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Transfer of organic Br and Cl from the Biosphere to the Atmosphere during the Cretaceous/Tertiary Impact: Implications for the stratospheric Ozone Layer

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Abstract. Following the Cretaceous/Tertiary (K/T) meteoritic impact some 65Myr ago, large portions of aboveground terrestrial biomass were burned. As a result, large amounts of various trace gases were injected to the atmosphere, inducing a wide range of effects on climate and ecosystems. Here, it is commented on the previously unaccounted for emission to the atmosphere of methyl bromide (CH₃Br) and methyl chloride (CH₃Cl) from extensive biomass burning that followed the impact. Based on reported biomass burning emission rates of the above organohalogenes relative to CO₂, it is estimated that their emissions from global fires resulted in tropospheric mixing ratios of around 20-65.8ppbv organic Cl and 110-390pptv organic Br. The above calculated mixing ratios of organic chlorine and bromine are more than an order of magnitude greater than their present, anthropogenically perturbed level and, although the ocean ultimately might absorb them, we argue here that they could still remain in the atmosphere for many years, and a substantial fraction could be transported to the stratosphere, thus substantially affecting the ozone layer. This would have led to very serious increases in short wavelength UV radiation reaching the lowermost atmosphere.

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