

Impact of Desert Dust and Biomass Burning on the Radiative Budget of the Sahel

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Overview

Observations indicate a global decrease in the Diurnal Temperature Range, the difference between daily maximum and minimum temperatures, during the late 1900s. Numerous studies indicate that increases in precipitation or cloud cover decrease DTR; however, the Sahel region of Africa suffered an extreme drought during this period. Working with the Weather Research and Forecasting model, we modelled five case days from the dry season (Oct-Dec) of the Sahel. Our results demonstrate that dust from the Sahara and biomass burning are capable of reducing daily maximum temperatures while increasing daily minimums.

Impact

Sahelian climate is extraordinarily sensitive to perturbations. Any change in the spatial distribution of temperatures can alter precipitation patterns and lead to droughts such as those seen in in the late 1900s. Such droughts are devastating to the region's economy and displace thousands of people, prompting a humanitarian crisis. Therefore it is imperative to quantify how aerosols affect the Sahelian radiation budget. A full understanding will enable us to prepare for, or even prevent, such disasters in the future.

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Key Findings

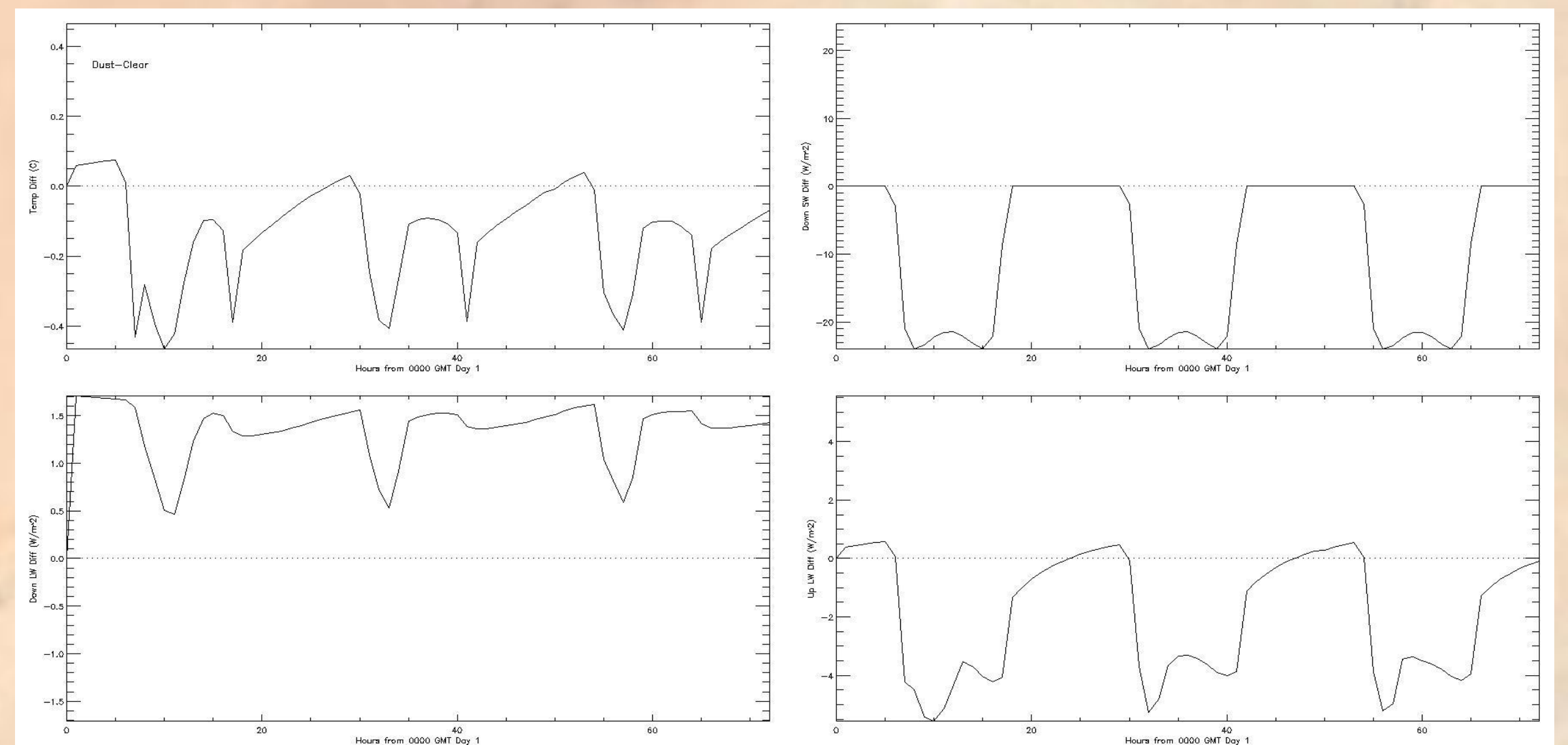


Figure 1 – Mean difference in surface variables for the five case days hour-by-hour. Differences are dusty days minus clear days.

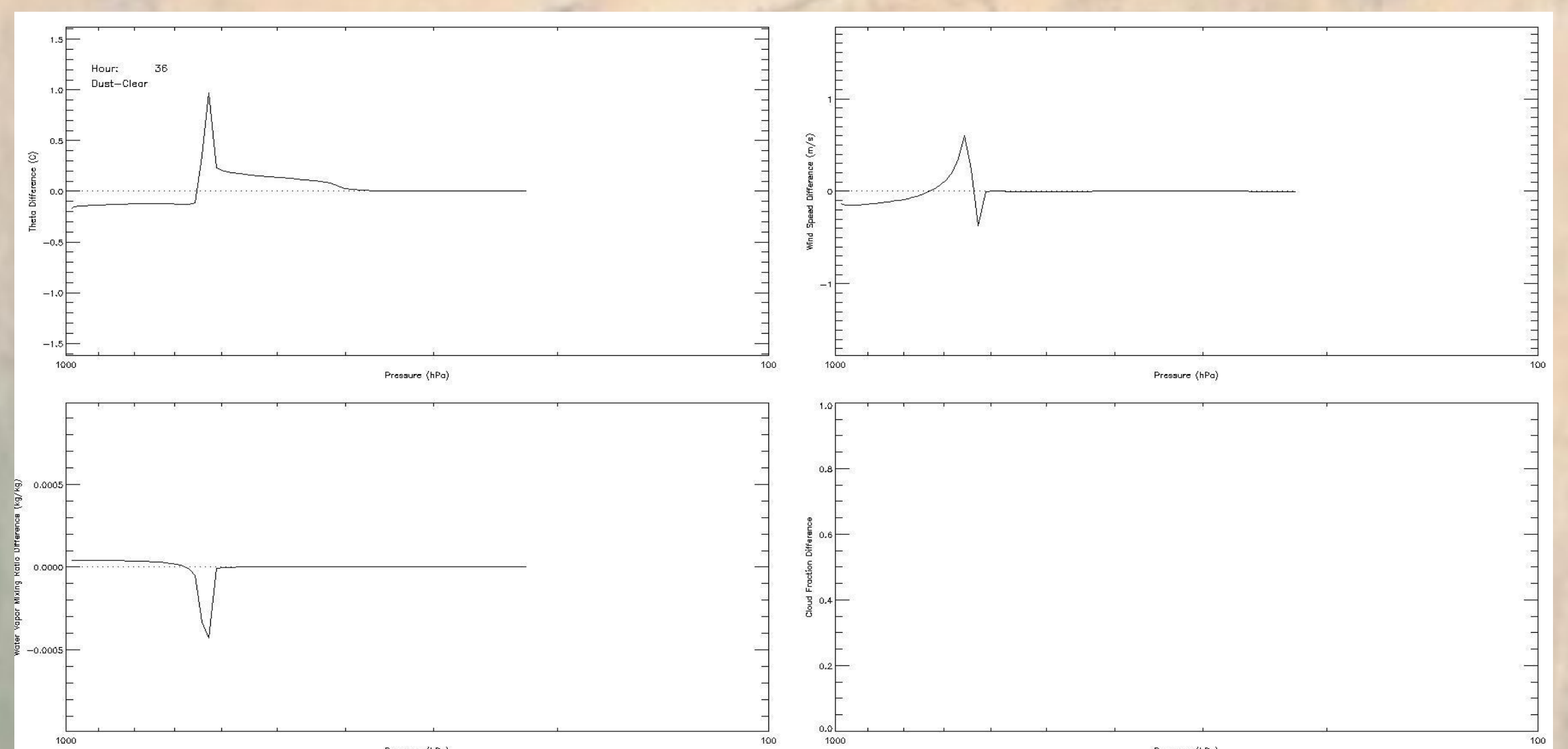


Figure 2 – Mean difference in vertical variables for the five case days at the 36th hour of the model simulation. Differences are dusty days minus clear days.

Explanation

Preliminary studies such as this reveal systems about which we know little. To fully understand the mechanisms of the Sahel will likely required space-based remote sensing techniques. By utilizing space-based observations in future studies, research on topics like Sahelian climate change demonstrate to the public that a strong presence in space is both beneficial and necessary to the well-being of humanity.