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The sources of the interocean exchange: connections between large-scale variability in the Indian Ocean and meso-scale variations around Madagascar.

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The connection between the source area for the interocean exchange, around Madagascar, and large-scale variability in the Indian Ocean is investigated using the combined TOPEX/Poseidon-ERS sea surface height (SSH) data over the period 1993-2003. The SSH in the Mozambique Channel and East Madagascar areas exhibits an interannual oscillation that is in part related to the propagation of large-scale SSH anomalies due to the occurrence of the Indian Ocean dipole (IOD) in the tropical Indian Ocean. A lagged correlation analysis with the IOD index shows that positive SSH anomalies from the IOD propagate westward and reach Madagascar after 1 year. For years in which a positive IOD is followed by its negative phase, negative SSH anomalies travel southward along Sumatra, re-enter the open ocean in the subtropical band 10S-15S, and arrive to the western coast after about 2 years. There is a significant correlation between the SSH and eddy kinetic energy (EKE) in the Mozambique Channel; periods of high EKE coincide with the dominance of positive SSH anomalies, and vice versa. The EKE variability in the region south of Madagascar appears to be related to changes in the intensity of the East Madagascar Current (EMC). From altimetry derived velocity anomalies, it is observed that a reduction in the South Equatorial Current (SEC) flow during and the year after a positive IOD event, leads to a weakening in the EMC. This weakening subsequently leads to a decrease in the eddy activity south of Madagascar, which has direct influence on the interocean exchange further south.