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Halogens and the chemistry of the free troposphere

D. J. Lary

¹Global Modelling and Assimilation Office, NASA Goddard Space Flight Center, Greenbelt, MD, USA

²GEST at the University of Maryland Baltimore County, Baltimore, MD, USA

Abstract. The role of halogens in both the marine boundary layer and the stratosphere has long been recognized, while their role in the free troposphere is often not considered in global chemical models. However, a careful examination of free-tropospheric chemistry constrained by observations using a full chemical data assimilation system shows that halogens do play a significant role in the free troposphere. In particular, the chlorine initiation of methane oxidation in the free troposphere can contribute more than 10%, and in some regions up to 50%, of the total rate of initiation. The initiation of methane oxidation by chlorine is particularly important below the polar vortex and in northern mid-latitudes. Likewise, the hydrolysis of alone can contribute more than 35% of the production rate in the free-troposphere.

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