



4 PROJECT REPORTS

Transfer of NOAA/NASA AVHRR Pathfinder SST Processing to NODC

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Background: Scientific Problem, Approach, Proposed work

This proposal to NOAA's Scientific Data Stewardship program (SDS) will transfer processing of the highly successful NOAA/NASA AVHRR Pathfinder sea surface temperature fields (PFSST) to the NOAA National Oceanographic Data center (NODC), where their long term availability, survivability, and provenance will be ensured.

The Pathfinder SST program was originally initiated as a cooperative research project in 1991 between the University of Miami Rosenstiel School of Marine and Atmospheric Science (RSMAS) and the NASA JPL Physical Oceanography Distributed Active Archive Center (PO.DAAC). Beginning in 2002, NODC began partnering with RSMAS to improve the Pathfinder CDR, improve its long-term stewardship, and broaden its usage.

The PFSST products have been reprocessed several times over the years, as the scientific understanding of the AVHRR instruments, algorithms and *in situ* matchup calibration data improved, and now provide a mature archive record of over two decades of global satellite measurements of sea surface temperature from multiple generations of AVHRR sensors.

Building on the success and maturity of the PFSST and the importance of this thematic climate record for research and industry, it is time to transition the production and quality control from the academic setting to a more stable and sustainable operational setting at the NODC. This transition will be accomplished by modernizing the current PFSST processing code into a package that will be compliant with the NODC architecture and easily scalable from large institutional data centers to single users that endeavor to continue to evolve the PFSST CDR in the future.

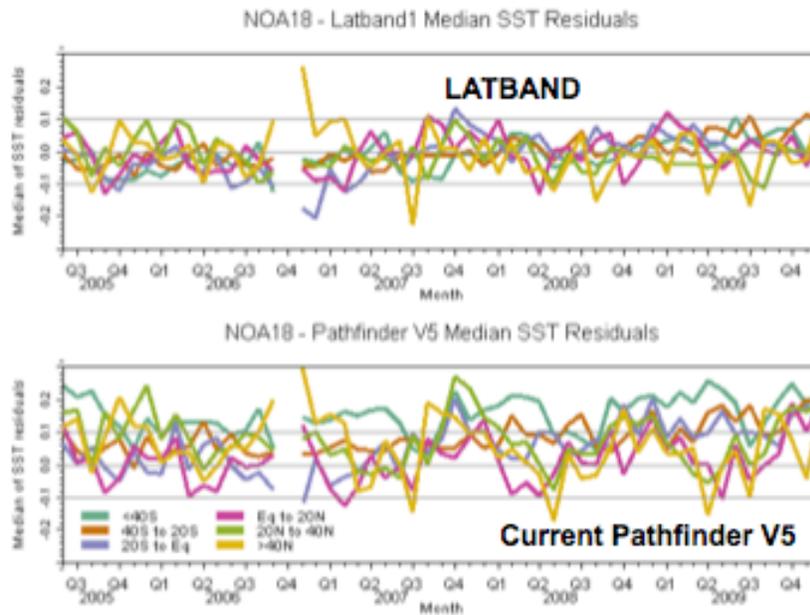
Accomplishments

Efforts during the current reporting period have been focused on integrating the AVHRR Pathfinder code base into the SeaDAS multi-sensor, multi-platform satellite processing system. The initial ingest of AVHRR L1b and subsequent conversion to swath level SST fields has been completed and transferred to NODC. In addition the AVHRR-*in situ* match-up database has been reformulated to provide a consistent record across all of the 5-channel AVHRR sensors, NOAA-7 through NOAA-18. As part of the improvement of the Pathfinder CDR record, the SST algorithm was reformulated to include improvements that have been introduced for the MODIS infra-red bands. In the new approach, monthly SST equations are developed for a



set of 6 zonal bands, LATBAND. A test application of LATBAND to NOAA-18 significantly reduced both zonal and seasonal residuals with respect to *in situ* observations. This in turn has improved the product standard deviation and now both MODIS and AVHRR provide equivalent performance leading to a more consistent inter-sensor long-term SST record

Application of LATBAND to NOAA-18



Median of SST residuals (VALIDATION set) by month (2005-2009). Each line corresponds to a latitude band. Upper panel corresponds to latitude-specific SST; lower panel is current Pathfinder SST V5.

Summary statistics for SST residuals, NOAA-18. (11-12 μ m bands)

Data set	Median (K)	Mean (K)	StdDev
Validation LATBAND	-0.178	-0.198	0.37
Validation Pathfinder V5	-0.093	-0.115	0.39

Summary statistics for SST residuals, MODIS AQUA. (11-12 μ m bands)

Training	-0.1644	-0.1781	0.3867
Validation	-0.1704	-0.1813	0.3889



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The Pathfinder and MODIS SST retrieval equations are developed to produce a “skin SST” leading to the nominal -0.17K offset with respect to buoy measurements and for the first time, a standard deviation less than 0.4.

Planned work

Specific activities for this proposal period include the following:

- 1) Transition ephemeris based high accuracy navigation into PFSST processing code.
- 2) Incorporate capability to read attitude corrections to support processing of 1km AVHRR input Level-1b fields.
- 3) Add ‘hypercube’ uncertainty fields equivalent to those used in the MODIS SST processing.
- 4) Transition AVHRR SST algorithm to use MODIS ‘LATBAND’ 6 zonal band formulation.
- 5) Compute ‘LATBAND’ and ‘hypercube’ tables for 5 channel AVHRR sensors from NOAA-7 through NOAA-18.
- 6) Finalize and test PFSST scripts in a LINUX cluster environment.
- 7) Conduct test processing of PFSST codes to verify process.
- 8) Deliver PFSST processing codes and scripts to NODC.
- 9) Conduct reciprocal tests to verify compatibility of PFSST AVHRR processing at NODC and RSMAS.