THE STUDY OF SPATIAL AND TEMPORAL VARIABILITY OF THE KUROSHIO EXTENSION USING REMOTE SENSING DATA WITH APPLICATION OF DATA-FUSION METHODS

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ABSARACT:

Analysis method using remote sensing data is one of the effective ways to research a spatial and temporal variability of the mesoscale oceanic motions. During past several decades, many researchers have been getting comprehensive results using remote sensing data with application of data fusion methods in many parts of geo-science. For this study, we took the integration and fusion of several remote sensing data, which are different data resolution, timescale and characteristics, for improving accurate analysis of variation of the Kuroshio Extension. Furthermore, we might get advanced ways to understand the variability of the Kuroshio Extension, has close relation to the spatial and temporal variation of the Kuroshio and Oyashio Current.

INTRODUCTION :

After originating from the North Equatorial Current, It takes different ways of flow result in geophysical interactions and affection by various forcing, and then it keeps own quality, but sometimes, lose. After separating for the Japan coast at 35°N,140°E(Bo Qiu 2000) the Kuroshio enters the open basin of the North Pacific where it is renamed the Kuroshio Extension. It has been observed to be an eastward flowing accompanied by large-amplitude meanders and energetic pinched-off eddies (e.g.,Kawai1972) result in interactions with the Oyashio Current. So, It is needless to say that the more data we have, the better analysis we get. At this point of view, even though remote sensing data such as SST, SSH, Chlorophyll have their own quality to show the variability and characteristics of the Kuroshio Extension, we could get more accurate analysis and get over the limitation, partial data missing of the SST and chlorophyll data caused by clouds if those data are well developed using data fusion and integration method. In this study, we are trying to analyze the spatial and temporal variability of the Kuroshio Extension using integrated remote sensing data through data fusion method

MAIN BODY:

Data processing and algorithms

During the data processing, because SSHA, SST and Chlorophyll data have each own different spatial and temporal resolution, we made all data in same spatial resolution using cubic spline interpolation. And then, we selected the region(31-37°N,130-170°E) showing characteristics of the up and down stream of the Kuroshio Extension(Bo Qiu 2000). For data processing, after reconstruction those data into 1°× 1° spatial resolution, we derived the best function relation using polynomial approximation from every pixel data set to fill up missing data pixel on SST and Chlorophyll. Then,we made temporal resolution of all data same for cross correlation of data (SSH&SST,SSH&CHLO,SST&CHLO), and took the cross correlation function (SSH&SST,SSH&CHLO,SST&CHLO) for trend and correlation followed by data fusion(weight of evidence, fuzzy logic) and data integration to get new setoff the data. Latest step for our data processing, we compared data set from data fusion with data set from NCEP or WOD01 to verify the reliability of our data set

Data used.

The NOAA/ NASA AVHRR Oceans Pathfinder sea surface temperature data(8-day averaged, spatial resolution 0.04397°, from January 1992 to December 2002) derived from the 5-channel Advanced Very High Resolution Radiometers (AVHRR) on board the NOAA -7, -9, -11, -14, -16 and -17 polar orbiting satellites are used in this study. also, we used both 10 years of TOPEX/POSEIDON Sea Surface Height Anomaly data(7-day averaged, spatial resolution 0.33333°, from January 1992 to December 2002) and SeaWifs chlorophyll data(8-day averaged, spatial resolution 0.08333°, from 1997 to 2002).

CONCLUSION:

We could get a new data set after polynomial approximation, cross correlation, data fusion(weight of evidence, fuzzy logic) method were applied to the each remote sensing data and taking the data integration. Specially, we had fully extended data set, has over 90% reliability level compared with in situ data.

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