Satellite Characterization of Bio-Optical and Thermal Variability in the Japan/East Sea

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LONG-TERM GOAL

My long term goal is to charcateize the physical and optical signatures of the Japan/east Sea through the use of satellite remote sensing. Our effort is to determine a climatology of the inherent optical properties (IOP's) using seaWifs satellite to define how the bio-optical cycle is driven by the physical circulation and processes.

OBJECTIVES

Our objective in this research is to exploit SeaWIFS and AVHRR satellite data to understand physical and bio-optical processes in the East Sea. Specifically: 1. Compare the location of SST and bio-optical fronts to determine the coupling between the optical and physical signatures. 2 define the seasonal position and variation of the subpolar front. 3. Characterize the changes in the bio-optical properties, which occur following the passage of a strong winter cold front. 4. Trace the bio-optical and SST signature of coastal waters from the EKWC as these waters transition to central basin waters along the subpolar front. 5Validate and tune the SeaWIFS algorithms and vicarious sensor calibration to extend bio-optical properties to inherent optical properties.

These objectives are aimed to 1. Provide a link between the satellite surface features and the subsurface measurements. 2.provide an initialization and validation for circulation models. 3. Ensure that ship time is optimized during the location and mapping of the front during SeaSoar deployments and 4. Provide a context to interpret the in situ measurements over broader spatial and temporal scales.

APPROACH

We plan on establishing a time series of SeaWIFs and AVHRR products for the Japan/East sea ti sharcteriz the spatail and temporal variability of the bio-optical and seasurface temperature for a period of several years.

We plan on collection of SeaWifs and AVHRR imagery aboard the Revelle on two SeaSOAR cruises (May 1999 and January 2000). These realtime collection will provide the ship sampling to measure the subpolar front and East Korean Warm Current. We plan on collection of remote sensing reflectance of IOP measurements to tune and valiadate the satellite products and determine how the surface bio-optical properties are linked with the subsurface SEASOAR measuments.

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WORK COMPLETED

We have establish methods of transferring and processing Satellite AVHRR and SeaWiFS imagery from the Japan / East Sea. We have automated the procedures for collection, processing and archiving. We have established a web site for viewing the archied data. We have started the archies site from March 1998 and is curr3ect through December 1998. We have over 200 seaWIFs imagers and 200 AVHRR imagers if the Japan / East Sea.

We have processed all SeaWIFS imagery using verison 1 and version 2 software for IOP and chlorphyll products. Version 2 which improves the IOP products was impliemted in Sept. 1998 and we are reproessing now. We have provesses AVHRR imagery for SST and chanel 4 radiance.

We have developed procedures for compositing SeaWisf IOP and Chlorophyll and AVHRR SST products. We have generated weekly and monthly composites of SSt and chlorphyll. These products are currently under review and being improved to handle problems with cloud cover and scaling properties.

Results can be observed on our web site.

We are updating the shipboard satellite receiving with new software and hardware in preparation for the cruises in May 1999.

RESULTS

Imagesfrom SeaWifs processing has been used to show the development of the spring bloom in the japan sea. The Subpoalr front is shown to bloom in chlorophyll in May and to occur with in 2-3 week period. During this time the SST show strong thermal variation associated with the subpolar front.

Difficulties in cloud screening of AVHRR imagery have propbed us to use the avhrr pathfinder cloud screening algorithm. The SST imagery illustrates the subpolar front and Korean Coastal Warm Current in spring. These features are less noticable in summer. The Seawifs ocean color imagery clearly illustrates the subpolar front in Spring and is less noticale in Summer and fall.

Coastal eddies associated with the EKWC are observed developing and extending off the coast into the central basin. These coastla features will be characterized during the cruises.

The subpolar front is characterized and series of eddy features and not a single linear front. The eddies features charcterize a diffuse field of highly energetic features which are observed in the SST and the bio-optical signatures. The bio-optical features are diferent then the SST features and will be examined in detail in the cruises.

IMPACT/APPLICATION

The seasonal dvelopment of the bio-optical and physical surface properties have been charcterized using Satellite imaegry. We are now atemping to understand the coupling and processes governing these charactreistices. Further we will determine in the next years cycle is similar or different then the 1998 characteriztices.

We have shown that SeaWifs imager can be used to defien the bio-optical cycle. We will be define ing accureace an valiation of thes products and defineing how these products can be linked with numerical models and insitu measurements.

\TRANSITIONS

Algortihms being developed for SeaWifs are being used by the NAVAL Optical products (6.4 SPAWARS) program for trnsition into the naval oceanographic Office and the regional centers. Thes algortihms are being improved for case 2 waters which occure along the Korean and japan Coastal and are advected into the central basin. These improvements to the algortihms are providing better extimates of the IOP and the chlorophyll concnetrations.

RELATED PROJECTS

1 – Spectral Signatures in littoral Zones NRL 6.1 program for understaning ocean color signatures for inversion to IOP's (Curt Davis, A. Weidemann, S. Ackleson)

2 – Nesting of satellite ocean color products NRL 6.2 program to understanding the spatial and temporal variability of the optical properties.

3. HYCODE ONR/NRL – 6.1-6.2 program to prepare for the launch of the hyperspoectral ocean color satellite NEMO.

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