Sea Surface Temperature of China Ocean Color and Temperature Scanner (COCTS) onboard HY-1C Satellite

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1 Introduction of HY-1C satellite

Chinese Haiyang-1C (HY-1C) satellite, the flow-on mission of HY-1A and HY-1B, launched on Sep. 7, 2018, is equipped with the China Ocean Color and Temperature Scanner (COCTS) and Coastal Zone Imager (CZI), as well as an Ultraviolet Imager (UVI), Satellite Calibration Spectrometer (SCS) and a satellite-based Automatic Identification System (AIS) receiver. The satellite assists in monitoring global ocean color and sea surface temperatures (SST) with the spatial resolution of 1-km, temporal resolution of 1-day and swath of more than 2900 km, coastal zones' environment with the spatial resolution of 50-m and swath of more than 950 km. The HY-1C data can also be widely used in land natural resources research and investigation. The atmospheric correction of COCTS over case II water can be completed by combining with UVI data.

COCTS, the main payload on-board China Haiyang-1C (HY-1C) satellite, is an optical radiometer to detect ocean color and surface temperature by 8-channel visible and near-infrared bands and 2-channel thermal infrared bands (10.3~11.3μm，11.5~12.5μm). COCTS of HY-1C detects global ocean and land twice a day, provides daily ocean color, land vegetation products as well as daytime Sea Surface Temperature (SST) and nighttime Sea Surface Temperature (NSST).

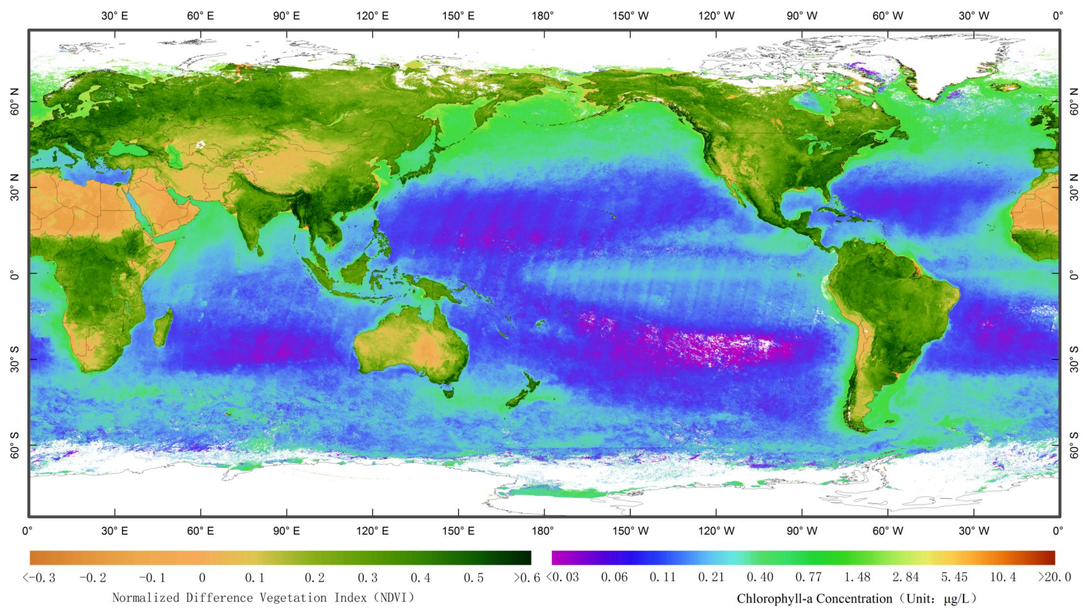

Fig.1 Normalized Difference Vegetation Index and Chlorophyll-a concentration product of HY-1C satellite (Sep. 14 ~ Dec. 31, 2018)

Method and Products

By using the non-linear algorithm for SST (NLSST) of split window, SST or NSST retrieved from the two thermal infrared spectrum channels of 11 and 12 μm of COCTS. The result of Multiple Channel Sea Surface Temperature (MCSST) algorithm is used to be as the first guess of NLSST equation. The coefficients of both NLSST and MCSST for COCTS are regression to ocean buoys and ship measurements.

Acknowledgements

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The iQuam in-situ SST data are downloaded NESDIS/NOAA (https://www.star.nesdis.noaa.gov/sod/sst/iquam/data.html).

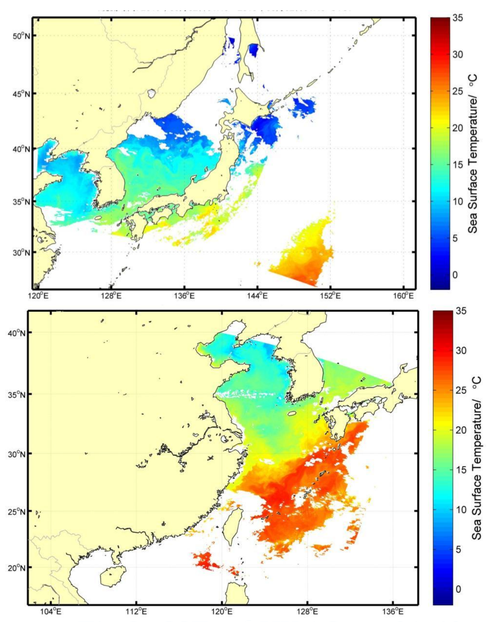

Fig.2 SST of HY-1C at 01:40, May,2 (top) and 02:50 (UTC), May, 21 (bottom), 2019

HY-1C satellite can provide tens of data products to public, including ocean color products, SST and NSST. These products are classified to level 0-level 4. L1 data are the radiances of all visible and near-infrared bands after calibration, L2 data are the standard ocean color and SST products (see Fig.2), L3 data are the grid products with a grid resolution of 4 km and 9 km. L4 data are the grid merged products with multiple data sources.

In general, L1 to L4 products of HY-1C satellite, can be distributed to public for free.

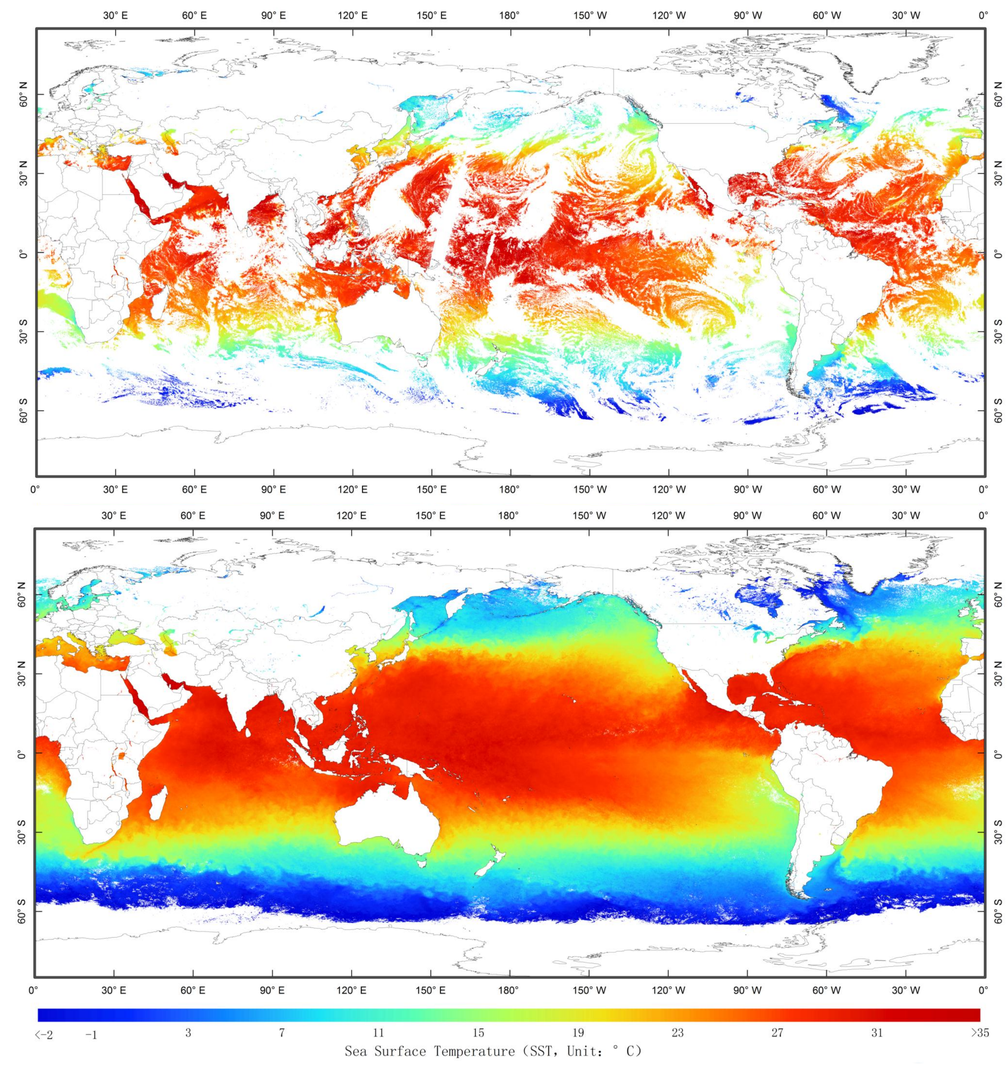

Fig.3 Global grid SST of HY-1C satellite (top: daily, Oct.2, 2018; bottom: monthly, Oct. 2018)

Validation of COCTS/HY-1C SST products

The SST products (version 1.0) are validated against simultaneous *in-situ* measurements of iQuam with a matching window of 3-hour and 5-kilometer. the root-mean square errors (RMSE) of the first two months daytime and nighttime HY-1C SST products in global ocean are 0.74 K and 0.82 K, respectively.

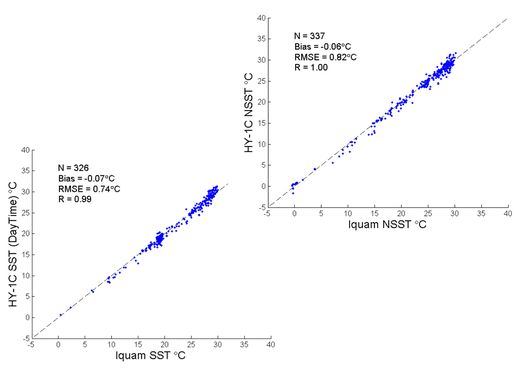

Fig4. Validation results of HY-1C SST