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TITLE: Understanding Return Stroke Data with Time Domain Fractal Lightning Modeling

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ABSTRACT BODY: Time domain fractal lightning (TDFL) modeling is an evolving technique for the study of lightning in the context of comprehensive existing experimental data.

It incorporates the complex geometry of the lightning channel, keeps track of the time evolution of charge and current distribution along the lightning channel, and with both combined, simulates realistic electromagnetic radiation signals from lightning flashes. Recent development enhances the technique by bringing in various elements from the plasma physics aspect of lightning physics. For example, simple models are included to take account of effects due to corona sheath, channel heating and cooling, channel conductivity dependence on temperature etc. With future development, an even more sophisticated treatment of these elements is expected.

With these features at hand, we present studies of return stroke related experimental data using TDFL. A wide variety of experimental data exists for the return stroke, including ground-base-current measurements, electric and magnetic field record, channel luminosity and estimations of various channel properties. We study these various aspects of lightning data under the single framework provided by TDFL. Emphasis is on exploring and explaining connections between the different types of data, e.g. dependence of the return stroke speed and electric field on channel properties, relation between ground-base-current peak current and charge transfer. Various other aspects such as effect of tortuous channel geometry, branches, and corona sheath are also explored.

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Additional Details

Previously Presented Material: About 25 percent of the material is presented in previous AGU meetings

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