

## El Niño, La Niña, and Walker Circulation

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The global atmospheric circulation at the equator consists primarily of three zonal-vertical airflow patterns in response to intense heating and strong upward motions over the equatorial regions of Africa, the Maritime Continent, and South America. In the Pacific Ocean, surface winds flow from east to west, with a small area east of the Galapagos Archipelago where the wind direction is westerly. In the Indian Ocean, the surface wind flows from west to east, and in the Atlantic Ocean the surface wind is easterly. In the upper troposphere, the zonal wind direction is opposite that at the surface. To compensate the upward motions associated with the three intense convective zones, downwelling motions occur in the troposphere throughout the non-convective regions, with increased downward speeds near the eastern regions of the Atlantic and Pacific Oceans and in the western Indian Ocean. This global wind pattern, known as the Walker Circulation, is coupled to the zonal sea surface temperature distribution and therefore responds to El Niño and La Niña conditions. The oceanic longitudes of the transitions from eastward-to-westward wind directions at 10- and 700-m heights, from westward-to-eastward wind directions at 10- and 700-m heights, and of maximum easterly and westerly 10- and 700-m wind speeds during El Niño, La Niña, and normal conditions will be described with satellite vector wind observations during 2000-2011. For example, in the May 2002 to February 2003 El Niño, the longitude of zero zonal 10-m wind speed moved  $35^\circ$  eastward from its normal position, producing reduced easterlies from  $135^\circ\text{E}$  (westernmost Pacific longitude that was analyzed) to  $150^\circ\text{W}$ ; virtually no change in the zonal 10-m wind speed was observed east of  $150^\circ\text{W}$  and throughout the Atlantic and Indian Oceans. The longitudinal extent of regions of diminished and enhanced easterly winds in El Niño and La Niña, respectively, will be discussed. Also, the 10- to 700-m wind shear will be described for El Niño, La Niña and normal conditions.