How did we get here?

• “Soumi NPP The newest NOAA/NASA mission to Earth...

These were the studies of the first SNPP Sounder Science Team. Their mission:

• To determine whether SDRs and EDRs from the NOAA IDPS* are suitable for continuing ongoing climate studies...

• To determine whether NOAA SDRs and EDRs from the NOAA IDPS can be used in conjunction with the existing Sounder Products (AIRS/IASI) to produce an extended data product line...

• To propose alternative strategies if these products do not meet NASA sounding scientist’s needs!

*IDPS = Interface Data Processing Segment, i.e., the NOAA SNPP data processing system
How did we get here?

- NASA established 5 Science Teams to analyze and evaluate NOAA SNPP Products
- Product Evaluation and Analysis Tool Elements (PEATEs) were also funded to support Science Team research activities

- The goals of the Science Teams/PEATEs:
  - determine suitability of SNPP for in NASA’s research programs
  - extending the data record started with NASA predecessor instruments and Earth Mission programs

- The Sounder PEATE, one of the 5 PEATEs supported:
  - The Sounder Science Team in assessing climate quality from CrIMSS products (CrIS and ATMS)
  - The SNPP Cal/Val and EDR Teams (informally)
Example Finding: Striping in Microwave

- ATMS-15 has 1/f noise (low frequency sensitivity fluctuation)
- The striping is transferred to EDR temperature

Source: S.Y. Lee, Sounder PEATE staff
Example Finding:
Poor Yield in Early EDR Products

- EDRs were routinely evaluated
  - Early EDRs exhibited very little high quality products (symbolized in BLACK)
  - Most FOVs are marked “LowMW” (GREEN) and “Poor” (RED)

- Product quality improved with subsequent releases - Mx7
Sounder PEATE Produced Products

• Calibration Subsets (CrIS and IASI)* FOVs in four categories:
  • Clear
  • Random
  • Deep-convective Cloud
  • Fixed-site

*Sounder Science Team can also access AIRS Calibration Subsets

• Simultaneous Nadir Observations (SNO), SNPP-CrIS/ATMS with:
  • Aqua (AIRS/AMSU)
  • MetOp A/B (IASI/AMSU/MHS)
  • NOAA-18, NOAA-19 (AMSU)
**Sounder PEATE Products (cont’d.)**

- **Level 3 Products (SNPP, MetOP, AIRS*)**
  - Daily, Multi-day, Monthly
  - Useful for characterizing global patterns of temperature, water vapor and key atmospheric constituents
  - Support cross-comparisons between SNPP, MetOP and AQUA Level 3 products

Source: Sung-Yung Lee, Sounder PEATE
Early mission NASA SNPP Science Teams reported findings regarding suitability for performing climate studies:

- Current IDPS products did not meet NASA’s needs
- SNPP instrument data is generally high quality could be very useful in developing multi-mission data sets
- NASA should develop its own products (Levels 1, 2 and 3)

Based on Science Team recommendations, NASA HQ agreed it was essential to develop data products from SNPP using NASA Science Team algorithms

- Issued ROSES A.29, calling for NASA Science Teams and SIPS with the following goals*:
  - Development of science quality standard data products using Suomi NPP measurements that will enable continuity of key standard Earth system data records from NASA’s EOS Terra, Aqua, and/or Aura satellites
  - Development and demonstration of innovative and practical applications of NPP measurements
  - Development of other new science data products from Suomi NPP measurements that will meet high-priority Earth science needs (a secondary priority)

*quoted from A.29 solicitation, p. 37
Emphasis of Science Teams

- Science Team emphasis is to be placed on developing Levels 2 and 3 data products and placing them into the production stream.

- Development of “merged data products*” is of secondary importance.
  
  "Development of merged Suomi NPP-EOS extended time series data products, while clearly NASA’s longer-term goal, will not be emphasized in this solicitation."

- Science Teams to develop ATBDs, algorithms and beta code.
  
  - ATBDs to be reviewed by NASA before authorization to code.
  
  - ATBDs, algorithms and code to be handed over to the SIPS for development of operational production code.

- The proposed implementation schedule is very ambitious.

*A.29, p. 6.
A word about Level 1

- Level 1 algorithms and code are to be developed by members of previous SNPP NASA Science Teams. (earlier ROSES awards)

  - A.29 proposers are to assume that NASA would provide Level 0 data and that previous Science Teams will deliver ATBDs and code to SIPS for implementation of L1 code

    - CrIS Level 1 Team:
      - University of Wisconsin – Madison
      - University of Maryland, Baltimore County

    - ATMS Level 1 Team:
      - Jet Propulsion Laboratory
      - Bjorn Lambrigtsen (Lead)
      - Sounder PEATE/SIPS implementation
### New NASA Science Teams and SIPS for SNPP

- **Five Science Teams/SIPS pairs were selected from A.29 solicitation:**

<table>
<thead>
<tr>
<th>Team/Focus</th>
<th>Instrument Specialization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land</td>
<td>VIIRS</td>
</tr>
<tr>
<td>Ocean</td>
<td>VIIRS</td>
</tr>
<tr>
<td>Atmosphere</td>
<td>VIIRS</td>
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<tr>
<td>Sounder</td>
<td>ATMS and CrIS</td>
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<tr>
<td>Ozone</td>
<td>OMPS</td>
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</tbody>
</table>

- **JPL was selected to be the Sounder SIPS and is teaming with the GES DISC**
  - JPL will be the chief developer, integrator and tester
  - GES DISC will perform operational data processing

- **Sounder SNPP Products will be archived at a TBD DAAC**
• The Sounder Science Team was also selected from A.29:

• **Chris Barnet** – Team Lead
  *Development and validation of a community hyper-spectral infrared microwave Earth retrieval algorithm: CHIMERA*

• **Hartmut Aumann**
  *Analysis of the AIRS and CrIS radiometric calibration under cloudy conditions and error propagation into environmental variables*

• **Jean-Luc Moncet** and **Vivienne Payne**
  *Refined Atmosphere Data Products from CrIS and ATMS*

• **Joel Susskind**
  *Analysis of CrIS/ATMS using an AIRS Version 6-like retrieval algorithm*

• **Karen Cady-Pereira** and **Helen Worden**
  *Developing retrieval algorithms for NH3 and CO from NPP CrIS measurements*

• **Bjorn Lambregtsen**
  *Microwave sounder Earth System Data Records*

• **Eva Borbas**
  *Continuation of EOS Clear Sky Infrared Total Precipitable Water Vapor Product Using a Combination of VIIRS and CrIIMSS Measurements*
Sounder SNPP Data Products

- The Sounder SIPS will work hand-in-hand with the Science Team to develop the following products*:
  - Level 1B Calibrated Radiances
    - ATMS
    - CrIS
  - Level 2 Products
    - Retrieved Products (Temperature, Water Vapor, … other species)
    - Cloud-cleared Radiances
  - Level 3 – gridded retrieval products, grouped into ascending and descending, 1x1-degree cells

- Additional Products
  - Simultaneous Nadir Observations (SNO)
  - Calibration Subsets (CalSub)
  - Other TBD products

- All products will be formatted to netCDF-4/HDF 5 specification
  *pending Science Team concurrence
Development Plans and Schedules

• Sounder SIPS will work with the Science Team to develop and release PGES and subsequent products
  • Work to a mutually agreeable schedule

• Products will be produced in accordance to the NASA data policy
  • Rapid release of all products
  • No sequestration of products for science team-only

• Science Team members and SIPS have yet to meet and develop a schedule
### Development Plans and Schedule

#### ID | Task Name
--- | ---
1 | 1 Sounder SIPS Management
   | 1.1 Coordinate With Science Team
   | 1.2 SIPS Planning and Infrastructure
   | 1.2.1 Develop Master SIPS Plan
   | 1.2.2 Software Management Plan
   | 1.2.3 ICD with GES DISC
   | 1.2.4 Develop Logical Design for L1, L2, L3 PGEs
   | 1.2.5 Develop Plans with Science Team

| 2 | PGE Development
   | 2.1 Develop Product Data Model
   | 2.2 Science Team Algorithm/Code Deliveries
   | 2.3 Level 1 PGE
   | 2.4 Level 2 PGE
   | 2.5 Level 3 PGE
   | 2.6 Develop ST Tools, Support Investigations

| 3 | OPERATIONS (at GES DISC)
   | 3.1 Prepare Operational Environment
   | 3.2 PGE Operational Processing
   | 3.2.1 Level 1 PGE - Full-Mission Processing
   | 3.2.2 Level 2 and 3 PGEs - Full-Mission Processing
   | 3.2.3 Reprocessing (Levels 1, 2 and 3)
   | 3.2.4 Forward Processing

| 4 | Version 1 Processing
   | Version 2 Reprocessing
   | Version 1 Development & Test
   | Version 2 Development & Test
   | Version 3 Development & Test
   | Version 2 Planning
   | Version 3 Planning

[Diagram showing development plans and schedule]
A Working Relationship
BACKUP SLIDES
Example Finding:
Comparing IPDS and Mini-IDPS Products

Differences are exhibited between IDPS and mini-IDPS products.

CrIS 1231.25 cm⁻¹ Channel

ATMS channel 21

Source: S.Y. Lee, Sounder PEATE staff