IMPROVEMENTS IN THE WWLLN NETWORK: BIGGER DETECTION EFFICIENCIES THROUGH MORE STATIONS AND SMARTER ALGORITHMS

CRAIG J. RODGER[1], James B. Brundell[2], and Robert H. Holzworth[3]

[1]Department of Physics, University of Otago, Dunedin, New Zealand.
[2]UltraMSK.com, Dunedin, New Zealand.
[3]Dept. Earth and Space Sciences, University of Washington, Seattle, USA

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). 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. In April 2009 we introduced a new algorithm for reprocessing WWLLN observations, leading to an increase in locations by a factor of 2.7. 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.

lightning, remote sensing

Craig J. Rodger, Department of Physics, University of Otago, P.O. Box 56, Dunedin, New Zealand.