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The water exchange between Chinchorro Bank and its surroundings

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Chinchorro Bank is a relatively large (∼500 km^2) atoll situated 33 km in front of the Yucatan Peninsula in the Caribbean coast of Mexico.
Two years of continuous measurements of the subsurface pressure field inside and around Chinchorro Bank, along with currents and waves observed outside, suggest four major processes governing the water exchange of the Bank with its surroundings: 1) surface wave pumping of water into the Bank through its eastern edge, 2) the large scale circulation in the region that drives the sea level changes through geostrophy, 3) the tidal pumping with imposed cyclic flows into and out of the Bank and 4) the imposed drift by the wind.
Waves impinging all along the eastern barrier reef induce water inflows (from overtopping the reef) and generate a pressure gradient that drives a drift from east to west throughout the Bank. This western drift can normally replenish the water over the Bank with a time scale of ∼10 days. However, extreme wave events, lasting around 24 hours, can replenish the whole Bank's water in the order of day.
The region's large scale circulation is dominated by the zonal Cayman Current impinging on the Yucatan Peninsula becoming the Yucatan Current as it turns northward. Variability in the strength and impacting latitude of this current causes sea level gradients within the Bank, i.e. a Yucatan Current increase of 1 m/s, over a period of a couple of weeks, sets up a zonal sea level gradient within that can replenish the whole Bank's water in a time scale of ∼14 days. At such times, the large scale current around the Bank is at a maximum thus ensuring an effective removal and dispersal of the exported waters.
The Bank has a micro-tidal regime with a semidiurnal amplitude of ∼12 cm during spring tides and a diurnal of ∼2 cm, these imply that the Bank is exchanging ∼10% of its waters with its surroundings daily. However small, this tidal pumping is effective for the ventilation of the Banks' waters in ∼10 days due to the large scale circulation around the Bank that ensures a real exchange with renewed waters.
The Bank's region is characterized by the persistent presence of the Trade Winds, besides winter Storms ("Nortes") and the common passage of hurricanes in the summer and fall. Winds, therefore, are clearly a dominant forcing factor in the Bank's exchange, not only for being responsible for generating the surface waves impinging on the Bank, as mentioned above, but also for setting up a water circulation within that on average replenishes the Bank's waters in ∼3 days.