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Diurnal variation of convective activities over tropical Africa and its associated upper tropospheric humidity variation

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Diurnal variations of upper tropospheric humidity (UTH) as well as middle tropospheric humidity (MTH) were examined in conjunction with the diurnal cycle of convection over tropical Africa and the adjacent tropical Atlantic Ocean using Meteosat-8 measurements. Cloud and humidity features were also tracked to document the diurnal variations of humidity and clouds in the Lagrangian framework.

A distinct diurnal variation of UTH (and MTH) is noted over regions where tropical deep convective cloud systems are commonly observed. The amplitude of the UTH diurnal variation is larger over land, while its variations over convectively inactive subtropical regions are much smaller. The diurnal variation of UTH tends to peak during nighttime over land, lagging deep convection and high cloud whose maxima occurred in the late afternoon and the evening, respectively. The time lag between the maximum UTH and deep convection/high cloud maxima over the ocean appears to be longer in comparison to that found over land. It was also indicated that both the UTH (and MTH) and the cirrus anvil cloud show a variation which is in phase, implying that moistening of the upper troposphere is closely linked to process of development and dissipation of deep convective clouds.