E205-006 **Room: 201B** **Time: May 18 10:15-10:30**

Improvements in the WWLLN network: Improving Detection Efficiencies Through More Stations and Smarter Algorithms

Craig Rodger[1]

[1] Department of Physics, University of Otago, Dunedin, New Zealand

Powerful lightning flashes with large return stroke peak currents induce energetic and electrical coupling between the troposphere and the upper atmosphere via the quasi-electrostatic and/or the radiated electromagnetic pulse (EMP). In particular, a single lightning EMP can affect a large area (˜105 km2) at ionospheric D-region altitudes, and the decay rate for the ionization produced at these altitudes can be less than the rate at which a large thunderstorm generates lightning EMP bursts. Several researchers have suggested that the lightning EMP which drives ELVES may be a significant source of variation in the upper atmosphere at regional and global scales. In addition, ”big” lightning is more loosely associated with other Transient Luminous Events (TLEs) and are linked to Terrestrial Gamma-ray Flashes (TGFs). Global lightning provides context on the activity levels of thunderstorm systems, assisting studies into TLEs, TGFs, meteorology and atmospheric electricity in general. One of the few experiments which can currently provide such observations is the multi-station World Wide Lightning Location Network (WWLLN).

The WWLLN-stations measure the very low frequency (VLF; 3-30 kHz) radiation from lightning discharges. Propagation at these very long electromagnetic wavelengths (up to 100 km) allows lightning strokes to be located in real time at up to 10,000 km from the receivers with a location accuracy that is estimated to be ˜10-20 km, and sometimes better than this. True global mapping of lightning from widely spaced (a few Mm) ground-based receivers requires the use of frequencies 30 kHz. Lightning impulses in this frequency range suffer low propagation attenuation, and hence propagation in the Earth-ionosphere waveguide is possible over global distances.

WWLLN detection efficiencies (DE) have been improving steadily through the introduction of additional receiving stations. However, the most significant improvements in DE comes from making better use of the existing measurements from the 30 network of receiving stations. A significant improvement was introduced in 2008, through a new algorithm to combine the existing measurements in a ”smarter way”, leading to more high-quality lightning locations. The reprocessing of the WWLLN ”raw” observations from 2005-2007 led to approximately 50% more high-quality locations, worldwide. Further improvements are possible, and planned. In this talk I hope to discuss our most recent efforts to produce new, smarter algorithms leading to DE improvements. I will also summarise the current state of the WWLLN, during a phase of significant station growth.

1st author:Craig J., Rodger,University of Otago
2nd author:James B., Brundell,UltraMSK.com
3rd author:Robert H., Holzworth,University of Washington