4.055 Importance of reactive halogens in the tropical marine atmosphere.

Early Career Scientist

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Abstract:

Halogen species (chlorine, bromine and iodine) are known to play an important role in the chemistry and oxidizing capacity of the troposphere, particularly in the marine boundary layer (MBL). Reactive halogens cause ozone (O_3) destruction, change the HO_x and NO_x partitioning, affect the oxidation of volatile organic compounds (VOCs) and mercury, reduce the lifetime of methane, and take part in new particle formation.

Numerical models predicted that reactive halogen compounds account for 30% of O_3 destruction in the MBL and 5-20% globally. Up to 34% of O_3 loss is due to I and Br combined in the TORERO area.

Recent studies have highlighted the key role that heterogeneous chemistry plays in explaining observations of BrO and IO abundances in the tropical troposphere. Moreover, it has been suggested that halogen species undergo heterogeneous reactions on ice surfaces.

The main objective of this study is to investigate the atmospheric chemistry in the tropical East Pacific with a focus on reactive halogens using the latest version of the Weather Research and Forecasting model coupled with Chemistry (WRF-Chem) and field data from the TORERO campaign. WRF-Chem is a highly flexible community model for atmospheric research where aerosol-radiation-cloud feedback processes are taken into account. Our reaction mechanism in WRF-Chem is based on the MOZART mechanism and has been extended to include bromine, chlorine and iodine chemistry. Heterogeneous recycling reactions involving sea-salt aerosol and ice particles have been included into

the model, along with oceanic emissions of important OVOCs and halocarbons. Sea surface emissions of inorganic iodine are calculated using the parameterisation of Carpenter et al. (2013).

Focusing on TORERO observations from the ships and a selected number of flights we present an evaluation of the relevant tropospheric gas-phase chemistry (O_3, H_2O), inorganic halogen species (BrO, IO), aldehydes (CH_3CHO, CHOCHO) and Very Short Lived Halocarbons (VSLH).