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Whitecaps, sea-salt aerosols, and climate

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ABSTRACT

Natural and anthropogenic aerosols affect climate directly by scattering incoming sunlight, and indirectly by changing cloud properties and lifetime. The inclusion of radiative forcing of different types of aerosols, sea-salt aerosols among them, in climate models improves predictions. Aerosol generation is one of many processes that must be simulated.

The generation function for sea-salt aerosols currently used in climate models is based on the relation between whitecap coverage and wind speed. The generation function may be improved by accounting for the dependence of whitecap coverage on environmental variables in addition to wind speed. For this purpose, one needs data of global whitecap coverage under a variety of conditions. The existing database for whitecap coverage is limited and, except for atmospheric stability, does not allow the establishment of other relations. A new method for estimating whitecap coverage on a global scale using the brightness temperature of the sea surface measured by a satellite-borne passive microwave radiometer is proposed.

I will describe the various processes through which sea-salt aerosols affect climate. Then, I will show how sea-salt aerosols form from sea spray and how sea spray production is modeled. Finally, I will describe the concept of a new method for estimating whitecap coverage, demonstrate its feasibility with actual data, and compare the new method results with existing in situ measurements and calculations from traditional formulas.