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Relationships linking satellite-retrieved ocean color data with atmospheric components in the Arctic

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We examined the relationships linking in-situ measurements of gas-phase methanesulfonic acid (MSA), sulfuric acid (SA), iodic acid (HIO3), Highly Oxidized Organic Molecules (HOM) and aerosol size-distributions with satellite-derived chlorophyll (Chl-a) and oceanic primary production (PP). Atmospheric data were collected at Ny-Ålesund site during spring-summer 2017 (30th March-4th August). We compared ocean color data from Barents Sea and Greenland Sea with concentrations of low-volatile vapours and new particle formation. The aim is to understand the main factors controlling the concentrations of atmospheric components in the Arctic in different ocean domains and seasons. Early phytoplanktonic bloom starting in April at the marginal ice zone caused Chl-a and PP in the Barents Sea to be higher than in the Greenland Sea during spring, whereas the pattern was opposite in summer. We found the correlation between ocean color data (Chl-a and PP) and MSA decreasing from spring to summer in Barents Sea and increasing in Greenland Sea. This establishes relationship between sea ice melting and phytoplanktonic bloom, which starts by sea ice melting. Similar pattern was observed for SA. Also HIO3 in both ocean domains correlated with Chl-a and PP during spring time. Greenland Sea was more active than Barents Sea. These results suggest that marine phytoplankton metabolism is an important source of MSA and SA, as expected, but also a source of HIO3 precursors (such as I2). HOMs had low correlation with ocean color parameters in comparison to other atmospheric vapours in this study both in spring and summer. The plausible explanation for low correlation is that the primary source of Volatile Organic Compounds (VOC) – precursors of HOM – is the soil of Svalbard archipelago rather than ocean. During spring, nucleation mode particles were found to correlate with Chl-a at Barents Sea and with PP at Greenland Sea. This means that biogenic productivity has a strong impact on new particle formation in spring although small particles are not related to biogenic parameters in summer.