

Re-evaluating the role of the Saharan Air Layer in Atlantic tropical cyclogenesis and evolution

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Abstract

The existence of the Saharan air layer (SAL), a layer of warm, dry, dusty air frequently present over the tropical Atlantic Ocean, has long been appreciated. The nature of its impact on hurricanes remains unclear, however, with some researchers arguing that the SAL amplifies hurricane development and with others arguing that it inhibits it. Most research in recent years has emphasized the potential negative impacts of the SAL, but is this emphasis justified? The potential negative impacts of the SAL include 1) vertical wind shear associated with the African easterly jet; 2) warm air aloft, which increases thermodynamic stability at the base of the SAL; and 3) dry air, which produces cold downdrafts. Multiple NASA satellite data sets and NCEP global analyses are used to characterize the SAL's properties and evolution in relation to tropical cyclones and to evaluate these potential negative influences. The results suggest that the negative influences of the SAL have been significantly over-emphasized, in part because of several false assumptions about the structure and role of the SAL.