Transition of Global Satellite Pathfinder SST CDR Production System to NOAA/NCEI for Operational Production

Xuepeng (Tom) Zhao[1], Korak Saha[1,2], Huai-min Zhang[1], Dexin Zhang[3], and Sheekela Baker-Yeboah[4]

[1]NOAA National Centers for Environmental Information (NCEI), [2]University of Maryland CICS, [3]NOAA/NCEP, [4]University of Maryland ESSIC

Abstract

The widely used global satellite based AVHRR Pathfinder Sea Surface Temperature (PFSST) climate data record (CDR), version 5.3 (PFv5.3), comprises nearly 34 years of daily 4km resolution Level-3 SST data from August 1981 to December 2014. The PFSST CDR was initially developed and produced in a research setting for twenty-five years at the University of Miami's Rosenstiel School for Marine and Atmospheric Science (RSMAS). Over a period of years beginning in 2012 the research production was transitioned to operations (R2O) at the NOAA National Centers for Environmental Information, Silver Spring, Maryland (NCEI-MD). The R2O transition was accomplished in three phase. First, code modernization by incorporation of the PFSST routines into the widely distributed NASA SeaDas6.4 software package. Second, development of a robust production environment at NOAA, first as a demonstration project of the Amazon cloud, and recently using local computers at NCEI-MD. Third, ability to produce matchup datasets at NCEI-MD required to validate and maintain the CDR. The completion of the R2O transition was not smooth, or as timely as planned, due to unstable funding and at times limited resource support. The project experienced multiple phases of start-up, hibernation, and a recent revival in the past two years. The R2O transition is now finally completed, NCEI-MD has achieved the capability of both retrospectively reprocessing and operational forward running of the PFv5.3 CDR products, production of matchup datasets, and documented in detail all the procedures needed to implement and run the production system at NCEI-MD. The most recent three years of data (2015-2017) have been independently produced at NCEI-MD, and the evaluation and validation of this 3-years of data is promising. We will report on the experiences and lessons learned from the R2O transition and present validation results extending the PFv5.3 CDR from 2014 to 2017. The future plan for operational forward processing and retrospectively reprocessing of PFSST CDR will also be discussed.

PFv5.3 vs. other GHRSST Products

PFv5.3 - OISST (nighttime, daytime)

PFv5.3 – CMC SST (nighttime, daytime)

PFv5.3 – iQuam2 (median difference; drifter only) (nighttime, daytime)

PFv5.3 – iQuam2 (RSD; drifter only) (nighttime, daytime)

Overview

- AVHRR Pathfinder SST version 5.3 CDR production system uses the NOAA -7, -9, -11, -14, -16, -17, -18, -19 AVHRR sensor data records as input and produce three kinds of products (L3C, L3U, and L2P) using nonlinear SST retrieval algorithm (Kilpatrick et al., 2001) with both wet and dry coefficients to achieve accurate retrievals.

- Production and processing is operationally done in local NCEI_MD linux servers (see Processing and Production Flow).

- PFv5.3 L3C, L3U, and L2P products (Figures 1A-C) and SST values of all quality levels give users more SST pixels to work with (Figures 1C versus 1D) and the option to apply their choice of cloud-masking procedures.

- The product files are in NetCDF format to ensure consistency with the Group for High Resolution SST (GHRSST) requirements.

Processing and Production Flow
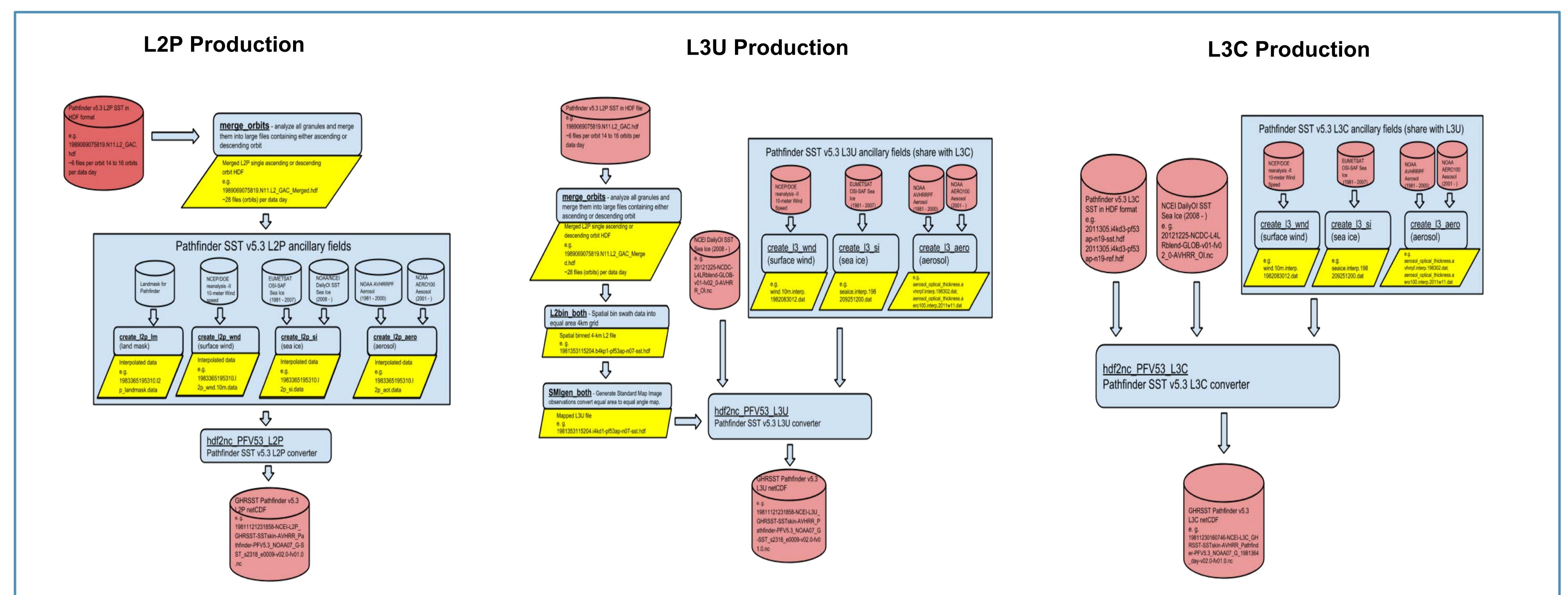
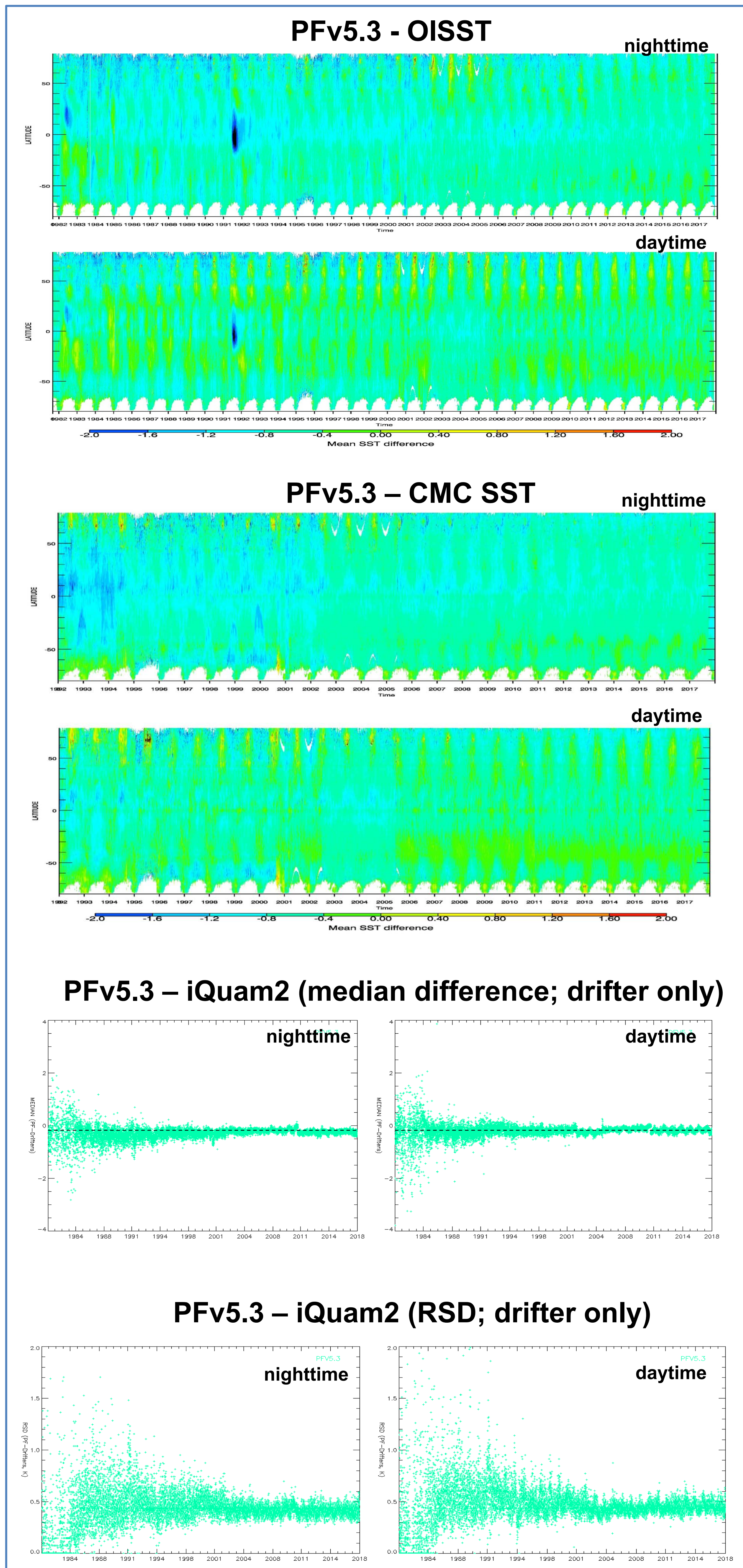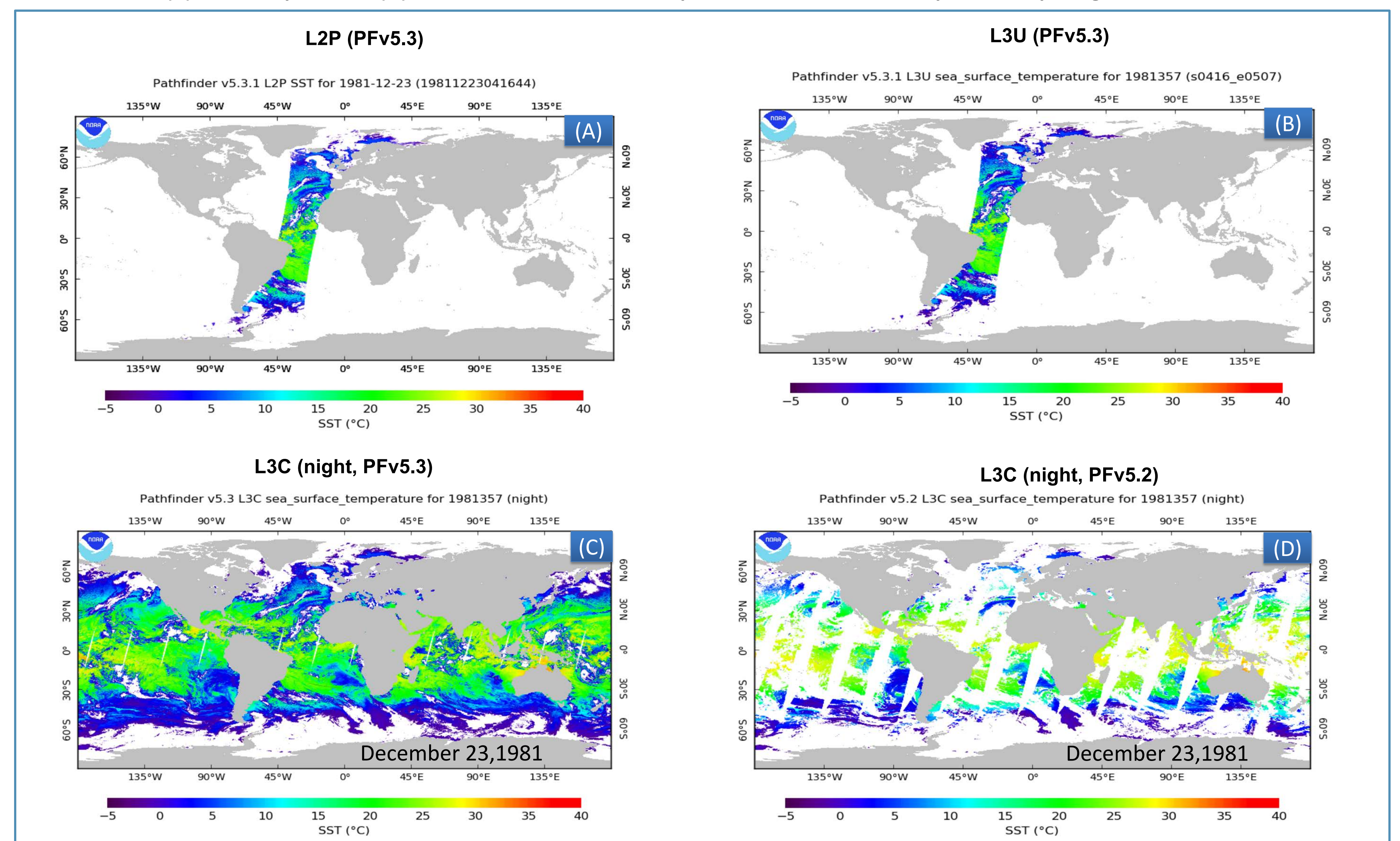L2P Production   L3U Production   L3C Production

Figure 1. (A) Level 2P and (B) Level 3U PFv5.3 products from large orbit files will be available to users in the release of version 5.3 in addition to (C) Level 3C product. (D) The old version PFv5.2 L3C product is with much less pixels comparing to PFv5.3.

L2P (PFv5.3) — Pathfinder v5.3.1 L2P SST for 1981-12-23 (19811223041644) (A)

L3U (PFv5.3) — Pathfinder v5.3.1 L3U sea_surface_temperature for 1981357 (s0416_e0507) (B)

L3C (night, PFv5.3) — Pathfinder v5.3 L3C sea_surface_temperature for 1981357 (night) (C) December 23,1981

L3C (night, PFv5.2) — Pathfinder v5.2 L3C sea_surface_temperature for 1981357 (night) (D) December 23,1981

Summary and Future Plan

R2O transition of PFv5.3 CDR production has been successfully accomplished at NCEI with the support of RSMAS SST team. PFv5.3 L3C SST compares well with other GHRSST products and the data from 1981 to current is available.
Near future plan:
- Quarterly operational updates to extend the record forward. Produce L2P, L3U, and L3C products through a reprocessing with Version 5.3.1 (improved binning issue of mixed day and night granules at high latitudes).
- Complete the production of global Coral Reef Temperature Anomaly Database (CoRTAD; Selig et al., 2010) Version6 product (1981-2017) based on PFv5.3 L3C SST along with an annual forward update.
- Populate the "SSES_bias" and "SSES_standard_deviation" variables for PFSST to make it 100% GDS2 compliant.
- Include MetOp-A/B/C AVHRR observations in the data production.

References

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2. Selig, E.R., K.S. Casey, and J.F. Bruno (2010), New insights into global patterns of ocean temperature anomalies: implications for coral reef health and management, *Global Ecology and Biogeography*, DOI: 10.1111/j.1466-8238.2009.00522.x

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