GammaLib - Bug #2179

ctools science verification fails

08/22/2017 04:35 PM - Knödlseder Jürgen

Status:	Closed	**Start date:**	08/22/2017
Priority:	Urgent	**Due date:**	
Assigned To:	Knödlseder Jürgen	**% Done:**	100%
Category:		**Estimated time:**	0.00 hour
Target version:	1.4.1		

Description

The science verification produces since April the following errors:

```
    ctools science verification.Test nodes model: Mean -19088.02665 of Pull_Crab_Intensity0 should be within [-0.40,0.40] range
    ctools science verification.Test nodes model: Standard deviation 17571.98646 of Pull_Crab_Intensity0 should be within
[0.80,1.20] range
    ctools science verification.Test nodes model: Mean -4.83094 of Pull_Crab_Intensity1 should be within [-0.40,0.40] range
    ctools science verification.Test nodes model: Standard deviation 1.98642 of Pull_Crab_Intensity1 should be within [0.80,1.20]
range
    ctools science verification.Test nodes model: Mean -37.78501 of Pull_Crab_Intensity2 should be within [-0.40,0.40] range
    ctools science verification.Test nodes model: Standard deviation 10.75212 of Pull_Crab_Intensity2 should be within [0.80,1.20]
range
    ctools science verification.Test nodes model: Mean -660.27252 of Pull_Crab_Intensity3 should be within [-0.40,0.40] range
    ctools science verification.Test nodes model: Standard deviation 4405.75126 of Pull_Crab_Intensity3 should be within
[0.80,1.20] range
    ctools science verification.Test diffuse cube model: Mean -8.34991 of Pull_Crab_Prefactor should be within [-0.40,0.40] range
    ctools science verification.Test diffuse cube model: Mean 13.47494 of Pull_Crab_Index should be within [-0.40,0.40] range
```

The following changes were done in GammaLib and ctools:

ctools

1. Add smoothly broken power law to science verification (#1948) (detail)
2. Optionally add LO_THRES and HI_THRES keywords to IRF (detail)
3. Enhance show_irf.py script (detail)
4. Introduce site-dependent energy range in make_pointings.py (detail)
5. Support of map cubes lying outside RoI in ctobssim (detail)
6. Do not fit smoothness parameter in smoothly broken power law for (detail)
7. Add user documentation for smoothly broken power law (detail)
8. Add unit test for show_irf.py example script (detail)
9. Correct debug message (detail)
10. Change show_irf.py so that it is also compliant with older matplotlib (detail)

GammaLib

1. Fixed issues with the GModelSpectralSmoothBrokenPlaw MC generation (detail)
2. Removed old code from GModelSpectralSmoothBrokenPlaw (#1948) (detail)
3. Enhance precision of GCTAEdisp2D::compute_ebounds_src (detail)
4. Set table boundaries in GCTAEdisp2D before normalizing the table (detail)
5. Revert to parallel tests (detail)
6. Correct model normalisation in test_model_spectral.py (detail)
7. Integrate smoothly broken power law spectrum (detail)
8. Correct comments (detail)
9. Add user documentation for smoothly broken power law (detail)
10. Make GModelSky::mc() method save against invalid energy ranges or model (detail)
11. Invert loop in GModelSpatialDiffuseCube::set_mc_cone to speed up (detail)
12. Assure that GCTAEdisp2D::mc() method does not block for empty energy (detail)
13. Add energy margin in response cube computation (detail)

History

#1 - 08/22/2017 04:36 PM - Knödlseder Jürgen

- Target version changed from 1.5.0 to 1.4.1

#2 - 08/22/2017 11:14 PM - Knödlseder Jürgen

- Project changed from ctools to GammaLib

- Status changed from New to In Progress

- Target version changed from 1.4.1 to 1.4.1

- % Done changed from 0 to 90

It turned out that a bug introduced in GModelSpectralNodes::mc() produced that problem. In fact, the case that there is a single node in the MC cache led to an exception instead of using this single node, which is needed for extrapolation. Changing the code as follows solved the problem:

```
if (m_mc_cum.size() > 1) {
    double u = ran.uniform();
    for (inx = m_mc_cum.size()-1; inx > 0; --inx) {
        if (m_mc_cum[inx-1] <= u) {
            break;
        }
    }
}
else if (m_mc_cum.size() == 0) {
    std::string msg = "No valid nodes found for energy interval ["+
                      emin.print()+","+emax.print()+"]. Either restrict "
                      "the energy range to the one covered by the "
                      "spectral nodes or extend the spectral nodes "
                      "in energy.";
    throw GException::invalid_return_value(G_MC, msg);
}
```

#3 - 08/23/2017 12:33 AM - Knödlseder Jürgen

- Status changed from In Progress to Closed

- % Done changed from 90 to 100

Fixed and merged into devel. A bugfix release 1.4.1 of GammaLib is in preparation.