Geophysical Research Abstracts
Vol. 19, EGU2017-4030, 2017
EGU General Assembly 2017

Intensity of Cold Water and its effects on marine culturing farms along the southeast coast of Korea

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To understand the characteristics and strength of the cold water that has caused damage to marine-culturing farms around Guryongpo, in the southeast coast of Korea, surface and water column temperatures were collected from temperature loggers deployed at a sea squirt farm during August-November 2007 and from a Real-time Information System for aquaculture environments operated by NIFS during July-August 2015 and 2016. During the study period, surface temperature at Guryongpo decreased sharply when south/southwestern winds prevailed (the 18-26th of August and 20-22nd of September 2007 and the 13-15th of July 2015) as a result of upwelling. However, the deep-water (20-30m) temperature increased during periods of strong north/northeasterly winds (the 5-7th and 16-18th of September 2007) as a result of downwelling. Among the cold water events that occurred at Guryongpo, the mass death of cultured fish followed strong cold water events (surface temperatures below 10[U+2103]) that were caused by more than two days of successive south/southeastern winds with maximum speeds higher than 5 m/s. A Cold Water Index (CWI) was defined and calculated using maximum wind speed and direction as measured daily at Pohang Meteorological Observatory. When the average CWI over two days (CWI2d) was higher than 100, mass fish mortality occurred. The four-day average CWI (CWI4d) showed a high negative correlation with surface temperature from July-August in the Guryongpo area (R2 = 0.5), suggesting that CWI is a good index for predicting strong cold water events and massive mortality. In October 2007, the sea temperature at a depth of 30 m showed a high fluctuation that ranged from 7-23[U+2103], with frequency and spectrum coinciding with tidal levels at Ulsan, affected by the North Korean Cold Current. If temperature variations at the depth of fish cages also regularly fluctuate within this range, damage may be caused to the fish industry along the southeast coast of Korea.