

The annual cycle of circulation of the southwest subtropical Pacific in an ocean GCM

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An ocean GCM, interpreted in light of linear models and sparse observations, is used to diagnose the dynamics of the annual cycle of circulation in the western boundary current system of the southwest Pacific. The simple structure of annual wind stress curl over the South Pacific produces a large region of uniformly-phased, stationary thermocline depth anomalies such that the western subtropical gyre spins up and down during the year, directing flow anomalies alternately towards and away from the boundary at its northern end, near 10°S. The response of the western boundary currents is to redistribute these anomalies northward towards the equator and southwards to the subtropical gyre; a redistribution that is determined principally by linear Rossby processes, not to boundary dynamics. When the subtropical gyre and South Equatorial Current (SEC) are strong (in the second half of the year), the result is both increased equatorward transport of the New Guinea Coastal Current, and poleward transport anomalies along the entire Australian coast. Because of this opposite phasing of boundary current anomalies across 10°S, annual migration of the bifurcation point of the total SEC, near 18°S in the mean, has no significance regarding variability of transport from subtropics to equator.

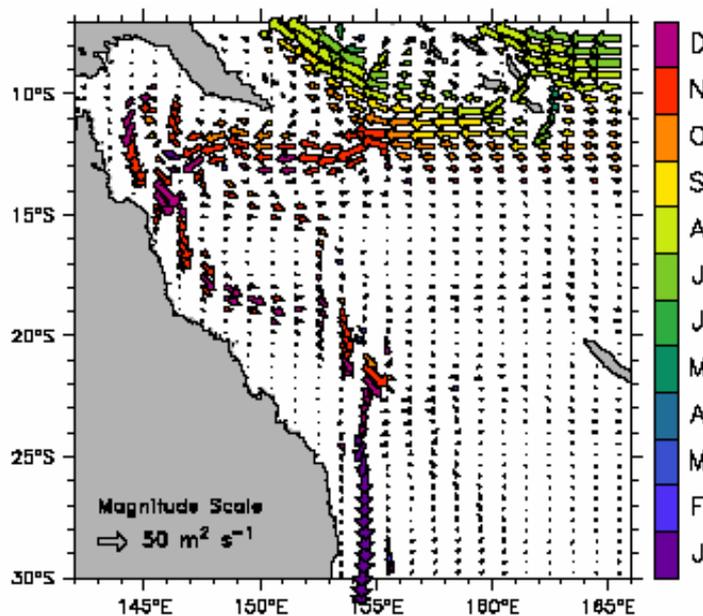


Figure: The annual cycle of 0-2060m transport anomalies in the OGCM. The area of each vector indicates the magnitude of the 1 cycle yr⁻¹ harmonic (scale at lower left), the direction points along the major axes of the variance ellipses, and the color indicates the month of maximum transport in the direction of the vector (scale at right). The choice of vector direction is arbitrary: each vector could be reversed, and its phase advanced by 6 months, to show the opposite phase of annual anomalies.

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