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Development of an online method for quantification of maritime molecular iodine and other gaseous iodine containing inorganic compounds

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The atmospheric chemistry of iodine is important in multiple ways. The focus lies on the ability to influence the oxidizing capacity of the atmosphere, i.e. by destruction of ozone, and the formation of iodine oxide particles (IOP), i.e. the influence on condensation nuclei (CCN). Using a variation of techniques, like differential optical absorption spectroscopy (DOAS), laser-induced fluorescence (LIF), inductively coupled plasma mass spectrometry (ICP-MS) and atmospheric pressure chemical ionization with tandem mass spectrometry (APCI-MS/MS), the reactive iodine species of atomic iodine (I), molecular iodine (I2), iodine monoxide (IO) and iodine dioxide (OIO) have all been detected in the atmosphere from Antarctica to the equatorial marine boundary layer (MBL). In the past few years there have been active research on IO, especially after revealing significant levels in open ocean measurements, OIO and higher iodine oxides. In addition to atmospheric measurements, significant developments in laboratory kinetics, photochemistry and heterogeneous chemistry of iodine species have been accomplished. [1]

Here we introduce an online-method for detecting gaseous molecular iodine and other gaseous iodine-containing inorganic compounds such as HOI, which is a further development of the technique used by Carpenter et al. [2]. The method is based on selective photolytic dissociation of the analytes, followed by oxidization and particle formation of the iodine compounds. The particles are than size-segregated and detected by a scanning mobility particle sizer (SMPS) system. Initial IOP forming is performed in a reaction chamber providing specific wavelengths according to corresponding bond dissociation thresholds. Atmospheric samples can also be pre concentrated by diffusion denuder (with α Cyclodextrin modified and immobilised silica coating) [3-5] and afterwards released by thermodesorption. First attempts of quantification are carried out by external calibration using an iodine diffusion source and aqueous solution of hypoiodic acid [6]. Preliminary results will be shown.

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