



## **Title: Validation of ZEUS Long Range Lightning Detection Network in Africa, ITCZ Atlantic and Northern South America.**

**Authors:** Themis G. Chronis (1), Emmanuil N. Anagnostou(1), and Carlos A. Morales(2)

### **Affiliation(s) and Contact**

1. University of Connecticut, 231 Glenbrook Rd., Storrs, CT 06269 , USA

(2) University of Sao Paulo Departamento de Ciências Atmosféricas Univ. São Paulo, Brésil-USP/IAG/ACA

Lightning represents one of the few meteorological phenomena that can be monitored in a global scale and high frequency. Electrification phenomena expressed via lightning activity over the ITCZ represent a dominant process, especially during wet seasons. The past decade, lightning research has gained significant ground and currently this information is used in a variety of applied fields of atmospheric science and meteorology. Lightning presents two distinct advantages compared to the existing techniques for monitoring thunderstorm evolution: it is directly related to the presence of vigorous convection and its detection allows wide-area coverage, with good accuracy and low maintenance cost.

As of June 2003, the Long Range Lightning Detection Network Zeus monitors the abovementioned convective activity, over Europe, Africa and the surrounding waters via a combination of 10 Very Low Frequency receivers (VLF). Available means that can play the rope of independent sources for directly assessing Zeus's locating accuracy as well as detection capabilities are limited to the Lightning Imaging Sensor (LIS) onboard NASA's Tropical Rainfall Mission Measurement (TRMM). Issues arising from the nature of the proposed comparison between space and ground-based lightning monitoring platforms will be analyzed in this proposed study. As an example, LIS cannot be used to validate data northern or southern of 38 degrees latitude

although it covers all longitudinal zones. For that reason we have selected a study area extending over an area ranging from 80 W to 50 E and 38S to 38 N. Furthermore, LIS images are obtained every 2ms, with individual pixels within its 600x600 km<sup>2</sup> field of view area having nominal resolution of 4x4 km<sup>2</sup>. This is acceptable resolution considering that Zeus locating accuracy is in the range of 10s of kms. While Zeus records primarily the electromagnetic radiation transmitted from major “Cloud-to-Ground” flashes, LIS does not make the above distinction, fact that complicates the comparison of coincident measurements made by the two systems.

The present study will examine the following aspects: 1) The network’s accuracy in terms of its lightning location retrievals (both within and outside the network’s periphery), 2) the location retrieval error dependence on the time of the day, 3) and number of receivers, and finally 4) the network’s detection capabilities in terms of time and location. The validation period extends from July to October 2004.