Observed Surface Oceanic and Atmospheric Variability in the whole Tropical Pacific at the ENSO Time Scale

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Two to three decades of data within 1961-1995 are examined over the whole tropical Pacific to determine the dominant spatial features and time scales of Sea Surface Temperature (SST), Sea Surface Salinity (SSS), 0/450 dbar dynamic height anomalies (η, an alias for sea level), zonal (τ^x) and meridional (τ^y) wind stress, wind stress curl (curl τ), and precipitation (P). Low-pass time filter is used to extract fluctuations at periods greater than one year. An Empirical Orthogonal Function (EOF) analysis is performed on the filtered time series to extract the ENSO (El Niño Southern Oscillation) related variations. At ENSO time scale, the SST changes are predominant in the eastern-central basin, contrasting with the SSS, τ^x, curl(τ) and P changes which are predominant in the western-central basin, whereas the η changes occur in the east and in the west. In the equatorial band, where the ENSO signal is dominant, the El Niño (La Niña) events are concerned (1) in the east and center, with warmer (colder) than average SST and a sea level increase (decrease), and (2) in the west, with fresher (saltier) than average SSS, westerly (easterly) wind anomalies, above (below) average rainfall limited to the east of about 150°E, and a sea level decrease (increase). Much smaller ENSO changes occur away from the equatorial band except in the convergence zones for SSS, P, and τ^y changes, and in two patches symmetrical about the equator and centered around 7°N and 7°S in the western basin for curl(τ). The ENSO-related η changes are schematically concerned with two types of movements appearing somewhat like zonal and meridional "seesaws". The zonal "seesaw", in near-equilibrium with τ^x, concerns chiefly the equatorial band: it is characterized by anomalously low (high) sea level in the west lagging by about half a year behind anomalously high (low) sea level in the east during El Niño (La Niña). Interestingly, the η changes extend off the equator in the west reflecting the role of ENSO-related changes in curl(τ). The meridional "seesaw", which lags by about one year behind the Southern Oscillation Index, consists of out-of-phase variations between the regions situated north and south of about 5°N, with the main changes happening in the western-central equatorial basin. The double "seesaws" result in a longitudinal mean η rise (drop) within about 5°N-20°S up to the mature phase of El Niño (La Niña), partly compensated by a longitudinal mean η drop (rise) within about 5°N-20°N. This presentation offers a novel and concise observational basis for testing ENSO-related theoretical studies and model simulations.

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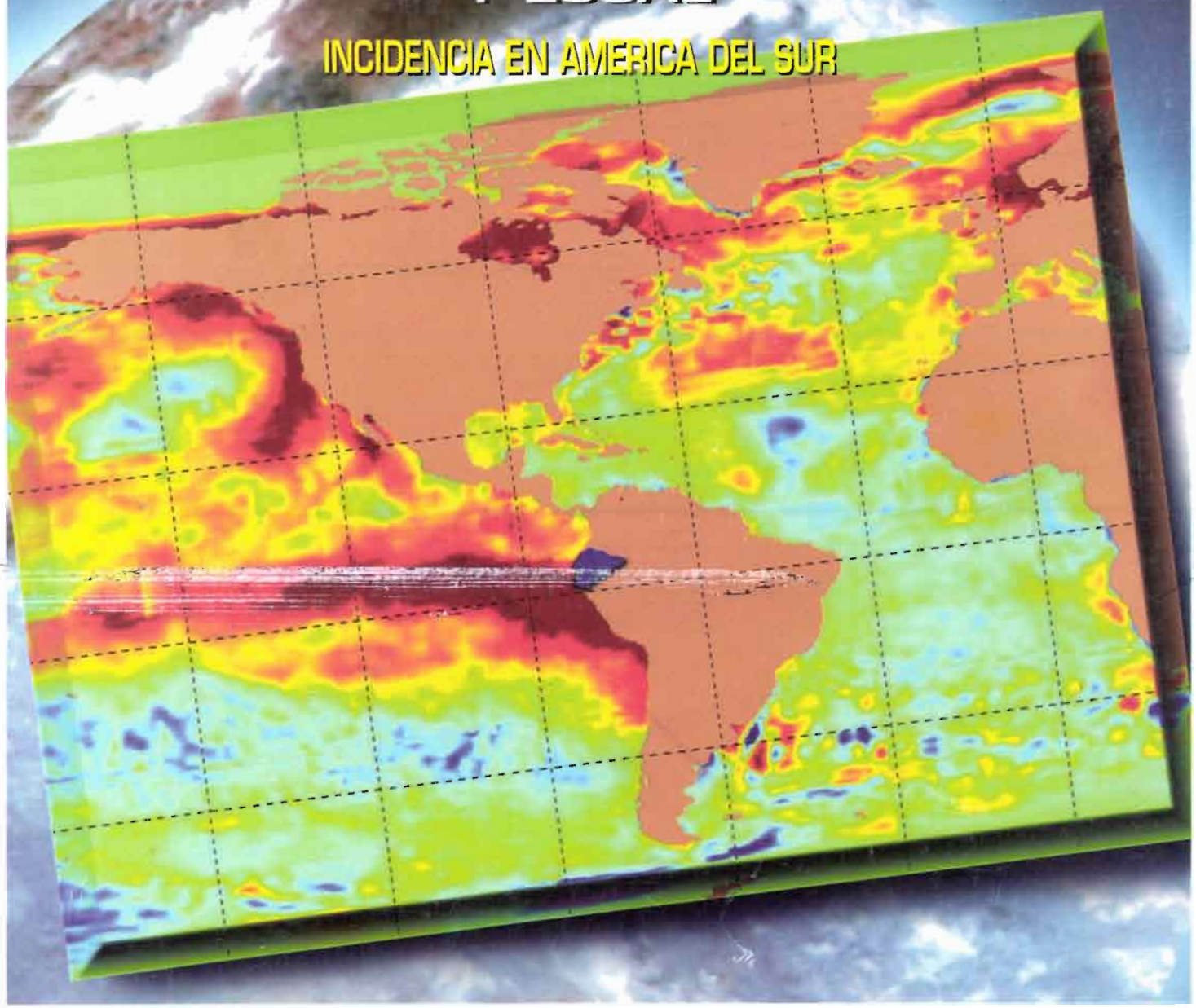

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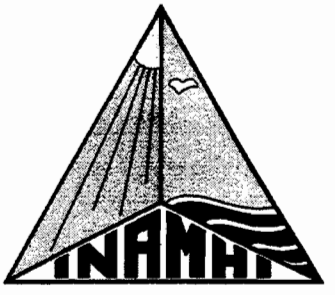

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CONFERENCIAS, ARTICULOS Y POSTERS

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