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Normalization issue in fermitools with Healpix map

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See also p11 (backup) of the [report](#) at Fermi-CM for brief summary.

We found that diffuse model normalizations (emissivity, isotropic, and inverse Compton) given by gtlake are too big when we use maps in Healpix. Also, model counts given by gtmodel are too small when we set norm=1. A screenshot of the XML file (input to gtmodel) and generated count map (by gtmodel), exposure map (by gtexpcubes2) and intensity map (count_map/exposure_map) are summarized below.

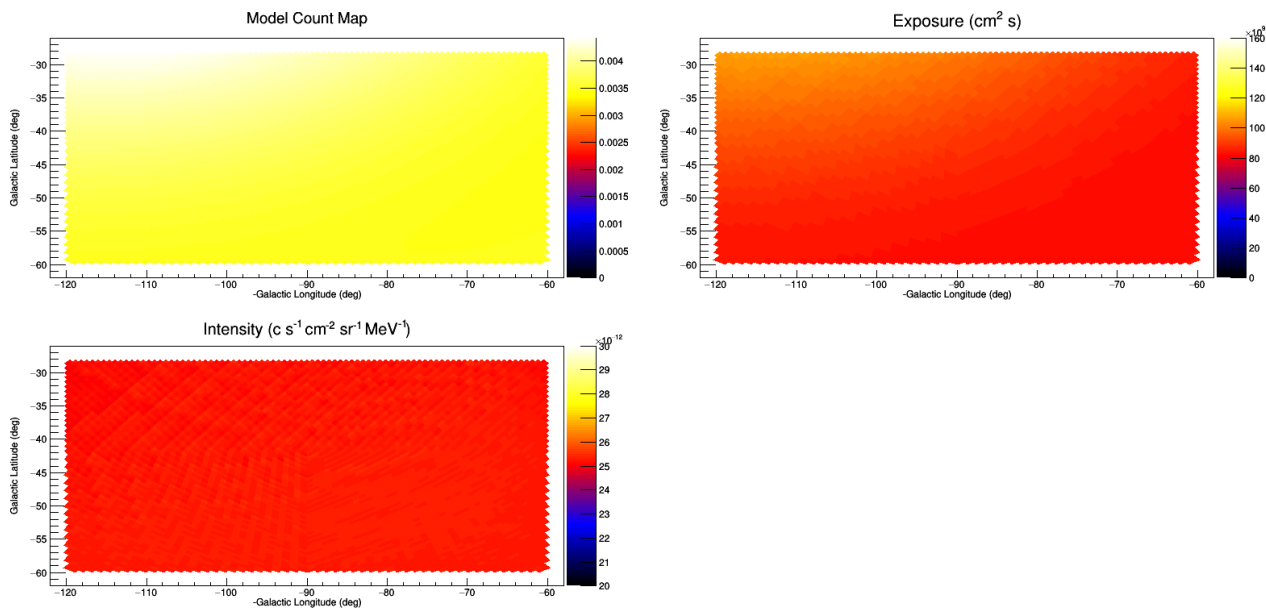
XML file:

```

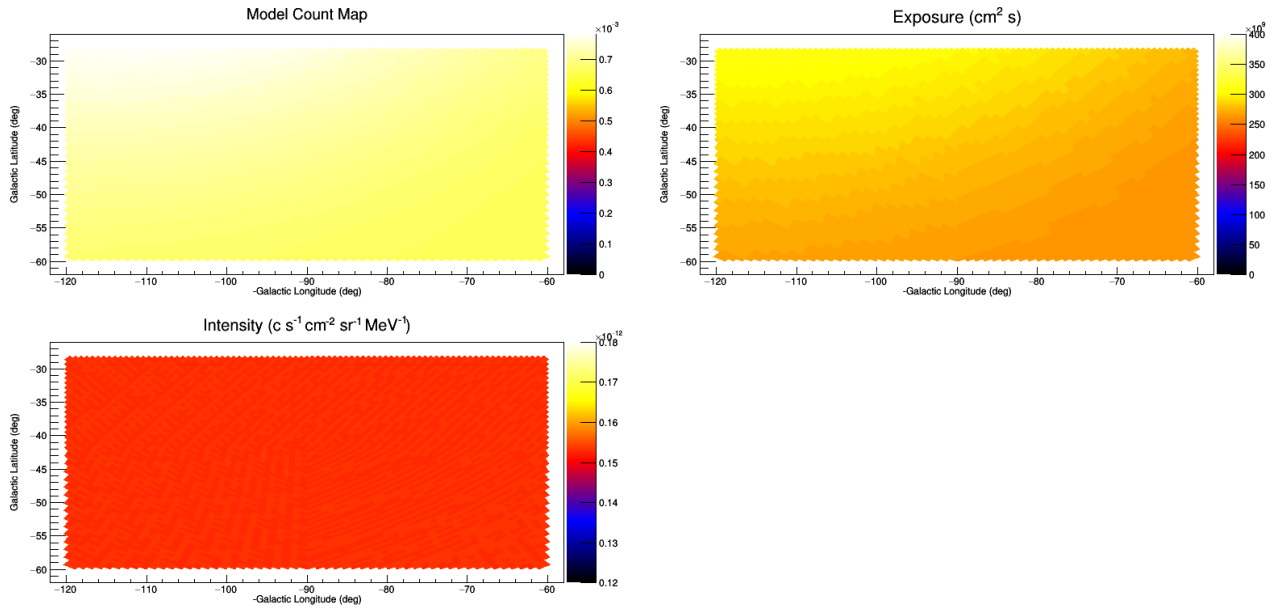
<spectrum type="ConstantValue">
  <parameter error="0.1" free="1" max="1e6" min="0" name="Value" scale="1" value="1"/>
</spectrum>
<spatialModel file="../Models/ics_isotropic_mapcube_54_77Xvarh75.gz" type="MapCubeFunction">
  <parameter free="0" max="1000" min="0.001" name="Normalization" scale="1" value="1"/>
</spatialModel>
</source>
<source name="Isotropic" type="DiffuseSource">
  <spectrum file="../Models/iso_P8R3_SOURCE_V3_v1.txt" type="FileFunction">
    <parameter error="0.1" free="1" max="1e6" min="0" name="Normalization" scale="1" value="1"/>
  </spectrum>
  <spatialModel type="ConstantValue">
    <parameter free="0" max="1000" min="0.001" name="Value" scale="1" value="1"/>
  </spatialModel>
</source>
</source_library>
~
~
~
~
~
( END )

```

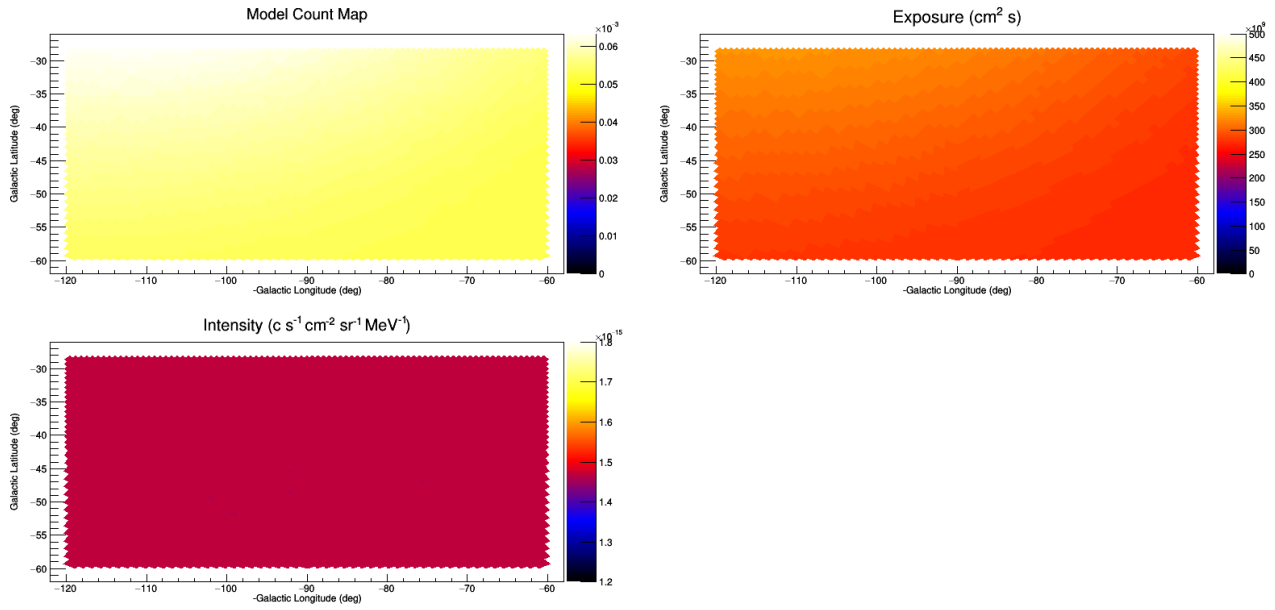
Maps at 100-126 MeV: count (left), exposure (middle), intensity (right)



Maps at 1-1.26 GeV:

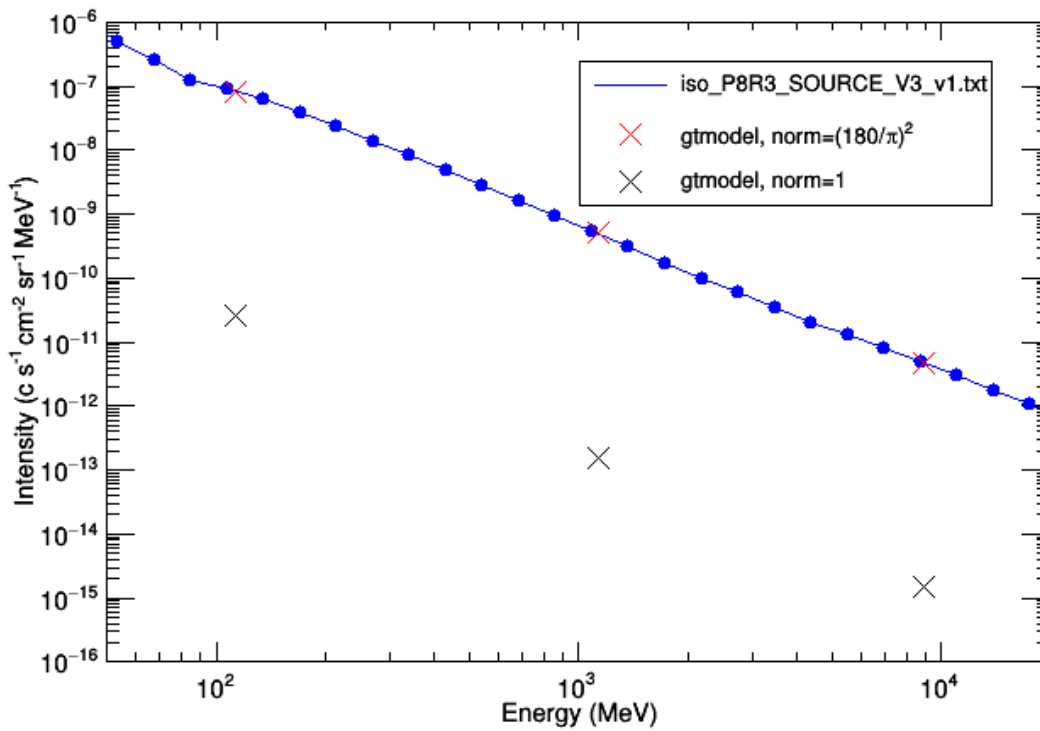


Maps at 7.94-10 GeV:



Intensity maps are uniform so we believe the simulation/calculation are OK. Let's compare obtained intensities with the input spectrum (iso_P8R3_SOURCE_V3_v1.txt)

Isotropic



As shown above, gtmodel gives >1000 times smaller counts (**black points**) than the input. If we apply the scaling with $(180/\pi)^2$, we have the spectrum (**red points**) as expected. So we take this factor into account in making plots. We suspect that intensity is interpreted per deg², not per sr, in fermitools (only) when we use Healpix maps.

ラベルがありません

1 コメント



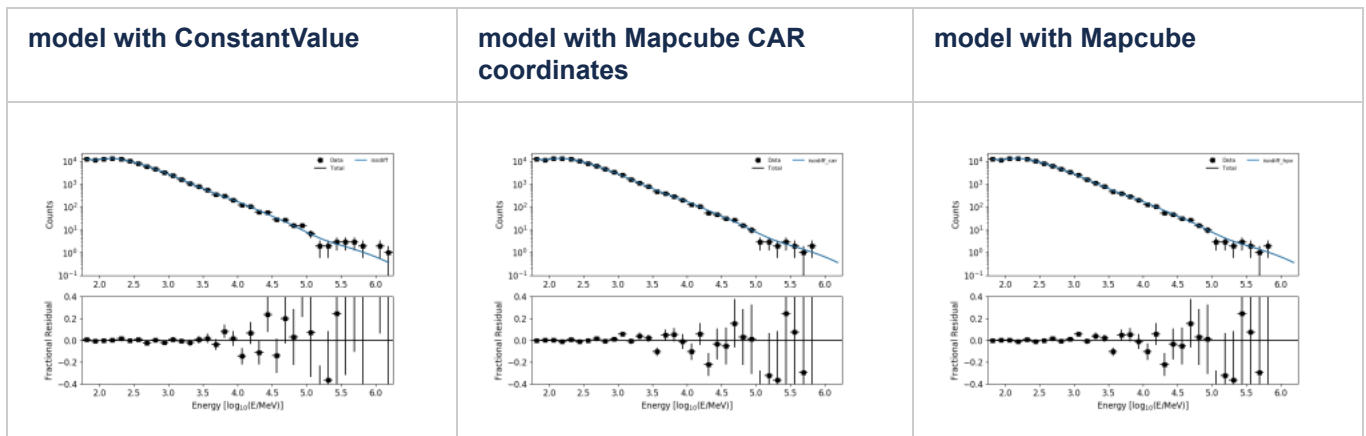
Leonardo Di Venere

Hello, I'm using intensity maps as well with fermipy. I've run a simple test on the isotropic model using fermipy to see if I get the same issue.

I've simulated an ROI with the isodiff model as defined in the standard analysis (SpatialType="ConstantValue" and SpectrumType="FileFunction") using fermipy.

Then I built two mapcube models, in which I have a constant spatial emission and I set the spectral dependence using the same values in the isotropic txt file (already expressed in $\text{MeV}^{-1} \text{s}^{-1} \text{cm}^{-2} \text{sr}^{-1}$). The first model was in CAR coordinates, while the second one in healpix format.

Then, I've replaced the original isodiff model with each of these two mapcube models and calculated the expected counts. These are the results, which seems to show that the models are compatible with the expectations.



I upload the two templates I'm using for comparison:

[isotropic_ccube_car.fits](#)

[isotropic_ccube_hpx.fits](#)

