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Using satellite data to determine sea spray aerosol production.

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Sea spray aerosol (SSA) consists of a suspension, in air, of particles that are directly produced at the sea surface. SSA particles are formed at the sea surface mainly by breaking waves via bubble bursting and by tearing of wave crests. The composition of SSA particles may differ from that of bulk sea water and research in the last decade has focused on the enrichment in organic matter in biologically active waters. One consequence of the enrichment in organic matter is that the hygroscopic and cloud droplet activation properties of sea-spray particles may differ from those calculated under the assumption that the particles are composed only of sea salt.
The amount of SSA produced per area of sea surface and per unit of time is described by the sea spray source function which can be formulated in terms of meteorological and oceanographic parameters. The most common of these parameters is the wind speed and in some cases also sea surface temperature is used to provide quantitative information on the production of SSA. In addition, information on enrichment in organic matter is obtained from satellite-derived ocean chlorophyll data which is used as a proxy. The scientific objective of the ESA Oceanflux Sea Spray Aerosol (OSSA) project is to further explore the use of satellite data to obtain information on the production of SSA and, based on the results, develop an improved source function. Satellite data provide information on a global scale, with a repeat time varying with the satellite platform and instrument and sampling strategy, of a variety of geo-physical quantities which often are only available as local point measurements, or through campaigns with a limited duration. The strategy of the OSSA project is to use these EO data in addition to already available information rather than replace it. For instance, excellent information on wind speed is available to the modelers through the ECMWF data with known and sufficient (in view of other uncertainties in the SSSF formulation) accuracy. Hence it will not be useful to replace this data with satellite observations. However, other information which may be important for the production of SSA, such as chlorophyll, sea surface temperature or wave information, is generally not available except from satellites and the use of such information has only been explored through few laboratory experiments and verified indirectly in the field. Satellites have thus far little been used for this purpose and the exploration of the use of such data may further develop the scientific understanding of the production of SSA and the role of SSA in atmospheric processes. In particular, OSSA sea spray source function results will be implemented in climate models to determine the SSA radiative effects, direct and indirect through aerosol cloud interaction.