NOTES AND CORRESPONDENCE

Comments on "Rainfall Variability in Equatorial and Southern Africa: Relationships with Sea Surface Temperatures along the Southwestern Coast of Africa"

LEONARD M. DRUYAN*

NASA/Goddard Space Flight Center, Institute for Space Studies, New York, New York

6 August 1987

In a discussion that refers to the relationship between warm sea surface temperatures (SST) in the southeast Atlantic Ocean and enhanced precipitation over southern Africa, Nicholson and Entekhabi (1987) relate the warm SST events to weakened subtropical anticyclones. They reason that the accompanying weaker surface circulation reduces upwelling between 10°–30°S and allows the infiltration of warm equatorial water into the African coastal waters between 0°–10°S. Indeed, this reasoning is widely accepted in explanation of warm SST off the west coast of South America during El Niño events (Streter and Zillman 1984), and it is just as likely valid for the Atlantic Ocean.

Nicholson and Entekhabi do not, however, consider the effect of the weakened circulation on the SST that results from its impact on the air–sea energy budget. I have examined monthly mean SST difference fields in the South Atlantic generated by the GISS 3-D climate model (Hansen et al. 1983) with an interactive ocean (Druyan 1987). In this version of the model, ocean transports are held constant while SST are allowed to respond to local imbalances in the air–sea energy exchange. Model simulations also show a coincidence of warmer SST near southwest Africa with weaker surface winds (and lower sea level pressure). However, the model design does not provide for changes in upwelling or for changes in warm water advection. Rather, computations of warm SST and lower wind speed correspond to spatially coherent reductions in the evaporation rate from the sea surface, which is very sensitive to surface wind speed. Thus, the weaker circulation reduces the upward latent heat flux and thereby contributes to the maintainance of warm SST anomalies. *This suggests that the reduction of evaporation rates may be an important factor in the persistence of the warm pools of ocean surface water,* even in the absence of anomalous ocean heat transports.

I would also like to suggest that the discussion of causal mechanisms by Nicholson and Entekhabi would be made more consistent by making two small changes to the text in the middle paragraph on p. 573: "Temperature fluctuations are partially governed by the intensity of winds parallel to the shore, which affects the intensity of upwelling and the advection of cold (warm) water from more *southerly* (northerly) latitudes . . . ." and also "*Higher* sea surface temperature implies a weakening of the high . . . during warm water years. . . ."

* Senior Research Associate, sponsored by the National Research Council, National Academy of Sciences. On leave from Bar Ilan University, Israel.

Corresponding author address: Dr. Leonard M. Druyan, NASA/GSFC, Institute for Space Studies, 2880 Broadway, New York, NY 10025.

REFERENCES

Druyan, L., 1987: GCM studies of the African summer monsoon. *Climate Dynamics,* **2,** 117–126.

Hansen, J., G. Russell, D. Rind, P. Stone, A. Lacis, S. Lebedeff, R. Ruedy and L. Travis, 1983: Efficient three-dimensional global models for climate studies: models I and II. *Mon. Wea. Rev.,* **111,** 609–662.

Nicholson, S., and D. Entekhabi, 1987: Rainfall variability in equatorial and southern Africa: relationships with sea surface temperatures along the southwestern coast of Africa. *J. Climate Applied Meteor.,* **26,** 561–578.

Streter, N., and J. Zillman, 1984: Climate of the South Pacific. *World Survey of Climatology,* Vol. 15, H. van Loon, Ed., Elsevier, 358–361.