WHAT IS A BIG LIGHTNING STROKE?

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This may seem a strange question to pose. However, in our exploration of the interactions between tropospheric electrical discharges and stratospheric/ mesospheric transient luminous events (TLEs) such as sprites, elves, blue jets, etc., the attention has often been focused on lightning events in the tails of the distribution of an increasing number of parameters. Advances in remote sensing over the past decade now provide us with a number of means to characterize the bigness of a flash. Lightning detection networks, such as the U.S. NLDN, have long provided an estimate of the peak current (kA) of initially, the first stroke in a flash, and now all detected strokes in a flash. The peak current has been found to be poorly correlated to the likelihood of sprite production, though there appears a stronger correlation to halo and/or elve occurrences. Results of an extensive climatology of peak current/TLE relationships during the 2000 STEPS program will be presented. Stroke multiplicity, now determined better than before, and for some purposes, large numbers of strokes in flash may be an appropriate measure of bigness, especially for positive polarity CGs. The most relevant lightning metric for sprite production is charge moment change (CMC), now relatively easy to retrieve from ELF/VLF signal. A CMC threshold on any given night appears to discriminate with considerable skill those +CG strokes which do and do not produce sprites. The CMC is composed of the product of the charge lowered to ground and the height from which it is lowered (Zq). New 3-D Lightning Mapping Arrays provide additional characterizations of the size of discharge: Zq, the area and volume from which the charge is drawn, the discharge duration, and the dimensions of the electrically active portions of the parent storm. Zq, the vertical extent of CGs, which may vary by a factor of 4 or more, is a key parameter in TLE modeling studies. Continuing currents, which have highly variable durations and magnitudes, accompany both positive and negative CGs. Remote sensing in the ULF now provides additional means to distinguish these lightning features which likely play a key role in triggering long delayed sprites. High speed cameras also provide optical confirmation of bright and long lasting discharges, both in cloud and cloud-to-ground. Field research programs designed to investigate the impacts of urbanization or land use on lightning must now recognize there exist multiple means whereby lightning may be characterized beyond the traditional metrics of flash density, polarity and peak current. In addition, analyses of four years of data from the New Zealand Lightning Detection Network reveal some unusual patterns in large peak current CGs due to impacts of both land/salt water boundaries and terrain.

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2. H - Waves in Plasma

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