Geophysical Research Abstracts
Vol. 12, EGU2010-76, 2010
EGU General Assembly 2010
© Author(s) 2009

Patterns of intraseasonal temperature variability and their relations with enhanced local predictability

Gustavo Naumann and Walter Vargas
CONICET - UBA, Buenos Aires, Argentina (gnaumann@at.fcen.uba.ar)

The knowledge of patterns that represent variability at the intraseasonal scale is one of the keys to understand the processes involved in this time scale. Current weather predictions indicate that predictability is relatively good for three weeks (Simmons and Hollingsworth 2002), however some spatial and temporal structures can be predicted beyond this period. Detecting these structures is difficult because unpredictable patterns that govern the physical effects exist superimposed on the predictable ones (Del Sole and Tippet, 2007). However, some persistent components can be predictable beyond three weeks and can also explain the variability of the monthly means, even if these processes explain little of the daily variability (Shukla 1981a). In this light, Lorenz (1969) and Shukla (1981b) explain that large-scale dynamical processes tend to be more persistent and hence more predictable than small-scale processes.

To detect the thermal structures that produce persistent phenomena a wavelet spectral analysis was performed over the daily maximum and minimum temperatures. The stations or reference series used in the analysis must have long records of high quality measurements, and must represent different or specific climatic regions of southern South America. This analysis aims to detect the main spectral features at the intraseasonal scale, where non-linear effects tend to produce quasi-periodicities over the daily temperature in the region.

A major feature is the 30-60 days quasi-periodicities in daily temperatures that seem to appear over the entire region. In general these periodicities can persist from 30 to 100 days. This means that the transitions between cold and hot events (a 30-60 days pattern) can persist over an entire season. Moreover, the occurrence of these periodicities has a markedly seasonal behavior with a maximum during winter which is highly related with the extreme cold air outbreaks.

An interannual analysis shows that the intraseasonal periodicities have 30 to 50 % probability of occurrence. Furthermore, we can observe that they tend to appear usually at 1-2 year intervals, less frequently at 4-12 year intervals and rarely at 20-year intervals. This behavior indicates the existence of biennial and triennial processes with specific circulation patterns that generate persistent events, as well as other processes in which different effects seem to prevail.

In order to detect the intraseasonal patterns of the thermal structure, both a principal components analysis (PCA) and a cluster analysis were performed. These methodologies show similar results. This pattern shows regional coherence, with a similar pattern in the whole region. The oscillation pattern is characterized by an increased intraseasonal signal in winter for the maximum and minimum temperatures.

The analysis of the two variables shows that the beginning of this signal is associated with a warm air outbreak followed 30 days later by an intense cold air outbreak. Following this, a hot wave is observed during the month of July and approximately 30 days later another strong cold outbreak is detected. Before and after this period the intraseasonal signal is rather inconsistent with negligible amplitudes.