AE24A-03 Analysis and Modeling of Intense Oceanic Lightning

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Recent studies using lightning data from geo-location networks such as GLD360 suggest that lightning strokes are more intense over the ocean than over land, even though they are less common [Said et al. 2013]. We present an investigation of the physical differences between oceanic and land lightning. We have deployed a sensitive Low Frequency (1 MHz sampling rate) radio receiver system aboard the NOAA Ronald W. Brown research vessel and have collected thousands of lightning waveforms close to deep oceanic lightning. We analyze the captured waveforms, describe our modeling efforts, and summarize our findings. We model the ground wave (gw) portion of the lightning sferics using a numerical method built on top of the Stanford Full Wave Method (FWM) [Lehtinen and Inan 2008]. The gwFWM technique accounts for propagation over a curved Earth with finite conductivity, and is used to simulate an arbitrary current profile along the lightning channel. We conduct a sensitivity analysis and study the current profiles for land and for oceanic lightning. We find that the effect of ground conductivity is minimal, and that stronger oceanic radio intensity does not result from shorter current rise-time or from faster return stroke propagation speed.

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