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# Western Boundary Sea-Level: A Theory and Rule of Thumb

Shoshiro Minobe
Professor, Physical Oceanography and Climate Laboratory, Hokkaido University, Sapporo, Japan

**Abstract:**

In order to understand better sea-level variability and change at coast,a theory that predicts coastal sea-level at the western boundary using the ocean interior sea-level is proposed for curved western boundary. The essential mechanism is that incoming mass by long-Rossby waves is ejected equatorward, associated either Kelvin or Kelvin-Munk waves. Consistently, the western boundary sea-level at a latitude can be expressed by the sum of contributions from western boundary sea-level at a height latitude and interior sea-level between the two latitudes. The theory is verified by using a linear, reduced gravity model. The comparison between the theory and model result shows a good agreement with the root mean squared error is less than 5% for steady state experiments, and generally less than 10% for time-dependent experiments. The theory implies that the sea-level at the western boundary do not depend on structures of the western boundary layer, and this is also confirmed by numerical experiments. A simple scaling law, i.e., a rule of thumb, derived from the theory. The implications of the rule are discussed for the past and future sea-level rise, including sea-level hot spot along eastern North America north of Cape Hatteras.