Report on the results of the ScienceTools Checkout 2

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I installed the ScienceTools version v5r4p1, then v5r4p3 with the installer downloaded from the link posted on the "workbook" page. I had to set the PFILES environment variable to the sane/v.../data directory to get things to work.

I went through Jim's Likelihood tutorial step by step after downloading the event and spacecraft data files. The **viewCuts** tool is very useful to check that the proper cuts were actually applied. I got exactly the same results as Jim regarding the spectral parameters for 3C273 and 3C279. The results are now copied into the file results.dat, which is a very useful feature for further process. *Suggestion: the user could be prompted for the file name or a message could be issued to tell the user that the results are stored in this file.*

I created a TsMap under the same conditions as Jim and got an output very similar to his. The running time now seems reasonable, only 33 minutes on my 3-GHz PC. *The documentation seems adequate for this part. I cannot overemphasize how these tutorials are useful.*

A fairly strong source, 3EG J0210-505 has been studied using Seth's 30-day file. The **Likelihood** results are: Prefactor=9.93+/-0.23, Index=-2.06+/-0.015. The corresponding flux above 100 MeV is 94+/-3 10^{-8} photon $cm^{-2}s^{-1}$, to be compared to an input value of 85.5 10^{-8} photon $cm^{-2}s^{-1}$, the input index being 1.99. The TS value for this source was found equal to 0 *(why is that?)*.

Since transient sources like blazars present a particular challenge, I wondered how I could identify sources exhibiting a "flaring" behavior, not an eruptive one like for GRBs, but a slow-varying one like for blazars. This required generating full-sky maps over "short" periods of time, like one day. **gtcnsmap** seemed the tool of choice for this purpose. To manipulate the results with an analysis package handling fits files, I used **astroroot** but had trouble to read in the image generated by **gtcnsmap** as it is not associated with an extension. *Suggestion: could this be fixed?* I could have added an extension by hand with **fv**, but I adopted another strategy, by generating the maps directly with astroroot, the FT1 files being converted to a TTree. This strategy offers the advantage of flexibility since any additional cut can easily be imposed on the data. The next problem was correcting for exposure. I could have used **gtexpmap** but the cut on time is defined from the event file, so **exposure_map** seemed more adequate (although it generates 3D images, while I needed 2D ones, integrating over energy. I couldn't find any **FTOOL** doing that, so I used **IDL** for this conversion). Finally 30 maps, worth 1 day of data each and duly corrected for exposure, were generated within **astroroot**. The next step was to try to identify those sources exhibiting variability in excess to the Poisson fluctuations. I fiddled a while with various (simple) methods but only 3C273 stood out convincingly. I stopped this exercise there for the time being, but I think it is worth pursuing in the future for blazar-specific studies.

Since I couldn't identify transient sources for myself, I looked into Seth's list and pickep up two of them, 3C273 and PKS1622-296 which were studied more specifically as a function of time. A short program (written in root C++) created the input files for **gtselect**, **gtlivecube**, **gtexpmap** and **gtlikelihood**, slicing the data in 1 day-periods. A short script looped over the time periods. The whole Likelihood analysis went apparently without problem but the TS values were always 0 for PKS1622-296. The resulting light curves are plotted in Figs. 1 and 2 for 3C273 and PKS1622-296 respectively. Whether they make sense or not is unclear to me. For 3C273, the 3EG catalogflux (E>100MeV) is 15.4 10^{-8} photon $cm^{-2}s^{-1}$ and the value input by Seth is 0.0015, presumably corresponding to 3 10^{-8} photon $cm^{-2}s^{-1}$ above 100 MeV (for an index of -2). For PKS1622-296, the 3EG catalog flux is 47.4 10^{-8} photon $cm^{-2}s^{-1}$, the value input by Seth is 0.026, corresponding to 52

10^{-8} photon $cm^{-2}s^{-1}$ above 100 MeV. The 3C273 flux thus appears unexpectedly large (by a factor of 30). The reason for this discrepancy may lie in the SpectralTransient class *(I couldn't find any documentation on it)*. Note: the redshift value assigned to 3C273 in Seth's input file is 10 times too high (1.58 instead of 0.158).

Since 3C279 lies in the same ROI than 3C273, its light curve is obtained at the same time. Its light curve is plotted in Fig. 3. The 3EG (E>100 MeV) flux value is 74.2 10^{-8} photon $cm^{-2}s^{-1}$, it is reduced by a factor of 10 in Seth's input file *(is that an on-purpose feature or still a leftover from DC1?)*. One thus expects the average value to be 7.4 in the units of Fig. 3, while it is found to be 12.6, i.e. a little high.

Finally, I tried to use Jim's SrcAnalysis python interface. After setting up the LD_LIBRARY_PATH variable so that all required packages were found in the sequence "from SrcAnalysis import *", an error message ("def load(*args): return lib_pyLike.ResponseFunctions_load(*args) RuntimeError: attempt to create string with null pointer") was issued when I tried to create an Observation object. I got the same error, whether I ran in Bordeaux or at SLAC (on noric13). I could have asked for help directly to Jim or via Jira, but I just shily gave up.

Suggestion: the main problem for the user working outside the SLAC network is making sure he (she) has the right environment. So it should always be clear which environment variable like LIKELIHOODROOT, PYTHONPATH, PFILES...is needed by the package he (she) is currently using. This information could be specified in a "readme" file or in the doc section of the directory, even if the variable is supposed to be set automatically by some means.

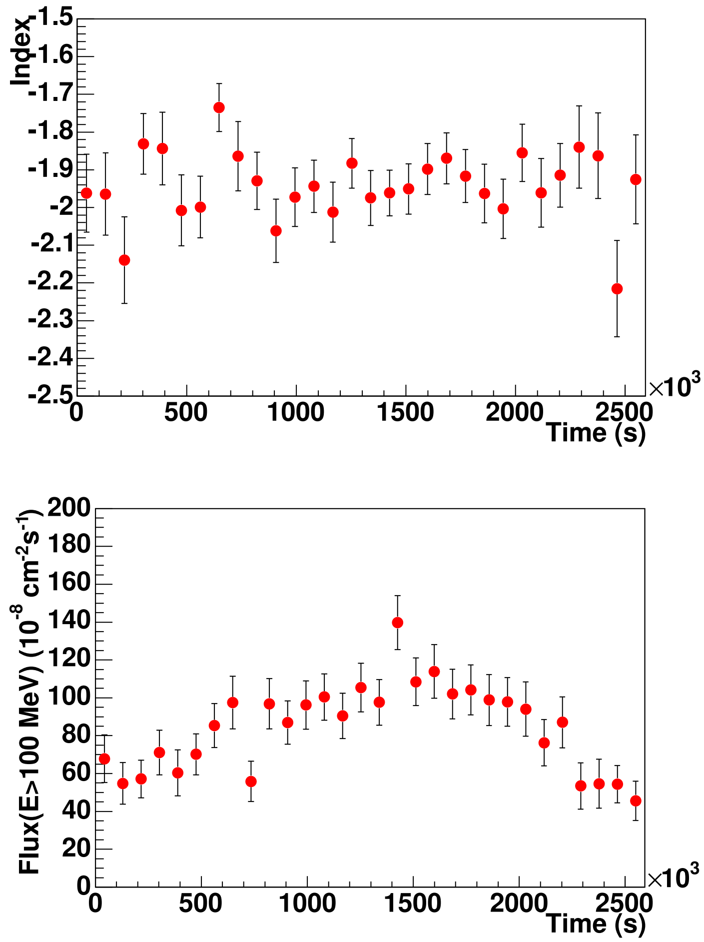

Figure 1: Light curve for 3C273.

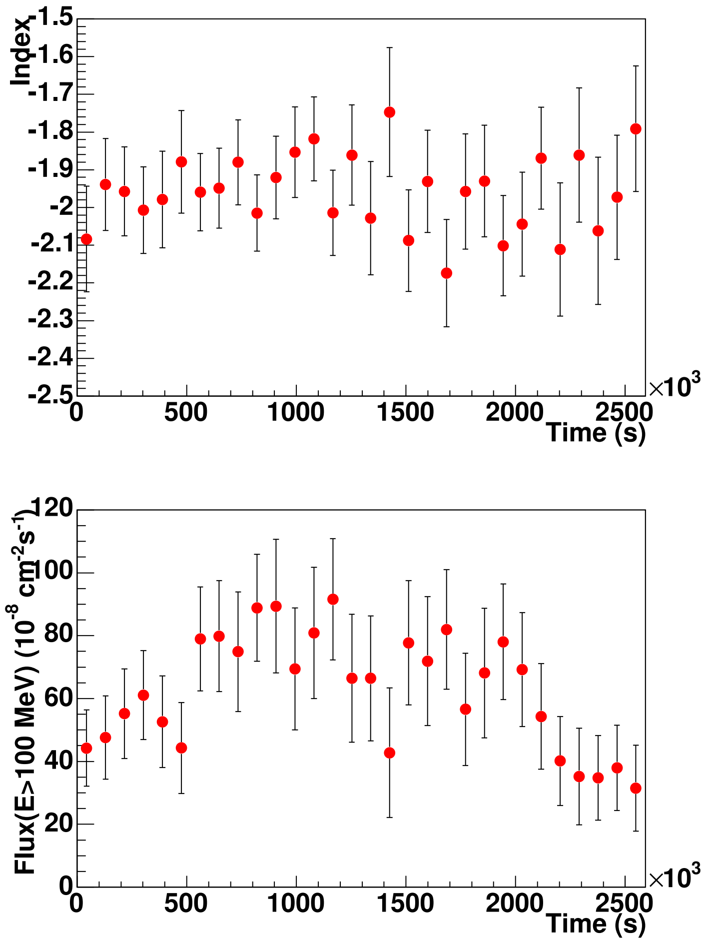

Figure 2: Light curve for PKS1622-296.

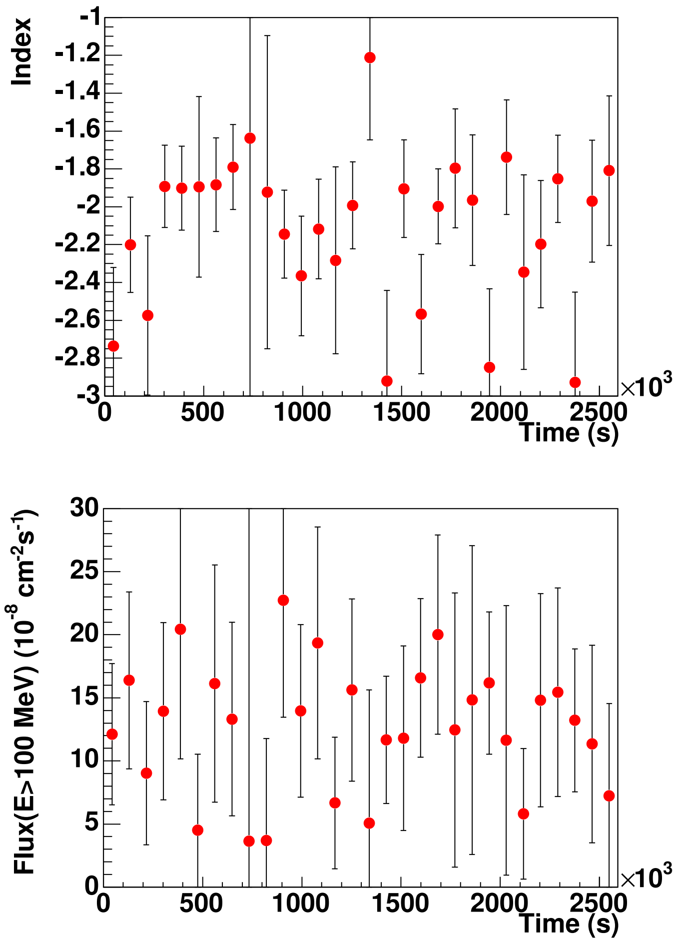

Figure 3: Light curve for 3C279.