Development of Outlier detection Algorithm Applicable to a Korean Surge-Gauge

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The Korea Meteorological Administration (KMA) is operating a surge-gauge (aerial ultrasonic type) at Ulleung-do to monitor tsunamis. And the National Institute of Meteorological Sciences (NIMS), KMA is developing a tsunami detection and observation system using this surge-gauge. Outliers resulting from a problem with the transmission and extreme events, which change the water level temporarily, are one of the most common discouraging problems in tsunami detection. Unlike a spike, multipoint outliers are difficult to detect clearly. Most of the previous studies used statistic values or signal processing methods such as wavelet transform and filter to detect the multipoint outliers, and used a continuous dataset. However, as the focus moved to a near real-time operation with a dataset that contains gaps, these methods are no longer tenable. In this study, we developed an outlier detection algorithm applicable to the Ulleung-do surge gauge where both multipoint outliers and missing data exist. Although only 9-point data and two arithmetic operations (plus and minus) are used, because of the newly developed keeping method, the algorithm is not only simple and fast but also effective in a non-continuous dataset. We calibrated 17 thresholds and conducted performance tests using the three month data from the Ulleung-do surge gauge. The results show that the newly developed despiking algorithm performs reliably in alleviating the outlier detecting problem.