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TITLE: An Overview of Lightning NOx Production Research Associated with the Deep Convective Clouds and Chemistry (DC3) Experiment *(Invited)*

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ABSTRACT BODY: Major goals of the DC3 experiment include determining the contribution of lightning to NOx in the anvils of observed thunderstorms, examining the relationship of lightning NOx (LNOx) production to flash rates and to other lightning characteristics, and estimating the relative production per flash for cloud-to-ground flashes and intracloud flashes. The talk will survey the observation types that were conducted during DC3 relevant to these goals and provide an overview of the analysis and modeling techniques which are being used to achieve them. NOx was observed on three research aircraft during DC3 (the NCAR G-V, the NASA DC-8, and the DLR Falcon) in flights through storm anvils in three study regions (NE Colorado, Central Oklahoma to West Texas, and northern Alabama) where lightning mapping arrays (LMAs) and radar coverage were available. Initial comparisons of the aircraft NOx observations in storm anvils relative to flash rates have been conducted. These analyses utilize estimates of the LNOx within the storm volume and the flux of LNOx through the anvils, which when combined with observed flash rates can be used to estimate storm-average LNOx production per flash. The WRF-Chem model is being run for cloud-resolved simulations of selected observed storms during DC3. Detailed lightning information from the LMAs (gridded flash rates as a function of time and information on the vertical distributions of flash activity) are compared with model-parameterized flash rates and assumed vertical distributions. Assumptions concerning NOx production per CG flash and per IC flash are tested through comparisons of the model output with the aircraft NOx data from anvil traverses. A specially designed retrieval method for lightning NO2 column amounts from the OMI instrument on NASA's Aura satellite has been utilized to estimate NO2 over the region affected by selected DC3 storms. Combined with NOx to NO2 ratios from the aircraft data and observed flash rates, average NOx production per flash can be estimated.

KEYWORDS: 3324 ATMOSPHERIC PROCESSES Lightning, 0322 ATMOSPHERIC COMPOSITION AND STRUCTURE Constituent sources and sinks, 0320 ATMOSPHERIC COMPOSITION AND STRUCTURE Cloud physics and chemistry, 3314 ATMOSPHERIC PROCESSES Convective processes.

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Additional Details

Previously Presented Material: 20% Fall 2012 AGU Meeting

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