameter file

- Power-law index for broadband
- Power-law indices for all bands if bright enough
- kT if fit to a thermal model
- Normalization of model
- Flux, with error, over 2-10 keV
- Goodness of fit
- Q-Value (statistical significance)

Status

The spatial fitting is done with script lev3_fit_psf.sh, and the spectral fitting is done with lev3_fit_spectrum.sh.

- Complete versions of both scripts are now included in CIAOD.
- Both scripts are run in our Level 3 pipeline tests.
- The spatial fitting is affected by updates currently being made to the PSF, PTSRC models. These updates are required for CIAO3.2. (Level 3 testing is helping to more rigorously test these CIAO3.2 updates.)
- The spectral fitting has no known issues.