Geophysical Research Abstracts
Vol. 21, EGU2019-12643, 2019
EGU General Assembly 2019

Propagation of Subseasonal Equatorially-Forced Coastal Trapped Waves down to the Benguela Upwelling System

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The oceanic connection between the coastal variability along the southwestern African coasts and the linear equatorial dynamics at subseasonal time-scales (<120 days) is examined using a variety of model outputs, ranging from linear to general circulation models. We focus on the equatorially-forced fast and weakly dissipative first-mode coastal trapped waves which are shown to propagate down to the southern tip of Africa. In the eastern equatorial Atlantic, the first-mode equatorial forcing is tangled with the higher-order Kelvin wave modes and is overshadowed by the dominant second baroclinic mode. The latter is slower and peaks 10 days after the concealed first-mode contribution. Within this time frame, the remotely-forced first-mode coastal trapped waves impinge on the variability of the Benguela upwelling ecosystem, almost in phase with the subseasonal sea level fluctuations in the Gulf of Guinea. Over 1993-2008, the equatorial forcing undergoes a substantial interannual modulation. Periods of energetic first-mode equatorial Kelvin waves coincide with a strong subseasonal coastal wind activity that breaks the stronger equatorial connection. This suggests the existence of a large-scale atmospheric connection between the equatorial wave forcing and the along-shore winds in the Benguela, modulating the maximum latitude at which the equatorial dynamics impacts the local marine resources.