Fourth Method of El Niño Prediction

The Third Addendum

by

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Main Paper (15 JAN 98)
Mystery of El Niño and Hurricanes

First Addendum (25 JAN 98)
Prediction of 1997-98 El Niño

Second Addendum (25 JAN 98)
Scaling El Niños: Fujita El Niño Scale

Third Addendum (26 FEB 98)
Fourth Method of El Niño Prediction

Notice: Above Addenda are included in World Atlas of Typhoons and Hurricanes

After proposing the Triple Independent Methods of El Niño Prediction, I wish to propose the Fourth Method based on the streaks of the Maximum Positive Anomaly.

Figure 6 presents the vertical cross section of Peru and Equatorial Currents characterized by the Equatorial and Gunther Under Currents. The depth and strength of these under currents could vary significantly.

SST of Peru Current varies with the Southern Hemisphere mode (p22 and Fig. 1). Figure 1 shows the SST isotherms of Peru and Equatorial Currents combined. Peru Current is relatively cold or warm according to the Southern Hemisphere seasons which do not influence significantly the anomaly pattern (Fig. 2).

It is of interest to find that the -150m subsurface temperature is 4° to 7°C warmer, inducing the annual mound of warm isotherms (Fig. 3). Temperature-longitude cross sections along the equator show the depth of the maximum positive anomaly where the descending water reaches the maximum warming, suggesting that the deeper the penetrating depth, the stronger the descending current (Fig. 4).

Unexpectedly, the isotherms of the Maximum Positive Anomalies (MPAs) revealed the existence of the dual streaks (Fig. 5) which originated 20° to 30° to the west of the equatorial front only in El Niño year, not in La Niña year.

If the formation of the MPA streaks can be applied to other El Niños, the onset and propagation of MPA streaks can be used as one of the predictors of El Niño.

Prediction Methods	First Indication Months
No. 1 Positive anomaly at 25°S	+1°C in JAN 97, +1.5°C in MAR 97 (p53)
No. 2 Movement of Equatorial Front	At sea surface, in NOV 96 and JUL 97 (p54)
No. 3 SLP Anomaly	At Easter Island in FEB - MAR 97 (p46)
No. 4 MPA Streak	In JAN - MAR 97 (Addendum 3)

I hope that these four methods will further increase the lead time of El Niño predictions. However, the lead time of predictions should be defined.

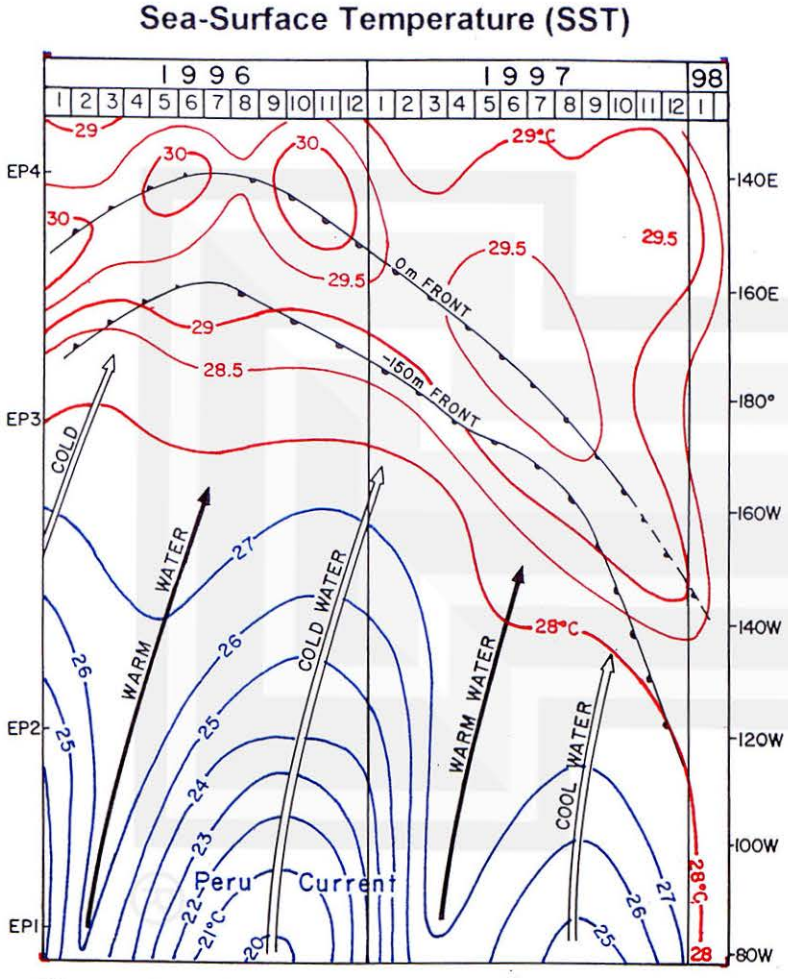

Figure 1. Sea-surface temperature from EP 1-4 (blue) and depth-temperature cross sections (red).

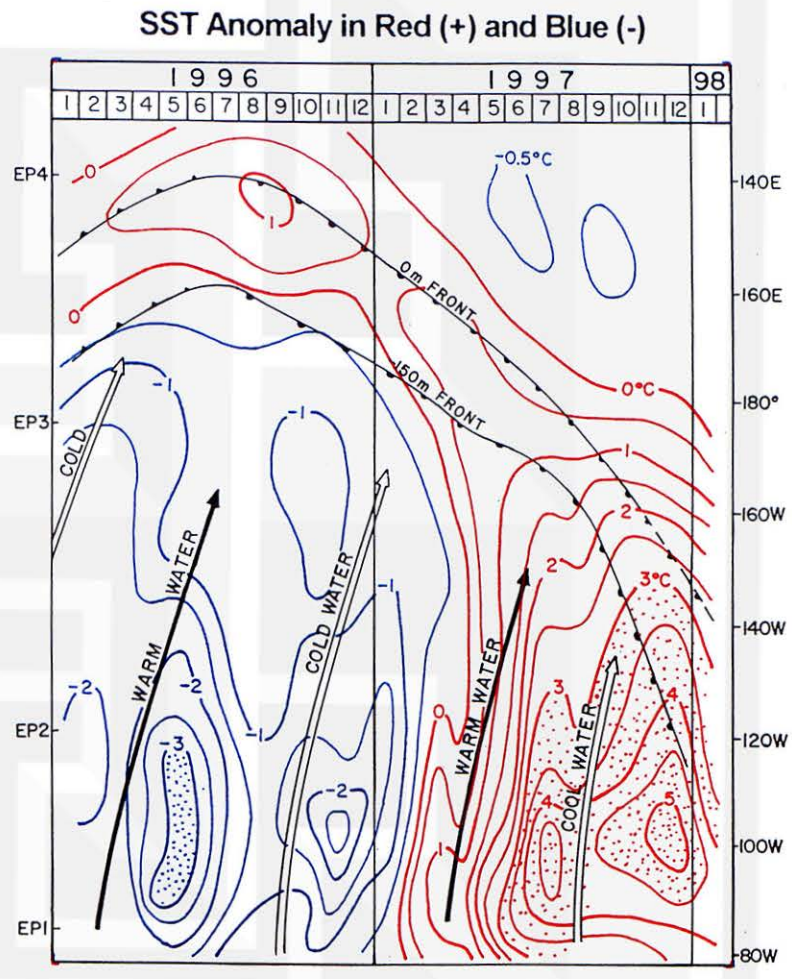

Figure 2. SST anomaly from depth-temperature cross sections (D-TCS).

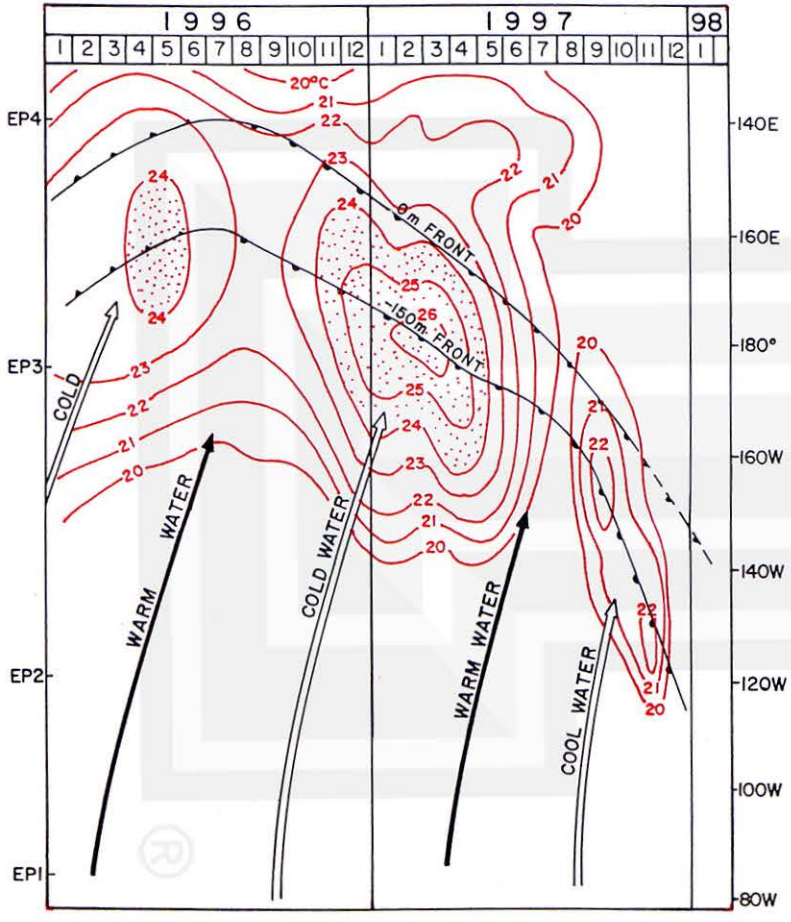

Figure 3. Mounds of high temperature at -150 m from D-TCS.

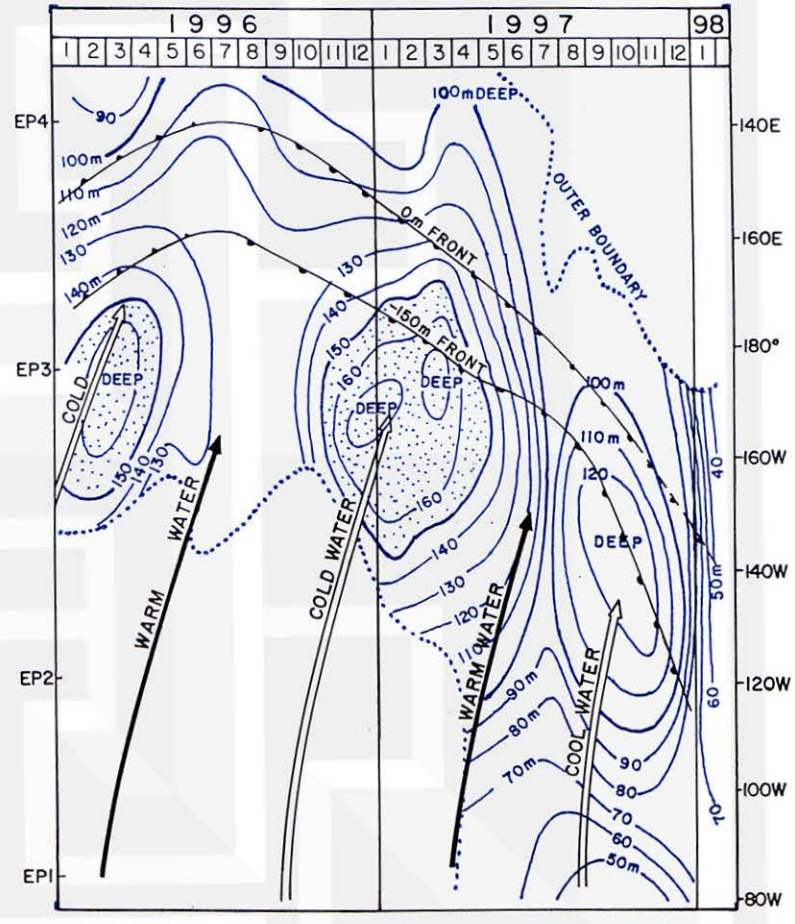

Figure 4. Pattern of MPA in meters. The deeper the DPA the warmer the mound temperature.

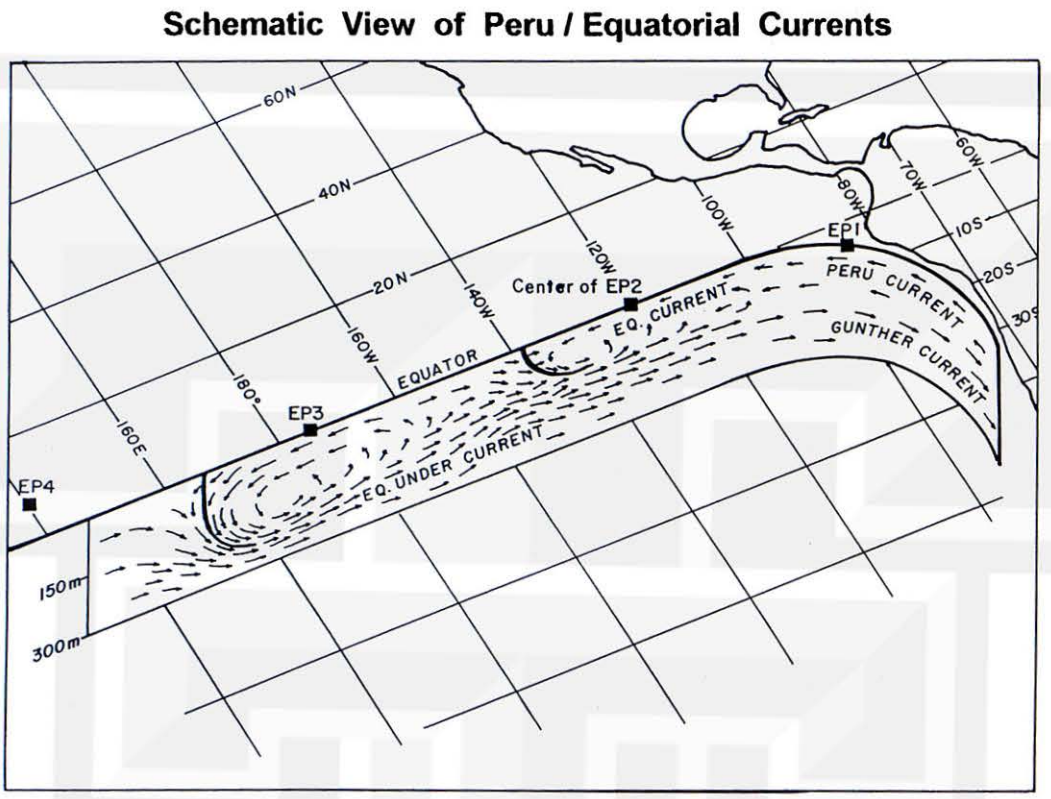

Figure 6. Vertical cross section of the Peru-Equatorial current system with strong under currents.

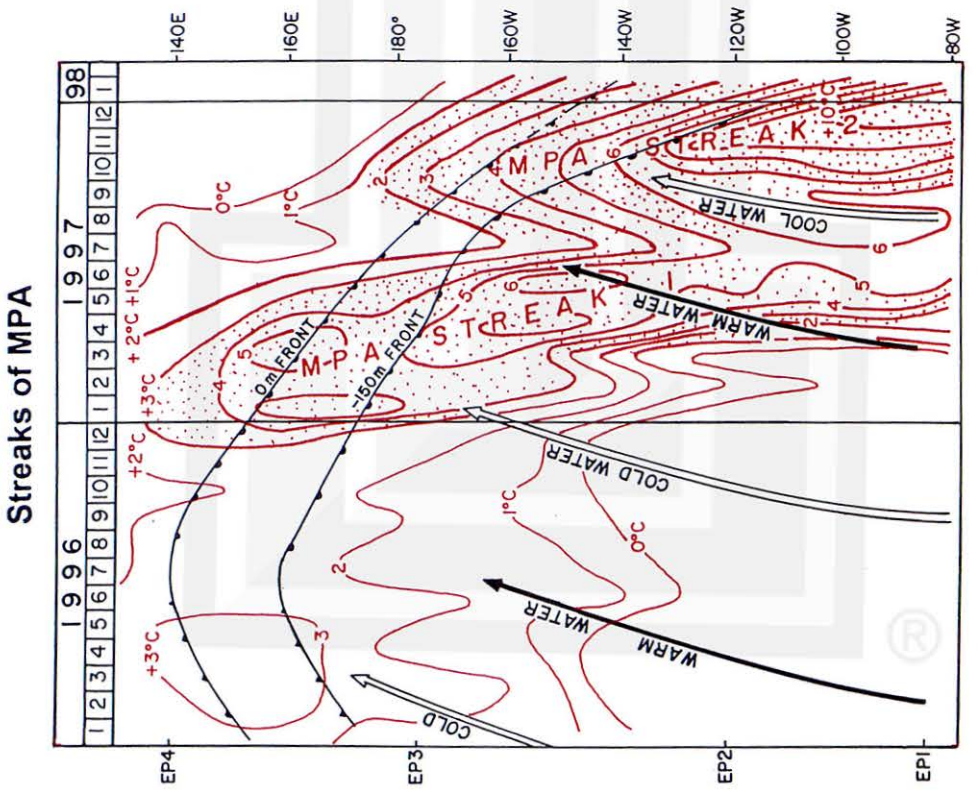

Figure 5. Streaks of MPA which can be used for the 4th method of El Niño Prediction.