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On the latitudinal and seasonal distribution of reactive halogens in the Eastern Pacific marine boundary layer

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Spatially and time-resolved observations of reactive iodine and bromine species were made during two field campaigns in the Eastern Pacific marine boundary layer (MBL) in order to improve our understanding of their sources and their impacts on ozone and aerosols. The first campaign, HaloCarbon Air Sea Transect-Pacific (HaloCAST-P), was a one-month ship-based study on a scientific cruise from Chile to Seattle during March-April 2010. The second campaign, Climate and HAlogen Reactivity tropicaL EXperiment (CHARLEX) in the Galapagos Islands, running from September 2010, is the first long-term ground-based study of atmospheric trace gases in this region (1).

Both ship-based MAX-DOAS measurements and ground-based MAX-DOAS, LP-DOAS and ROFLEX observations indicate a constant and ubiquitous presence of reactive iodine (IOx = I + IO), with enhanced mixing ratios over the oligotrophic parts of the ocean and slightly increased IOx mixing ratios in the warm season (although IO itself does not show a seasonal trend). On the other hand, BrO was not observed above the LP-DOAS 0.5 pptv (2σ) detection limit, indicating BrOx levels on the low side of the range predicted by models (2,3).

The mixing ratios observed in the eastern Pacific show similar variability and magnitude, although they are generally lower than in other remote tropical locations (1). A recently reported time series of satellite observations of IO around Galapagos (4,5) is inconsistent with the spatial distribution and low surface mixing ratios measured in our study.

In situ measurements of meteorological and physical ocean variables, Chlorophyll-a and halocarbons, along with satellite ocean colour imagery were used to gain insights into the possible sources and the impacts of iodine in this environment. Regarding the current halogen impacts on the regional MBL chemistry, the low mixing ratios observed indicate that they will neither affect significantly surface ozone nor trigger significant new particle formation.

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