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NOx/HNO3 PDFs in the upper troposphere as a metric for convection processes using GEM-AQ

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Deep convection plays a significant role in the chemical composition of the upper troposphere and the lower stratosphere (UT/LS). Boundary layer pollutants can be transported by deep convection rapidly into the upper troposphere where their lifetimes are longer and the horizontal winds are stronger. As well, upper tropospheric air with high concentrations of ozone can be mixed down toward the surface. Lightning frequently accompanies deep convection, which is a source of nitrogen oxides. The amount of NOx from lightning (LNOx) continues to be an uncertainty (Schumann and Huntriesser, 2007). This source of NOx can play a large role in the chemistry of the upper troposphere. Characterizing convection and associated physical and chemical processes in a model remains difficult, particularly when they must be parameterized in global models. Thus the possibility of developing metrics which could be used to discriminate model processes is critical. One possible such metric is the probablility distribution function (PDF) of NOx/HNO3 in the UT region (Betram et al. 2007). We analyse this ratio for the Kain-Fritsch convection scheme in GEM-AQ and compare with observations from INTEX and also satellite observations ACE, MLS, OSIRIS etc. We also investigate the PDF for convection at mid-latitudes and in the ITCZ. Preliminary results emphasize the impact of in-cloud removal processes.