NPOESS Preparatory Project (NPP)
Science Data Segment (SDS)
Ocean PEATE Status and Plans

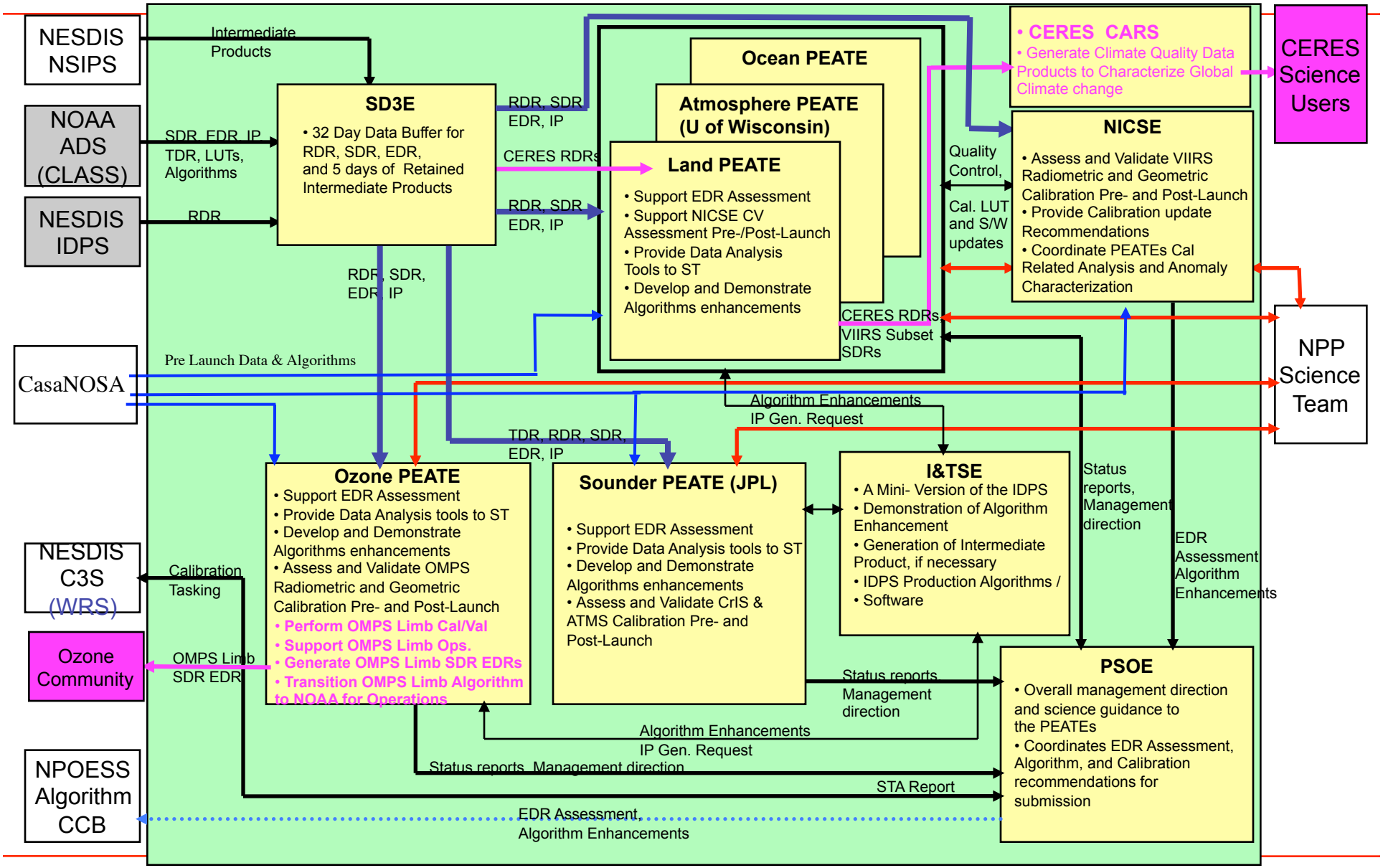
January 27, 2010

Ocean PEATE Team

SDS Overview

- The NASA NPP Science Data Segment is a distributed system consisting of:
  - Central Science Data Delivery and Depository Element (SD3E)
  - Discipline-specific Product Evaluation and Analysis Tools Elements (PEATEs)
  - NPP Instrument Calibration Support Element (NICSE)
  - Integration and Test Support Element (I&TSE) – the mini-IDPS
  - Project Science Office Element (PSOE)
- The PEATEs are supported by existing NASA discipline data processing centers.

SDS Architecture



SDS Level 1 Requirements

- 2.1.2.1 The SDS shall be designed with the assumption that the operational IPO IDPS generated NPP EDRs **do not require reprocessing or re-computation in order to support climate research needs**. Consequently, the SDS **will not be designed to routinely generate climate data products** which require long-term archival in the ADS.

- 2.1.2.3 In developing the SDS, the Project **shall assume that EDRs produced by the IDPS are climate quality** and put in place the capability to test that hypothesis in order to contribute to improving the quality of future EDRs. The SDS shall provide suggested algorithm improvements to the IDPS.

The SDS is NOT tasked to produce data products for distribution.

Primary Tasks of the Ocean PEATE

- Acquire VIIRS data products from the SD3E and ADS/ CLASS:
  - Raw Data Records (RDRs) – Level-0 equivalent
  - Sensor Data Records (SDRs) – Level-1B equivalent
  - Environmental Data Records (EDRs) – Level-2 equivalent
  - **There are no Level-3 equivalent products.**
- Assess the quality of the NPP Ocean EDRs for accomplishing NASA's climate research requirements.
- Provide suggested algorithm improvements to the IDPS via the Project Science Working Group (PSWG).
- Process selected data subsets in support of Evaluation and Validation activities.

VIIRS Ocean Products for Evaluation

- All VIIRS Ocean products to be evaluated will be acquired from the IDPS, ADS/CLASS, or the mini-IDPS.
- Testing and evaluation of algorithm changes will require regenerating product time series in the mini-IDPS, to be downloaded to the Ocean PEATE.
- The Ocean PEATE will design changes to the code in the mini-IDPS for the purpose of algorithm improvement or problem resolution, develop appropriate test cases and request runs to verify and evaluate the changes.

Distribution of Ocean Data Products

- The Archive Data Segment/Comprehensive Large Array Stewardship System (ADS/CLASS) is the official portal for all NPP distributed data products.
- The Ocean PEATE will support limited distribution of available products (i.e., those that have been acquired for evaluation) to VIIRS Ocean Science Team members.

IDPS VIIRS Ocean EDR Data Flow

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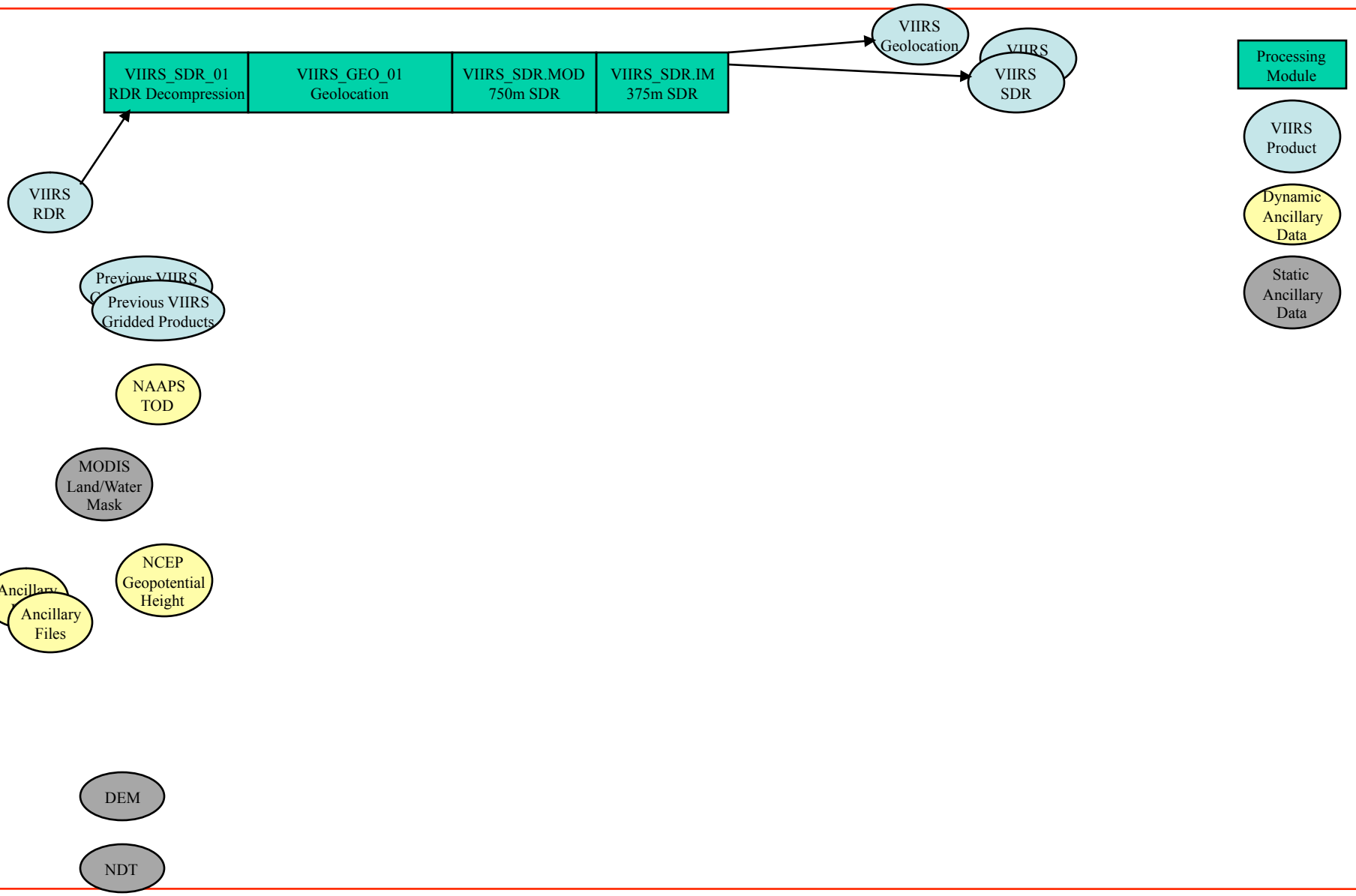
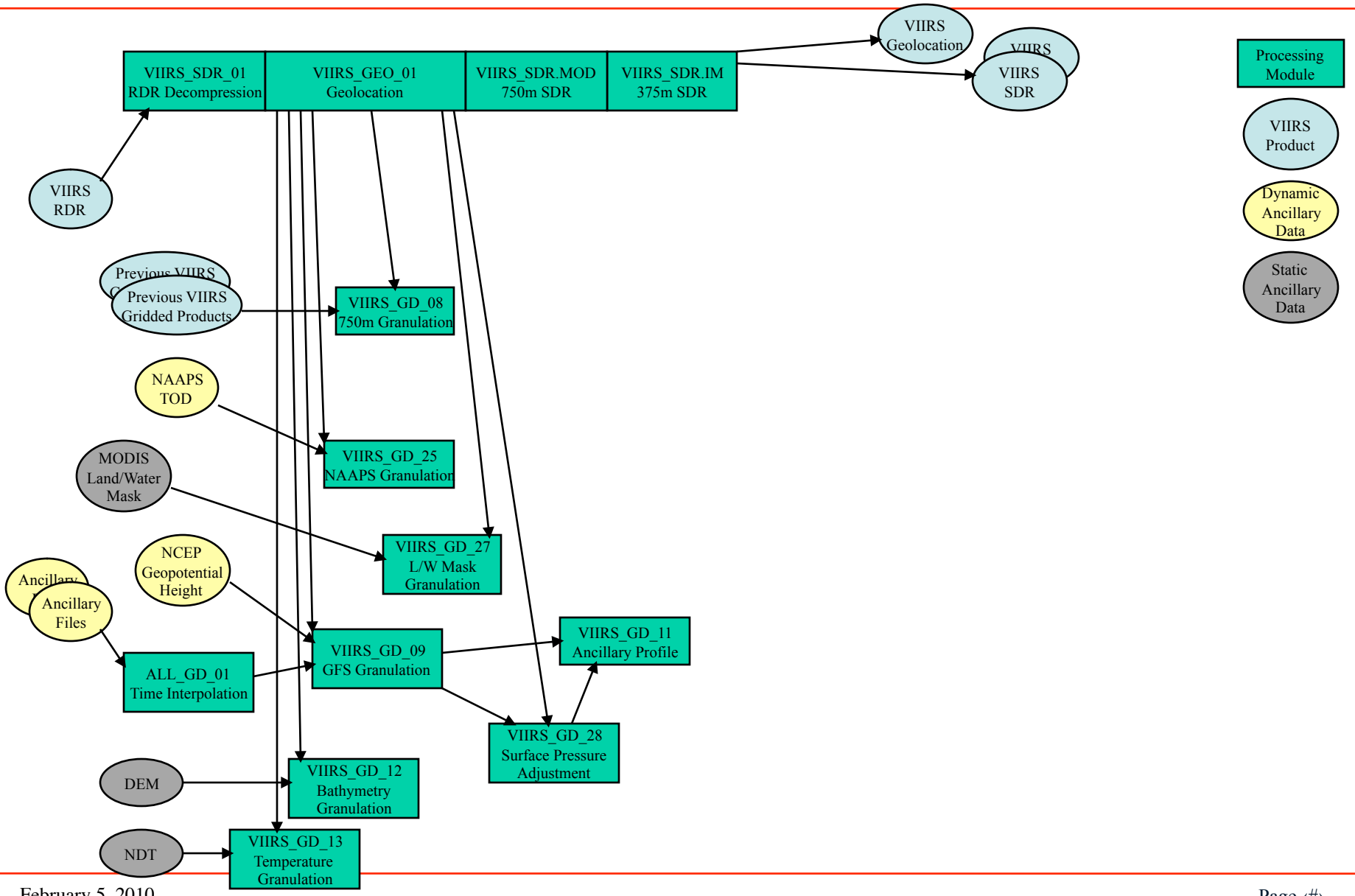
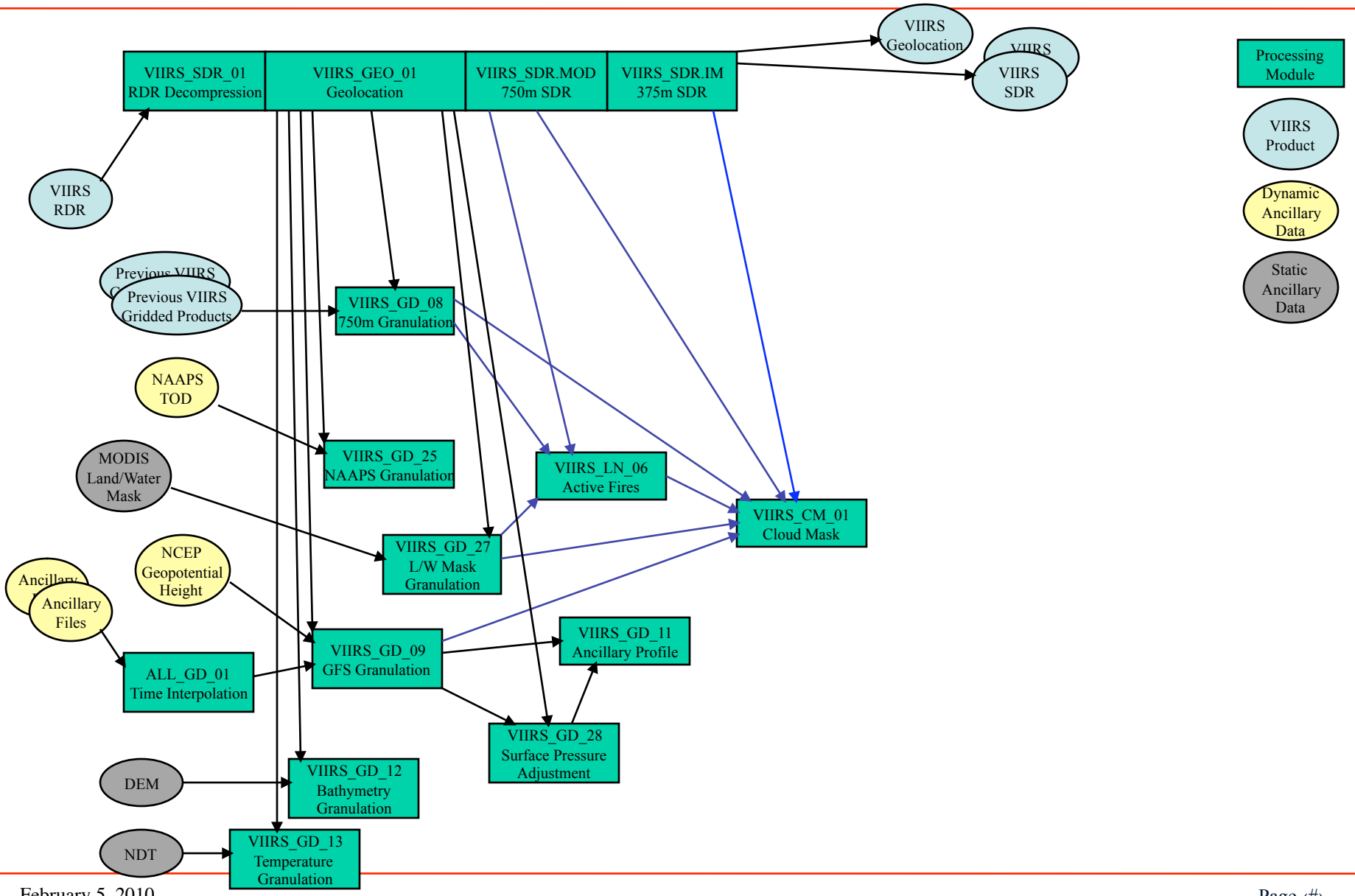


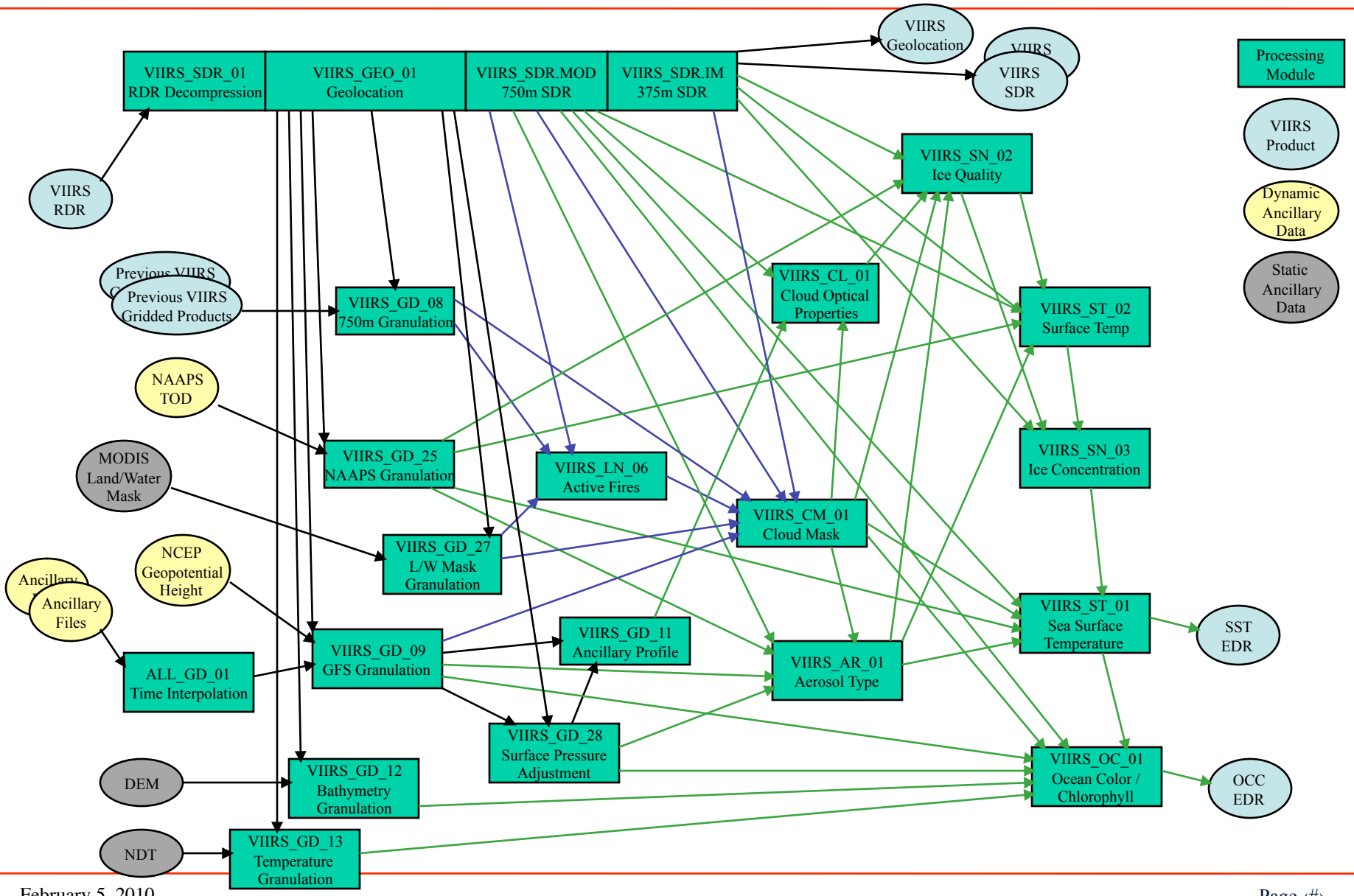
IDPS VIIRS Ocean EDR Data Flow



IDPS VIIRS Ocean EDR Data Flow



IDPS VIIRS Ocean EDR Data Flow



VIIRS Ocean EDRs

- The Ocean Color and Chlorophyll (OCC) EDR contains:
  - Chlorophyll-a concentration
  - nLw at 412, 443, 488, 555 and 672 nm
  - IOP-a at 412, 443, 488, 555 and 672 nm
  - IOP-s at 412, 443, 488, 555 and 672 nm
  - Quality flags
- The Sea Surface Temperature (SST) EDR contains:
  - Skin SST
  - Bulk SST
  - Quality flags
- The content and structure of the NPP data products are described in the Common Data Format Control Books.

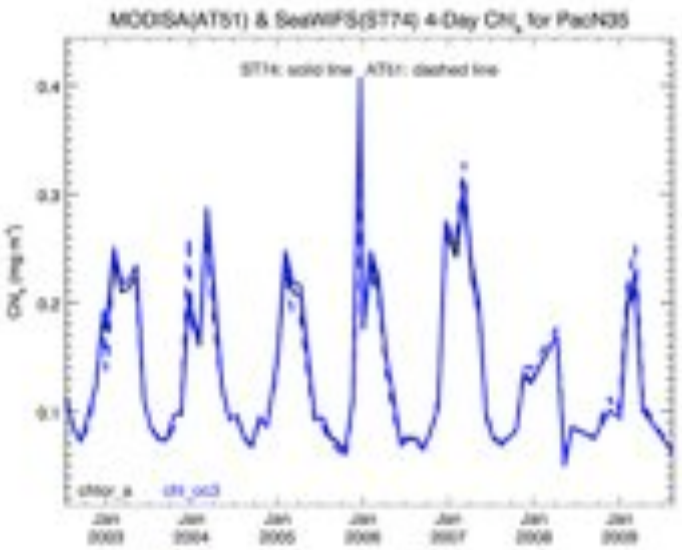
Evaluation Vs. Product Level

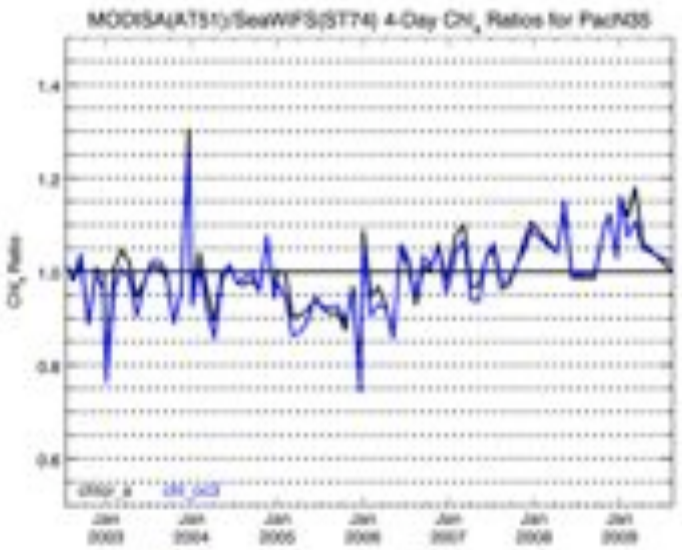
- Level-1 (SDR) Evaluations
  - Onboard calibration analyses
  - Vicarious calibration
- Level-2 (EDR) Evaluations
  - Matchup analyses
  - Residual detector (striping) and scan (RVS) dependence
- Level-3 Product Evaluations
  - Sensor cross-comparisons
  - Algorithm comparisons
  - Temporal anomaly evaluations

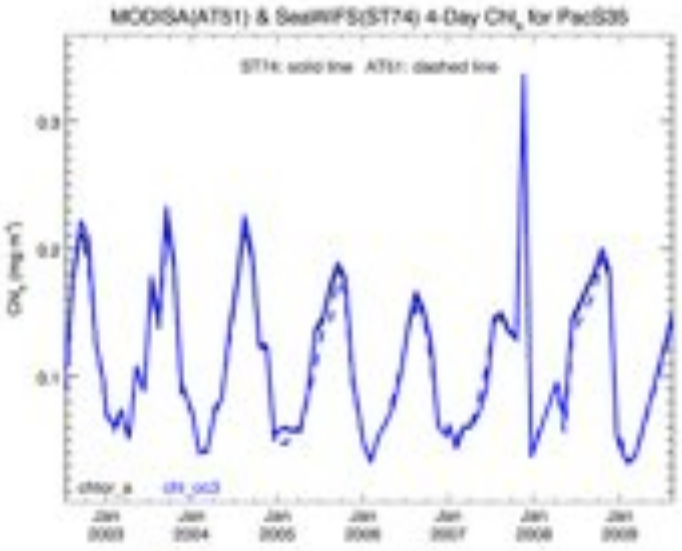
Level-3 Product Generation

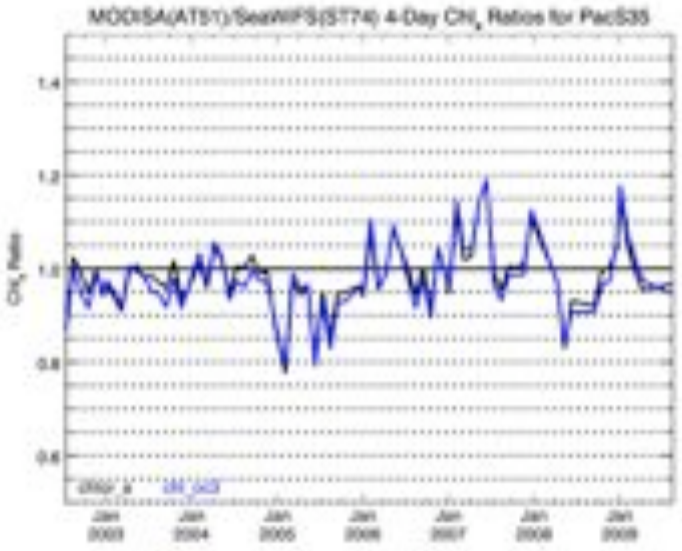
- Sensor and algorithm cross-comparisons and interannual comparisons require Level-3 products. The IDPS does not produce the equivalent of Level-3 Ocean products.
- The Ocean PEATE has implemented software to process VIIRS EDRs to Level 3 binned products in current OBPG format.
  - Current OBPG binning code with new EDR input functions
- This will automatically provide the additional capabilities to produce multi-temporal composites and standard mapped image (SMI) products.

Example: Sensor Zonal Cross-Comparisons









Ocean PEATE Design

- The NPP Ocean PEATE will be implemented within the framework and facilities of the current NASA Ocean Data Processing System (ODPS)

- This system has been successfully supporting operational, satellite-based remote-sensing missions since 1996, and its capabilities continue to evolve and expand to meet the demands and challenges of future missions.

Ocean PEATE Gap Analysis

- Acquire, ingest and catalog NPP VIIRS data products: RDRs, SDRs and Ocean EDRs (Data Acquisition & Ingest and Data Cataloging).
  - Status: Testing of acquisition and ingest scripts has been completed based on sample products in SD3E.
- Process Ocean EDRs (SST and OCC) to Level-3 to support data product and algorithm evaluations (Level-3 Scheduler, VDC and Level-3 binner).
  - Status: Level-3 processing software modification is completed; installation in ODPS is in progress.
- Perform VIIRS EDR matchups with Ocean CARS *in situ* data (extract code).
  - Status: Need to incorporate VIIRS spatial metadata into matchup procedure; need to develop *in situ* test data sets.

Ocean PEATE Gap Analysis (cont).

- Incorporate VIIRS SDR processing for vicarious calibration analysis.
  - Status: This has been performed as part of the VIIRS simulator development.
- Produce VIIRS simulated data using VOST-developed software.
  - Status: Simulator development in progress.
- Acquire SST *in situ* data from RSMAS and perform matchups with SST EDRs
  - Status: Need to incorporate VIIRS spatial metadata into matchup procedure; need to identify *in situ* test data sets.
- Support distribution of data products for team members.
  - Status: In progress.

NPP Ground Segment Testing

- The NPP Project System Integration and Test (SI&T) team is planning a Ground Segment Integration Test (GSIT).
- This test will encompass all systems and facilities of the NPP Ground Segment, including the PEATES.
- The current schedule is for this to be performed in March 2010.
- The PEATEs are working with the SI&T team to generate test procedures, and are developing test-unique capabilities to create and deliver test artifacts regularly during the test.
- Future Ground Segment test opportunities are still TBD.

Schedule

Initial Capability (L-18 months)

- All interfaces fully implemented and tested (subject to external Project schedules)
- Verify initial versions of operational code running in I&TSE
- L-3 product code developed and tested
- Prelaunch VIIRS test data storage and SDS interface testing with existing ODPS storage capacity
- Initial test products acquired for review by VIIRS Ocean Science Team

Full Mission Capability (L-12 months)

- Routine exercise of interfaces to acquire proxy, surrogate and/or simulated data
- Verify pre-launch version of operational code running in I&TSE
- Distribution capability developed and tested
- Test products routinely acquired based on simulated data and posted for access by VIIRS Ocean Science Team
- Data storage for 1 year

The current NPP launch readiness date is September 22, 2011.

Conclusion

- Ocean PEATE requirements will be supported using the proven capabilities of the ODPS, which will support EDR evaluation strategies successfully employed on current missions.
  - Our approach provides progressive stages of evaluation for Level-1B (SDR), Level-2 (EDR) and Level-3 products.
  - Evaluation methodologies and tools are already established for data sets cataloged within the ODPS.
  - Additional development effort (Level-3 products) leverages existing software.
- The charter of the PEATE is to support NASA's evaluation of the NPP data products.
- However, if NASA assigns additional responsibilities and provides resources, the OBPG is prepared to support VIIRS at the same level as MODIS and SeaWiFS.