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## **The Impact of Aviation on the Nitrogen Oxide Distribution: An Analysis using CARIBIC Observations and the AERO2K global aviation Emissions Inventories**

Key area: 2. Climate impact of aviation emissions  
oral presentation

As a precursor for tropospheric ozone, nitrogen oxide ( $\text{NO}_x$ ) plays a key role in photochemistry. By this,  $\text{NO}_x$  also impact on the radiative forcing. The  $\text{NO}_x$  concentration in the upper troposphere and lower stratosphere (UTLS) is controlled by different sources and processes, such as long-range transport, lofting from the boundary layer, lightning, and air traffic emissions.

Insufficient knowledge about the  $\text{NO}_x$  background concentration in the UTLS is responsible for uncertainties concerning the ozone production, since it depends in a non-linear way on the background  $\text{NO}_x$  mixing ratios. Therefore, models show uncertainties in radiative forcing due to aviation- $\text{NO}_x$ .

Within the framework of CARIBIC (Civil Aircraft for the Regular Investigation of the atmosphere Based on an Instrument Container) nitrogen oxide measurements are performed aboard a passenger aircraft. The destinations of the aircraft are located in North and South America, Africa, and Asia. Since 2005 unique records of  $\text{NO}$ ,  $\text{NO}_y$  (the sum of reactive nitrogen oxides), further trace gases and aerosols have been obtained in the UTLS. This broad dataset gives a comprehensive view of the seasonal and regional distribution of  $\text{NO}$  and  $\text{NO}_y$  in the UTLS.

In this work, the contribution of aircraft- $\text{NO}_y$  to the measured  $\text{NO}_y$  budget in the UTLS is investigated using the AERO2K global aviation emissions inventories for 2002 and backward trajectories. Overall 157 CARIBIC flights between 2006 and 2011 were analyzed. Regional distinctions as well as seasonal differences concerning the contribution of aircraft- $\text{NO}_y$  to the measured  $\text{NO}_y$  budget were found. In the northern regions (above  $35^\circ \text{N}$ ) aircraft- $\text{NO}_y$  has an impact of about 12 % on the measured  $\text{NO}_y$ . However, in the more southern regions ( $35^\circ \text{S} - 35^\circ \text{N}$ ), the impact is about 4 %.