Cooling Over the Agulhas Bank, Variable Trends and Associated Consequences on the Environment

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Abstract:

The Western Indian Ocean (WIO) is believed to have experienced one of the highest heating trends globally over the past 43 years (1982 - 2024). This phenomenon may have potential implications in the future, such as impacts on fisheries and coral reefs (coral bleaching). However, exceptions exist, notably, the Agulhas Bank, south of South Africa. Upwelling cells along the South African coast generally become active during the austral summer months due to prevailing winds (with Port Alfred and Tsitsikamma experiencing the most upwelling). Trend analysis has demonstrated that the two high-pressure cells in the atmosphere (South Atlantic High and South Indian High, west and east of Southern Africa, respectively) have gradually moved southward over the past few decades, which in turn has led to an increase in strength for upwelling-favourable winds (easterlies in the case of South Africa's southern coastline). However, the overall trend over the past four decades has not provided a comprehensive explanation. The variability of the trend has potentially been the most significant driver of fisheries trends over the Agulhas Bank (regime shifts). Squid, prevalent on the Agulhas Bank, is a critical component of the South African fisheries sector. Since the lifetime of squid is relatively short (approximately one year), unlike species such as hake, changes in environmental properties (SST, chl-a) can have devastating effects on the total catch annually due to a disruption in spawning behavior and recruitment. In 2013, a squid crash occurred in which 80% of the annual catch plummeted and lasted 18 months. Other species movements, such as Bull Sharks, which move south from Mozambique in the austral summer towards the Breede River, approximately 250 km from Cape Town, may change their movement patterns in the future due to their inability to cope with sudden drops in temperature (increasing upwelling).



Keywords:

Agulhas Bank, trends, upwelling, winds, squid.

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