

TERRESTRIAL GAMMA-RAY
FLASHES OBSERVED ON BATSE/CGRO AND ELF/VLF RADIO
ATMOSPHERICS

Cohen, M.B.¹, Inan, U.S.¹, Fishman, G.²

¹Stanford University

²NASA Marshall Space Flight Center

Abstract Submission Form
2006 National Radio Science Meeting

Abstract: cohen15587

Date Received: September 3, 2005

During its nine year lifetime in orbit, the Burst and Transient Source Experiment (BATSE) detector, aboard the Compton Gamma Ray Observatory (CGRO) spacecraft observed a total of 74 Terrestrial Gamma-ray Flashes (TGFs). Of these, simultaneous broadband ELF/VLF data from Palmer Station, Antarctica, were found to be available for six new TGF cases in addition to two previously reported cases [Inan et al., 1996]. Analysis of temporal and directional association between radio atmospherics and TGFs reveal solid evidence of an associated radio atmospheric in three of the six events, while a fourth case exhibits evidence of magnetically conjugate source lightning. In all three cases, and with the propagation time of both gamma-rays and radio atmospherics fully accounted for, the associated sferics are found to occur 1-3 ms prior to the production of TGFs. In one of three cases with associated radio atmospherics, three consecutive gamma-ray peaks in the BATSE data are apparently linked to three consecutive radio atmospherics. In two of the six BATSE TGF cases with Palmer data, no evidence is found for any associated radio atmospherics occurring within 10-ms of the TGF event, although the presence of an active storm center in the region underneath BATSE/CGRO is confirmed by sferic activity during the 30-min period surrounding the event. For the remaining one of the six cases, no associated sferics is found to be arriving from a direction consistent with the location of the CGRO. However, an associated sferic is observed to be arriving from approximately the geomagnetically conjugate region, suggesting that this particular TGF might have been produced by a lightning flash in the conjugate region. Overall, the analysis of all six BATSE cases with Palmer data points to the possibility of different physical mechanisms generating TGFs under different conditions.

1. (a) Morris Cohen
Morris Cohen
Stanford VLF Group
350 Serra Mall
Packard Building Room 356
Stanford, CA
94305 USA
mcohen@stanford.edu
(b) 6507993674
(c)
2. G - Ionospheric Radio and Propagation
3. (a)
4. C - Contributed Paper
5. No special instructions