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CONFLICT ANALYSIS OF MULTI-SOURCE SST DISTRIBUTION

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Abstract. This article focuses on evaluating the quality of sea surface temperature(SST) observed by satellite remote sensing. Under the premises that the scarcity of field measurement data and the abundant but overlapped multiple satellites detect information, in this article the consistency of multiple source information is used to verify the accuracy and reliability of satellite remote sensing data. Due to the limitation of Grubbs test when analyzing multi-source satellites SST, an improved algorithm is proposed, which is found to be more effectively than the traditional variance method when quantifying the differences and conflicts of SST. And the method is applied to the data extracted from 11 SST products in East China Sea, so a large amount of points set with high consistent can be confirmed, the outlying data can be discovered and eliminated, the waters (not include the outlying data) with confliction can be dig out and the conflicting level also can be quantized. It provides reference for the subsequent researchers to evaluate the quality of marine information.

Key words. false-alarm, SST, interact-evaluation, remote sensing measurement, data fusion.

1. Introduction

In engineering measurement, because of the particularity of environmental targets and the measured indexes, some indexes cannot be measured directly and are difficult to be obtained, and it requires an indirectly way to obtain the measurement. Therefore, the measurement accuracy to some degree is limited to measurement method under this situation. At present, multiple-source measurement has a board application and becomes an effective method to improve the measurement accuracy. As for multiple-source measurement, various reasons (including the reason of measuring equipment itself, the changes of measurement environment and different precision among measuring equipment) will cause obviously differences in measurement results even for the same target at the same time. Thus, it has strong applied value to reduce the uncertainty and conflict of measure data in many fields.

As the development of satellite remote sensing technique, it can do repeated measurement in the same temporal and spatial in most of global areas, the series satellites which could provide high-quality and large-scale SST data, mainly including HY-1, FY-2(china), NOAA, SeaWiFS, EOS/MODIS (US) and MTSAT(Japan)[1]. SST, being one of the most important geophysical parameters in the ocean, plays an important role in global climate change. The technique to obtain SST has the problems of coverage overlapping, information redundancy and so on. Therefore, how to discover the conflict relationship and inconsistency has become an important subject as to investigate the marine information. Hosoda[2]used standard deviation to conduct cross-validation on GLI SST and AMSR SST, and drew a conclusion that the general value is about $\leq 1°C$. Iwasaki [3] made mutual contrast validation on the following four kinds of data: (CAOS) SST, (MWOI) SST, (MGD) SST and (RTG) SST, and he also analyzed the difference and defect of each data. Barton [4] conducted inter-comparison on the data (NOAA-16/AVHRR SST,

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ENVISAT/AATSR SST, Terra and Aqua/MODISSST) for the year 2003, then obtained the conclusion that the temperature error is $\leq 0.61°C$ near the waters of Australia.

Due to the different measuring accuracy of satellites remote sensing, under the same condition, the result measured by different satellite remote sensing for the same object, will have certain difference that causes much uncertainty and even conflicts among the data obtained by multi-channel satellites. The technology adopted by satellite remote sensing to obtain Sea Surface Temperature has the characteristics such as wide coverage (almost cover all of the global waters) and long-term repetitive measurement that will compensate the shortage of field measurement to a certain extent. However, these characteristics also result the overlaps of coverage and the redundancy of information. Therefore, the research on how to find out the conflict and inconsistencies of multi-channel satellite data, especially on quantizing the conflict level, separating the kinds of the conflicts and providing basis for subsequent researchers to solve important problems in this area, has become an important subject for the research on marine data. This paper includes the following five parts. The first part is the background of multi-satellite remote sensing. The second part introduces the common methods to judge conflicts of measurement data from satellite remote sensing. The third part details the strengths and the weaknesses of Grubbs formula. In the fourth part, it introduces an improved Grubbs algorithm and its advantages by comparing to the original algorithm. The fifth part is experimental section. This paper compares the effects that obtained between the common method and the improved one in processing conflict data through experiments, and then uses the Argo buoy data to validate the correctness, feasibility and practicability of the processing results.

2. Traditional method of remote sensing SST

There are two methods for judging the differences of measurement data from satellite remote sensing: the field measurement data comparison [5][6] and the variance discriminance [7]. The variance discriminance is the most common one. However, both methods have shortages.

Both [5] and [6] use comparison method to find out the abnormality of satellite data, and believe the best way to inspect the accuracy of satellite remote sensing SST is that using field measurement during the observing time of satellite. By taking the data obtained from field measurement as real values and comparing those values with satellite remote sensing data, it can determine whether there are abnormal data in satellite remote sensing data. But due to the extensity of the ocean itself, the amount of the measured data obtained from field devices are limited. Thus, it needs a lot of manpower, material resources and financial power. Besides, what we got from satellite remote sensing is the Sea skin temperature, while the data from field measurement is the sea surface temperature. They are different [8].In [3][7], they used variance to analyze the abnormality of meteorological data. By computing the variance value of a group data from field measurement, it can determine whether there is inconsistency in those data. However, the variance method cannot describe the conflict comprehensively. For example, we cannot distinguish how many numbers affect the variance of a group principally. And this is the weakness of variance method.

In order to compare the consistency and conflict of the multi-source satellite data earnestly and effectively, this paper puts forward a new method based on the Grubbs method. Grubbs method cannot describe the conflicts effectively because of