OBSERVATIONAL STUDY OF THE MID SUMMER DROUGHT DURING THE CLIMATE EXPERIMENT IN THE AMERICAS WARM POOLS

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Introduction

The Mid Summer Drought (MSD), a relative minimum in convective activity in the middle of summer over the tropical northeastern Pacific, has been described by Magaña et al (1999). Such characteristic in the summer season is related to the seasonal evolution of the Sea Surface Temperature over the eastern Pacific warm pool. While the MSD occurs over the eastern Pacific, a maximum in precipitation is observed over the Caribbean coast of Central America.

The eastern Pacific warm is active in terms of tropical convection over the Inter Tropical Convergence Zone (ITCZ), while the Caribbean warm pool is free of convection, except off the coast of Nicaragua and Costa Rica. These warm pools appear to be connected through dynamical mechanisms, including a low level jet. Perturbations over such barotropically unstable jet appears to result in disturbances that manifest in the eastern Pacific warm pool, that at times may even become tropical cyclones.

During the summer of the 2001, the Climate Experiment over the Americas Warm Pools, known as ECAC, was conducted to test hypothesis related to the onset of the rainy season, the dynamics of the MSD, and the characteristics of the low-level jet over the Caribbean. ECAC is described in a previous presentation in this volume by Magaña et al (2002). In the present work, some preliminary results on the dynamics of the MSD are discussed using information collected during ECAC, following Magaña et al´s hypothesis. The analyses consider changes in the atmospheric and oceanic conditions.

The MSD during the summer of the 2001

As can be observed from precipitation reports from stations along the southern Pacific coast of Mexico and rainfall estimates over the eastern Pacific warm pool, the MSD was present in the 2001 (Fig. 1) as in any normal year.

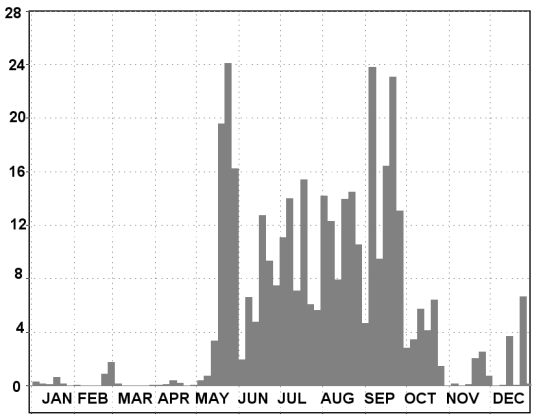

Fig. 1 Pentad precipitation (mm/day) during 2001 over the eastern Pacific warm pool.

As proposed by Magaña et al (1999), fluctuations in convective activity over this warm pool should lead to changes in the intensity of precipitation and consequently to the MSD. However, such changes in SST over the warm pool were only determined through the use of satellite estimates, which did not show a clear bi-modal structure during summer. Based on actual in situ measurements of SST during three periods (18 – 28 May, 7

– 27 July, and 1 – 9 September), the changes in SST over the warm pool related to the MSD could be detected (Fig.2). When the SST observations are compared with those obtained through satellite estimates it is determined that a systematic error of around 1°C exists. Even more, the satellite estimates hardly exhibit the month by month changes in SSTs.

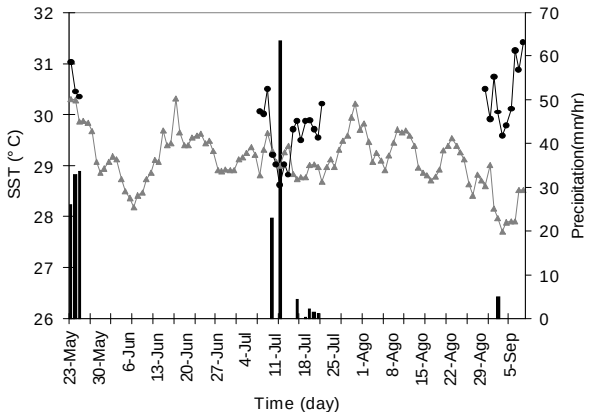

Fig. 2 Time series of observed (•) and satellite estimated (Δ) SST, and precipitation (bars) during the summer of 2001 over the eastern Pacific warm pool.

Changes in downwelling short wave radiation near the surface were also measured. It is observed that during intense precipitation, solar radiation and the SST decrease over the warm pool region. The latter may be up to 2°C in one day. However, the SST may rapidly recover to values above 30°C.

The vertical profiles of humidity over the warm pool do not show substantial changes from one month to another. However, more in depth analysis of precipitable water are necessary.

During July, the low level jet over the Caribbean Sea reached maximum intensity, with values of up to 15 m/s over 14N, 78W. In a couple of times, the flow through the Central American mountains appeared to generate cyclonic circulations through the interaction with southerly flow along the Pacific coast of Central America.

Conclusions

As proposed by Magaña et al (1999), the SSTs over the eastern Pacific exhibit a double peak; one prior to the onset of the rainy season, and a second one during August. Changes in solar radiation over the surface, due to the presence of deep convective clouds, results in decreases in SST. It is not clear what the role of winds over this region is.

The interaction of the easterly flow from the Caribbean and the Central American topography should be further explore, particularly in relation to the flow over the Papagayo gap. This analysis may result relevant in tropical cyclogenesis studies over the eastern Pacific.

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References

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