The World Wide Lightning Location Network (WWLLN): Real-time Global Lightning Detection and Location

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An experimental lightning detection network, the World Wide Lightning Location Network (WWLLN), is being developed to provide low-cost, real-time global lightning coverage with 10 km location accuracy and >50% detection efficiency. While still growing, the network currently consists of 20 stations which 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 a few kilometres. 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.

The global location accuracy ranges from ~2-20 km, with the global median being ~3 km, and the global mean ~3.5 km. Regional case studies have shown that WWLLN detection efficiency depends on peak current, with a larger efficiency for strokes with high peak currents than with low peak currents. Based on a comparison between all WWLLN good lightning locations in February-April 2004, and the activity levels expected from satellite observations we estimate that the WWLLN is currently detecting ~2% of the global total lightning, providing good locations for ~5% of global cloud to ground (CG) activity. However, a comparison in Australia against commercial lightning detection data found that the WWLLN detected ~13% of the total lightning, suggesting a ~26% CG detection efficiency and a ~10% cloud-stroke detection efficiency.

We will present the latest status of the WWLLN network. A new algorithm is currently being tested, grouping station group arrival times into locations, leading to large improvements in network detection efficiency. In addition, we are developing a first-principles physics model to simulate the detection efficiency of the WWLLN network.