Influence of Large-scale Variations in Convective Available Potential Energy (CAPE) and Solar Cycle Over Temperature in the Tropopause Region Over India Using Radiosonde During 1980–2005

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We have shown the relationship between seasonal, annual, and large-scale variations in convective available potential energy (CAPE) and the solar cycle in terms of temperature at the 100-hPa pressure level using daily radiosonde data for the period 1980–2006 over Delhi (28.3°N, 77.1°E) and Kolkata (22.3°N, 88.2°E) and for the period 1989–2005 over Cochin (10◦N, 77◦E) and Trivandrum (8.5°N, 77.0°E), India. In general, there was a tendency for increases in CAPE to be associated with decreases in temperature at the 100-hPa pressure level on all time scales. Decreasing linear trends in temperature were found at Delhi and Kolkata over the period 1990– 2006. Our analysis suggests that the trend towards increasing convective activity in the troposphere leads—at least partly—to the trend towards cooling in the tropopause region. High CAPEs are, in general, associated with high rainfall. The minimum annual temperatures were observed almost simultaneously with enhanced annual CAPE during the northern summer, with a larger anti-correlation (−0.62) over Delhi than at other stations. The influence of the solar cycle on the control of temperature was significant (~4–5°C) only around 8–10°N. Temperature variations in the upper troposphere are viewed as being jointly controlled by CAPE and the solar cycle, with the respective contribution of each being location-dependent.