



The seasonal cycle and variability of sea level around the China seas

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We use 81 tide gauge records, satellite altimetry along with NEMO model outputs and meteorological data to investigate the spatial and temporal variations of the seasonal sea level cycle along the Bohai Sea, the Yellow Sea, the East China Sea, and the South China Sea (the “China Seas”). The maximum range of tide gauge records vary greatly across the 81 stations, ranging from 18 to 59 cm. The seasonal cycle accounts for 37% - 94% of the monthly sea level variability. The seasonal cycles in recorded by tide gauge records can be divided into four types: i) an asymmetric sinusoidal cycle; ii) a clearly defined peak on a flat background; iii) a relatively flat signal; iv) a symmetric sinusoidal cycle. Type i) is found in the Northern China and Taiwan, Korea, Japan as well as The Philippines where IB correction plays an important role in the seasonality, type ii) along the eastern and southern China where IB correction makes the minimum sea level clear, type iii) in Vietnam and the Gulf of Thailand where tide gauge records and IB effects both show almost no seasonal cycle, and type iv) in East Malaysia where pressure variations are not an important contributor to the seasonality. Atmospheric pressure is an important driver of the seasonal cycle with a dominant annual cycle in Qinhuangdao and Tanggu in the northern China. Multiple linear regression analysis of the meteorological forcing factors including zonal wind, meridional wind and SLP to tide gauge records shows that SLP is the main contributor in northern and the eastern China while wind associated with monsoonal circulation makes the largest contribution around the tropics.