

## **CHUVA International Workshop**

### Special Session: CHUVA LIGHTNING

## **COMPARATIVE ANALYSIS OF BRASILDAT TOTAL LIGHTNING NETWORK FOR THE VALE DO PARAIBA CHUVA CAMPAIGN**

Kleber P. Naccarato

Osmar Pinto Jr.

Atmospheric Electricity Group - ELAT

Instituto Nacional de Pesquisas Espaciais - INPE, Brazil

BrasilDAT network is an EarthNetworks Total Lightning System (ENTLS) that combines wide-band sensors and relative dense network deployment to detect both IC and CG discharges simultaneously. Multiple time-of-arrival (TOA) sensors are used to locate and verify individual strokes adding precision to the system. The TOA method reduces potential error in locating lightning events and improves detection efficiency and location accuracy. In our present time with GPS timing and location capabilities, the TOA method has become increasingly more accurate than magnetic direction finding. The EarthNetworks Lightning Sensor (ENLS) operates in a wide range (from 1Hz to 12MHz) and was designed and built within the latest and most advanced electronics and components. This effort is to reduce system noise and to broaden the frequency range in order to create an integrated unit capable of detecting both CG and IC discharges. Some theoretical calculations show that BrasilDAT has presently 85 to 90% CG detection efficiency, about 50 to 60% IC detection efficiency, and about 500m CG location accuracy within the Southeastern Brazil. At present, BrasilDAT is composed of 56 sensors installed in 11 States of Brazil: RS, SC, PR, SP, RJ, ES, MG, MS, MT, GO, and BA. The full network deployment is planned to be concluded by the end of 2013 reaching up to 75 sensors covering almost all Brazilian regions (except to the Amazon basin).

RINDAT network was established in 1998 and has at the present time 36 sensors of Vaisala technology installed in 9 States of Brazil (mainly in the mid-southern portion of the country). It is a hybrid network composed of different types of sensors (LPATS, IMPACT, LS7000 and LS7001) which have distinct detection technologies: time-of-arrival (TOA) only, and a combination of TOA and direction magnetic finder (MDF). They operate at the low frequency (LF) ranging from 100 to 400kHz. Electromagnetic signals at this frequency range propagate close to ground and are subject to different propagation effects depending on the surface characteristics. Recent works shown that the RINDAT network has an average detection efficiency of 80 to 85% and a location accuracy of less than 1km within the Southeastern Brazil. Since additional LS7000 / LS7001 sensors (which are capable of detecting 30% of intra-cloud discharges) are still under installation, the RINDAT network is still not able to provide reliable total lightning information over the whole region.

This paper intends to compare BrasilDAT total lightning data provided during the CHUVA Campaign in Vale do Paraiba (from Nov/2011 to Mar/2012) to three other LLS that operated simultaneously: RINDAT Lightning Detection Network, TLS200 Vaisala and LMA network. The main goal is to evaluate what kind of information BrasilDAT network is able to provide in comparison to other network technologies. Since each technology has its own limitations, it is not intended to use any dataset as a reference. In the analysis we will try to compare also the whole lightning data to other available data sources like radar and satellite imagery and numerical prediction models.