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Chemistry of Very Short Lived Halogens in the Troposphere: Pre-Industrial to Present day

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Ozone in the troposphere is one of the most important short-lived gases contributing to greenhouse radiative forcing (IPCC, 2007) and is of central importance to the chemistry of this region of the atmosphere. Tropospheric ozone is produced by photochemical oxidation of carbon monoxide, methane and other non-methane volatile organic compounds in the presence of nitrogen oxide. A large fraction of the tropospheric ozone loss occurs within the tropical marine boundary layer via photolysis to excited oxygen atoms followed by reaction with water vapor, reactions with odd hydrogen radical, and surface deposition. In addition, inorganic halogens (i.e. chlorine, bromine, and iodine species) are known to destroy ozone through efficient catalytic reaction cycles. In this study, we use the NCAR 3D chemistry climate model (CAM-Chem), including a detailed representation of tropospheric and stratospheric chemistry. Its scope has been extended to include halogen sources, reactive halogen chemistry, and related atmospheric processes (Ordonez et al., ACP, 2012; Saiz-Lopez et al., ACP,. 2012). The purpose of this work is to contrast the pre-industrial importance of tropospheric halogen driven ozone loss to present day conditions, specifically the importance of iodine and bromine chemistry. The sensitivity to inorganic nitrogen abundance will be shown. The model results compared to the pre-industrial surface ozone measurements at Montsouris (Volz and Kley, 1988) will also be discussed.