Thin tropical clouds cool the climate

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On this picture, thin mid-level clouds are observed in the foreground with deep convective clouds in the background. Credit: Radovan Krejci

Thin clouds at about 5 km altitude are more ubiquitous in the tropics than previously thought and they have a substantial cooling effect on

climate. This is shown in a recent study by researchers from Stockholm University and the University of Miami published in *Nature Communications*. The cooling effect of mid-level clouds is currently missing in global climate models.

"Using the satellite observations and high-resolution numerical modelling, we find that thin mid-level clouds are frequently formed in the tropics in the vicinity of deep convective clouds and that their cooling effect could be as large as the warming induced by high cirrus clouds", says lead author of the study Quentin Bourgeois, postdoctoral associate at the Department of Meteorology (MISU) and the Bolin Centre for Climate Research, Stockholm University.

Clouds play a pivotal role in determining the Earth's climate and radiation budget, yet we still have a lot to learn about them. In particular, little is known about mid-level clouds, i.e. clouds located at approximately 5 km altitude, as these clouds are challenging to study.

"To bridge our gaps in knowledge about thin mid-level clouds we used space-borne lidar instruments that provide detailed information on the vertical distribution of clouds", says Quentin Bourgeois.

The scientists anticipate that their study will trigger further interest in thin mid-level clouds, which have been neglected for too long. In particular, the mechanism of their formation is not well understood yet. The authors also hope that the climate research community will factor in clouds in climate models more often in the future so that projections of climate change will become more accurate.

Clouds effects on global climate

Clouds cover about 70% of the Earth's surface at any time. Different types of clouds affect the Earth's climate differently: low liquid clouds,

such as the cotton-like cumulus, cool the Earth while high altitude ice clouds, such as the wispy cirrus, warm the climate. Overall, clouds cool the climate by about 20 W m-2. In contrast, the Earth receives on average about 340 W m-2 energy from the sun every day and our current emissions of anthropogenic greenhouse gases warm the climate by about 3 W m-2.

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