



A New Algorithm for Quantifying the Thermocline Structure

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In order to understand and predict variation of seawater temperature due to climate change, it has recently been tried to study the variation pattern of thermocline. However, there are difficulties in extracting the thickness of thermocline quantitatively because it is difficult to detect the time and area that seasonal thermocline is formed in the mid-latitude, and the thermocline structure has a feature with various shapes. Therefore, this research aimed to develop a algorithm for extracting thermocline top and base point. For the development of algorithm, seawater temperature data observed in the southern sea of Korea for 17 years (National Fisheries Research & Development Institute) was used as experimental data. In the first experiment, the critical value of the temperature gradient being used typically in the conventional studies on thermocline was find out and applied to extract top and base of thermocline. As a result of this experiment, it was not suitable for extracting the thermocline structure having various shapes because it detects the thermocline and extracts the thickness of thermocline with a critical value. To solve this problem, a graph shape of the hyperbolic tangent function similar to the shape of thermocline was applied to the vertical seawater temperature profile. This method has a strong point that extracts thermocline top and base well if the thermocline structure is symmetric, however, it is inappropriate for asymmetric shape of thermocline. Accordingly, to develop a method applicable also to the asymmetric thermocline structure, the differential hyperbolic tangent function structure was projected to the vertical seawater temperature gradient curve. By using this method, the thickness of thermocline could be well extracted for not only the thermocline with various shapes but also the vertically asymmetric structure. In the future, it is expected that the quantitative algorithm for the thermocline structure developed through this experimental study would be useful to analyze a relationship between climate change and vertical variation of seawater temperature by applying it to the world ocean area.