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Diurnal variations in water vapor over Central and South America

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Diurnal variations in atmospheric integrated water vapor (IWV) are studied employing IWV estimates, with a 30 minutes sampling rate, derived from Global Navigation Satellite Systems (GNSS) observations during the period 2007-2013. The analysis was performed in 70 GNSS tracking sites (GPS + GLONASS) belonging to Central and South America, which have more than 5 years of data. The selected area involves different climate types, from polar to tropical, and diverse relieves, therefore the patterns of IWV diurnal variations are very different for each station.
There are many processes that could induce diurnal variations in atmospheric water vapor (Dai et al, 1999 a,b), the most relevant causes are: surface evapotranspiration, atmospheric large-scale vertical motion, atmospheric low-level moisture convergence and precipitation and vertical mixing (which affects the vertical distribution of water vapor but does not affect the IWV).
Firstly, our work study the main characteristics of the IWV diurnal cycle (and for surface temperature, T) obtained for all stations together, using Principal Component Analysis (PCA). First and second PCA modes highlight the global main behaviors of IWV variability for all stations. The first mode on IWV represent the 70% of the variability and could be related to the surface evapotranspiration, while the second mode (27 % of the variability) is practically in counter phase to T variability (its first mode represent the 97% of the variability), therefore this mode could be related to breeze regime.
Then, every station is separately analyzed and seasonal and local variations (relative to the relives) are detected, these results spotlight, among other characteristics, the sea and mountain breeze regime.
This presentation shows the first analysis of IWV diurnal cycle performed over Central and South America and another original characteristic is PCA technique employed to infer the results.

Reference:
Dai, A., K. E. Trenberth, and T. R. Karl, 1999 a: Effects of clouds, soil moisture, precipitation and water vapor on diurnal temperature range. J. Climate, 12, 2451-2473.
Dai, A., F. Giorgi, and K. E. Trenberth, 1999 b: Observed and model simulated precipitation diurnal cycle over the contiguous United States.J. Geophys. Res., 104, 6377-6402.