

Benchmark Dataset for Constraining Trade-Cumuli Feedback with Process Understanding

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Project Overview

Climate models widely disagree on how tropical low-level clouds will respond to climate warming, thus causing large uncertainty in climate sensitivity estimates. The underlying reason for the models' disagreement is a poor understanding of processes of shallow convection, in particular on scales that remain unresolved in current climate simulations. We lead an ISSI (International Space Science Institute, Bern) International Team (<https://teams.issibern.ch/tradecumulifeedback/>) which aims to understand the mesoscale processes that couple trade-cumuli to circulations in order to constrain their feedback, with a focus on the spatial patterning of these clouds — a largely ignored feedback component. The Team comprises of 13 scientists from 6 countries and multiple institutions who work on shallow convection. We use novel field measurements of clouds and circulation, satellite observations, and large-eddy simulations to understand aforementioned mesoscale processes. Our goal is to improve process-understanding and thus, constrain the wide range of cloud-feedback provided by climate models. One of the expected outcomes of our Team is a joint reference data-set providing regional mesoscale quantities as benchmarks for the modelling community to validate their simulations. With the help of this data-set, the Team will also disentangle the trade-cumulus feedback into its individual components, and provide a basis for future investigations.

We ask for resources from the Swift system of DKRZ for the storage of this benchmark dataset, thus allowing our Team to access and use the data with ease as well as enabling the wider scientific community to utilize the data without access restrictions. The dataset will be synthesized in a uniform format, by compiling analyses from multiple public-domain sources such as field-campaign measurements, satellite measurements and large-eddy simulations. We also request some Levante resources temporarily to make the dataset Swift-ready.