



OPERATIONAL GEOSTATIONARY FRONTAL PRODUCTS

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Introduction

Geostationary sea surface temperature fronts have been produced at NOAA from daily-averaged GOES SSTs since 2006. The automatic detection of these fronts for the entire GOES domain (-180W to -30W, -45S to 60N) is operationally performed using an algorithm developed by Canny [1986], on a daily basis.

Methodology

Input Data

The frontal product utilizes as its input the GOES-SST 24 hour daily average. This is an operational product of GOES-SST available on the product server.

Edge Detection Algorithm

The edge detection algorithm begins with the daily-averaged binary field. First, pixels associated with land, cloud or other flag values are zeroed out. This mask is then dilated by one pixel. The dilated mask will be applied later in the processing. The daily-averaged binary field is median-filtered (3x3), with this filtered field then being subjected to the Canny Edge Detection algorithm. The result is a binary (zero or one) field, where frontal pixels are denoted by ones. The dilated land/cloud mask is then applied to this frontal pixel field, thereby eliminating frontal pixels associated with cloud or land edges. The resulting frontal pixel field is 6.3Mbytes, coincident with the input SST field, containing zeros except where a front has been detected.

Output Data

When hourly data is used, two resultant files, the daily-averaged SST and the daily frontal locations, are compressed and archived. If daily average data is used, only daily frontal file is produced and archived.

Literature of the methodology and geostationary SST frontal study

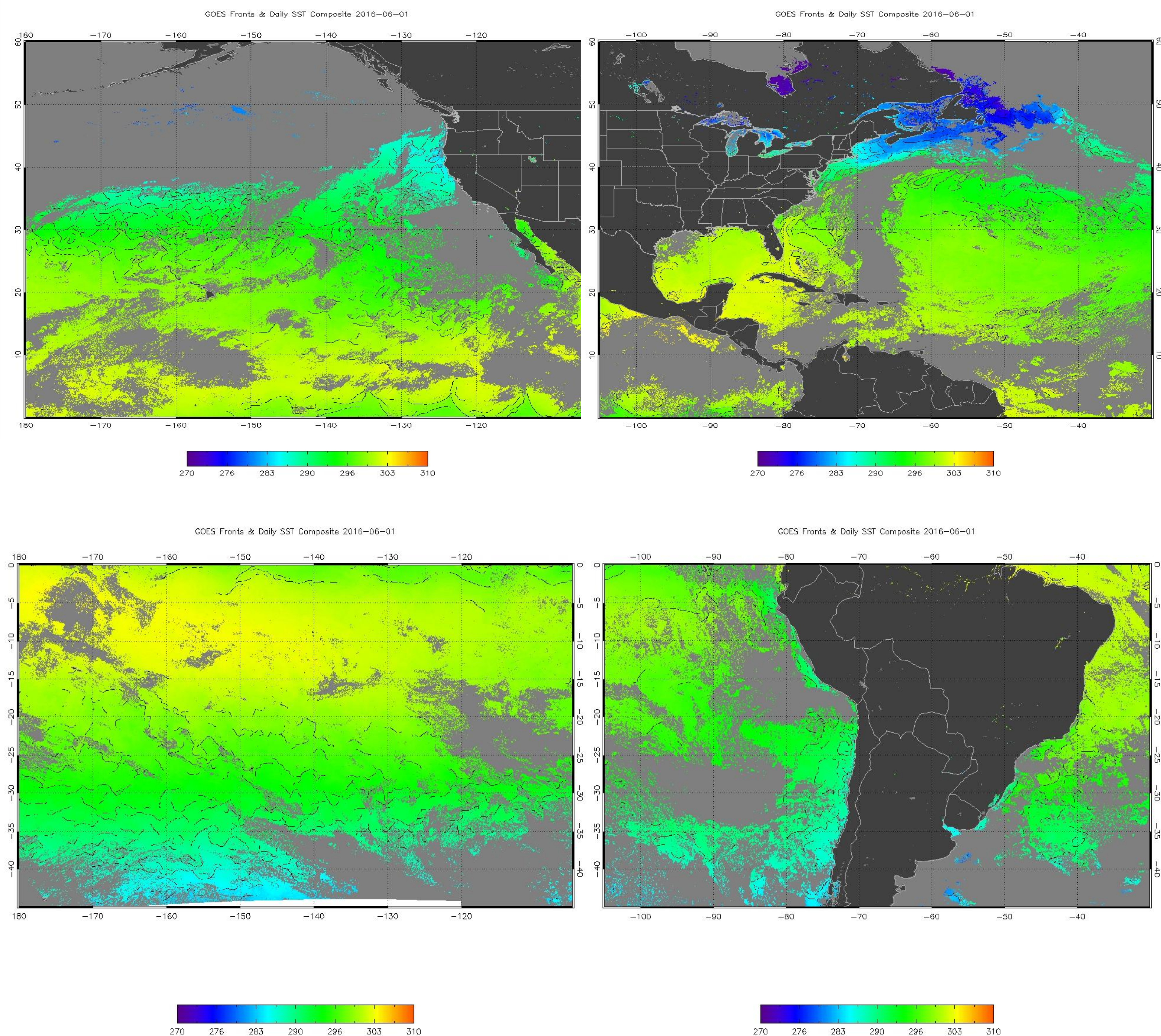
Canny, J (1986) A computational approach to edge-detection, IEEE Trans Patt. Anal. Mach. Intell., 6, 679-698.

Breaker, L. C., T. P. Mavor and W. W. Broenkow (2005) Mapping and monitoring large-scale ocean fronts off the California Coast using imagery from GOES-10 stationary satellite, Publ T-056, 25 pp, Calif. Sea Grant Coll. Program, Univ of Sand

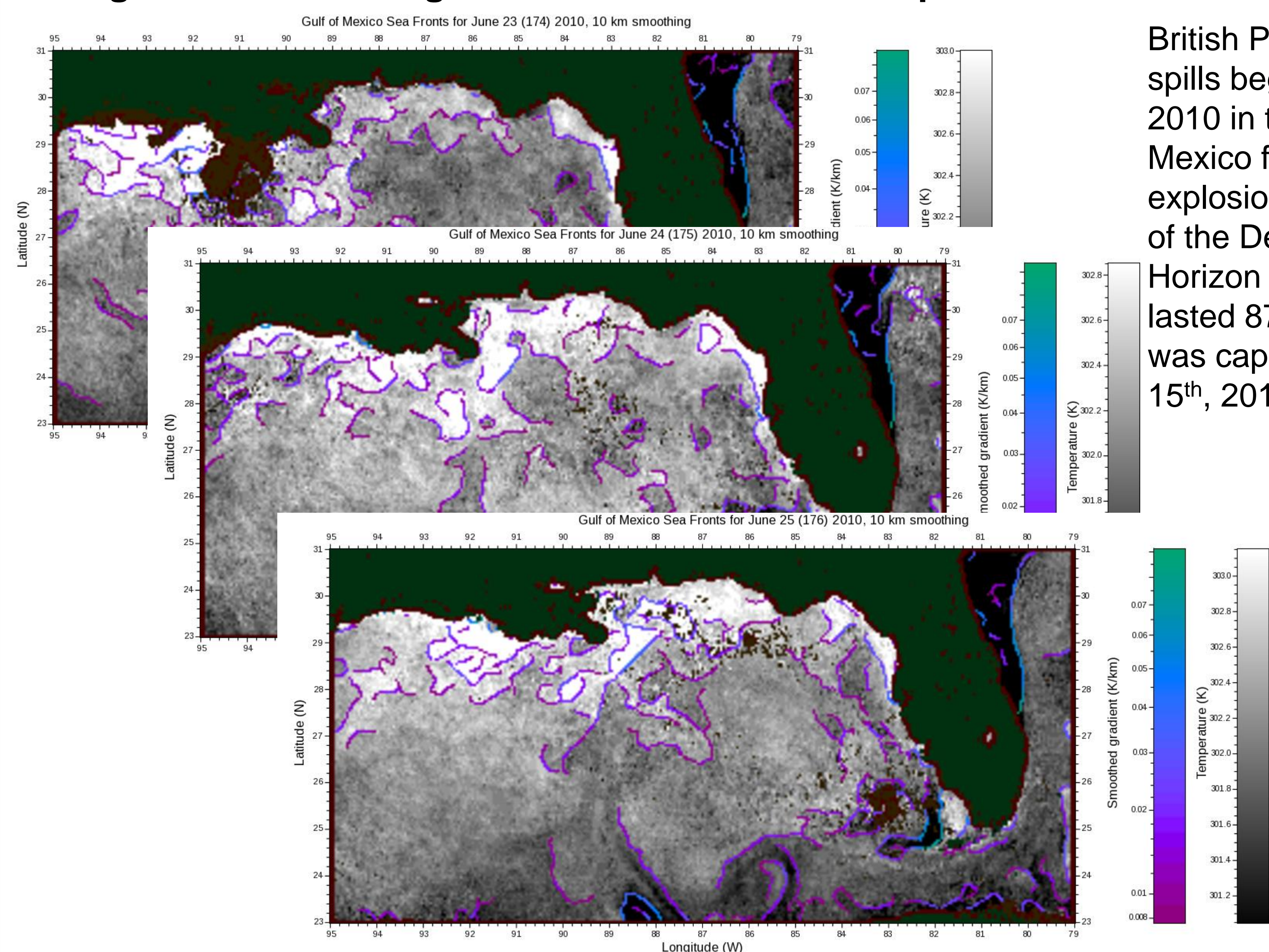
Castelao, R.M, T.P. Mavor, J. A. Barth and L. C. Breaker (2006), Sea surface temperature fronts in the California Current System from geostationary satellite observations, J. Geophys. Res., 111, C09026

Sample operational images

http://www.star.nesdis.noaa.gov/sod/mecb/goes_validation/test/sst_fronts.php



For Gulf of Mexico, a more detailed regional SST frontal map with frontal gradient magnitude has been generated since the BP oil spill in 2010



British Petroleum oil spills began on April 20, 2010 in the Gulf of Mexico following the explosion and sinking of the Deepwater Horizon oil rig, and lasted 87 days, until it was capped on July 15th, 2010.

Summary and Future Work

- GOES SSTs are used to generate frontal product operationally.
- The product is used to detect frontal locations and amplitude, and can be used as tracers for ocean circulation and transport.
- Currently, daily frontal products using GOES SSTs are generated. Further development should include frontal map being generated with hourly or higher temporal resolution and from more geostationary satellite platforms, especially for focused areas and study purposes. In the near future, similar products will also be generated from GOES-R ABI measurements.