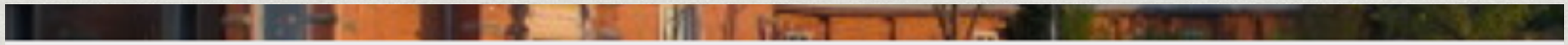
ISIS: ADVANCED TOPICS

V. GRINBERG, ISIS WORKSHOP, AUG 18 2015

ISISscripts

http://www.sternwarte.uni-erlangen.de/isis/



The Remeis ISISscripts

A HUGE COLLECTION OF USEFUL ISIS FUNCTIONS

The **ISISscripts** are written and maintained by the Remeis observatory. They contain hundreds of useful functions, written for the X-ray data analysis software **isis** (Interactive Spectral Interpretation System, homepage), which is written in the scripting language **SLang** (homepage). In case you have questions or comments, you can write us an email.

These scripts were started by Manfred Hanke, but soon filled with more functions by many people at the Remeis observatory. Although some functions are quite specialized, the majority of the functions can be widely used. These function range from general **SLang** functions for array manipulation or adaptive integration routines, to parallel fitting functions (together with the Remeis **SLmpi** module) or powerful plotting routines (written by Mike Nowak, see homepage). Usually these functions are well documented with internal help functions. General tips, tricks, and examples can also be found on our wiki page

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Download

The newest version of the isisscripts can be downloaded by clicking on the button to the right. It contains the latest stable release. Note that these scripts are updated almost daily, Hence, if you would like to stay up-to-date, it might be best to schedule a **cron**-job and fetch the file via a **wget** command.

ISISSCRIPTS.TGZ

Last Update: 2015-Aug-07 10:12:09

ISISscripts

http://www.sternwarte.uni-erlangen.de/isis/

```
isis> brew("coffee");
```

ISISscripts

http://www.sternwarte.uni-erlangen.de/isis/

```
isis> help fits_save_fit
fits_save_fit

 SYNOPSIS
    saves the model and info of the observation to a FITS table

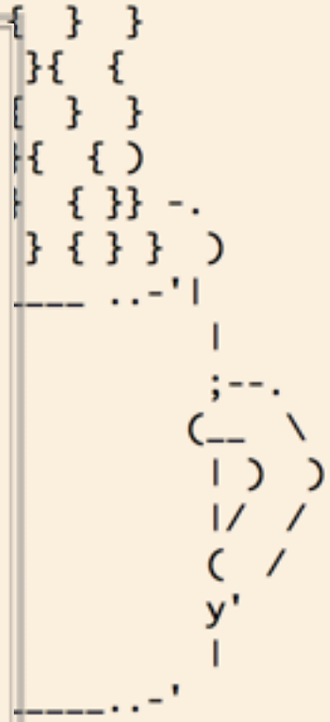
 USAGE
    fits_save_fit(String_Type filename[, Struct/String_Type conf]);

 DESCRIPTION

   This function saves information about the model and the observation
   in a FITS table. This routine combines the calls of
   fits_save_fit_struct and fits_save_fit_write.

   Additionally, confidence intervals can be given in form of a
   structure containig the fields
```

```
isis> brew("coffee");
```



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DESCRIPTIC
```

```
isis> help mc_sig
mc_sig

 SYNOPSIS
    calculates the significance of a spectral component doing a Monte Carlo (MC) simulation

 USAGE
    Struct_Type mc_sig(String_Type withComponent.fits, String_Type withoutComponent.fits);
 or Struct_Type mc_sig(String_Type torqueDir);

 QUALIFIERS
    mcruns     - number of MC loops (default: 10)
    beforeData - script to be called before any data is loaded (default: NULL)
    afterData  - script to be called after the data have been loaded (default: NULL)
    beforeFit  - array of scripts to be called right before a fit of faked data to
                 the model without [0] and with [1] the component (default: NULL)
    torque     - calculate significance using given number of torque jobs, i.e. total
```

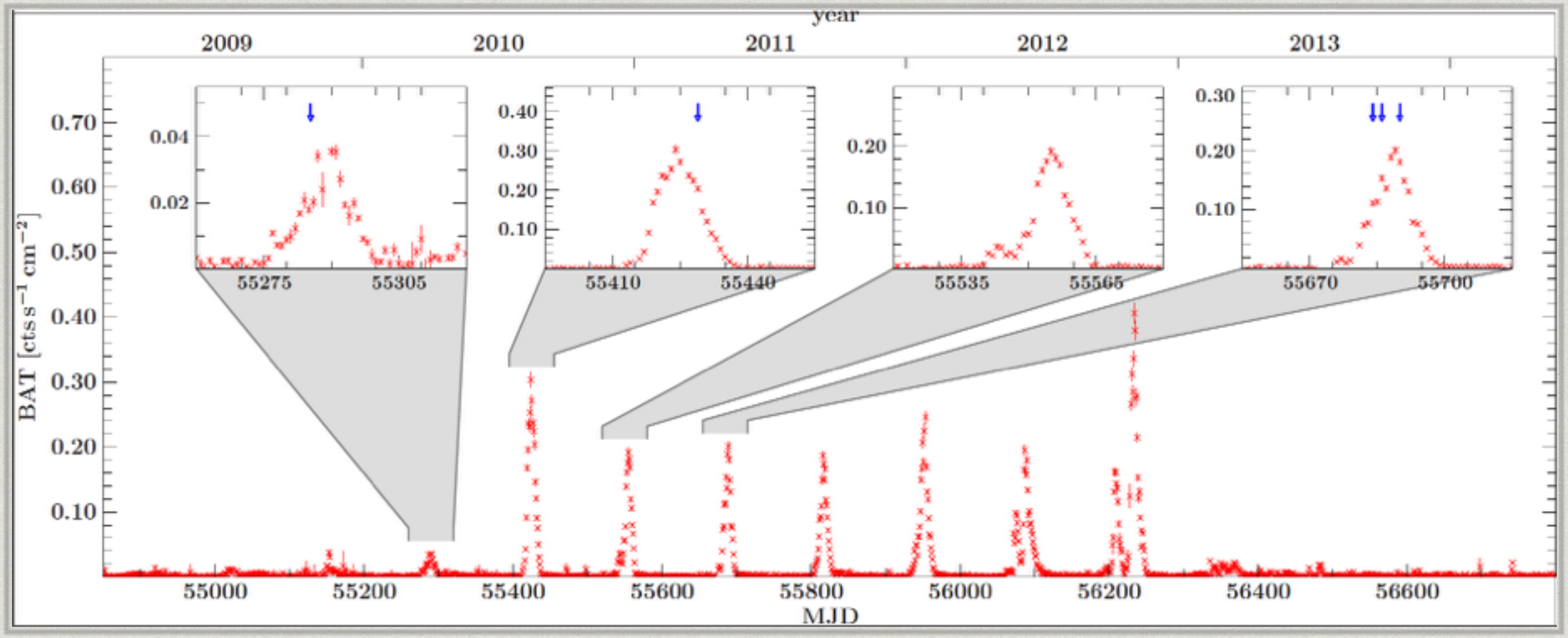
ISISscripts

http://www.sternwarte.uni-erlangen.de/isis/

- Maintained by Remeis observatory Bamberg (Jörn Wilms' group), with help from MIT (mainly me …)
- git-directory & downloadable zip; easy to use & update; git makes author of file easy to find out to ask questions …
- contributions and improvements welcome
- include Mike Nowak's isisrc & plotting routines (i.e., you can do all the cool things from Mike's talk - and more)

SLxfig

S-Lang functions that automatically run Xfig's fig2dev and LaTeX to produce pdf, (e)ps, png, …



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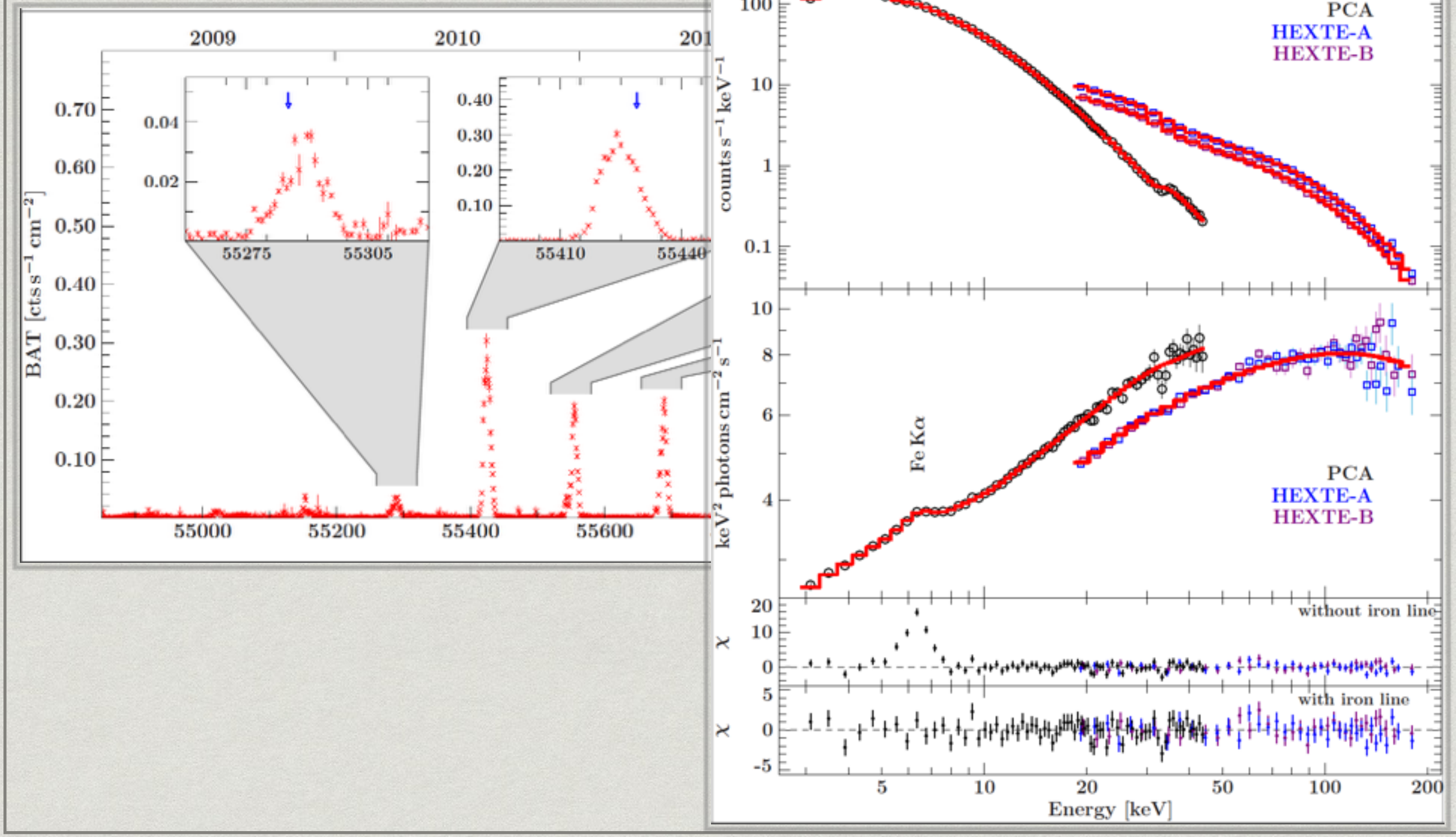

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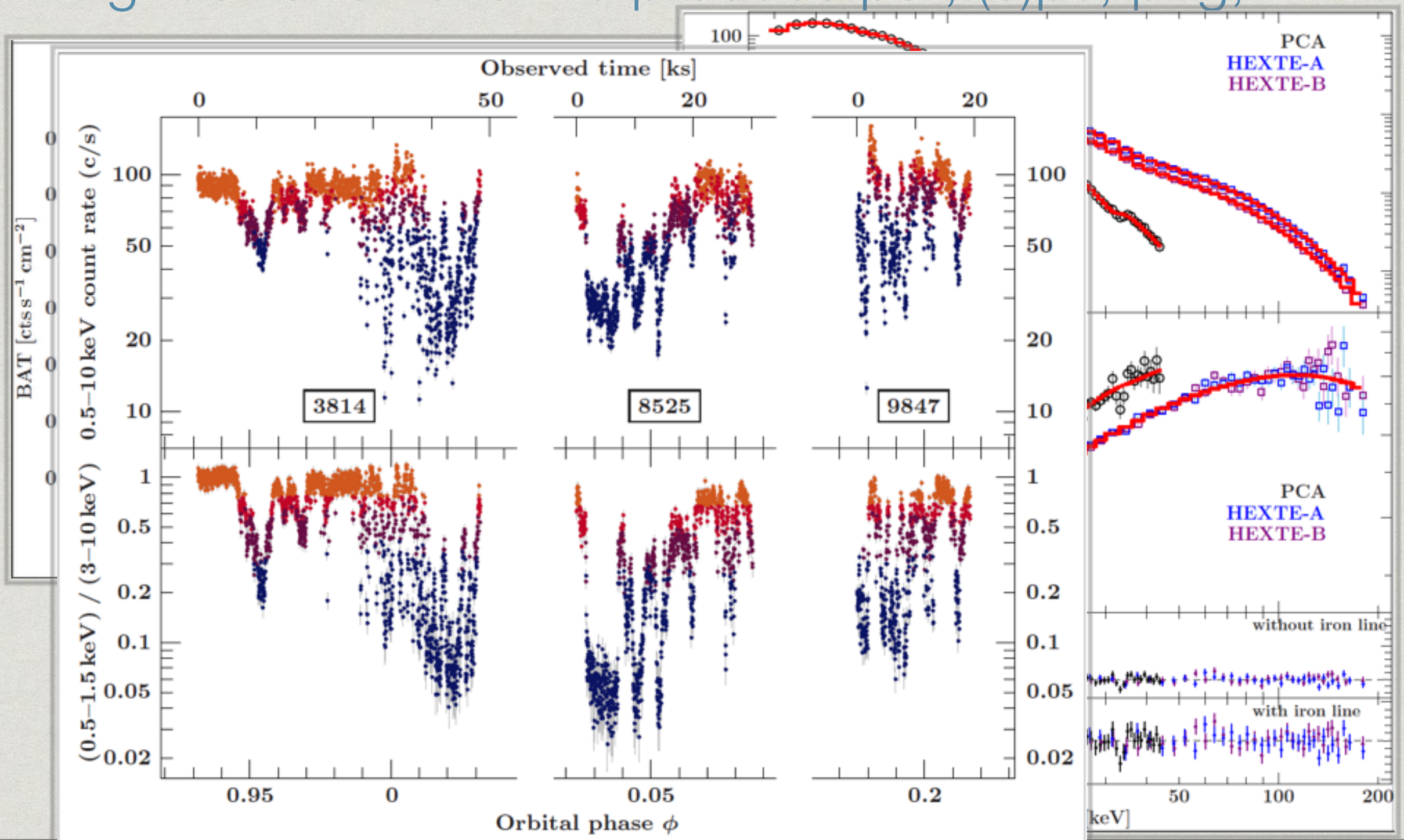

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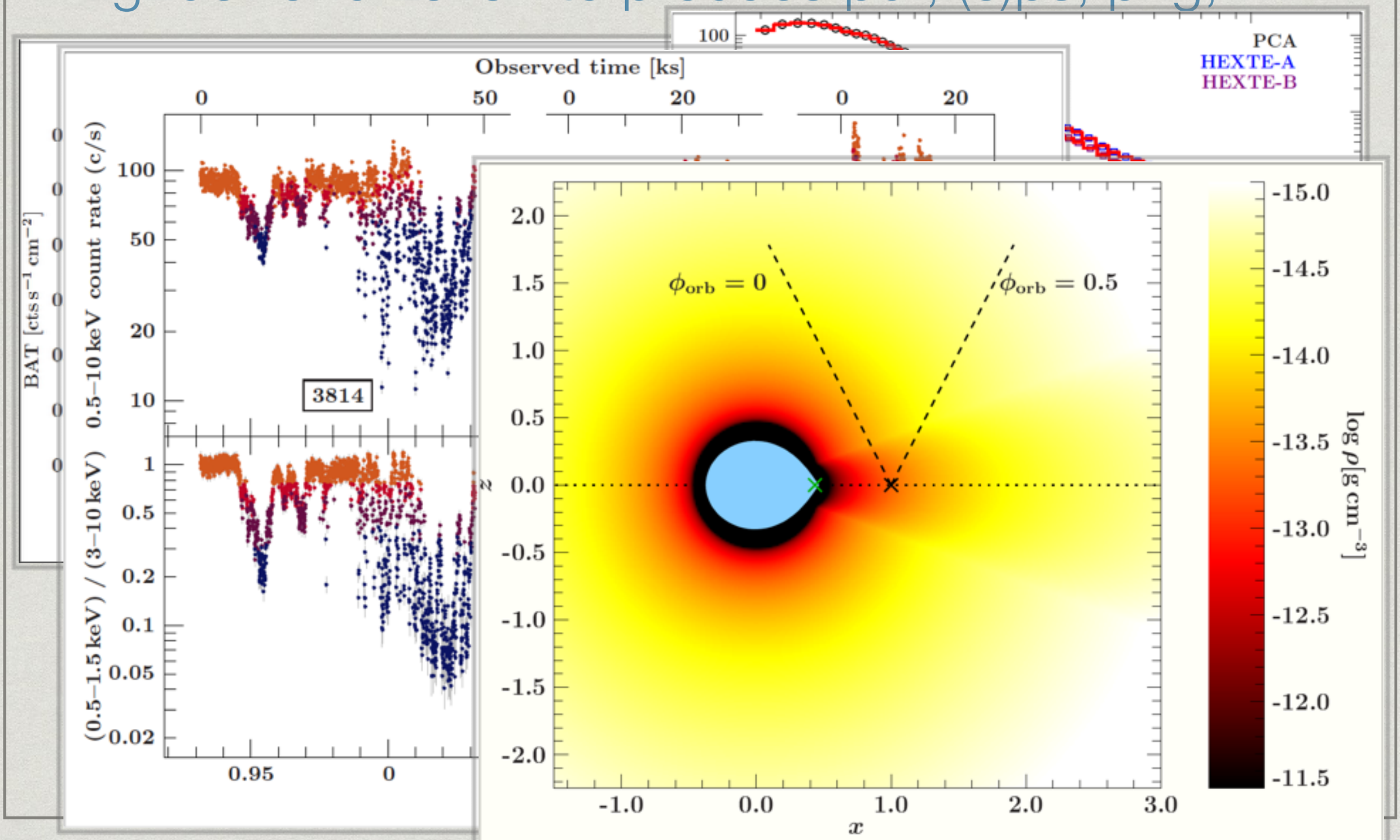


SLxfig

S-Lang functions that automatically run Xfig's fig2dev and LaTeX to produce pdf, (e)ps, png, ...

- object-oriented programming in s-lang
- plotting in the same environment as your analysis - seamless transition and easy changes
- paper-quality plots that seamlessly interact with quick plotting routines for spectra
- comprehensive library of plots & code & refs to more pages with both:
  http://www.sternwarte.uni-erlangen.de/wiki/doku.php?id=isis:slxfig
- two examples in the tutorials: light curve & spectra,
  ==> should enable an easy start into xfig

More modules …

http://www.jedsoft.org/slang/modules/

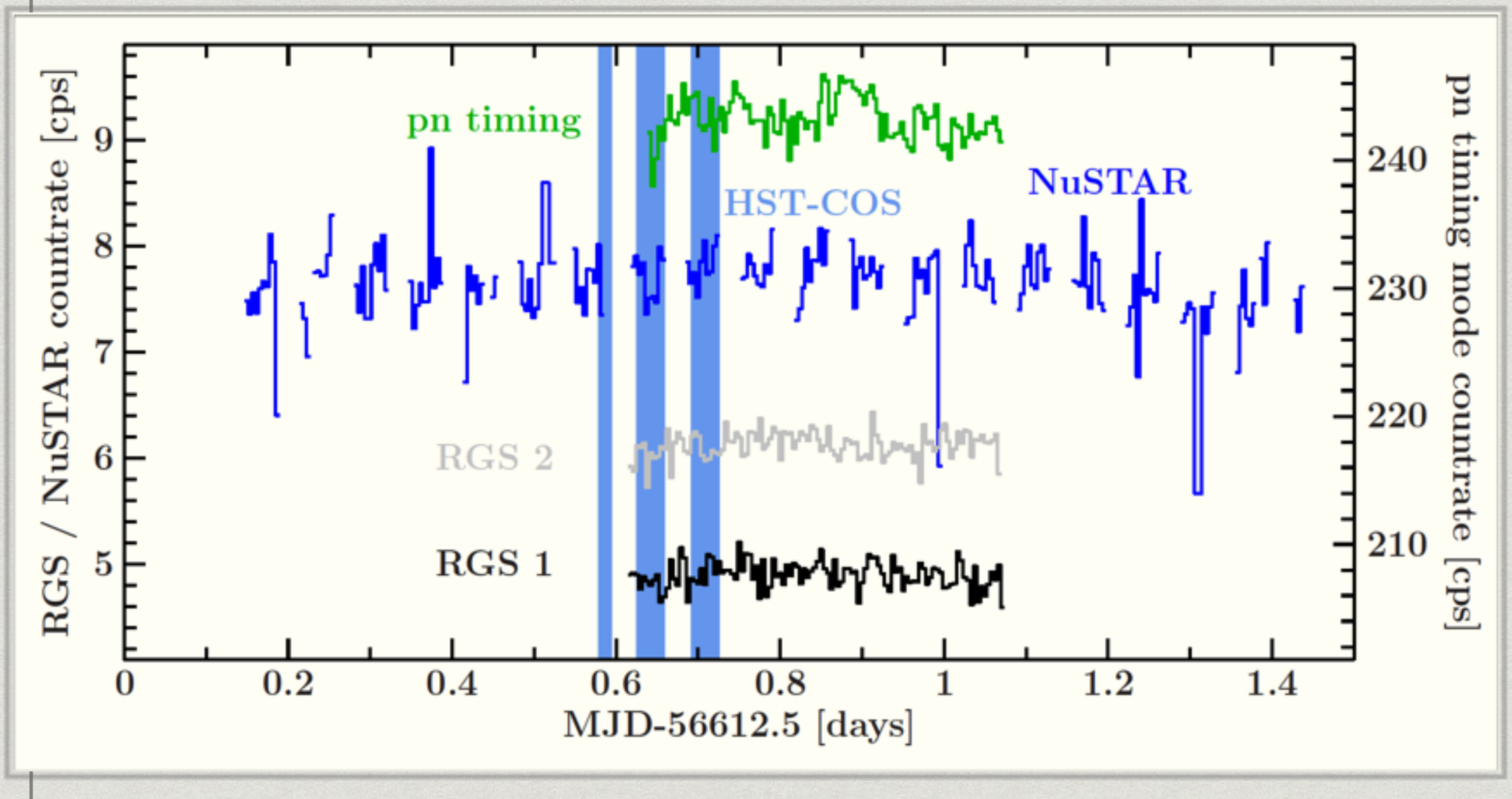
slxfig is just one of a number of modules …

- *rand*: A random number/distribution module
- *stats*: statistics module, includes statistical tests and probability functions
- *gsl*: wraps the GNU scientific library, provides, e.g., FFT
- also: all local models from your *xspec* installation

Scripting in ISIS

- spectral fitting & scripting within the environment —> I think this is easier than xspec where one needs a wrapper like pyspec
- example in the tutorials: loop over 3 spectra —> my own last analysis were >2700 spectra and same number of light curves in different energy bands

Non X-ray data



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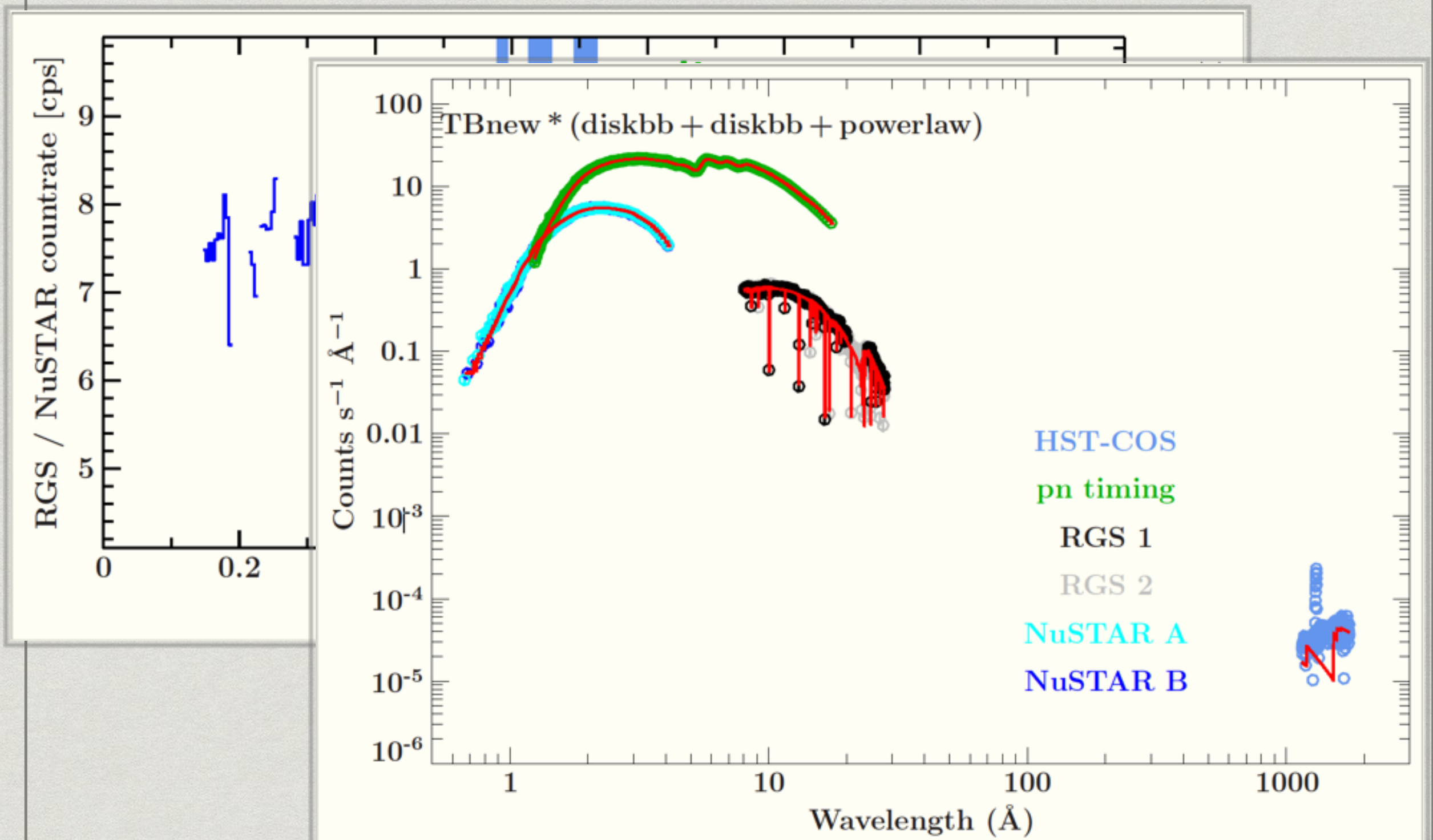

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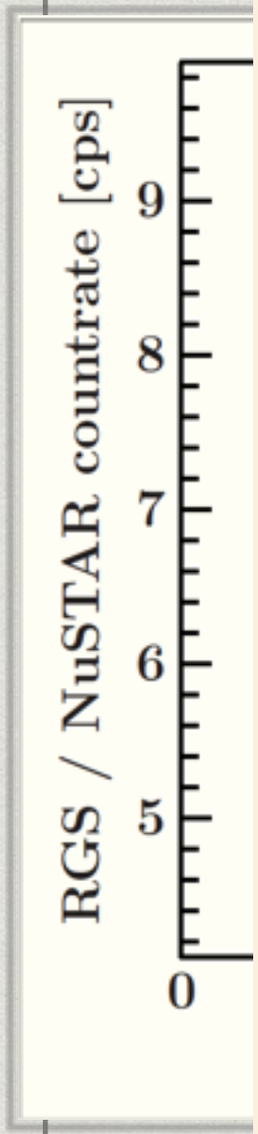


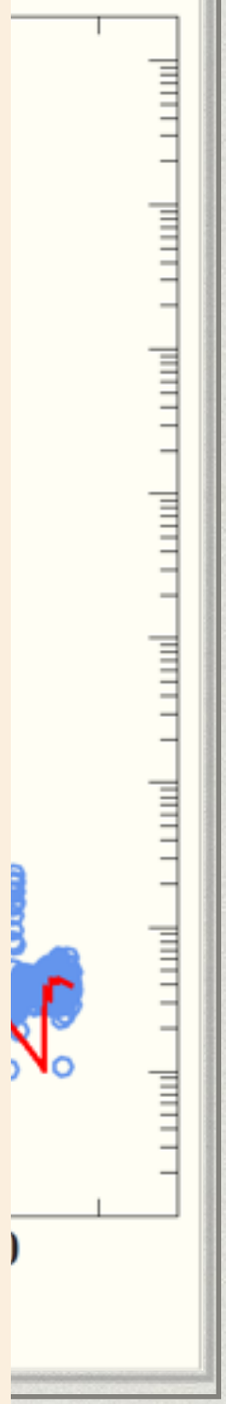

```
isis> help define_counts
define_counts

 SYNOPSIS
    Define a counts-histogram using slang arrays

 USAGE
    s = define_counts (Struct_Type | bins | [lo, hi,] counts [, err])

 DESCRIPTION
    This function provides a way to define a new data-set using
    S-Lang arrays.  As input, it accepts 1) a Struct_Type with
    fields bin_lo, bin_hi, value, err or 2) a list of four
    equal-length arrays with the same data or 3) a single array
    containing only the bin values.  The new data-set is added to
    the internal list just as though the data had been loaded from
    an ascii or FITS data file.  Normally, the function returns the
    integer index of the new data-set.  If the function fails, the
    return value is -1.

    The wavelength grid arrays (bin_lo, bin_hi) and the uncertainty
    (err) arrays are optional.  If the wavelength grid arrays are
    shorter than the counts array (or are missing), they are
    ignored, and the data grid is assumed to be supplied by an RMF.
    If the uncertainty array is shorter than the counts array (or
```



Non spectral data

- two suited of X-ray timing tools: *SITAR* & *foucalc*
- arrival time analysis for X-ray pulsars (*atime*_***)
- simple linear fit functions build it
- for everything else: spectra are also just arrays, so define the data as a “spectrum” and fit e.g. a Gaussian

```
%%assume h is the histogram over the (lo,hi) grid
%%and we expect the distribution of the values to be Gaussian

variable hid = define_counts(lo,hi,hist,sqrt(hist));
fit_fun("gauss");
()=fit_pars
```

HAVE FUN TRYING STUFF OUT!