# 6.085 Distributions of BrO and IO in the tropical marine boundary layer and free tropopshere.

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Abstract:

Halogens affect atmospheric chemistry by destroying ozone, changing the oxidative balance, processing mercury, and by particle growth. The halogen radicals bromine and iodine monoxide (BrO and IO) were measured by the University of Colorado Airborne Multi-AXis DOAS instrument (CU AMAX-DOAS) over the Western (CONTRAST project) and Eastern (TORERO project) tropical Pacific Ocean aboard the NSF/NCAR GV aircraft. Observations of up to 3.0 pptv BrO and 0.1 to 0.25 pptv IO over the Eastern Pacific Ocean (Dix et al., 2013; Volkamer et al., 2015; Wang et al., 2015) pose new constraints to develop halogen chemistry in state-of-the-art models, which tend to underestimate the total BrO column, and over predict BrO in the lower troposphere.
CU AMAX-DOAS is optimized to (1) locate BrO, IO, and the OVOC glyoxal in the troposphere, (2) decouple stratospheric absorbers, (3) maximize sensitivity at instrument altitude, and (4) enable observations over a wide range of SZA. In the past we have used Optimal Estimation inversion to retrieve vertical BrO and IO profiles during aircraft ascents and descents that were successfully evaluated by comparing e.g. DOAS $NO_2$ and $H_2O$ with atmospheric models and in-situ observations (Volkamer et al., 2015). We have also developed a method that parametrizes radiative transfer for the fast conversion of slant column densities into volume mixing ratios along the flight track. The method is based on comparison of $O_2$-$O_2$ collision complexes at tropospheric altitudes. Here we present a summary of BrO and IO distributions based on AMAX-DOAS observations over the Western and Eastern tropical Pacific, describe our methods, discuss spatial distributions and atmospheric implications. Further we introduce the concept of mountain top measurements in the tropical free troposphere, to generate long-term time series for model evaluation of a critical and data poor compartment of the atmosphere.