Spatial and Temporal Characteristics of Satellite-measured Whitecap Coverage and Sea-Salt Aerosols

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ABSTRACT

Oceanic whitecaps are the major source of sea-salt aerosols. Sea-salt aerosols are the dominant natural aerosols in remote marine air. They control the radiative properties of the clean background atmosphere by scattering incoming sunlight, changing cloud properties and lifetime, and providing media for chemical reactions. The inclusion of sea-salt radiative forcing in climate models improves predictions. The generation of sea?salt aerosols is the first, and 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. Effects of other variables, beside wind, yield a more realistic evaluation of sea-salt aerosol loadings. A new method has been developed for estimating whitecap coverage on a global scale using the satellite?measured brightness temperature of the ocean surface. Whitecap coverage evaluated with this method incorporates the effects of sea-surface temperature, salinity, wind fetch, wind duration, and amount of surface-active material.

An extensive database of whitecap coverage has been compiled with the new method and used to derive spatial and temporal characteristics of oceanic whitecaps and sea-salt fluxes. We will present global daily and monthly maps of whitecap coverage. The spatial distribution of oceanic whitecaps will be discussed and compared with that calculated from wind speeds. The effect of sea-surface temperature will be demonstrated. Seasonal variations in whitecapping will be tracked. Implications of the new estimates of whitecap coverage will be illustrated by evaluating global sea-salt aerosol flux, CO2 exchange, and ocean albedo in the presence of whitecaps.