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Optically thin clouds in the winter trades

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We investigate the abundance and radiative effect of small and optically thin clouds in trade wind cumulus cloud fields from high-resolution satellite imagery. Using radiative transfer calculations to simulate clear-sky observations, we can identify optically thin cloud areas in ASTER images, a signal that is undetected by the satellite products that are commonly used for cloud radiative effect and cloud feedback analysis. Results from the analysis within the EUREC4A campaign suggest that the area covered by optically thin clouds is approximately as big as the area covered by clouds that are detected by common cloud masking algorithms. Compared to clear-sky ocean observations, the enhanced radiance from optically thin clouds leads to a high-bias in clear-sky estimates and hence a low-bias in the estimated radiative effect of trade wind cumuli. Next to the radiative effect, we discuss further implications that a broad cloud optical depth distribution might have on modelling results of a perturbed climate.