The difference in the rate of Galactic Cosmic Ray (GCR) carbon ions obtained in MC simulations by NRL and Ohio groups initiated the study of the orbital variation of GCR carbon flux. Some results are reported below.

Figure 1 shows the rate of GCR carbon ions generated in the GLAST target sphere versus the orbital time by three versions of GlastRelease: **v7r0p1**, **v7r3p10**, and **v9r3** which is the latest tagged version as of today. Simulations cover 48 hours (~30 GLAST orbits) with 5 min sampling intervals. At each point 2000 events (~ 27% of which are carbon events) were collected for the rate estimate. The CrHeavyIonPrimary source was used, and the data were read off from the FluxSvc/FluxAlg algorithm. The simulation start time was set to the default mission start date, "2001-01-01 00:00:00".

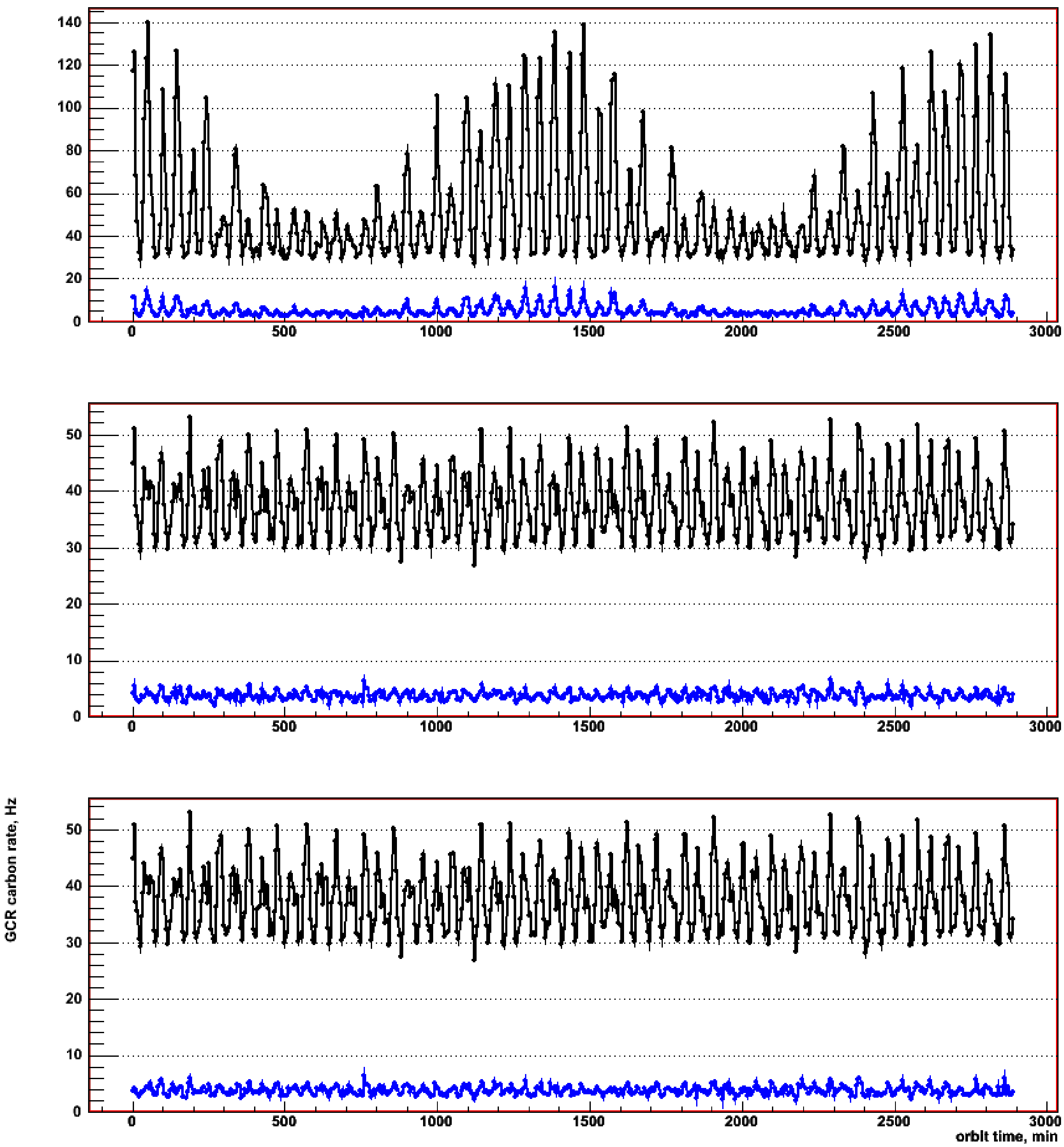

Figure 1: Rate of the GCR carbon ions vs. orbital time (from top to bottom GlastRelease v7r0p1, v7r3p10, v9r3).

The blue line shows the rate of carbon ions that enter the CAL.

In all the plots above we observe the orbital modulation of the GCR flux caused by the satellite's approach/to retreat/from the Earth's magnetic poles. In addition, the flux rate produced by **GR v7r0p1**, has a lower-frequency, daily modulation due to rotation of the Earth's magnetic axis around its rotational axis. This effect, however, has not been seen in the simulation produced by **GR v7r3p10** and **GR v9r3** where the flux rate seems only to be subject to the orbital variations.

Since the rate of GCR heavy-ions is primarily determined by the geomagnetic latitude, we compared its variation with time for the various versions of GlastRelease.

In Figure 2 the variation of geomagnetic latitude with orbital time is shown. As with GCR flux rates, there is a daily modulation in simulation produced by **GR v7r0p1** and there is no such modulation in results from **GR v7r3p10** and **GR v9r3**.

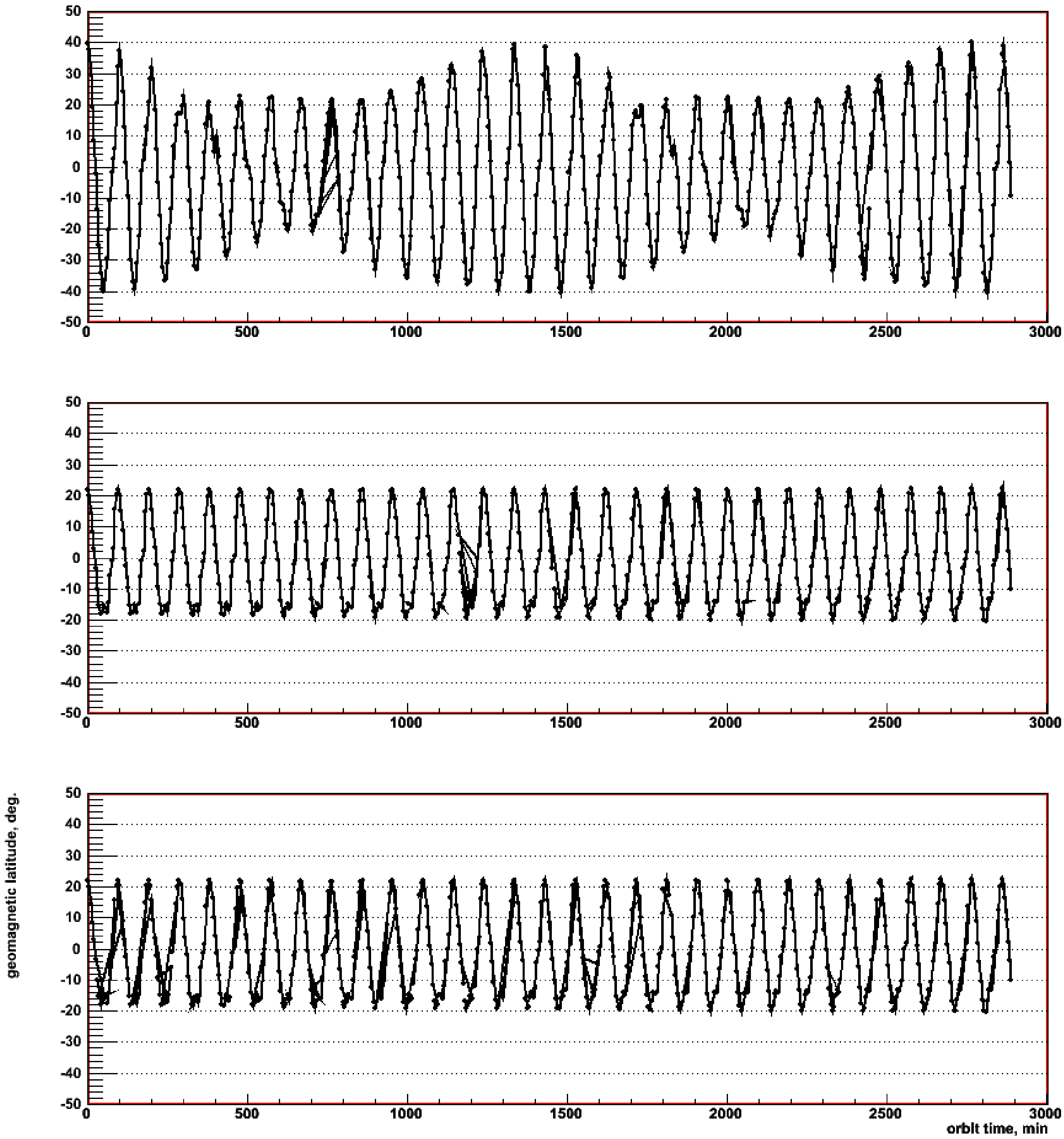

Figure 2: Variation of geomagnetic latitude with orbital time (from top to bottom GlastRelease v7r0p1, v7r3p10, v9r3).

Mark Strickman suggested using an "input pointing history" data for the FluxAlg algorithm, used for DC2 background simulations, in order to check whether the lack of this information in **GR v7r3p10** and **v9r3** causes the problem.

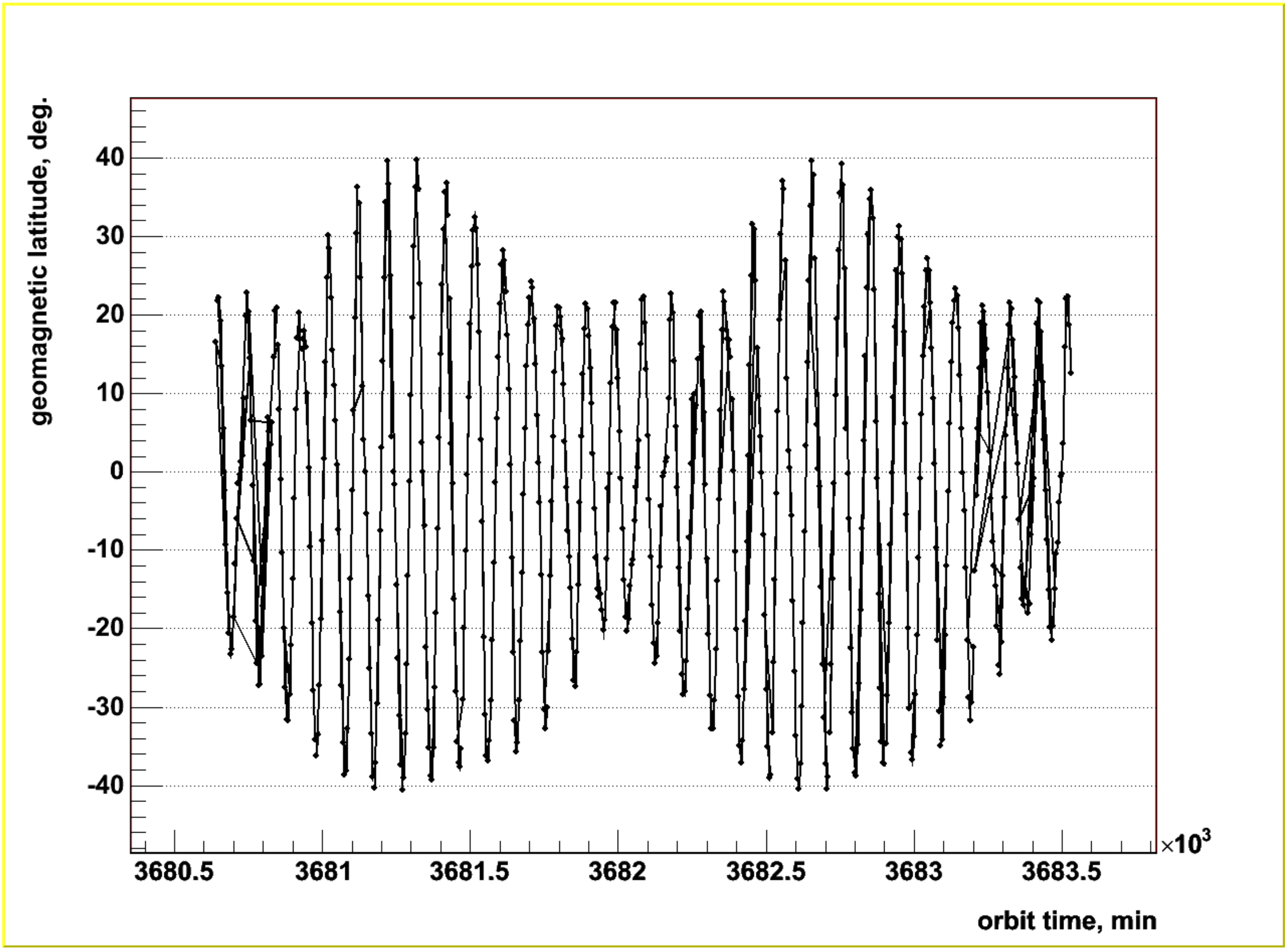

Figure 3: Geomagnetic latitude vs. orbital time for GR v9r3 with input pointing history data.

Figure 3 shows the variation of geomagnetic latitude with orbital time, where a pointing history file "pointing_55day_20080101.txt" was used as an input to the FluxAlg. This is the same file that has been used for creating the DC2 background pointing history (can be found in DataChallenge package).
With the proper input pointing history information we now observe the daily variations of geomagnetic latitude. The data shown in this plot has a start date "2008-01-01 00:00:00", since the pointing history file was created for this time span.

As of today, Toby Burnett has fixed the problem which was in a utility routine in the “astro” package. Its latest tag reflects the correction. The upcoming GR release will also have the corrected version of the “astro”.

Figure 4 shows the variations of the rate of GCR carbon ions entering the sensitive body of the CAL with time. This rate varies substantially over a time period of 1 day, exhibiting approximately a factor of 5 difference. This effect should be taken into account when designing filters and comparing results.

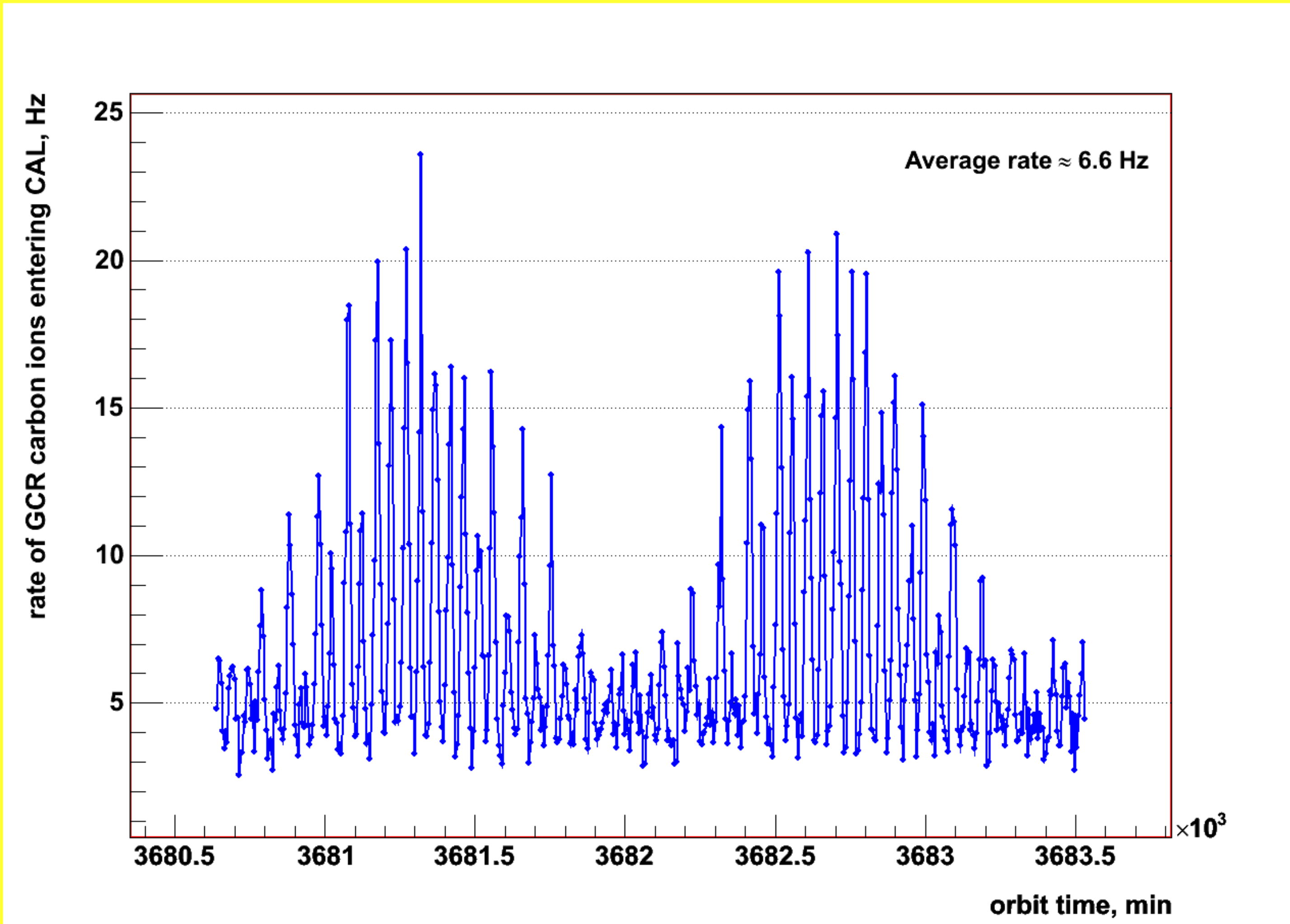

Figure 4: Rate of GCR carbon ions entering CAL vs. time produced by GR v9r3, using input pointing history information.