

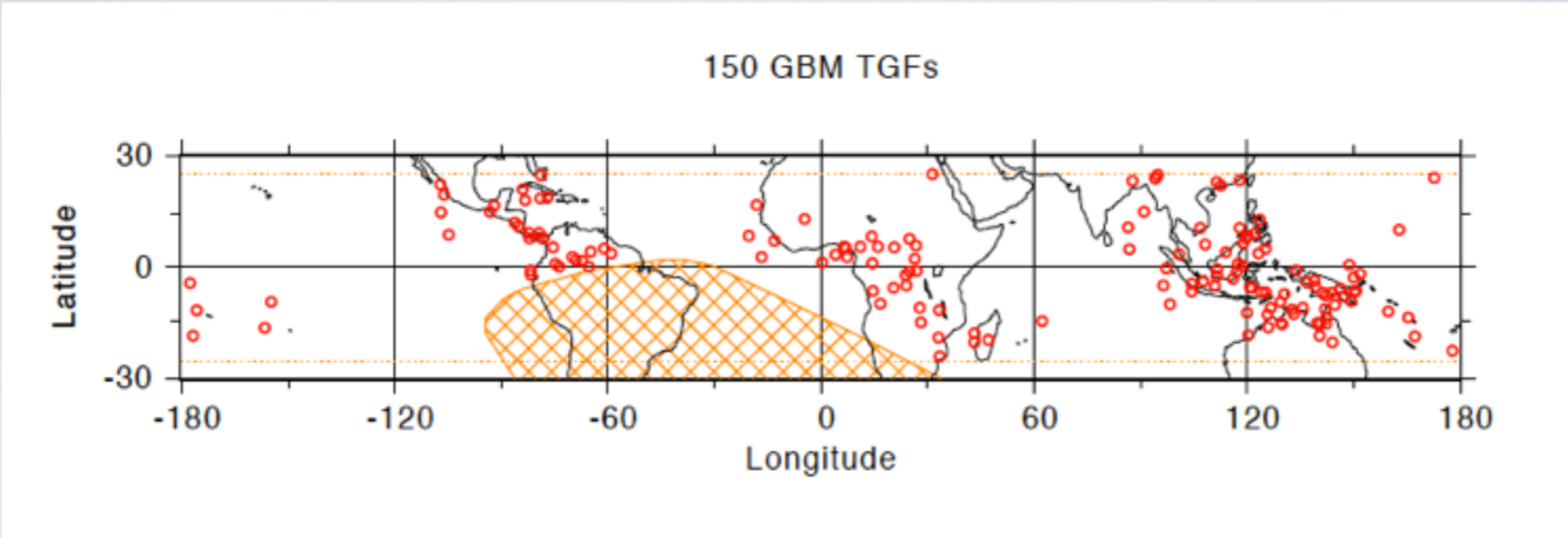
GBM OBSERVATIONS OF TERRESTRIAL GAMMA-RAY FLASHES

S. Foley

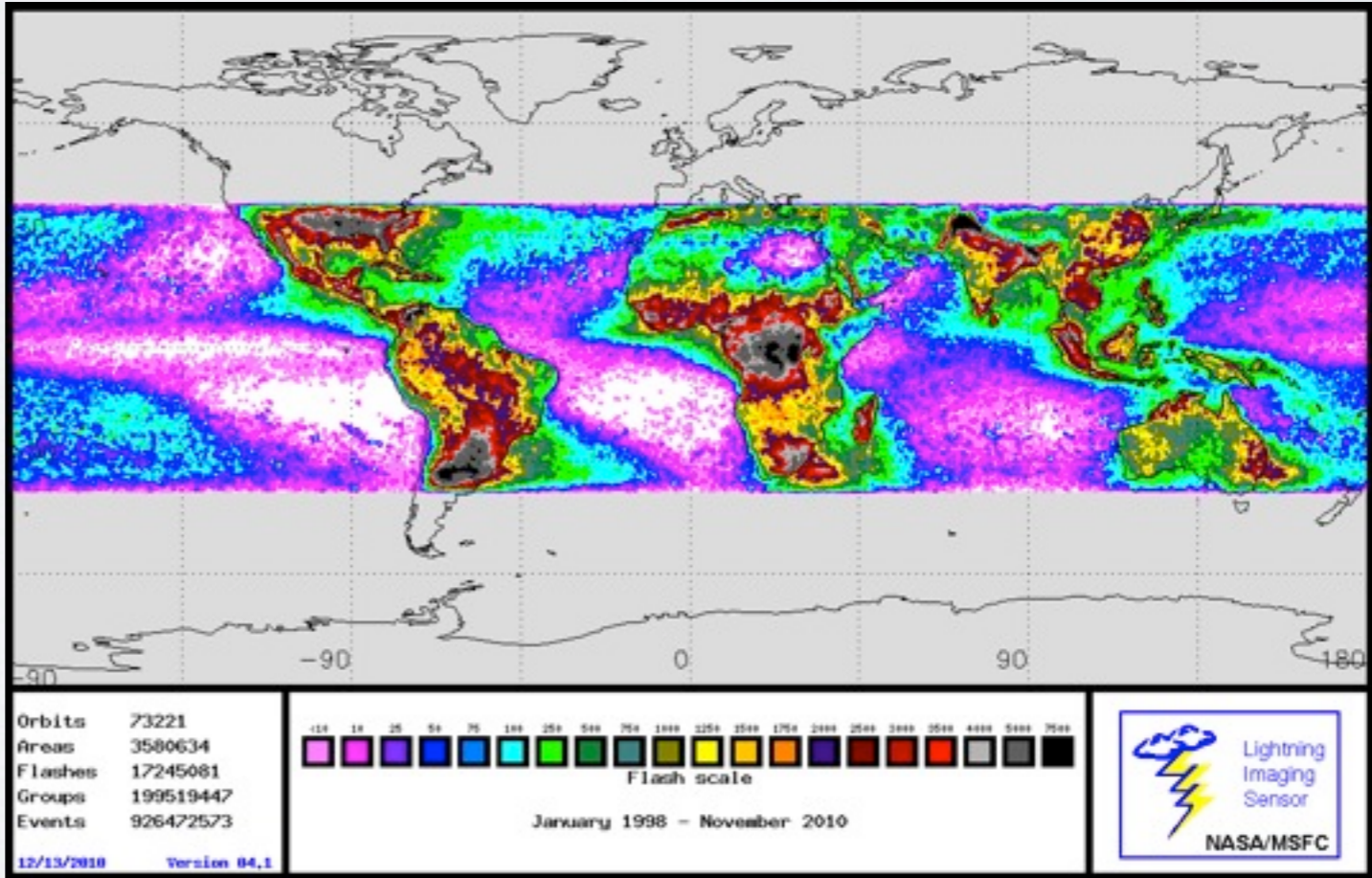
Max-Planck Institut für extraterrestrische Physik

on behalf of the Fermi-GBM TGF team

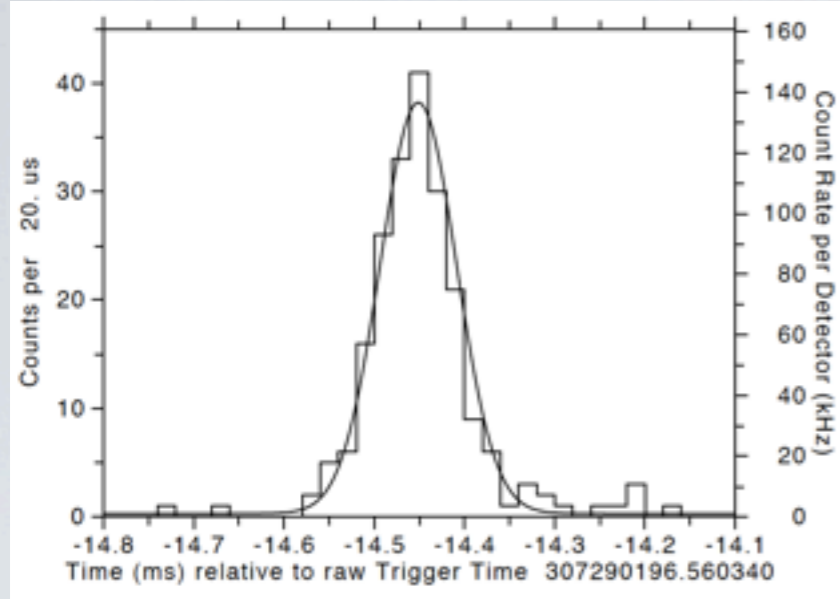
GBM TGFs



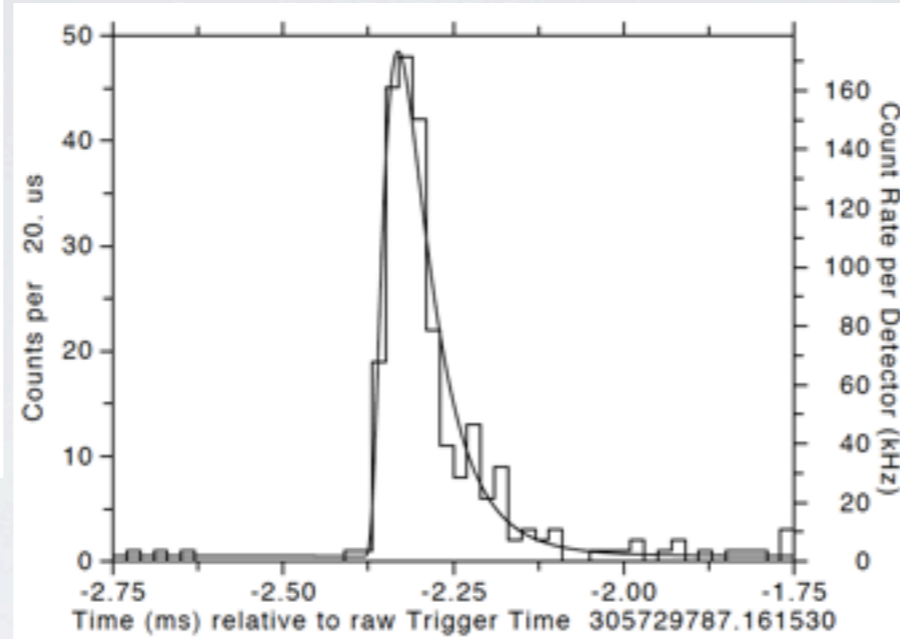
NASA/MSFC Lightning Imaging Sensor
Lightning strikes since 1998



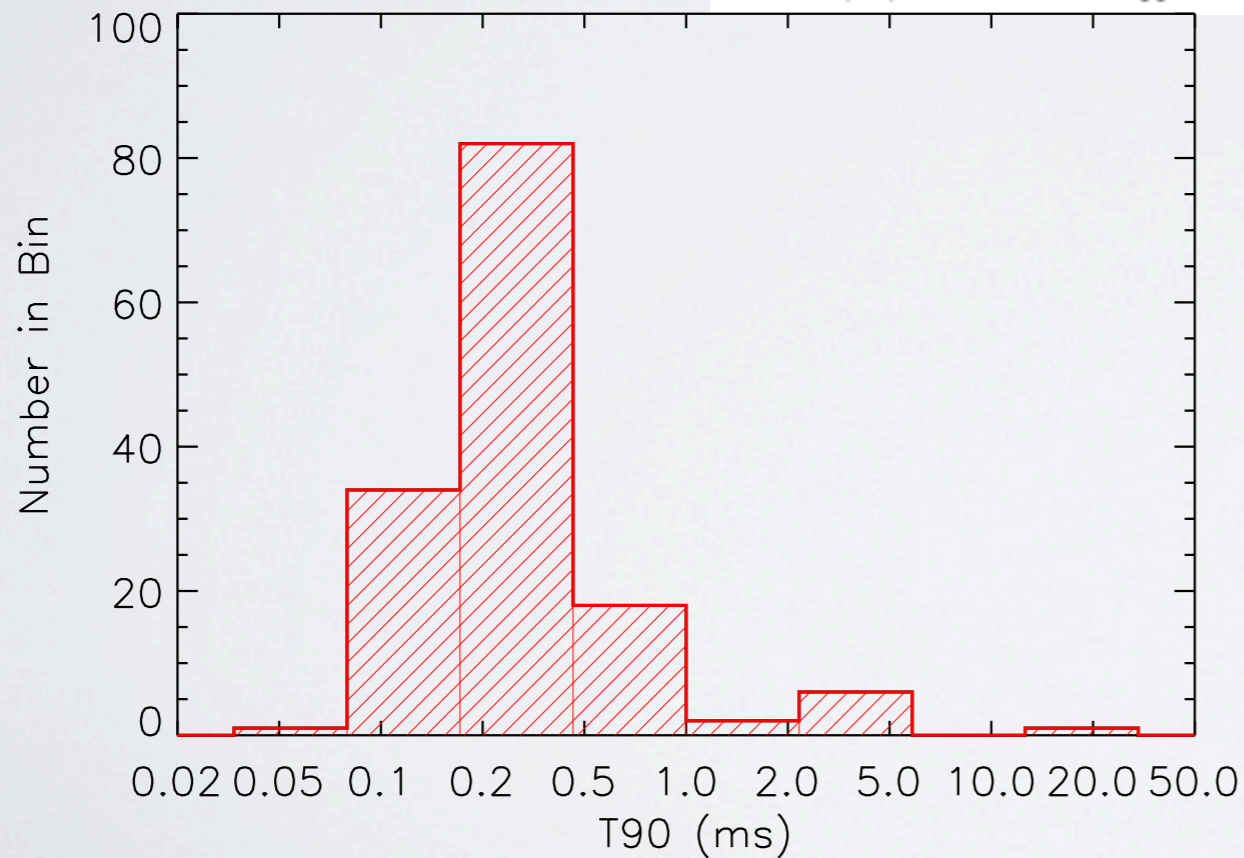
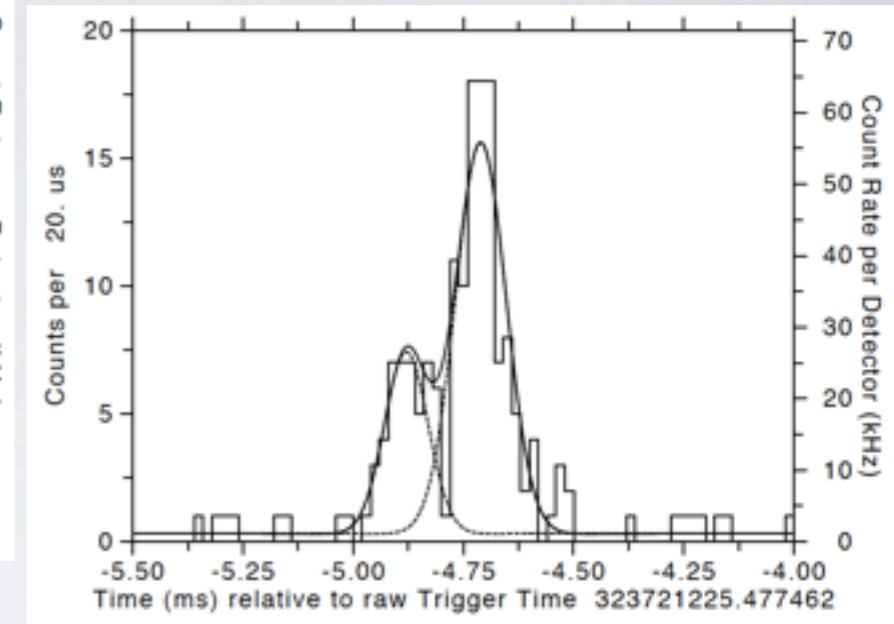
Gaussian:
TGFI00927.599



Log-normal:
TGFI00909.539



2 overlapping Gaussians:
TGFI10405.773

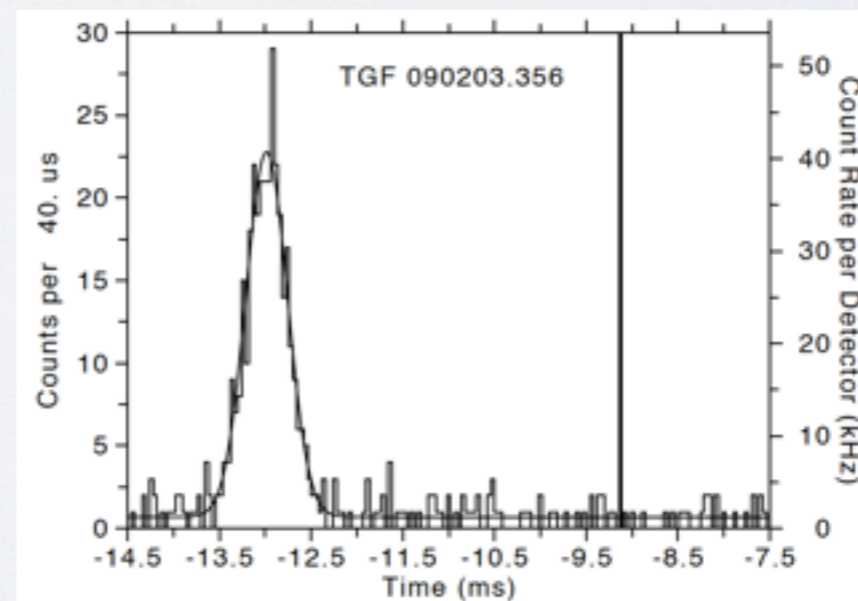
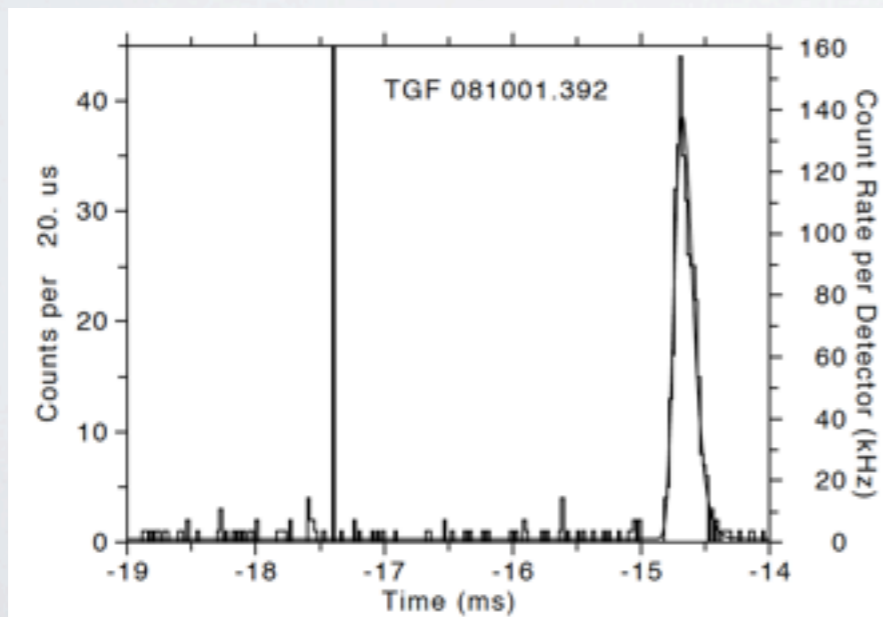
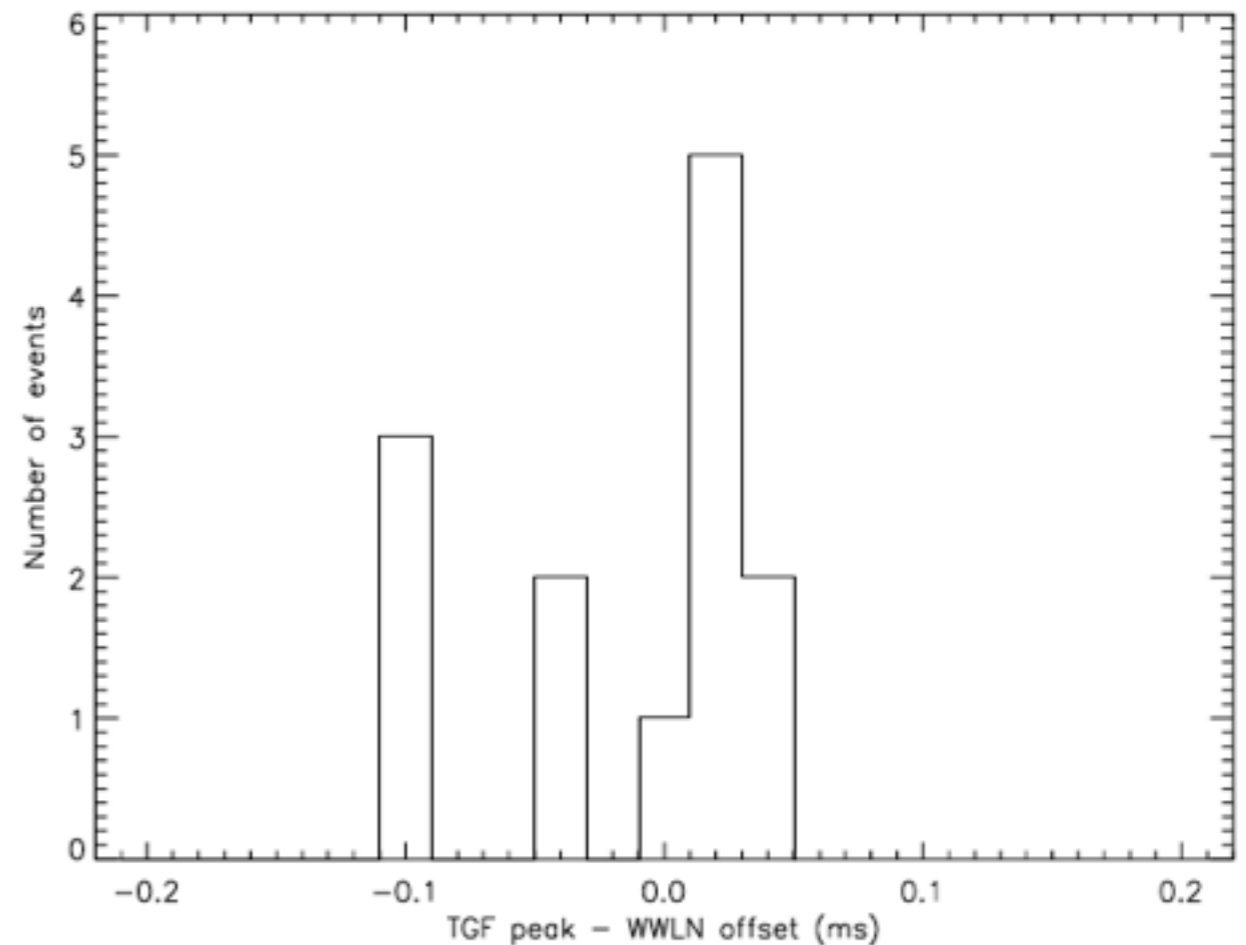


See poster **TGF S2.NI**

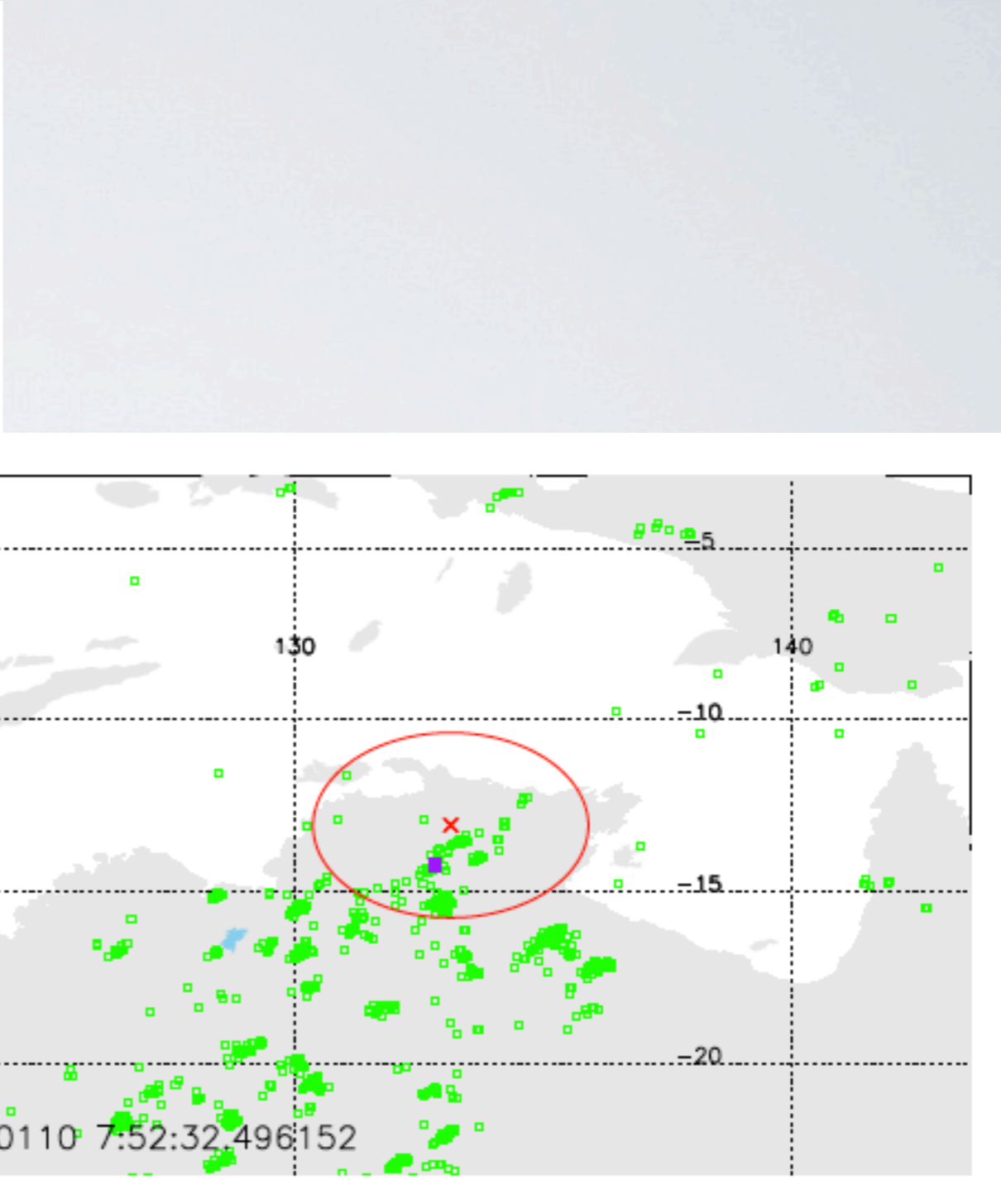
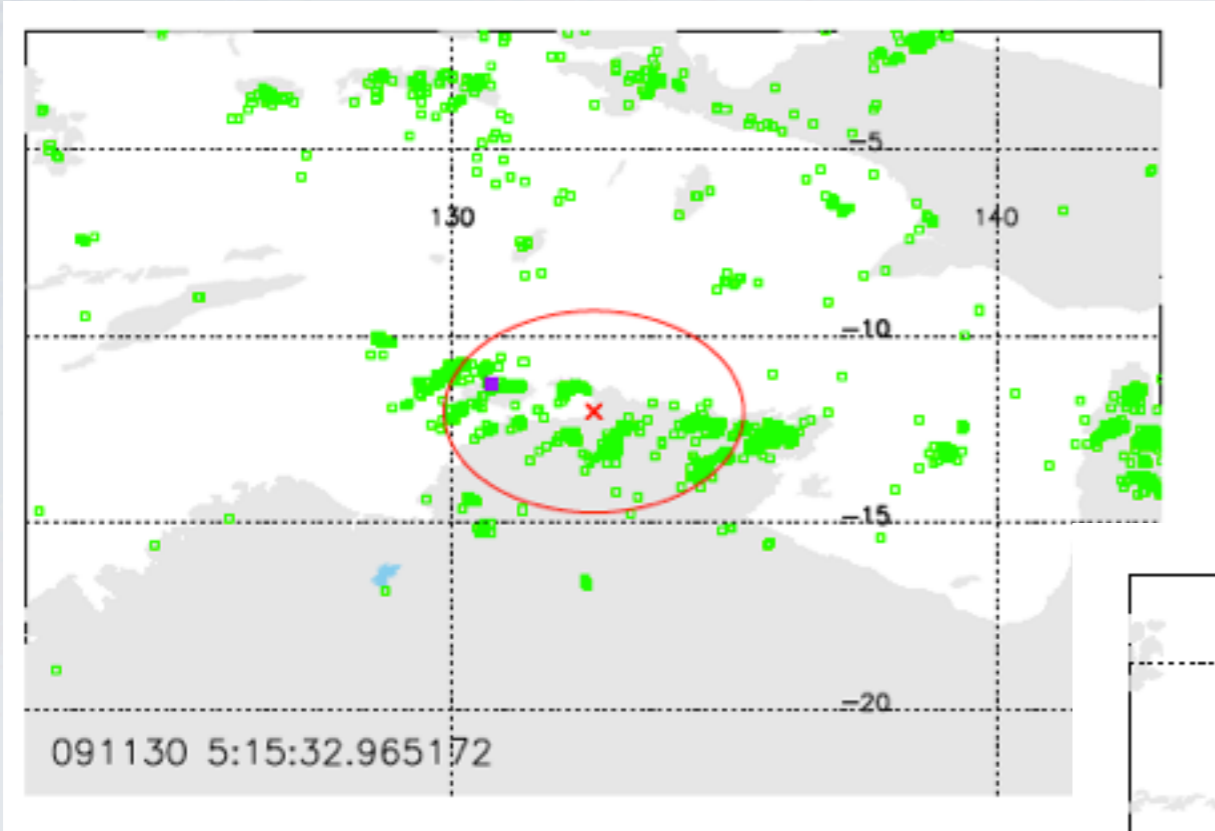
TGF - Lightning Correlations

- Correlate World Wide Lightning Location Network (WWLN) radio signals of lightning strokes with TGFs
- 30% match rate (15/50)
- Maximum distance of 300 km

Connaughton et al. 2010

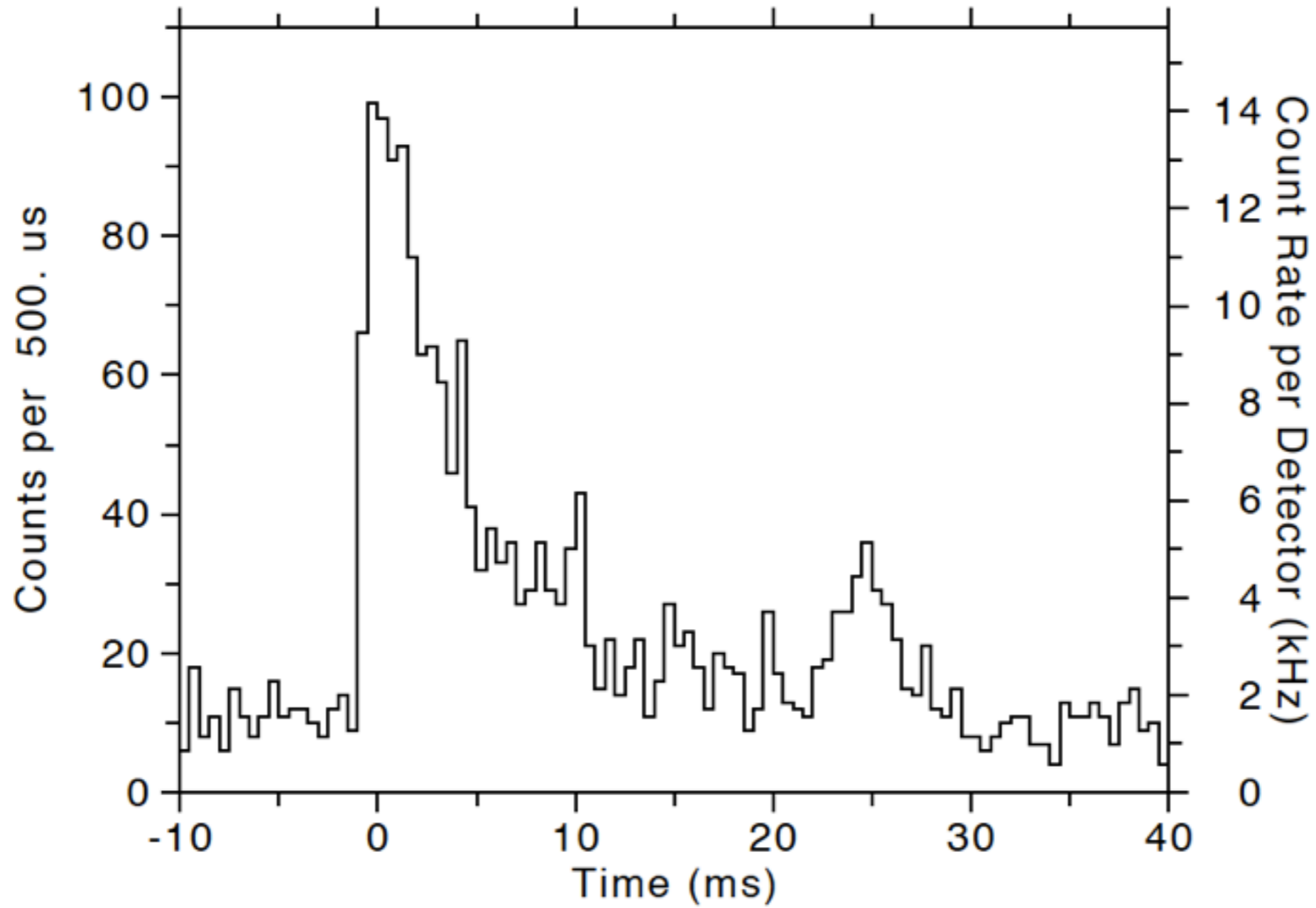


Lightning Locations



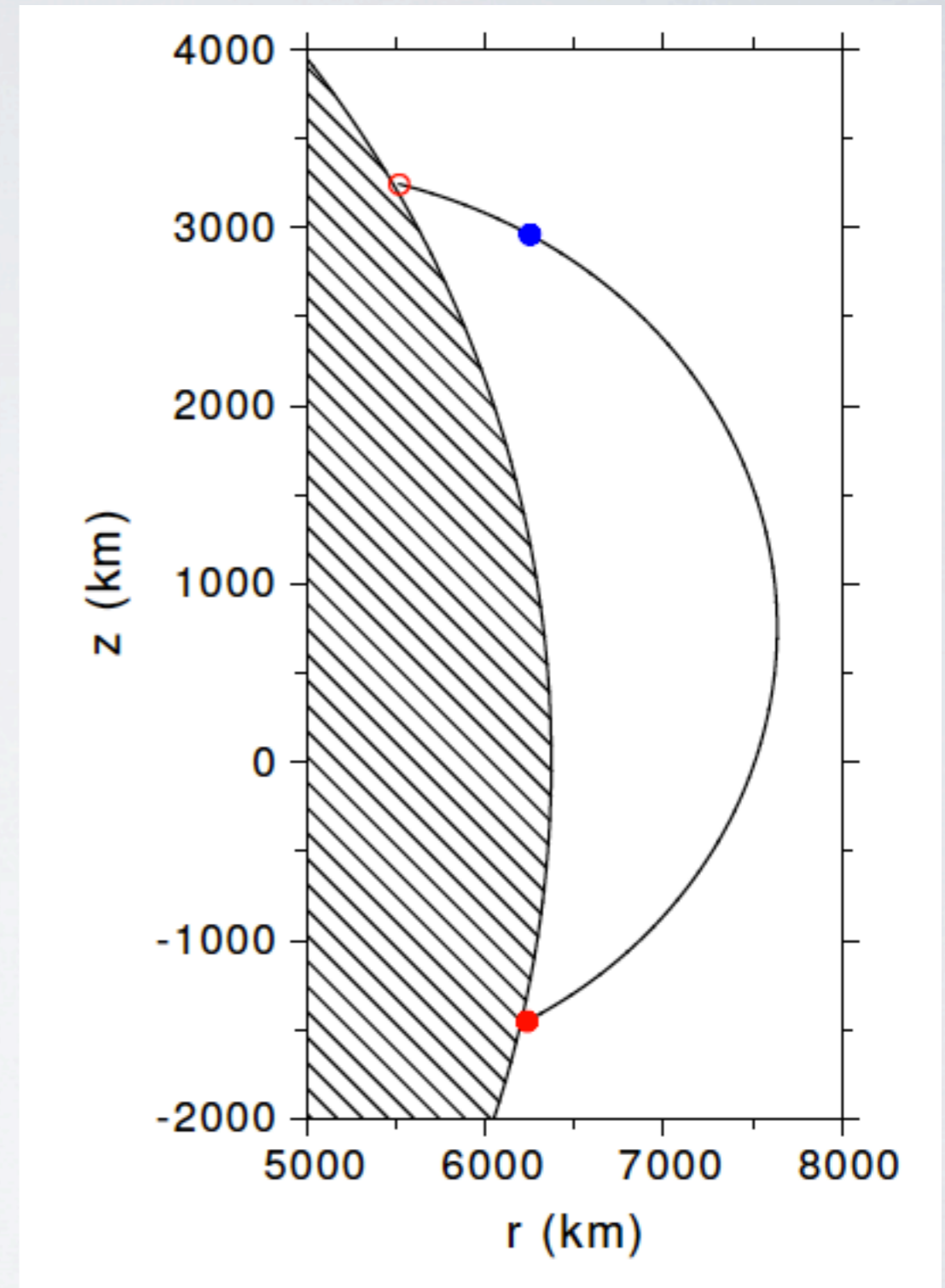
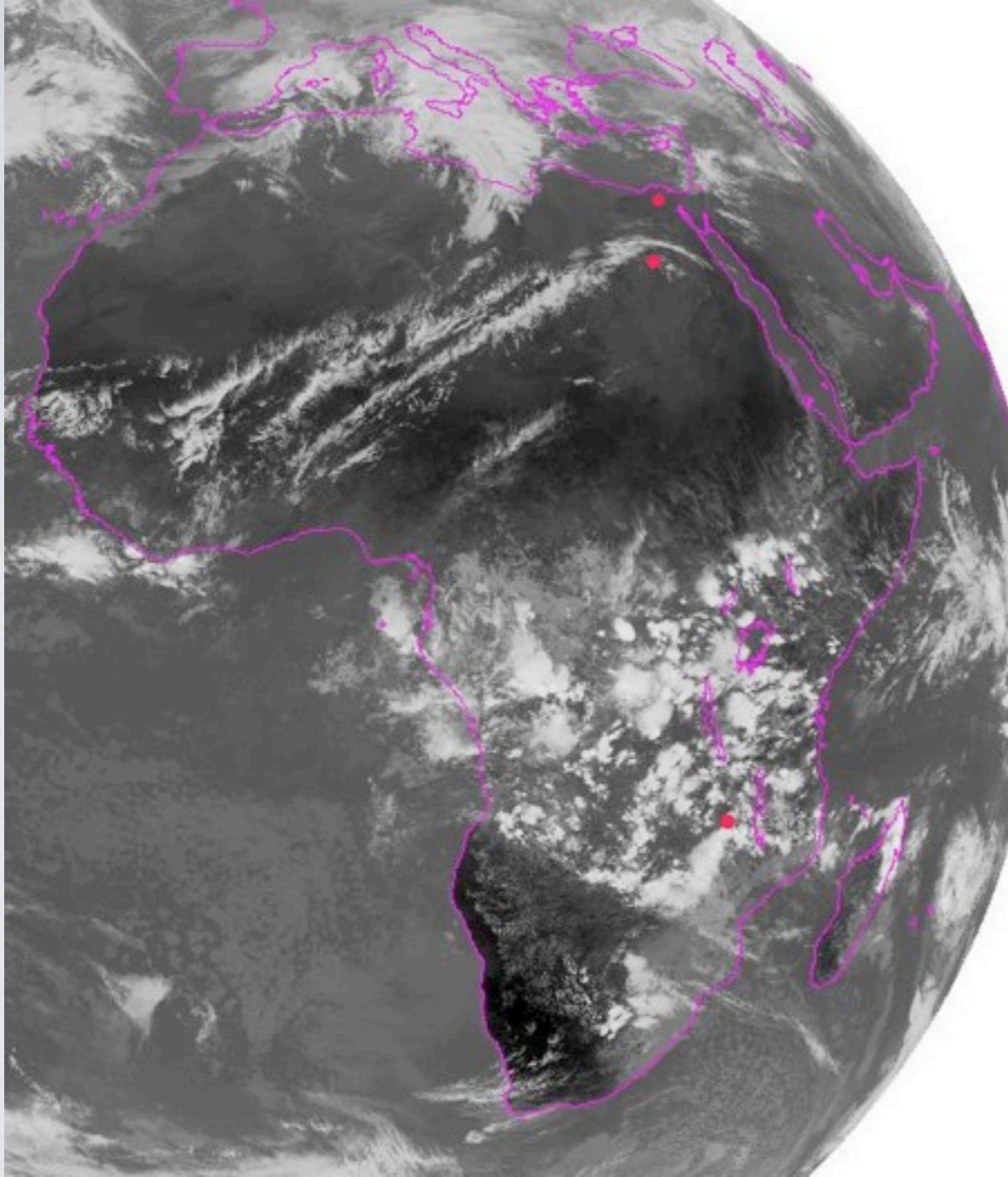
Connaughton et al. 2010

TGF091214

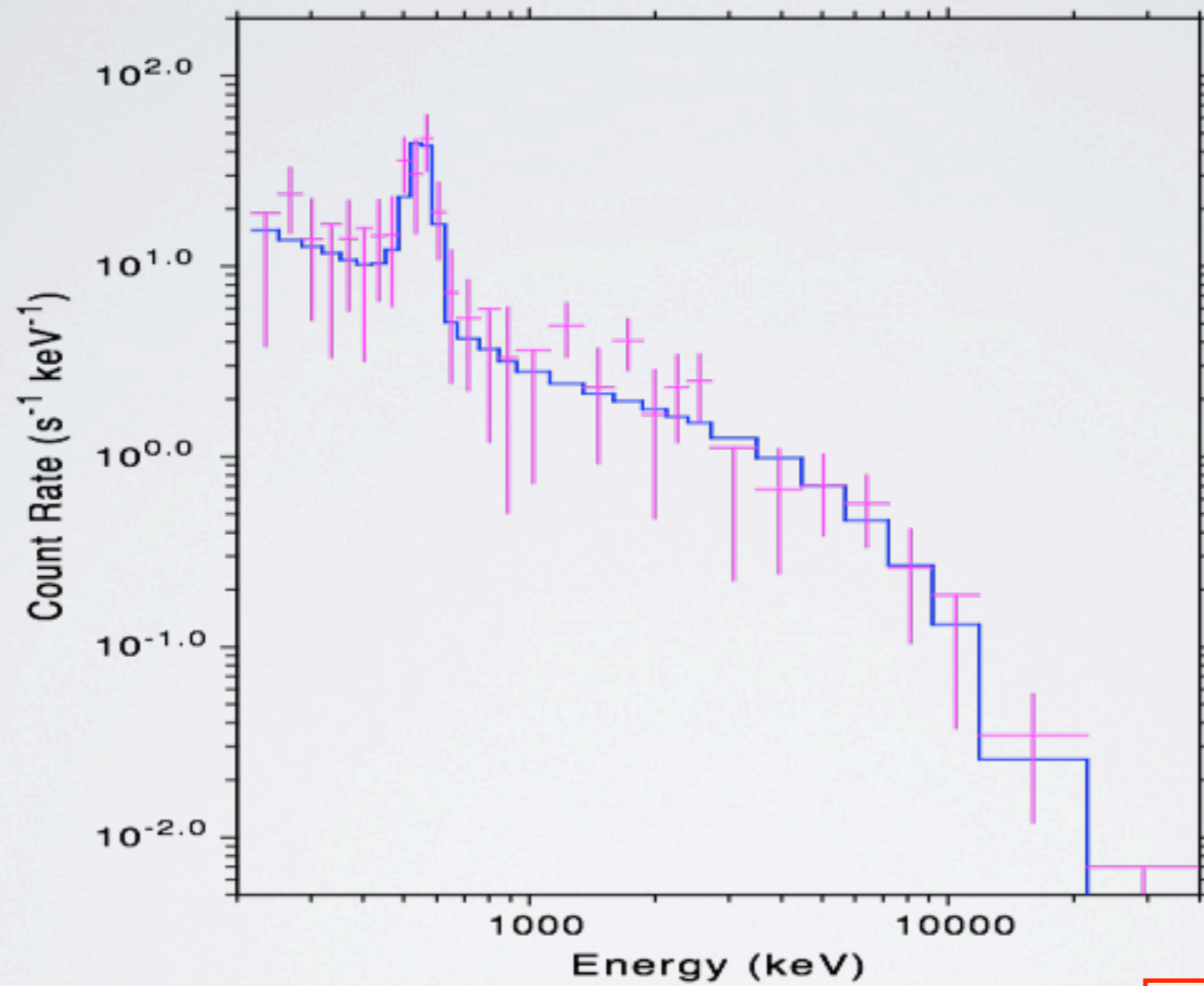


Briggs et al. 2011

Electron TGFs

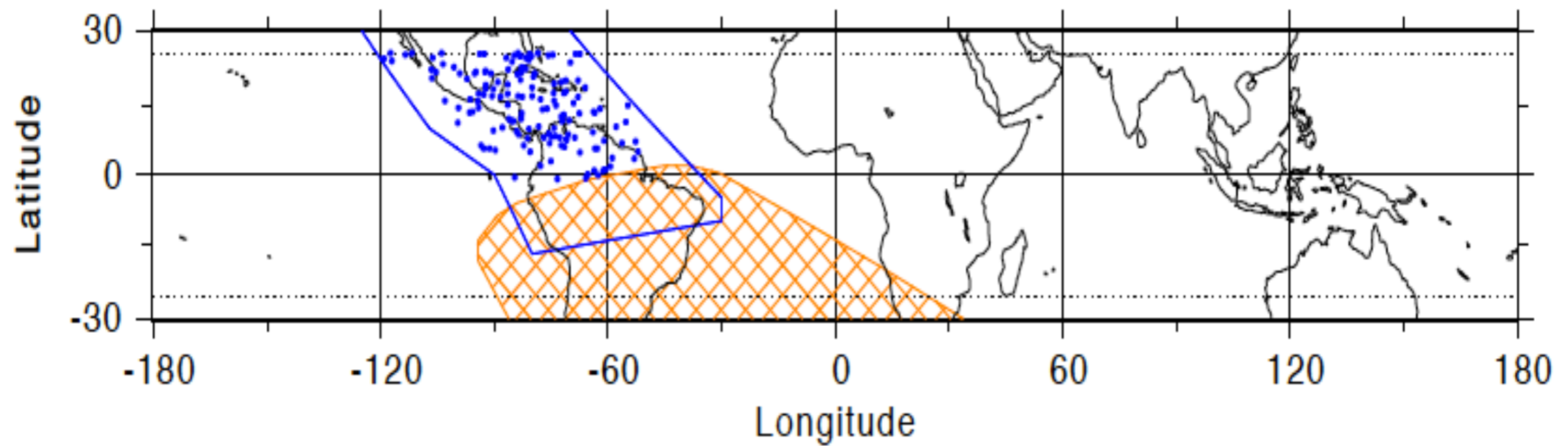


Also Positrons!



Briggs et al. 2011

Continuous Data



148 TGFs from 113 days between July and November 2010

Summary

- GBM has triggered on over 150 TGFs to date
- 30% of GBM TGFs correlated with WWLN lightning strokes within 300 km
- Spectra of electron TGFs have strong 511 keV positron annihilation lines
=> contain large fraction of positrons
- Large increase in number of TGFs from ground continuous data search
- GBM TGF Papers: http://gammaray.nsstc.nasa.gov/publications/tgf_journal.html
- **TGF Workshop in Huntsville July 13 & 14 2011**: <http://cspar.uah.edu/conferences/tgf-workshop-2011.html>