

Cloud Observations and Processes in Sea Breeze Inducted Convection over South-west Saudi Arabia

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Abstract

The Saudi Aerosol-Cloud-Precipitation Enhancement Campaign (SARPEC) aims to determine the effectiveness of operational cloud seeding techniques for rainfall augmentation within the arid climates of the Kingdom of Saudi Arabia. The first SARPEC intensive operational period (IOP) occurred in the late summer of 2023 coincident with the seasonal monsoon of the Asir mountains/escarpment of south-west Saudi Arabia. In-situ measurements of cloud microphysics properties are obtained using the North Dakota Citation Research Aircraft, which deployed a Cloud Droplet Probe (CDP), a Cloud, Aerosol, and Precipitation Spectrometer with Depolarization (CAPS-DPOL) and Precipitation Imaging Probe (PIP). Five cloud physics missions occurring from 5 August 2023 to 16 August 2023 had two scientific objectives. The first was to perform cloud penetrations at various levels (-10 °C, -15 °C, -20 °C) above cloud base to determine how liquid water content properties vary with vertical development, and the second was to observe the effects of ice crystal aggregation processes. The 5 August 2023 flight measured a core at both -15.9 °C (22 kft) and -18.5 °C (25 kft). The cloud core droplet effective radius had a small increase in size from 7.8 to 9.2 μm at the higher altitude and similar concentrations (586 and 570 cm^{-3}), which indicates a lack of droplet coalescence in parcels moving upward through the core.

Conference

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