Title: Response of Air Surface Temperatures over Central America to Oceanic Climate Variability Indices

Author: Eric J. Alfaro

Institution: School of Physics (LIAP-DFAOP), Center for Research in Geophysical Sciences (CIGEFI) and Center for Research in Marine Sciences and Limnology (CIMAR), University of Costa Rica, 2060-Ciudad Universitaria Rodrigo Facio, San José, Costa Rica. E-mail: *ejalfaro@cariari.ucr.ac.cr*. Tel:(506) 207-5320. Fax: (506) 234-2703.

EXTENDED ABSTRACT

In this study were used 337 grid points (0.5 ° latitude x 0.5° longitude), over Central America, from a monthly air surface temperature data set. The Central American air surface temperature showed homogenous variations in two important aspects: the annual cycle and the seasonal variations. These variations were explained mainly by the first principal components. The region also shows a clear positive trend that is in agreement with the global temperature pattern that supports the idea of global warming.

Multiple regression models were adjusted between the temperature first principal components (dependent variables) and several Sea Surface Temperature indices (independent variables) for all the seasons. The models fixed showed that the ENSO indices, Niño 3 and 4, have the largest influence over the region when compared with the influence of the other indices, having positive correlation with all the first surface temperature principal components. This explains more than the 53% of the variance in the region. It could be an indicative of latent and sensible heat transfer from the ocean to the overlying atmosphere. All these models had percentage of detection greater than 50% and false alarm rates lower than 19%. Also, in spite that the Skills of the models fixed are high (> 0.6), the methodology is recommended for its use in a categorical way for climate predictions. In this aspect, the analysis of the categorical scores showed predictability potential, because they had high probability of detection and low false alarm rate scores.

Those results agree with the Transfer Function Model fixed to Sea Surface Temperature Anomalies (SSTA) of the Gulf of Tehuantepec, Papagayo, Panama and Quepos time series. These models show that Niño 3.4 has the most important influence over the region when compared with the influence of the other indices, having positive correlation with all the SSTA series. It shows an influence of this index on the relative termocline's depth in front of the Central American Pacific Coast.

In the decadal scale, the first mode of the Air Surface Temperature Anomalies (ASTAs) looks to be related with the eastern tropical Pacific, the second mode with the tropical north Atlantic and the central tropical Pacific and the third mode with the tropical south Atlantic.

The results of these regression models and the correlation analysis, suggest that in general eastern Pacific (mainly) and Atlantic variability in both interannual and decadal scales, has a clear positive influence over the air surface temperature in Central America, in which warm (cold) SSTA events are correlated with warm (cold) ASTA events. This remote or local connection could be active through several processes like the modulation of the size and SSTs magnitude of the warm pool near Central America or by inducing some anomalous troposphere patterns (e.g. PNA or wind shear). The first process affects the sensible and latent heat transfer from the ocean to the atmosphere and the second could alter the seasonal behavior, directly or through feedback processes, of some atmospheric variables like SLP, surface wind and precipitation that are related with the air surface temperature in the region.

On the other hand, precipitation decadal variability showed positive correlations with decadal SSTA variability in the Tropical North Atlantic (TNA) and in the eastern tropical Pacific. The modulation of the TNA in this time scales is very similar to what is proposed for the interannual scale, but for the Niño 3 is opposite, showing that warm (cold) events are associated with convergence (divergence) in low levels over Central

America and divergence (convergence) in high levels. This flow pattern could be associated to processes that work in favor (against) the deep convection over the region.

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