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Mesoscale eddies in the NE Pacific tropical-subtropical zone.

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Mesoscale eddy characteristics in the NE Pacific tropical-subtropical zone (16-30N) are analyzed using nearly 20 years of satellite altimetry maps and an automated eddy detection algorithm known as "the closed contours of sea-level anomaly (SLA)". The mean eddy characteristics of the study region are described based on the analysis of 1055 anticyclonic and 1097 cyclonic eddy trajectories. Eddies are preferentially formed near the coast in three main subregions: Punta Eugenia, Cabo San Lucas and Cabo Corrientes. The seasonally highest eddy generation occurs during spring in the three subregions, when surface winds are upwelling-favorable and strong upwelling events occur, thus promoting strong vertical shear between currents. Being highly non-linear and propagating toward the open ocean, mesoscale eddies can thus transport near-coastal seawater properties and plankton toward remote regions. In general, Punta Eugenia and Cabo San Lucas show the highest eddy occurrence. Long-lived eddies, having a life span greater than 16 weeks, are preferentially formed in Punta Eugenia. On average, eddy radii are larger than the Rossby internal radius of deformation, probably due to an up-scale energy cascade of geostrophic turbulence. Mean eddy propagation speeds in Cabo San Lucas and Punta Eugenia regions show higher values than the first baroclinic Rossby waves, while eddies south of $\sim$19N travel slightly slower. The seasonal eddy generation and the eddy-prolific areas can be explained by the climatology of surface currents, where the eddy-prolific areas coincide with sites of strongest surface speeds, and the timing of the highest seasonal eddy generation corresponds with the strongest seasonal surface currents. Although relatively strong interannual variability is observed in terms of the local eddy activity index, no clear correlation is observed between eddy-generation events and large-scale climate indices such as the Pacific Decadal Oscillation index or the Multivariate ENSO index. This study provides important results for the comprehension of eddies and their interactions with the ecosystem, and also provides essential metrics for validating numerical models.