

Inter-decadal modulations in the dynamic state of the Kuroshio Extension system: 1905-2016

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The Kuroshio Extension is an eastward-flowing, inertial jet in the subtropical western North Pacific after the Kuroshio separates from the coast of Japan. Being the extension of a wind-driven western boundary current, the KE has long been recognized as a turbulent current system rich in large-amplitude meanders and energetic mesoscale eddies. An important feature emerging from the past 25-yr satellite altimeter measurements is that the KE system exhibits clearly-defined decadal modulations between a stable and an unstable dynamic state. The decadal-modulating KE dynamic state exerts a great impact on the regional sea surface temperature, heat content and water mass properties. By clarifying the relationship and physical processes between the basin-scale wind forcing and the KE dynamic state over the altimeter era, we hindcast the KE dynamic state going back to 1905 with the use of ECMWF reanalysis wind stress product. It is found that the low-frequency KE variability modulated in the past century in connection with the mid-1920s, mid-1940s, and mid-1970s' climatic regime shifts in the Aleutian Low pressure system. In addition to the modulations in KE's response to the external wind forcing, the midlatitude ocean's feedback to the overlying atmosphere appeared to have differed within the epochs of the different 20th century regimes.

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