2.067 Measurement of effective quantum yields for the photolysis of aqueous I- and estimation of atmospheric I2 emission rate.

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Abstract:

The chemistry of iodine plays an important role in the oxidizing capacity of the global marine atmosphere. However the sources of iodine are not well understood. Organoiodine compounds such as methyl iodide and inorganic compounds such as hypoiodous acid and molecular iodine (I_2) are considered to be the main source of atmospheric iodine in the marine atmosphere. These molecules undergo photochemical reaction and release I atoms. I_2 can be emitted from the reaction of gaseous ozone molecules ($O_{3(g)}$) with iodide ion in aqueous phase ($I^-_{(aq)}$) on the sea surface. The photo-oxidation of $I^-_{(aq)}$ also have the potential to emit gaseous iodine molecules ($I_{2(g)}$) into the marine atmosphere. In this study, the values of the molar absorption coefficient and the photolysis quantum yields of $I^-_{(aq)}$ in the range of 290-500 nm were experimentally determined. Also, the influence of pH and dissolved oxygen on the photolysis quantum yields was investigated. Based on these obtained parameters, we estimated the rate of $I_{2(g)}$ emission to the marine atmosphere. This result indicates that the photolysis of $I^-_{(aq)}$ could contribute to a significant part of the source of the marine atmospheric iodine compounds. This reaction has been implemented in a global chemistry-climate model, showing that it provides an additional oceanic source of inorganic iodine that can enhance the levels of reactive iodine in some oceanic regions. This study suggests that the formation of $I_{2(g)}$ from the photolysis of $I^-_{(aq)}$ as well as the emissions of $I_{2(g)}$ and gaseous hypoiodous acid ($HOI_{(g)}$) from the reaction of $O_{3(g)}$ and $I^-_{(aq)}$ on the sea surface must be considered to perform more exact model calculations for the impact of the atmospheric iodine compounds.