Relating Satellite Observations of Surface Thermal Forcing and Sea Surface Temperatures Changes During El Niño

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Monthly net surface solar irradiance (S) from 1993-1990, and surface latent heat flux (E) from 1987 to 1993 derived from spaceborne sensors were used to examine the relation between surface thermal forcing and sea surface temperature (T_s) in the tropical Pacific, in their seasonal cycle and El Niño anomalies. The relations of seasonal changes imply that evaporation cooling is significant over most of the ocean and that solar heating is the main drive for the changes of Ts away from the equatorial waveguide where ocean dynamics may be more important. However, T_s is not the most direct and significant factor in the seasonal changes of S and E over most of the ocean: the solar incident angle may be more important to S and wind speed and air humidity are found to correlate better with E. During ENSO, organized deep convection overlies the warm ocean, forms high clouds, and reduces S, while the low wind speed and high humidity that result from surface convergence reduce E. The results are negative correlations between both forcing components and T_s at the upward branch of the displaced Walker circulation. The negative correlation between S and T_s is dominant for $27°C<T_s<30°C$; but a positive correlation is discerned when $T_s>30°C$ and is coincide with subsiding and clear atmosphere over extremely warm water. The relation bet ween wind speed and T_s and between E and Ts are largely negative, except in a small equatorial area in the east. Since latent heat flux depends directly on wind speed, the relative role of evaporative cooling and dynamic forcing on upper ocean heat balance is not clear. Daily data over the warm pool, where high frequency convective activities are more dominant, confirm the same relations.