

Quiescent Solar Emission

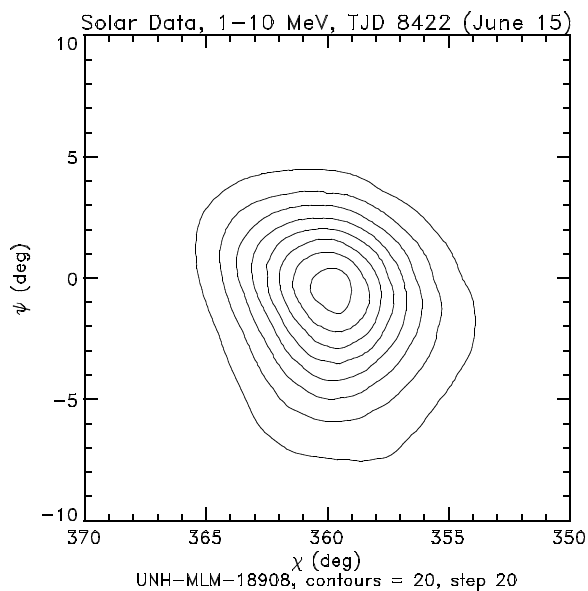
- **Does the Sun produce detectable levels of gamma-rays even during “quiet” times?**
 - ⇒ low-level continuous acceleration processes, which might account for coronal heating, could lead to gamma-ray emission.
 - ⇒ cosmic-ray bombardment of Sun could lead to albedo emission.
 - ⇒ decay of massive solar neutrinos (c.f. Rich Miller’s thesis).
 - ⇒ both continuum and line emissions (low-energy neutron and proton capture reactions) could be present.
- **Goal is to sum all available COMPTEL data to look for integrated flux and also to look for flux levels which may vary as a function of solar cycle.**
- **Phase 6 proposal to get high-latitude (i.e., low-background) observations of quiet-time sun did not fit into timeline.**
- **Work has proceeded using available data.**
- **Necessary DRI data has been generated.**
- **Initial results for 1-10 MeV have been generated.**

Generation of Solar DRI Data

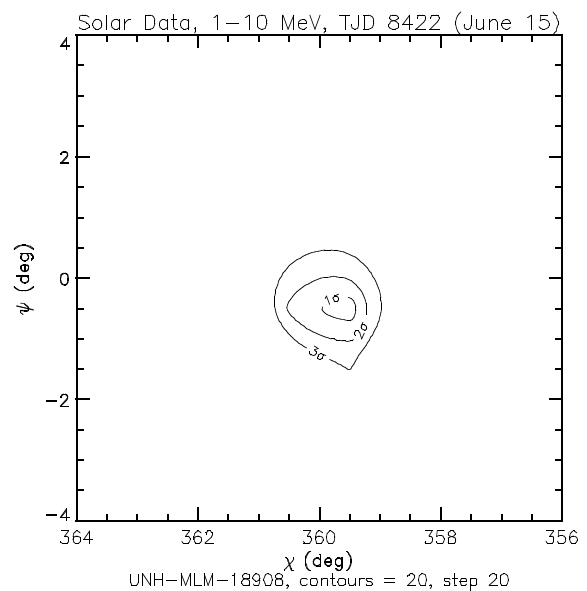
- Used data from each day where sun was within 40° of z-axis.
 - 104 days in phase 1 (93 days within 30°)
 - 24 days in phase 2 (9 days within 30°)
 - 39 days in phase 3 (15 days within 30°)
 - 30 days in phase 4 (15 days within 30°)
 - 52 days in phase 5 (37 days within 30°)
- Generated sun-centered DRI data separately for each day.
 - ⇒ Solar position was taken to be that at 12h UT.
 - ⇒ For maneuver days, solar position was taken at mid-point in time of available data.
- Data selections
 - Zeta $> 10^\circ$ (effectively eliminates impulsive June 9 and 11 data)
 - D1E = 70 keV - 20 MeV
 - D2E = 650 keV - 30 MeV
 - ToF = 115 - 130
 - PSD = 40 - 100
 - $\bar{\phi} = 0^\circ - 50^\circ$
- Data processing set up as scripts (based on COMPASS command-line processing), so that generation of DRI data for arbitrary energy intervals is simplified.

Initial Results for 1-10 MeV: June 15

- Clear signal seen.
- Max likelihood = 172.4, located at (359.8°, -0.5°)
 - Total counts = 1301 ± 109
 - $n_{\sigma} = 11.9$
 - Flux = $3.52 (\pm 0.30) \times 10^{-4} \text{ cm}^{-2} \text{ s}^{-1} \text{ MeV}^{-1}$
- Consistent with (0°, 0°)



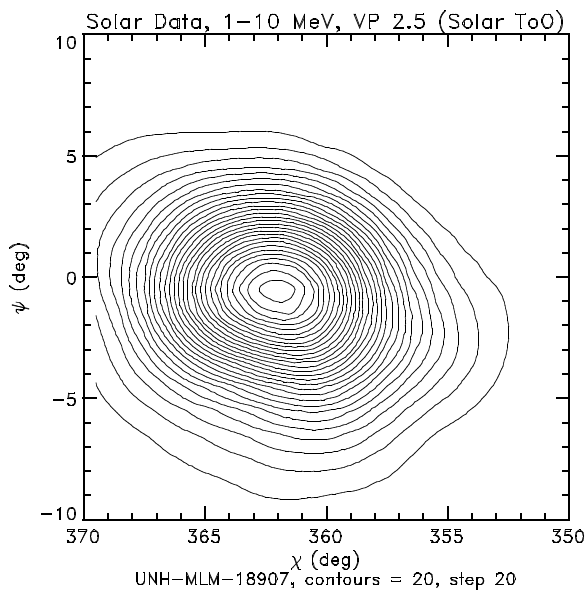
Likelihood Map



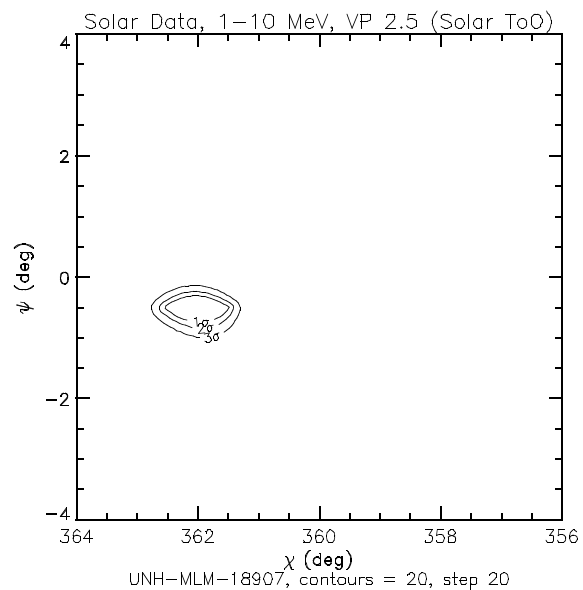
Location Contour Map

Initial Results for 1-10 MeV: VP 2.5 (ToO)

- Clear signal seen - stronger than for TJD 8422 !?!
- Max likelihood = 597.91, located at $(362.0^\circ, -0.6^\circ)$:
 - Total counts = 7012 ± 311
 - $n_\sigma = 22.6$
 - Flux = $2.22 (\pm 0.10) \times 10^{-4} \text{ cm}^{-2} \text{ s}^{-1} \text{ MeV}^{-1}$
- Inconsistent with $(0^\circ, 0^\circ)$!
- Elongation probably consistent with solar motion ($\sim 1^\circ/\text{day}$), i.e, the inherent uncertainties in solar position.
- Offset suggests an error in calculated solar positions.



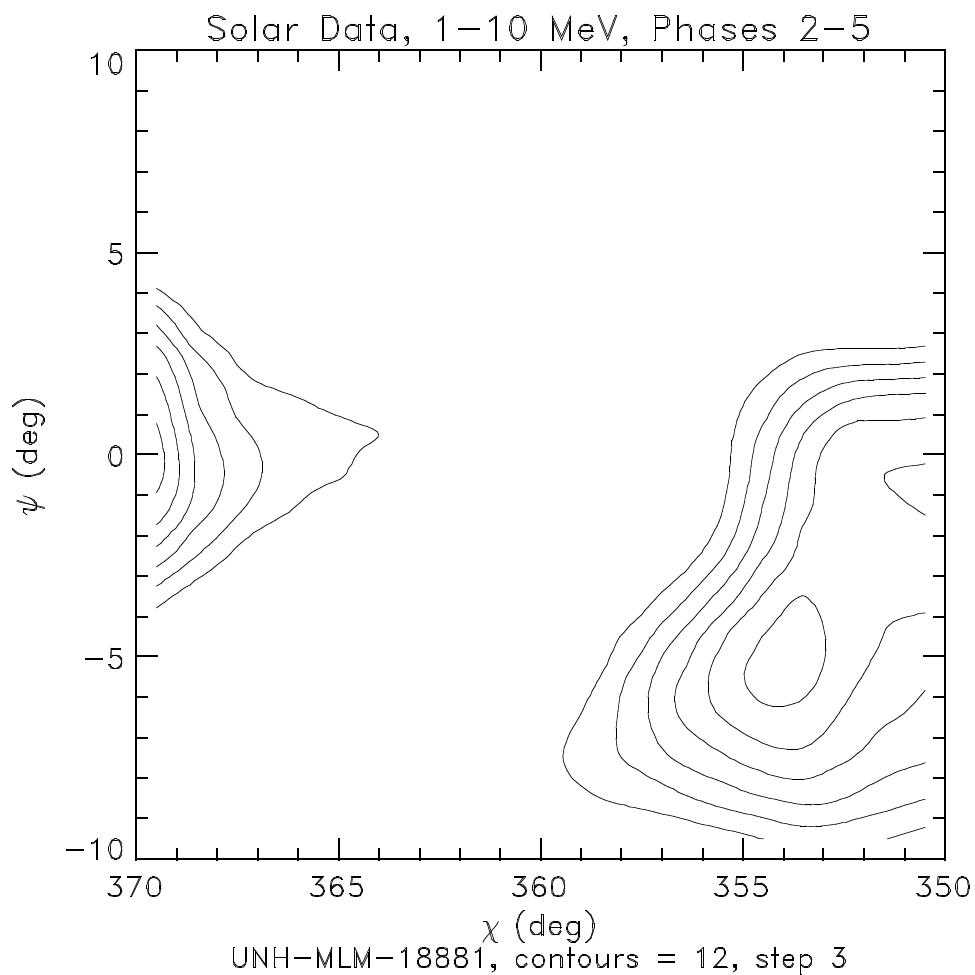
Likelihood Map



Location Contour Map

Initial Results for 1-10 MeV: Phases 2-5

- No clear solar signal.
- Image appears noisy - likelihood values as high as 28.
- Needs careful review.



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- **Still some issues to be investigated:**
 - Relative significance between TJD 8422 and VP 2.5.
 - Offset in solar location for VP 2.5.
 - Noisy nature of Phase 2-5 image.
- **Abstract has been submitted to January AAS Meeting. Ideal goal would be to include:**
 - 1-10 MeV flux limits (or detection!)
 - 8.07 MeV flux limits (or detection!)
 - 2.2 MeV flux limits (or detection!)