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Aircraft observations of a new DMS oxidation product over the North Atlantic using a HR-ToF-CIMS

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Marine ecosystems are an important component of the climate feedback system. One of the main pathways for ocean-climate interaction is through the oxidation of DMS (dimethyl sulphide), a gas released from phytoplankton in the sea surface. DMS derived products are known to be important in marine cloud formation and the Earth's radiation budget. Aerosol-Cloud interactions currently represent the largest uncertainty in climate modelling (Boucher et al., 2013). Our research focuses on airborne measurements using real-time high resolution instruments to identify and quantify trace oceanic biogenic gases on board the FAAM research aircraft. Here we present aircraft measurements made over the North Atlantic ocean using a HR-ToF-CIMS, across three seasons during the most recent ACSIS/ARNA campaigns. Here we report some of the first observations of an alternative DMS oxidation product, hydroperoxymethyl thioformate (HPMFT) using chemical ionisation mass spectrometry with iodide reagent ion. Observations of this novel species have never been reported in the atmosphere but laboratory studies suggest that the main oxidation route of DMS occurs through this species, in certain environments (Berndt et al., 2019). This has potentially significant climate implications, none of which are currently represented in global climate models. The fate of this newly measured species once in the atmosphere is uncertain but is likely to alter our understanding of the marine sulphur cycle. These observations along with laboratory and modelling studies will aid in being able to understand the role of HPMFT in the ocean-climate feedback system.

References

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