HIGH-SPEED VIDEO OBSERVATIONS OF POSITIVE GROUND FLASHES PRODUCED BY INTRACLOUD LIGHTNING

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High-speed video recordings of two lightning flashes confirm that positive cloud-to-ground (CG) strokes can be produced by extensive horizontal intracloud (IC) discharges within and near the cloud base. These recordings constitute the first observations of CG leaders emanating from IC discharges of either polarity. In one case, the discharge began with a negative leader that propagated horizontally, went upward and produced an IC discharge. After the beginning of the IC discharge, a positive leader emanated from the lowest portion of the IC discharge, and initiated a positive return stroke. In the other case, the IC discharge began with a positive leader and then initiated a downward-propagating positive leader that contained recoil processes and produced a bright return stroke followed by a long continuing luminosity. These observations help to understand the complex genesis of positive CG flashes, why IC lightning commonly precedes them and why extensive horizontal channels are often involved. The association of complex intracloud discharges with positive flashes suggests that positive discharges cannot always be modeled as the neutralization of simple, vertically stacked monopoles [Rakov, 2003]. Moreover, it can be helpful to studies on sprite morphology [Mika and Haldoupis, 2008] and to studies on why sprites are more common above some particular kind of storms [Lyons et al., 2008].

Positive lightning, intracloud, sprite

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