2016 JPSS STAR Science Team Annual Meeting

Summary

Great Turnout:

❖ Over 350 registered participants from NOAA, NASA, Universities, and industries. 194 oral presentations plus 38 poster presentations

❖ Visions/Plans from JPSS Director, STAR Acting Director, JPSS Program Scientist, EUMETSAT Program Scientist

❖ SDR, EDR, Flight, Ground, overviews followed by detailed science presentations and discussions, great interactions among SDR, EDR science team members

❖ Updates on Enterprise Algorithms and Reprocessing: Progress, Challenges, Actions

❖ Recommendation from science communities and users on next steps of JPSS Algorithms and Cal Val strategy

❖ Nuances:
  ❖ Societal benefits: What are the values of our work
  ❖ Interns: JPSS Education and Outreach

Met All Meeting Objectives

✓ Review JPSS Program Level and NESDIS Level Priorities

✓ J-1 Instruments and Algorithm Readiness

✓ Review Science Teams Support for Suomi NPP

✓ Interaction/Communication among stake holders
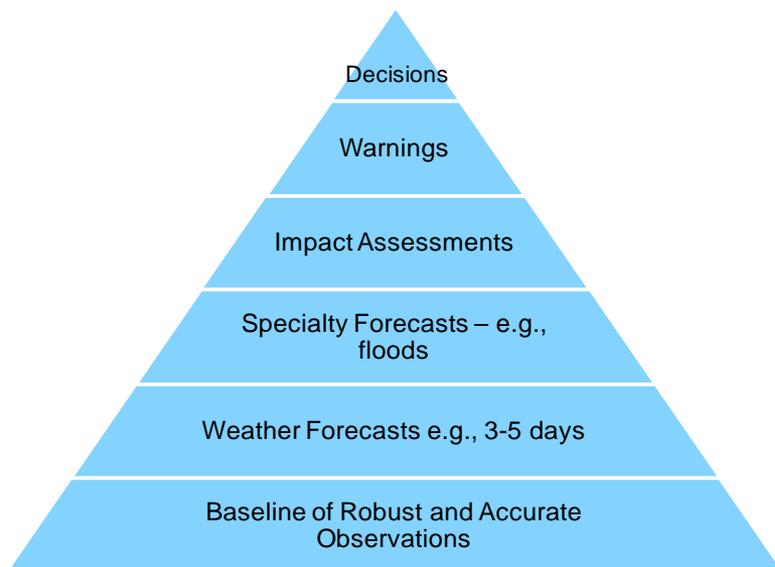
✓ Feedback from user community

Moving Forward

√ **Baseline Algorithms/LUTs for Reprocessing**
- √ SDR generate demonstration data sets
- √ Evaluation/feedback from EDR teams
- √ Reach consensus on the baseline for reprocessing
- √ Coordinate with NCEI and other stakeholders on the R2O of the JPSS products reprocessing

√ **Leveraging resource by building collaboration**
- √ Enterprise Algorithms
- √ Enterprise cal val, Datasets, tools
- √ Coordinated campaign planning/opportunities

√ **J1 Readiness**
- √ Work with ASSIST to setup test data flows
- √ Efficient R2O Process
- √ Continue building ICVS LTM

√ **Advanced Products to support user applications**

Observations To Decision Making

Decisions

Warnings

Impact Assessments

Specialty Forecasts – e.g., floods

Weather Forecasts e.g., 3-5 days

Baseline of Robust and Accurate Observations

- Develop a robust baseline of accurate observations through requirement analysis, traceability, and user consultation to ensure J1 products generated are accurate and address user needs.
- Work with users, understand how products are used, Identify improvements and enhance algorithm development to meet user needs. Provide user training on product utility (e.g. NUCAPS on AWIPS and training)
- Map capabilities of various data products from J1, and other satellite platforms (e.g. GOES-R), in-situ and other fused data sets to address data needs across NOAA line offices and a wide variety of users.
- Operations to Operations (O2O): Evaluate NESDIS operationally produced S-NPP/J-1 products and use of the products for operational applications (e.g. Fire Products to NAM model applications to forecast trajectories.

Summary for Breakout Sessions

S-NPP SDR Performance and J1-Readiness

ATMS

- SNPP ATMS has a stable performance in orbit and all the parameters meet the specifications with large margins. ATMS striping mitigation algorithm updated to further improve data quality. Additional improvements applicable to both S-NPP and J1 include:

  - ✓ Radiance based calibration algorithm
  - ✓ Physical model based Lunar contamination correction algorithm
  - ✓ Allan variance NEdT monitoring

- STAR ICVS monitoring of SNPP ATMS scan drive motor current excursion supported NASA/NOAA decision makers for defining the Suomi NPP ATMS scan reversal schemes.
- ATMS SDR team have completed two rounds of J1 ATMS TVAC analysis and supported anomaly investigations.
- J1 ATMS PCT has been updated for operations.

CrIS

- SNPP CrIS instrument and SDR performances are very stable.
- CrIS full spectral resolution (FSR) SDR data are routinely produced at STAR processing system and the FSR data have been made available to the user community for various applications and research
- SDR algorithm/software is ready for operation to J1 CrIS

S-NPP SDR Performance and J1-Readiness

VIIRS

- All SNPP VIIRS SDRs meet or exceed requirement.
- VIIRS SDR team evaluated J1 waivers, developed, tested, and delivered J1 SDR algorithms upgrades mitigating certain instrument waivers; developed research capabilities for post-launch implementation to address SWIR nonlinearity, saturation handling, and testing other DNB agg modes
- Geolocation software code/LUTs are ready for operation to J1 VIIRS

OMPS

- SNPP earth view SDR and Geo-SDR for both SNPP OMPS NM and NP meet the requirement and are well defined for representative conditions
- SDR algorithms and their LUTs have been modified for J1 OMPS SDR processing. The J1 SDR algorithm was delivered after performing end-to-end tests. The SDR team intends further testing support with JCT 3.5 and TVAC data

All SDR teams participated in J1 pre-launch characterization and continued support for pre-operational testing of J1 algorithms. The SDR teams also finalized post-launch Cal/Val plans and schedules for Beta, Provisional and Validated maturity.

SST Products

- VIIRS **L2/L3 Data Producers**-8: STAR(5), NAVO(2), U. Miami(1)
  - NOAA ACSPO product continues history of solid performance
  - Reduced-size ACSPO L3U widely used & improved
  - New ACSPO error characterization improves SST performance
  - U. Miami and NAVO continue improving their VIIRS SST products

- ACSPO **Holdings/Archives**-2: STAR(1), NCEI/Silver Spring(1)
  - ACSPO L2P/L3U Products are fully archived at PO.DAAC and NCEI
  - STAR is exploring supplemental product access via CoastWatch

- ACSPO **Users**-10: UKMO(1), ABoM(2), JMA(1), NOAA CRW(1) and Geo-Polar Blend(1), JPL(1), NCEI(1), NOS(1)
  - Sustained 2 major users: CMC and NOAA Geo-Polar-Blended
  - 2 new users: **Met Office (OSTIA)** and NOAA CRW
  - 5 emerging users: ABoM, JMA, JPL, NOS, NCE/Asheville

Ocean Color Products

- VIIRS global ocean color products have been routinely produced using the NIR, SWIR, and NIR-SWIR atmospheric correction algorithms, providing necessary satellite data for various applications in coastal and inland waters, as well as for further improving data quality.

- The team completed VIIRS mission-long science quality ocean color data reprocessing (including SDR and EDR) with MSL12 Processing System. Two data streams are routinely produced: near-real-time and science quality ocean color data.

- Developed VIIRS instrument calibration capability with new calibration LUTs resulting in significant improvements to VIIRS OC products. The OC team also achieved significant improvement in OC products over global high altitude lakes through important updates, new algorithms, and with vicarious calibration using MOBY data.

- Results of evaluation indicate that the VIIRS-SNPP is now capable of providing high quality global OC products in support of science research and operational applications.

GCOM-W1/AMSR2

- JAXA's GCOM-W1/AMSR-2 Day-1 products have been operational since 11/14/2015. Research products are available since 11/2013. The products include:
  - AMSR-2TB's, Total Precipitable Water (TPW), Ocean Surface Winds (OSW), SST, Cloud Liquid Water (CLW), Rain Rate (RR)/Type
- The team has delivered product updates for improved ocean EDRs, and Day-2 products, and awaiting ORR. The Day-2 products include:
  - Snow water equivalent (SWE), Snow Depth (SD), Sea-Ice concentration (SIC) and Soil Moisture (SM)
- The team is coordinating with JAXA on sensor calibration/updates and continuity for follow-on missions.
- On-going Interactions with users on developing new applications and expand utility of data sets
  - Tropical Cyclones – NHC, JTWC
  - Marine forecasts – OPC
  - Hydrology – WPC, NWC
  - Day 2 products – NIC, NWC, etc.

Land Products

- Land algorithms are currently transitioning to Enterprise solutions. JPSS Enterprise Workshop has numerous presentations describing the changes in the retrieval algorithm, product content and other details. The team continues preparations for re-processing and details of reprocessing efforts are at STAR reprocessing workshop.
    - LSA retrieval quality has significantly improved after three updates of LUTs of regression coefficients since launch. An improved enterprise albedo algorithm is currently under development to address many issues with the current IDPS product.
    - The SNPP LST marginally meets the mission requirements based on the ground based validations (CONUS, Europe, Greenland, Australia, China), radiance based validations, and cross satellite comparisons with MODIS, AATSR, SEVIRI etc.
    - Overall Surface Type Products classification accuracy is about ~78%. Recent updates have shown some accuracy improvements for croplands.
- Product development for operational applications
    - NCEP/EMC land: consistent, gridded, global, 1-km composites
    - biophysical variables for terrestrial ecological studies
    - fire radiative power for smoke/air quality applications
- Pursuit of Interagency / international coordination and collaboration for
    - science algorithms / products
    - validation
    - multi-satellite observing systems

Cryosphere (Snow, Ice, and Polar Winds)

- Products:
  - Snow: Binary snow cover, snow fraction
  - Ice: Ice surface temperature, ice concentration, ice thickness/age
  - Polar winds

- All products meet requirements (with one qualification)

- All products have better performance than their IDPS counterparts (a few only slightly better; others substantially better)

- Planned improvements for J1 are minor

- All products are ready for J1!

Atmosphere Products

- **VIIRS imagery is generally very high quality with many operational users:**
  - NRL, NIC, NCEI, JTWC, NWS (including NHC and Alaska Region), US State Department/foreign governments
- **Terrain-corrected geolocation is needed for all Imagery EDRs**
  - Lack of terrain correction impacts any land surface application of VIIRS Imagery
  - Working with NCEP on the use of VIIRS cloud products for use in CrIS cloud characterization.
- **Clouds Operational Status**:
  - Code will go operational in NDE in Nov 2016. The next update is August 2016 for a January 2017 operational update. Enterprise now includes Cloud Base and (baseline) Cloud Cover Layers.
- **Cloud team user-focused priorities**
  - Working on the use of VIIRS cloud products for use in CrIS cloud characterization, optimizing cloud heights for the Polar Winds Application., active in inserting VIIRS cloud / precip. information in JPSS Hydro Initiative, and demonstrating use of I-bands for cloud products – a unique capability from VIIRS.
- **Aerosols findings**
  - VIIRS AOT, and dust and smoke masks are evaluated for assimilation in aerosol forecast models, for monitoring model forecasts (NCEP, ESRL, NRL), and for improving air-quality forecast (PSU). VIIRS AOT is investigated in field experiment (UMBC). Found that EPS AOT has less bias than IDPS, that VIIRS+MODIS is better than MODIS alone, and that VIIRS RGB and AOT essential for identifying smoke plume transport upwind; 48 hour aerosol trajectories are critical tool for forecast.

Soundings Products

NUCAPS

- NUCAPS has been implemented in NWS AWIPS-II and is is fully operational for multi-sensors (IASI/AMSU, CrIS/ATMS) onboard multi-satellites (Suomi NPP, Metop-A/B)
- New channel configuration and tuning for ATMS, MW only retrievals improved; IR+MW "yield" is increased by 3%; still more to do
- NUCAPS is upgraded for CrIS full-spectral data, test results indicate similar or slightly better performance for T, q retrievals and significant improvements for trace gas EDRs
- A lot of good feedback from users in NWS forecast office.

- J1 Readiness: implementation of new SARTA model, regression coefficients generation, new tuning, testing.
- Maintain interaction with users, NUCAPS in AWIPS-II, training support, feedback, response.

MIRS

- MiRS v11 sounding EDR implemented with significantly improved performance and the problems with retrieval of snow products for Blizzard 2016 have been corrected .

- Future work: Snow (vegetation correction), Rainy condition sounding (update a priori constraints), Hydrometeors (improvements to CRTM i.e. scattering, precharacterization of precip type, particle size/shape distribution in CRTM, CLW over land for light rain detection) and Air mass-dependent bias correction

Traces Gases

o Future algorithm developments: Mathematically sound retrieval algorithms are key and multi-sensor products should be developed from NIR and TIR measurements for joint retrievals of trace gases.

o Users application initiatives:
  o More trace gas user's verification efforts using planned field campaigns (FIREX, Atom) of opportunity for real time user support and post mission data assimilation studies. The goal is to evaluate the impact of these retrievals on global and regional chemistry forecasts.
  o NWS (NGGPS and AQFC) to use JPSS operational trace gas products (NO_2, O_3, etc.).
  o A network of commercial air craft based trace gas measurements (especially CO_2 and CH_4) for a global scale verification of the COP-21 agreement.

Ozone Products

- Heritage/Enterprise Version 8 Algorithms to create Total Column Ozone and Nadir Ozone Profiles with improved horizontal resolution are ready for implementation at NDE and for reprocessing.

- An improved atmospheric SO2 algorithm will allow correction of ozone amounts for elevated SO2 levels.

- The Version 2 Limb Ozone Profile algorithm is ready for implementation at NDE.

- We are working with users, operations, and the OMPS SDR team to prepare for these new products and their improved horizontal resolution with J1.

GSICS Workshop Summary

- GISCS activities have matured to the point where they are providing the foundation for a true Global System of Infrared instrument measurements including Polar and Geostationary satellites.

- Methods for Visible, Microwave and Ultraviolet instruments are progressing and are addressing differences in the reference measurements, sensor technologies and Earth signatures in their different spectral regions.

- The ICVS is an important asset in the NOAA participation in GSICS activities.