

# **Lightning NO<sub>x</sub> : impact of thunderstorms and TLE's on stratospheric ozone**

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Nitrogen oxides are key species controlling ozone chemistry in the stratosphere. Mostly originating from the photolysis of N<sub>2</sub>O, a gas source emitted at the surface by plants and fertilizers, they are also produced by lightning within the 10-15 km altitude range, particularly in the tropics, by ionisation of oxygen and nitrogen and eventually also directly in the lower stratosphere by Blue-jets. The NO<sub>x</sub> concentration due to lightning (called LNO<sub>x</sub>) observed from high altitude aircraft and long duration circumnavigating balloons during the European projects TROCCINOX and HIBISCUS was shown to increase the NO<sub>x</sub> concentration by a factor two in the upper troposphere over tropical continents compared to oceanic areas where lightning is less frequent. The question is to know how much TLEs could also contribute directly into the stratosphere. Although models are predicting significant NO<sub>x</sub> production by TLEs in the stratosphere, little signature was observed on MIPAS, GOMOS or HALOE profiles during the summer thunderstorm season, but these analyses apply to zonal mean profiles only and moreover the measurements are limited to altitudes above 22 km, leaving open the possibility of a significant contribution of blue-jets between the tropopause around 16 km and 22 km. New balloon experiments and satellite data analyses are in progress which hopefully could provide a clearer answer on the possible NO<sub>x</sub> production by TLEs.