

# 西北太平洋不同区域海平面变化特征分析\*

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**摘要:** 重点研究西北太平洋长期验潮站海平面变化的季节、年际和年代际变化特征。所选站点多年平均变化速率为1.71 mm/a。结果表明,近岸区、大洋沿岸区、大洋区主要周期均为12个月;近岸区、大洋沿岸区、大洋区部分低纬度站点存在6个月周期;所有站点都存在明显的年际和年代际周期信号;中高纬度地区年代际信号强于年际信号,热带地区年际信号强于年代际信号;近岸区、大洋沿岸区、大洋区站点年际和年代际变化具有明显的地域性;热带地区受 ENSO 影响强于中高纬度地区,热带大洋区受 ENSO 影响强于大洋沿岸区,热带大洋沿岸区受 ENSO 影响强于近岸区;受 PDO 影响较明显的站点位于 25°N~40°N 的中纬度地区。1993—2010 年间,近岸区、大洋沿岸区、大洋区验潮站、大洋区 T/P 的主要周期均为12个月,但变化速率和季节变化振幅各不同,大洋区验潮站滞后其他区近1个月达到极值。

**关键词:** 海平面变化异常值;近岸区;大洋沿岸区;大洋区;SOI 指数;PDO 指数

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## 参考文献:

- [1] Nicholls R J, Cazenave A. Sea-level rise and its impact on coastal zones [J]. *Science*, 2010, 328(5958): 1517-1520.
- [2] Church J A, Gregory J M, Huybrechts P, et al. Changes in sea level, The scientific basis; Contribution of working group I to the third assessment report of the intergovernmental panel on Climate Change [M]. Cambridge, UK: Cambridge University Press, 2001: 639-694.
- [3] Church J A, White N J, Coleman R, et al. Estimates of the regional distribution of sea level rise over the 1950 to 2000 period [J]. *Journal of Climate*, 2004, 17: 2609-2625.
- [4] White N J, Church J A, Gregory J M. Coastal and global averaged sea level rise for 1950 to 2000 [J]. *Geophysical Research Letters*, 2005, 32, L01601.
- [5] Merrifield M A, Merrifield S T, Mitchum G T. An anomalous recent acceleration of global sea level rise [J]. *Journal of Climate*, 2009, 22: 5772-5781.
- [6] Fenoglio-Marc L, Tel E. Coastal and global sea level change [J]. *Journal of Geodynamics*, 2009, 49: 151-160.
- [7] Prandi P, Cazenave A, Becker M. Is coastal mean sea level rising faster than the global mean? A comparison between tide gauges and satellite altimetry over 1993-2007 [J]. *Geophysical Research Letters*, 2009, 36, L05602.
- [8] Holgate S J, Woodworth P L. Evidence for enhanced coastal sea level rise during the 1990s [J]. *Geophysical Research Letters*, 2004, 31, L07305.
- [9] 丁荣荣, 左军成, 杜凌, 等. 南海海平面变化及其比容高度和风场间的关系 [J]. *中国海洋大学学报: 自然科学版*, 2007, 37(Sup. II): 23-30.
- [10] Han G Q, Huang W G. Low-frequency sea-level variability in the South China Sea and its relationship to ENSO [J]. *Theoretical and Applied Climatology*, 2008, 97: 41: 52.
- [11] Arnold L G, Claudia F G. Pacific decadal oscillation and sea level in the Japan/East sea [J]. *Deep-Sea Research*, 2004, 51: 653-663.
- [12] Han G Q, Huang W G. Pacific decadal oscillation and sea level variability in the Bohai, Yellow, and East China Seas [J]. *Journal of Physical Oceanography*, 2008, 38: 2772-2783.
- [13] Vinogradov S V, Ponte R M. Annual cycle in coastal sea level from tide gauges and altimetry [J]. *Journal of Geophysical Research*, 2010, 115, C04021.
- [14] Nerem R S, Mitchum G T. Estimates of vertical crustal motion derived from differences of TOPEX/POSEIDON and tide gauge sea level measurements [J]. *Geophysical Research Letters*, 2002, 29(19): 1934.
- [15] Nakano M, Yamada S. On the mean sea levels at various locations along the coasts of Japan [J]. *Journal of The Oceanographical Society of Japan*, 1975, 31: 71-84.
- [16] Ukawa M, Fujita E, Yamamoto E, et al. The 2000 Miyakejima eruption: Crustal deformation and earthquakes observed by the NIED Miyakejima observation network [J]. *Earth Planets and Space*, 2000, 52(8): xix-xxvi.
- [17] Douglas B C. Sea level change in the era of the recording tide gauge. *Sea Level Rise: History and Consequences* [M]. San Die-

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- go; California USA Academic Press, 2001, 75: 37-64.
- [18] 李立, 吴日升, 李燕初, 等. TOPEX/POSEIDON 高度计浅海潮汐混淆的初步分析 [J]. 海洋学报, 1999, 21(3): 7-13.
- [19] 左军成, 陈宗镛, 周天华. 中国沿岸海平面变化的一种本征分析和随机动态联合模型 [J]. 海洋学报, 1996, 18(2): 7-14.
- [20] Lombard A, Cazenave A, Traon P L, et al. Contribution of thermal expansion to present-day sea level change revisited [J]. *Global and Planetary Change*, 2005, 47: 1-16.
- [21] 荣增瑞, 刘玉光, 陈满光, 等. 全球及南海海平面变化及其与厄尔尼诺的关系 [J]. 海洋通报, 2008, 27(1): 1-8.
- [22] 顾小丽, 李培良. 太平洋海平面变化特征及影响因素分析 [J]. 海洋学报, 2009, 1(31): 28-36.
- [23] Torrence C, Webster P J. Interdecadal changes in the ENSO-Monsoon system [J]. *Journal of Climate*, 1999, 12(8): 2679-2690.
- [24] 吕俊梅, 琚建华, 张庆云, 等. 太平洋海温场两种不同时间尺度气候模态的分析 [J]. 海洋学报, 2005, 27(5): 30-37.
- [25] Bo Qiu. Kuroshio extension variability and forcing of the pacific decadal oscillations; responses and potential feedback [J]. *Journal of Physical Oceanography*, 2003, 33: 2465-2482.

## The Analysis of Sea Level Variation in Northwest Pacific

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**Abstract:** This study focuses on the similarities and differences of sea level variation in near-shore area, coastal area, and oceanic area in Northwest Pacific. The characteristics of seasonal, inter-annual and decadal changes are various. The trend is generally rising, and the mean rising rate is 1.71mm/year. As for the main period of SLA, Near-shore Area, Coastal Area, and Oceanic Area are all 12-month in the low latitude area. The influence of ENSO is stronger in Tropical region than that in middle and High latitude region. For the propical region, the influence of ENSO is the strongest in the oceanic, then the coastal area, and the weakest is the near-shore area; The gauge station which locates at middle latitude between 25°N and 40°N is obvions influeneed by PDO. From 1993 to 2010, the main period of near-shore area, coastal area, and oceanic area is 12-month, but the variety of rate and annual amplitude are different. Oceanic Area(gauge station)reaches the extremum about one month later than other areas.

**Key words:** Sea level anomaly; near-shore area; coastal area; oceanic area; SOI; PDO

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