

## **Measurements of solar and terrestrial heating and cooling rate profiles in Arctic and sub-tropic stratocumulus**

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Stratocumulus covers approximately 20 % (annually averaged) of the Earth's surface and thus strongly influences the atmospheric and surface radiative energy budget resulting in radiative cooling and heating effects. Globally, the solar cooling effect of the widespread sub-tropical stratocumulus dominates. However, in the Arctic the solar cloud albedo effect (cooling) is often smaller than the thermal-infrared greenhouse effect (warming), which is a result of the lower incoming solar radiation and the low cloud base height. Therefore, Arctic stratocumulus mostly warms the atmosphere and surface below the cloud. Additionally, different environmental conditions lead to differences between sub-tropical and Arctic stratocumulus.

Broadband pyranometers and pyrgeometers will be used to measure heating and cooling rate profiles in and above stratocumulus. For this purpose two slowly moving platforms are used (helicopter and tethered balloon) in order to consider for the long response times of both broadband radiation sensors. Two new instrument packages are developed for the applied tethered balloon and helicopter platforms, which will be operated within Arctic and sub-tropical stratocumulus, respectively. In June 2017, the balloon will be launched from a sea ice floe north of 80 °N during the Arctic Balloon-borne profiling Experiment (ABEX) as part of (AC)<sup>3</sup> (Arctic Amplification: Climate Relevant Atmospheric and Surface Processes and Feedback Mechanisms) Transregional Collaborative Research Center. The helicopter will sample sub-tropical stratocumulus over the Azores in July 2017.