

## ***Interactive comment on “Physical properties of iodate solutions and the deliquescence of crystalline $I_2O_5$ and $HIO_3$ ” by R. Kumar et al.***

**Anonymous Referee #3**

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### **Statement:**

Particle formation in the marine boundary layer is a current hot topic in the atmospheric community. One potential compound group which can participate to secondary particle production is iodine related compounds originating from molecular iodine precursors. Therefore, the study “Physical properties of iodate solutions and the deliquescence of crystalline  $I_2O_5$  and  $HIO_3$ ” of Kumar et al. discuss an important issue relevant to marine iodine related compounds. Even though the experimental data and particle size range (10–50 micron) is far away from the particle sizes of ultrafine new particle formation, the study shows important thermodynamic data with experimental physical properties (water activity, density, viscosity) for iodate solutions and hygroscopic data for  $I_2O_5$  and  $HIO_3$  particles. Those aid to understand more fully the properties of

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iodate solutions and the iodine related particles. Importantly,  $I_2O_5$  and  $HIO_3$  are highly interesting iodine compounds in marine new particle formation.

In general, the manuscript is clearly and well written. However, there are some aspects that are needed to consider in the manuscript. After taking into account the following comments through the manuscript, this study would be appropriate for publication in Atmospheric Chemistry and Physics (ACP).

### **General comments:**

Ristovski et al. (2006) have measured hygroscopic properties of particles generated using photochemistry of a iodine precursor in the presence of ozone, and from  $I_2O_5$  and  $HIO_3$  particles, respectively.

Remove “most likely  $I_2O_5$ ” from the abstract, line 2. It is not clear if  $I_2O_5$  is the primary iodine oxide produced from secondary compounds formed from marine biota. For example, Jimenez et al. (2003) and Saunders et al. (2010) concluded  $I_2O_4$  to be primary iodine oxide. On the other hand, Kumar et al. do not study secondary ultrafine particle formation formed from an iodine related precursor in this work and cannot therefore suggest most likely iodine oxide based on this work. Probable importance of  $I_2O_4$  should also be discussed more fully in the introduction and be mentioned in the conclusions.

The atmospheric implications in the conclusions of the manuscript are needed to further discuss because  $I_2O_4$  could also explain no observable particle growth in ultrafine particles ( $< 100$  nm).

Conclusions and atmospheric implications, p. 20836 line 27 and p. 20837 line 1: volatile chemical species (e.g., oxalic acid, if not cloud processed; Saunders et al. 2010) are not able to participate to particles growth to below 50 nm sizes. For atmospheric implications of iodine oxides, the authors should discuss about the contribution of different marine secondary compounds (e.g., less volatile organics, sulfuric acid,

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iodine oxides, HIO<sub>3</sub>) in the growth of marine ultrafine particles.

**Specific comments:**

Introduction, p. 20826, line24: please clarify what references therein the authors mean. This would be clearer for a reader.

Please, take the previous works into account in the manuscript.

**References:**

Ristovski et al. Characterization of iodine particles with Volatilization-Humidification Tandem Differential Mobility Analyser (VH-TDMA), Raman and SEM techniques. Atmos. Chem. Phys. Discuss., 6, 1481-1508, 2006.

Jimenez et al. New particle formation from photooxidation of diiodomethane (CH<sub>2</sub>I<sub>2</sub>). J. Geophys. Res.-A., 108(D10), art. no. 4318, 2003.

Saunders et al. Studies of the formation and growth of aerosol from molecular iodine precursor. Z. Phys. Chem. 224 (2010), 1095-1117/DOI 10.1524/zpch.2010.6143.

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Interactive comment on Atmos. Chem. Phys. Discuss., 10, 20823, 2010.