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Observed reduction in low-level clouds over the northeastern Pacific attributed to increase in sea surface temperatures

Hendrik Andersen^{1,2}, Jan Cermak^{1,2}, and Lukas Zipfel^{1,2}

¹Institute of Meteorology and Climate Research, Karlsruhe Institute of Technology, Karlsruhe, Germany
(hendrik.andersen@kit.edu)

²Institute of Photogrammetry and Remote Sensing, Karlsruhe Institute of Technology, Karlsruhe, Germany

In this contribution, a significant reduction of low-level marine clouds (LLCs) in the northeastern Pacific is found over a 20-year period in satellite observations and attributed to increasing sea surface temperatures (SSTs).

LLCs play a key role for the Earth's energy balance, however, their response to climatic changes is not clear, yet. Here, 20 years of Clouds and the Earth's Radiant Energy System (CERES) cloud observations are analyzed together with reanalysis data sets in multivariate-regression and machine-learning frameworks to link an observed decrease of LLCs in the subtropical northern Pacific to changes in environmental factors. In the analyses, the observed LCC trend is explained almost exclusively by an increase in SSTs, but counteracted to some extent by increased low-level moisture availability. The influence of other factors such as estimated inversion strength, local winds and aerosols is investigated in the statistical frameworks but found to be negligible when compared to the effect of SST changes. The results provide observational evidence for the low-cloud feedback that back model findings of reduced LCC due to increased SSTs in a changing climate.