



## **Analysis of VLF signals associated to AGILE Terrestrial Gamma-ray Flashes detected over Central America**

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Analysis of radio signals detected on ground and associated to Terrestrial Gamma-ray Flashes (TGFs) have proven to be a successful tool to extract information on the TGF itself and the possible associated lightning process. Triangulation of Very Low Frequency (VLF) signals by means of the Time Of Arrival technique provides TGF location with few km accuracy. The AGILE satellite is routinely observing TGFs on a narrow band across the Equator, limited by the small satellite orbital inclination ( $2.5^\circ$ ). However, until recently it was not possible to provide firm associations between AGILE TGFs and radio signals, because of two main limiting factors. First, dead-time effects led to a bias towards long duration events in AGILE TGF sample, which are less likely associated to strong radio pulses. In addition, most VLF detection networks are less sensitive along the equatorial region. Since the end of March 2015 a major change in the AGILE MiniCalorimeter instrument configuration resulted in a ten fold increase in TGF detection rate, and in the detection of events as short as 20 microseconds. 14% of the events in the new sample resulted simultaneous (within 200 microseconds) to sferics detected by the World Wide Lightning Location Network (WWLLN), therefore a source localisation is available for these events. We present here the first analysis of VLF waveforms associated to AGILE TGFs observed above Central America, detected by magnetic field sensors deployed in Puerto Rico. Among the seven TGFs with a WWLLN location at a distance lower than 10000 km from the sensors, four of them have detectable signals. These events are the closest to the sensors, with distance less than 7500 km. We present here the properties of these TGFs and the characteristics of the associated radio waveforms.