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Reactive nitrogen in the global upper troposphere from NASA DC8 and MOZAIC aircraft campaigns

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Reactive nitrogen in the upper troposphere (~8-12 km) impacts global climate, air quality and the oxidizing capacity of the whole troposphere. Here we use aircraft observations from instruments onboard the NASA DC8 aircraft for campaigns from 1997 (SONEX) to the recent ATom campaign (2016-2018) and the MOZAIC commercial aircraft campaign (2003-2005) to address uncertainties in the dynamics of reactive nitrogen ($\text{NO}_y = \text{NO}_x + \text{NO}_x$ reservoir compounds) in the global upper troposphere (UT). Our initial analysis of the DC8 aircraft observations is consistent with previous work in that PAN is the dominant NO_y component (average: 43%; range: 40-60%), followed by NO_x (on average, 21%), with smaller contributions (on average, 3.5-12.5%) from pernitric acid (HNO_4), organonitrate (RONO_2) and nitric acid (HNO_3). We go on to compare multiyear mean NO_y from MOZAIC to the combination of all NASA DC8 campaigns to determine whether we can build a near-global climatology of NO_y and its components to compare to GEOS-Chem to assess our understanding of these very important atmospheric components.