

Trends and patterns of sea surface temperature fronts in coastal upwelling off Southern Vietnam

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The study examined sea surface temperature (SST) fronts in a coastal upwelling region in South Centre Vietnam, one of global marine hotspots that are very susceptible to climate change. Upwelling activity leading to fronts formation is associated with warming trends of SST in this region. Histogram method of Cayula and Cornillon was applied to detect fronts from high resolution level-3 mapped products of 250m generated from level-1 daily MODIS satellite imageries. An increasing SST trend of approximately 0.05°C/year was observed throughout the period between 2003 and 2018, and Southwest (SW) monsoon shows higher rates of increasing than Northeast (NE) monsoon. The two longest marine heatwaves (MHW) occurred during El Niño years, nine days in 2010 and 16 days in 2016, with highest maximum intensity of 2.95°C in 2016. The study found that there are two frontal patterns that are strongly related to monsoon seasons in this region. The first pattern is upwelling front occurring along the coast of Binh Thuan and Ninh Thuan Provinces and extending eastward from the upwelling centre during the SW monsoon. The second one is shelf front running along the 100m – 200m isobath that separates the north-to-south cold-water current with the open ocean during the NE monsoon. Frontal frequency (FF) trend is significantly increasing in the northern region of the study area where shelf fronts are dominated, which is linked to increasing SST trend. The results show that trends and patterns of SST and fronts have been influenced by El Niño events in this small scale of marine hotspot over 16-year period.

Key words: oceanic front, hotspot, marine heatwave, coastal upwelling, satellite imagery