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Response of summertime low-level clouds in the Okhotsk Sea to oceanic meso-scale SST variability

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In summer, the Okhotsk Sea is often covered by low-level clouds or marine fog. The low-level clouds are formed mainly by downward sensible heat flux, which is in turn caused by low sea surface temperatures (SSTs) in the Okhotsk Sea. After cloud formation, mixing layers develop below the clouds because of longwave emission from the clouds together with shielding of incident shortwave radiation, leading to the enhancement of upward turbulent heat fluxes at the sea surface. These processes would thus produce a feedback between SST and low-level clouds, which by a rough estimate contribute significantly to keeping SST low in the Okhotsk Sea.

On the other hand, recent studies revealed atmospheric responses to SST variations with scales of western boundary currents to meso-scale eddies. Because this kind of SST variability is also abundant in the Okhotsk Sea, questions would occur whether or not summertime low-level clouds respond to such SST variability, and if it does, in what conditions, how strong, whether it affects the SST–cloud feedback or not.

In order to investigate these possibilities, we conducted numerical simulations of summertime low-level clouds in the Okhotsk Sea with a horizontal resolution that permits the oceanic meso-scale variability.

Keywords: Okhotsk Sea, low-level clouds, sea surface tempetarure, meso-scale variability