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Loop Current Rings and Seasonal Cycle

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A reduced gravity model (1.5 layer) is used in order to simulate the eddy-shedding process in the Gulf of Mexico and to study the influence of the seasonal cycle on it. The upper-ocean temperature is constant in space but varies in time. Thus, by using a linear thermodynamic equation for the density of the upper layer to make sure that we are being consistent with the planetary geostrophic approximation, a reduced gravity parameter which evolves with the time is obtained.

Without seasonal forcing, a single peak in the ring shedding period appears, which depends on model geometry and upper layer thickness and reduced gravity value. When seasonal variation in the reduced gravity value is included, a more complex behavior is observed, which is characterized by a bi-modal distribution crucially depending on the amplitude of the reduced gravity variation. When the amplitude is large, the annual signal clearly dominates, but when it is weaker different bi-modal distributions appear, some of which resemble the observed one.