Basic questions

- Describe how SNPP/JPSS products provide continuity from legacy POES, METOP, DMSP, EOS? Or is SNPP/JPSS a new capability for our application?
  - Soil Moisture, GVF, (and density of vegetation), veg type, soil type
    - SMOPS combines soil moisture for global composite
  - *Many legacy products not exploited operationally are being used in R&D, so consistency with NPP/JPSS is important.*
  - LDA requires climatology and its consistency – reprocessing and dynamic continuity

- What benefits or improvements do you expect from SNPP/JPSS?
  - Expected impact (low, medium, high) and why?
    - Impact is contingent of the readiness of the operational model transition from R&D to operation is critical
    - Eventually high impact
    - *Consistency between land products and between land and cryo, global 1km*
    - *VIIRS NDE GVF weekly at 4km, subdaily LST, SA*
    - *Ops needs for radiance assimilation are very basic – Community wants improvements but hindered by requirements*
    - *Need for spectral emissivity from blended product incl. CrIS*
    - *Additional data products (MODIS heritage}*

Basic questions

- Provide Details on:
  - when do you plan to use the SNPP/JPSS Product?
    - Is there an actionable plan?
      - Soil Moisture, GVF near future
    - Is it funded? Partly – JCSDA activities, funding for testbed
    - What is the priority? High
    - Have you thought about how you will get the data and have you identified the issues with your operational use of SNPP/JPSS ?
      - Need to transition to ops within NCEP
    - Initialization (GVF, albedo) vs. assimilation (NASA LIS) – snow, soil moisture
    - LST: verification (systematic planned), potential for assimilation
  - Are the current legacy products well utilized?
    - *AVHRR TOA NDVI 5 yr climo (GVF); Snow cover and depth (DMSP & AMSR E); old snow albedo DB; MODIS Sfc Type.*
    - *All are prepackaged…not xDR.*
    - *Plans for more routine validation use.*
  - Is the SNPP/JPSS product part of a blended product?
    - Potential for blended albedo from mid-am/pm platforms
  - What additional work needs to be done to ensure that the SNPP/JPSS product is/will be well utilized?
    - *Need better dialogue between operational use and researcher on what is needed – better requirements definition…global values are inadequate.*

Are enhancements needed for:

- Accessibility (data flow, latency, format)
  - Latency varies per product. Snow is daily, but working with NSIC on sub-daily; GVF weekly; burned area currently has daily rolling based on weekly, but would prefer daily
  - GRIB2
- Product performance (accuracy, precision)
  - Error characterization
    - Recommend keeping levels of validation maturity
    - Encourage independent validation
  - Rqmts in terms of global APU for all conditions doesn't reflect real needs
- User applications (modifications to modeling , decision tools, visualization to use the new products)
  - Post-processing of EDRs is critical
  - Current EDRs are important fundamental products

Improving User Utilization of JPSS Snow and Ice Products

Sean Helfrich (National Ice Center) and Jeff Key (STAR)

Moderator: Ray Godin

Participants: Cezar Kongoli, Igor Appel, Mark Tschudi, Peter Romanov, Chris Grassotti, Mark Middlebusher, Paul Meade (phone), Yinghui Liu (phone), Patty Pratt (phone)

Responses to Questions

- Describe how SNPP/JPSS products provide continuity from legacy POES, METOP, DMSP, EOS?

VIIRS snow and ice products provide continuity with products from heritage imagers such as AVHRR, MODIS, and OLS, e.g., snow cover (binary and fractional*), sea ice extent, sea ice concentration, sea ice surface temperature, imagery (including icebergs, Great Lakes ice)

AMSR2 and ATMS provide continuity for sea ice concentration, snowfall, snow water equivalent (SWE), snow depth

- What's missing from SNPP/JPSS that is currently used?
    - Automated algorithms for ice motion, ice edge, and icebergs.

- Or is SNPP/JPSS a new capability for our application?

SNPP also provides some new capabilities:
     VIIRS: sea ice concentration, ice "age"/thickness
     AMSR2 : sea ice type (first-year, multiyear),
     ATMS: Snow Grain Size

See Notes section of slide

Responses to Questions, cont.

- – What products are desired that SNPP/JPSS <u>could</u> provide?

Snow Density over land, Snow Depth over Ice, Ice Motions, Iceberg detection, ice edge, Uncertainty metrics, Ice Age (years), freshwater ice concentration and thickness

- What benefits or improvements do you expect from SNPP/JPSS?
  - Expected impact (low, medium, high) and why?

Better spatial resolution from both VIIRS and AMSR2 will provide more detailed structure. VIIRS will help resolve summertime ice edge degradation and concentration over SSMIS. New products can be applied directly into the NIC snow and ice analysis system. Impacts: medium.

Responses to Questions, cont.

- Provide Details on:
  - when do you plan to use the SNPP/JPSS Product?
    - Is there an actionable plan?
    - Is it funded?
    - What is the priority?
    - Have you thought about how you will get the data and have you identified the issues with your operational use of SNPP/JPSS ?

The NIC has already begun using VIIRS imagery. Other VIIRS products are being evaluated (sea ice characterization and concentration; snow cover). AMSR2 products are not yet operational but test data will be evaluated over the next 6-12 months.

There are no funds to transfer AMSR2 products into NIC operations. The use of VIIRS blended products is largely unfunded.

Priority – NIC: high; NCEP (Marine Modeling Analysis Branch) – unclear

Responses to Questions, cont.

- Provide Details on (cont):
  - Are the current legacy products well utilized?

  From imagery and passive microwave: yes

  - Is the SNPP/JPSS product part of a blended product?

  Yes: IMS, NIC charting, NAVO's Arctic Cap Nowcast/Forecast System (ACNFS)

  - What additional work needs to be done to ensure that the SNPP/JPSS product is/will be well utilized?

  The VIIRS Sea Ice Concentration IP needs its own set of quality flags. It needs to be a deliverable IP (despite plans for Block 2.0). More tools and algorithms to assist in product blending and metadata of blended products.

- Are enhancements needed for:
  - Accessibility (data flow, latency, format)

  Desired formats: netCDF, geotiff, GRIB2

  - Product performance (accuracy, precision)

  Additional quality flags and more uncertainty metrics would be beneficial.

  - User applications (modifications to modeling , decision tools, visualization to use the new products)

  Validation and intercomparison tools

Imagery-Cloud Applications Outbrief

Basic questions

- Describe how SNPP/JPSS products provide continuity from legacy POES, METOP, DMSP, EOS?
  - Or is SNPP/JPSS a new capability for our application?
- What benefits or improvements do you expect from SNPP/JPSS?
  - Expected impact (low, medium, high) and why?
- Provide Details on:
  - when do you plan to use the SNPP/JPSS Product?
    - Is there an actionable plan?
    - Is it funded?
    - What is the priority?
    - Have you thought about how you will get the data and have you identified the issues with your operational use of SNPP/JPSS ?
  - Are the current legacy products well utilized?
  - Is the SNPP/JPSS product part of a blended product?
  - What additional work needs to be done to ensure that the SNPP/JPSS product is/will be well utilized?

Are enhancements needed for:

- Accessibility (data flow, latency, format)
- Product performance (accuracy, precision)
- User applications (modifications to modeling , decision tools, visualization to use the new products)

Imagery and Clouds

- Current Uses
  - Cloud products are being distributed primarily thru LDM
  - DNB for AK is in SBN (see footnote below)*
  - Future imagery and cloud SBN plans controlled through Suomi NPP Data Exploitation (NDE)
  - DNB
    - Is being worked as a L1RD KPP
  - DNB has been shown to be critical in
    - NCEP Centers
    - NWS PAC found value with TC Flossie
    - AK
    - WFOs
  - Evaluating single channel and RGB Products continuity with Geo
  - Value of hybrid Leo-Geo imagery products (OPC, WPC, NWS Pac and AK is already doing this from DB)
    - AWC, SPC looking for this in the future

Imagery and Clouds Concerns

- Latency
- Bandwidth constraints
  - Raw data for generating products
  - Products to users
- Education of who is doing what
- Accessibility to data
  - Data Formats
  - NWS users have a mix of AWIPS 1 and AWIPS II
  - Lack of tools to manipulate the datasets
- Not far along with validating products with model data
- Moving products from the demonstration efforts to operations in NCEP Centers, regions, and WFOs
- Need to continually prioritize to guide future decisions

Imagery and Clouds - Initiatives

- NWS is going towards a RTMA and URMA (Mesoscale Analysis) – forecasters need to know what the actual analysis is in 3D (see footnote below)[1]
  - Provides a snapshot of the atmos in as NRT as possible
  - VIIRS needs to get into this process – would go into the existing database
  - Plugs into aviation
  - Is there a plan and is it sufficiently resourced?
  - NESDIS provides the cloud product for the RTMA and URMA
- Synthetic model imagery has proven very valuable for GOES how can JPSS evaluate this capability (see footnote below)[2]
  - Sounders on Polar can help push Peterson model work

Imagery and Clouds - Initiatives

- Need verification of physical consistency from cloud products and solar insolation
  - Clouds drive what happens at the surface which in turn drives models

Cloud and Imagery Priorities

- Cloud levels and type for aviation support
- Polar wind data assimilated into models
- RTMA and URMA
- More access to DB – TAFB/OPC for Pacific
- Education and Training – basic, application-based,
- Better communication of who is doing what

BACKGROUND

Imagery and Clouds

- Ward
  - Cloud layers for aviation (IDPS has a cloud layer product h/m/l and cloud type)
    - Cloud altitudes (ft) just arrived at AWC (thru LDM) this is global Geo. Could be a good hybrid product
    - Adding VIIRS to the NOAA AK Cloud composites ....evaluate its value for Pacific
- Andrew Collard
  - Polar winds from VIIRS into global models. Wind products produced 9 May need to be assimilated
    - Earliest assimilation is Spring 2015

Trace Gas Breakout

Monika Kopacz, Chris Barnet

Thursday May 15 10:30 – 2:30

How to Cross the Wall of Ignorance

- And the Chicken and the Egg

- The developers had a "Build it and they will come" mentality.

- Funding provides ability to build a product, but not with the interaction needed to have it anticipated by the user community. Users not engaged in the early process. This user engagement exercise is funding limited.

Basic questions

- Describe how SNPP/JPSS products provide continuity from legacy POES, METOP, DMSP, EOS?
  - METOP/IASI, EOS/AIRS EOS/Aura/TES, EOS/Terra/MOPITT
- For new capabilities from SNPP/JPSS describe the benefits
  - No new trace gases, BUT
    - Dense 70% global coverage,
    - LTM (multi satellite mission, with multi year overlap, when all other resources are beyond their design life),
    - Gasses retrieved simultaneously
    - Possibility of additional gases (HCN, HDO, Ammonia)
    - Lower noise
- Provide Details on:
  - when do you plan to use the SNPP/JPSS NESDIS Product? NOTE: IASI === NUCAPS because it is identical code, format, and very similar characteristics
  - NESDIS deliver product (IASI+NUCAPS):
  - Ira Aoeifer IASI CH4 currently, funded by NASA ROSES
  - currently sporadic users for science applications
  - validation/comparisons with GOSAT, potential with OCO
  - Jonathan Smith using IASI and NUCAPS O3/CO
  - NASA/SPoRT using O3
  - TOAST O3
  - Users of legacy instrument (e.g., AIRS, TES, MOPITT) users of these instruments will have to use CrIS product and ultimately will have vested interest in using products

Atm Chem Part 2

- Is there an actionable plan? Workshop – STAR/CPO workplan to develop products – engage user community
  - Is it funded? Yes,
    - STAR developers has responsibility to meet the requirements via continuous measurements
    - AER is funded for new research NH3 algorithm via AC4
    - CPO/AC4 has resources to support atmospheric composition studies
- What is the priority?
  - CPO/AC4: have not ranked priorities yet, it is one of a few priorities
- Have you thought about how you will get the data and have you identified the issues with your operational use of SNPP/JPSS? CLASS, Users have expressed concerned with access
- Are the current legacy products well utilized? yes
- Is the SNPP/JPSS product part of a blended product? Yes TOAST, TACO-O3
- What additional work needs to be done to ensure that the SNPP/JPSS product is/will be well utilized? Averaging kernels in operational products (data reduction), validation of product wrt reference instrument, closer collaboration between developer and user community

Are enhancements needed for:

- Accessibility (data flow, latency, format)
  - Low latency products are needed for field experiments
    - The scientific interaction can be supported by STAR
    - But we need to communicate this capability
  - Numerous users have complained that obtaining trace gas products from CLASS:
    - Is not user friendly (cumbersome),
    - There is a lack of tools to narrow search range,
    - That all our products in one large file (no targeted retrieval)
- Product performance (accuracy, precision)
  - Full resolution required for CO and opaque water lines and may improve other products
  - Desire for filling spectral gap – formic acid, HDO
- User applications (modifications to modeling , decision tools, visualization to use the new products)
  - Level 3
  - Tailored products (e.g. lower vertical sampled CO with Avg Kernels
  - Website visualization
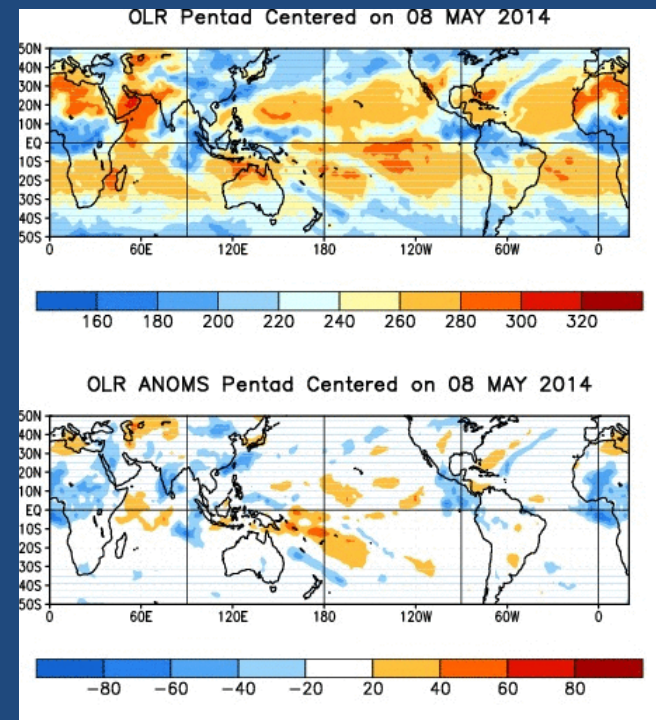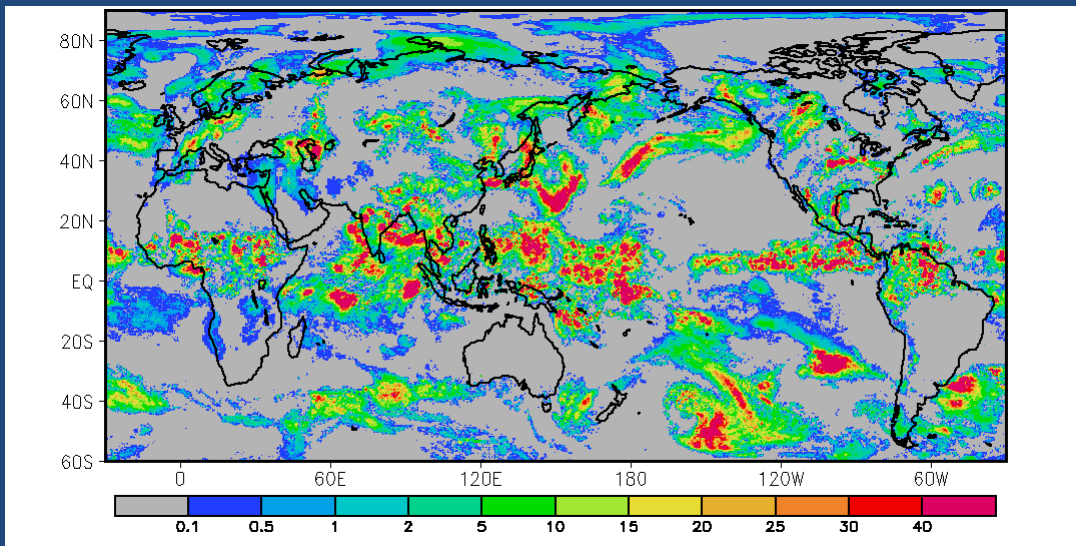
OLR is Critical for Weather / Climate

- Monitoring of weather / climate / tropical storms (ENSO, MJO et al.)
- Monitoring and mitigation of hazards
- Monitoring crop production
- Forcing Verifying weather / climate models
- Global water cycle / energy budget studies / global change studies
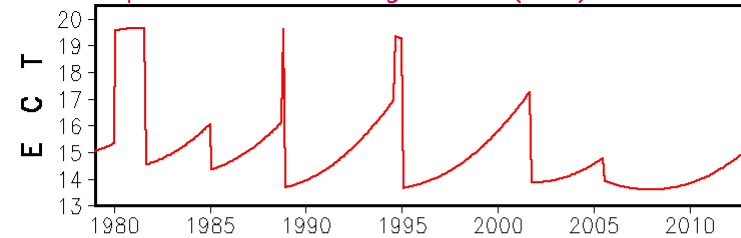- Deriving precipitation information

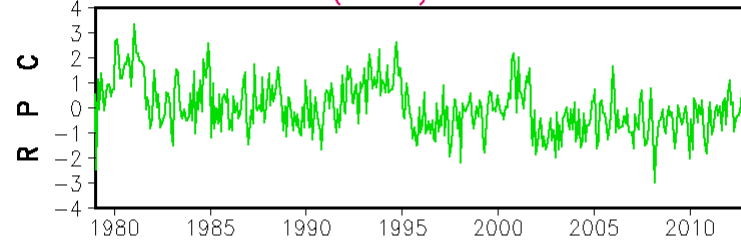# Current Operational OLR is a 30-Year Old technology

- Based on AVHRR
- Using data from one single satellite only
- Less-than-desirable accuracy / coarse resolution
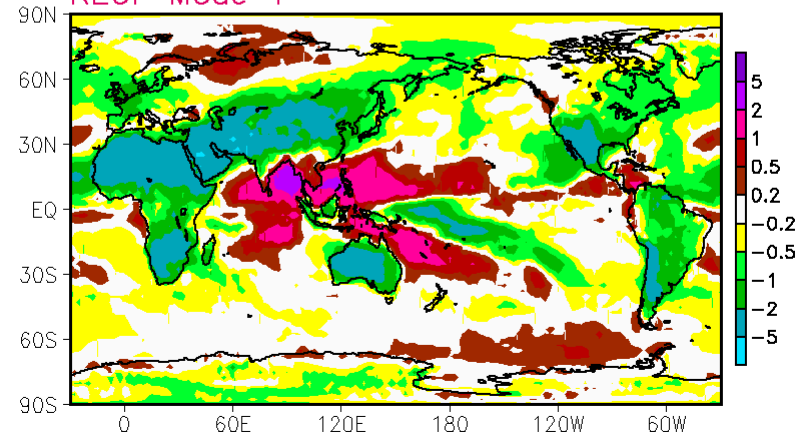- Discontinuities
- We need new OLR data!!
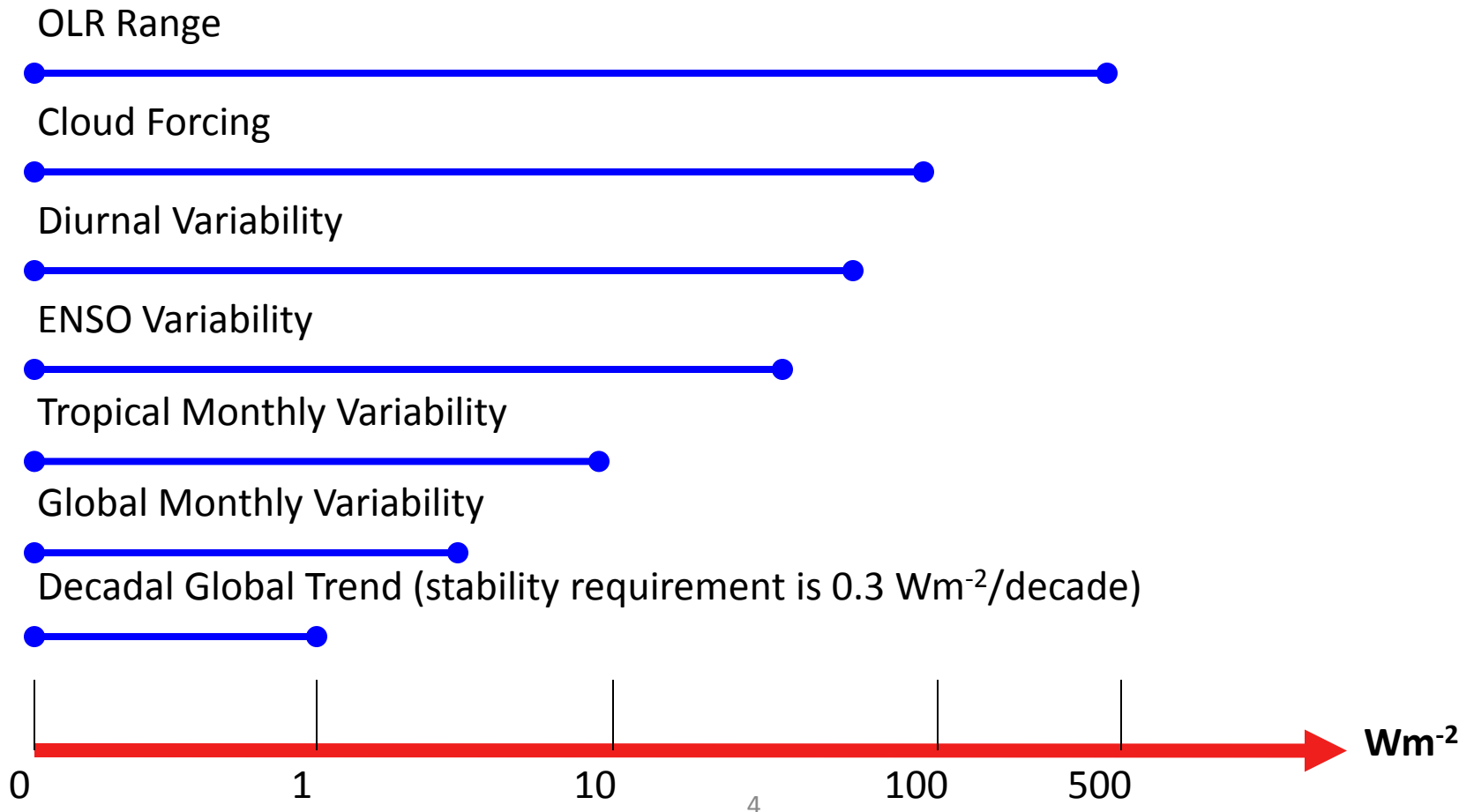
OLR Variability & Accuracy Requirements

Absolute Accuracy vs. Uncertainties

Process vs. Time Series Applications

OLR Range

Cloud Forcing

Diurnal Variability

ENSO Variability

Tropical Monthly Variability

Global Monthly Variability

Decadal Global Trend (stability requirement is 0.3 Wm^{-2}/decade)

Wm^{-2}

0   1   10   100   500

Outgoing Longwave Radiation Overview

Outgoing Longwave Radiation (OLR) is the energy leaving the Earth as infrared radiation Definition:

$$OLR = \int_0^{\pi/2} \int_0^{2\pi} \int_{\lambda_1}^{\lambda_2} [R(\lambda, \theta) d\lambda] \cos(\theta) \sin(\theta) \, d\theta d\varphi$$

$R(\lambda, \theta)$ the radiance at the top of the atmosphere.

Spectral coverage is essential, that is why OLR from hyperspectral sensors more accurate.

1. Std ~ 11 W/m², AVHRR IR window channel at 11 μm (Ohring et al., 1984)
2. Std ~ 6 W/m², Meteosat IR window + WV channels (Schmetz and Liu, 1988)
3. Std ~ 4 W/m², HIRS IR window + WV + CO_2 channels (Lee et al., 2007)
4. Std ~ 3 W/m², AIRS full IR spectra (Susskind et al, 2012; Sun et al., 2011)

CrIS OLR Status

➢CrIS OLR passed Critical Design Review (CDR)

➢NOAA/STAR uses IASI-like algorithm and derived the conversion coefficients from radiances to OLR based on match-up AIRS, CERES.

➢The CrIS OLR product is under validations.
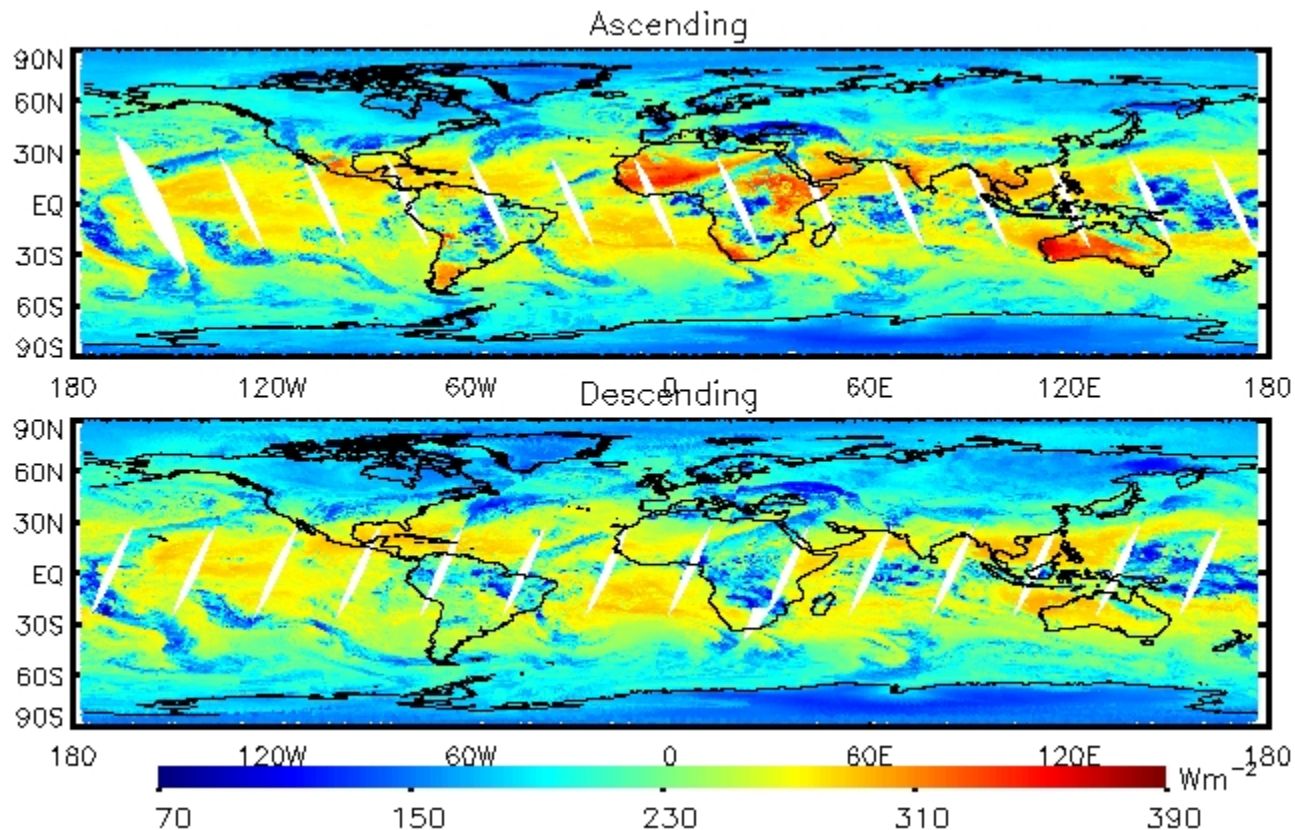
Basic questions

- Describe how SNPP/JPSS products provide continuity from legacy POES, METOP, DMSP, EOS?
    - Or is SNPP/JPSS a new capability for our application?

    Community including CPC would like to replace the AVHRR based OLR data with a blended product (hyperspectral OLR from CrIS et al, plus from   other sensors)

- What benefits or improvements do you expect from SNPP/JPSS?

    Inter-satellite calibration among hyperspectral OLR sensors from different platforms

    Improved sampling from both the morning and afternoon operational satellites

    L2 data reprocessed from the beginnings of respective satellite observations

    OLR from multiple platform / sensors integrated into a single time series of high quality with reduced latency (~12 hours) and refined resolution (0.25^{o}lat/lon,daily)

    -- Expected impact (low, medium, high) and why?

    Medium

- Provide Details on:
    - when do you plan to use the SNPP/JPSS Product?

    Somewhere around FY15-FY16 when we finish work to establish a homogeneous record of OLR from multiple satellite / sensor from at least 1981 updated on a real-time basis (~6hr delay)

        - Is there an actionable plan?

        Yes,. We drafted a proposal to NESDIS/OSD on converting IASI OLR to operation and another one to be submitted to JPSS on CrIS OLR.

        - Is it funded?

        Yes, by NESDIS/OSD for IASI up to FY14, No, no funding from JPSS for CrIS.

        - What is the priority?

        Reprocessing the IASI/CrIS OLR and blend them with OLR from other historical data for a consistent record

        - Have you thought about how you will get the data and have you identified the issues with your operational use of SNPP/JPSS ?

        Yes.

    - Are the current legacy products well utilized?

        CrIS OLR is not yet publically available. People are still using AVHRR OLR for climate monitoring et al.

    - Is the SNPP/JPSS product part of a blended product?

        No. There is no blended OLR so far, we are proposing an effort to do so.

    - What additional work needs to be done to ensure that the SNPP/JPSS product is/will be well utilize

        Create a homogeneous long-term (>=30 years) record of high accuracy / high resolution OLR by blending information from hyperspectral sensors with those from other instruments.

Are enhancements needed for:

- Accessibility (data flow, latency, format)
    a latency of 6~12 hours is good enough for weather/climate applications.

- Product performance (accuracy, precision)
    We have not yet conducted comprehensive examination on this. However, for climate applications, it is more important to ensure accurate inter-satellite calibrations and lime corrections for the OLR data

- User applications (modifications to modeling , decision tools, visualization to use the new products)
    - *monitoring of global climate (El Nino, MJO et al.)*
    - *monitoring of tropical convection, severe storms and hazards (hurricane and disasters..)*
    - *weather / climate model verifications*
    - *enhance climate forecasts*
    - *climate diagnostics and attributions*
    - *distributed from CPC to climate centers of many countries around the world for climate monitoring, and decision support*

- Other topics:
    - Product fusion?
        - Yes, blending info from different sensors from LEO / GEO platforms
    - Reprocessing
        - We need the retrievals to be reprocessed every time a new algorithm is implemented

Improving User Utilization of JPSS products – Microwave Precipitation (and TPW)

Thursday May 15 10:30 – 2:30

Ralph Ferraro, Limin Zhao, Yu Zhang

Facilitator - Lance Williams

About 20 participants, including - NWS (OHD, NCEP/CPC), OAR (ESRL) , NASA (TRMM/GPM), NESDIS (STAR, OSPO, OSD), UMD
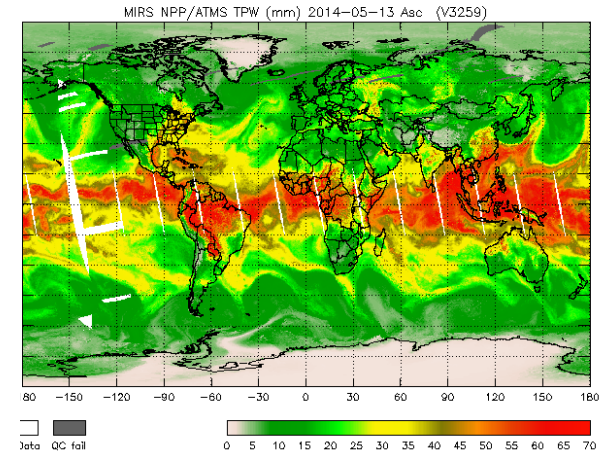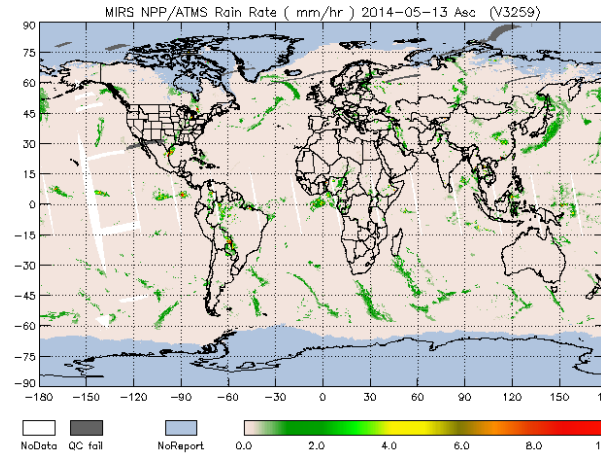
It would be good to have additional input from FNMOC, AFWA, NAVO, NWSFO, …

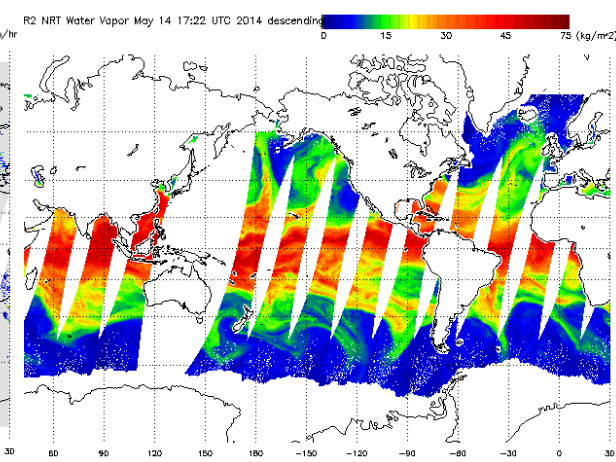# MW Precipitation from JPSS
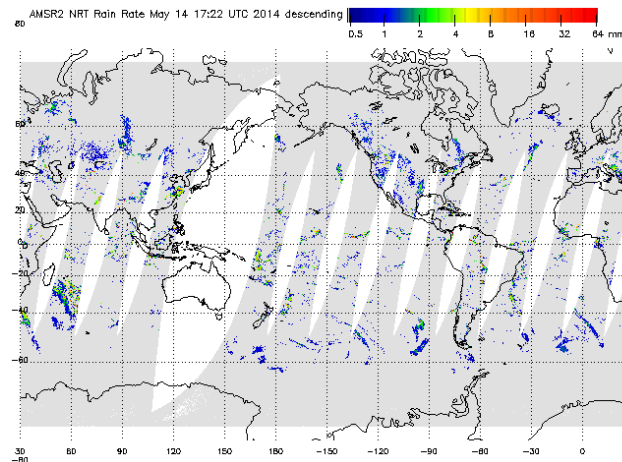## (Should we expand to TPW as well?)

- **S-NPP ATMS**
  - MiRS rain rates (and TPW) via NDE

- **GCOM AMSR-2**
  - GPROF2010V2 rain rates (and STAR TPW EDR) via GAASP

Basic questions

- Describe how SNPP/JPSS (including GCOM) products provide continuity from legacy POES, METOP, DMSP, EOS?
  - For most users, it's continuity. Use both sounders and imagers.
    - L1 and L2 products in the 1330 orbit
    - L3 through primarily blended precipitation and TPW products
- What benefits or improvements do you expect from SNPP/JPSS?
  - Expected impact (high) and why?
    - ATMS provides greater swath width and better sensor signal quality, more channels, better resolution. Compensates for loss of MetOp-A data
- Provide Details on:
  - when do you plan to use the SNPP/JPSS Product?
    - The CMORPH and GPM projects are already testing these rain products (GOES-R, JPSS PGRR and NASA)
    - The NESDIS bTPW and bRR are also testing ATMS and GCOM products (PSDI, JPSS)
    - ScAPMR (GOES-R baseline QPE) will indirectly use via blended MW L2 data set
    - Have you thought about how you will get the data and have you identified the issues with your operational use of SNPP/JPSS ?
      - Augment L2 blended products into L3
      - Latency is an issue
  - Are the current legacy products well utilized? YES
  - Is the SNPP/JPSS product part of a blended product? YES
  - What additional work needs to be done to ensure that the SNPP/JPSS product is/will be well utilized? See following slides

Are enhancements needed for:

- Accessibility (data flow, latency, format)
  - Better latency (DB over OCONUS a possible solution)
  - Data access/security - causes delays and aguish…
  - Common format (netCDF vs HDF) for L1, L2 would be desired
- Product performance (accuracy, precision)
  - Consistency between legacy and JPSS satellites - long term stability – REPROCESSING!
- User applications (modifications to modeling , decision tools, visualization to use the new products)
  - Error characteristics for all user time/space needs

Other Topics 😁

- Product fusion
  - Meeting all users needs require different methods
    - Latency drives the fusion method
    - Time/space resolution
  - Synergy with GOES-R
    - Utilize 1 minute rapid scan (SRSOR), lightning, etc.
- Advancement in products
  - Snowfall rate, warm rain, orographic precip., cloud microphysics (NWP)
  - Error characteristics
- Long-Term Stability/Reprocessing
  - Start of S-NPP and GCOM records
  - Time series continuity from POES

Atmospheric Composition Products
(How to be a Climate and Atmospheric Composition Project in an Operational Weather Satellite Program.)

L. Flynn

May 15, 2014

NOAA STAR JPSS Science Meeting

Total Ozone Products

- OMPS Nadir Mapper Total Ozone
  - NCEP requests V8TOz content in NRT BUFR products
    - NRT products are performing well and will move to validated status with known SDR and EDR improvements. Speed of progress for V8TOz implementation is resource limited.
  - Ozone Watch: Long-term ozone monitoring at NCEP requires ozone CDRs. We need funding for J1 Ozone CDR creation.
  - S-NPP RDRs are capable of producing CDRs; because of changes in NOAA operational SDRS, the data files at CLASS do not provide a consistent set for this purpose. NASA PEATE S-NPP SDRs/EDRs have been reprocessed.
  - Higher spatial resolution is needed but is not an immediate priority.
  - The Legacy Version 8 algorithm is being implemented. It will allow required performance for J1 when SO_2 exclusions end.

CrIS NUCAPS Total Ozone

- Products are planned for use to follow EOS AIRS products in OPC for detection of stratospheric folds. (SPORT)

- Products are a component of the operational TOAST/TACO daily maps. Orbital updates are possible to improve latency of this product. TOAST products are frequently accessed.

Nadir Ozone Profile Products

- OMPS Nadir Mapper Total Ozone
  - NCEP is waiting for Version 8Pro BUFR products which will match existing SBUV/2 assimilated products.
  - Ozone Watch: Long-term ozone monitoring at NCEP requires ozone CDRs. We need funding for J1 Ozone CDR creation/reprocessing.
  - The S-NPP SDR data files at CLASS do not provide a consistent set for creating CDRs. NASA PEATE S-NPP SDRs/EDRs have been reprocessed.
  - Higher spatial resolution is desired for regional air quality.

OMPS Limb Profiler Products

- OMPS Limb Profiler Ozone Profile
  - OMPS Limb Profiler ozone products can provide continuity for EOS Aura MLS products.
  - We are proceeding with R2O for a high vertical resolution product in NDE. We will have to work with the users on the BUFR content for use in The GFS.

- OMPS Limb Profiler Aerosol Profile
  - This is a very important product but has minimal operational uses until the next major volcanic eruption perturbs the stratosphere. It may remain a NASA product.

SO$_2$ Users

- **VAACs: The SO$_2$ products are used to track volcanic eruptions for aviation hazards. This is the most important NRT application.**

- **EPA & ARL: Air Quality forecasts and monitoring (SO$_2$ & NO$_2$ amounts, aerosol classification)**

- **USGS/AID: Passive volcanic outgassing**

- **Atmospheric chemistry and climate change research**

- **MACC II ECMWF**

Atmospheric SO_2 Products

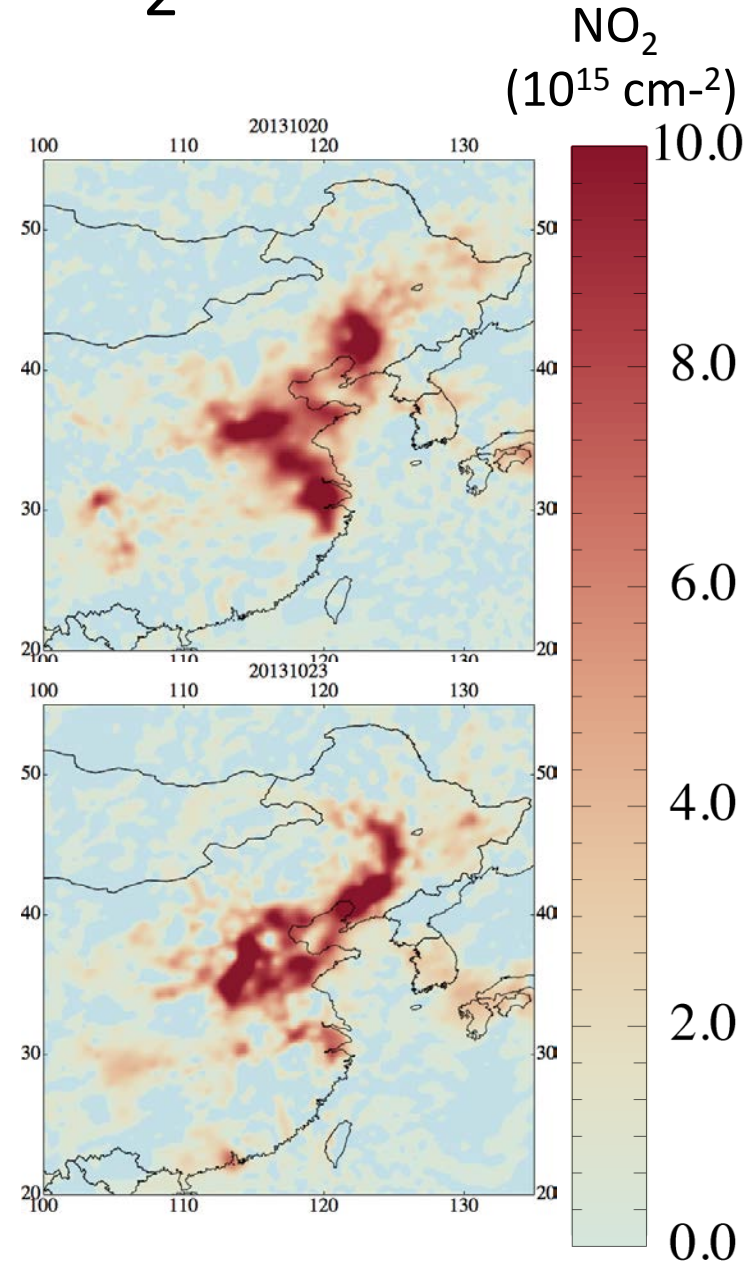- The Linear Fit SO_2 algorithm will be implemented as a module of the Version 8 total ozone operational upgrade.

- SO_2 applications can make good use of higher spatial resolution. A minimum of a factor of 3x3 improvement is base-lined for J1.

- The requirements for SO_2 in the Suspended Matter products were removed. The OMPS and CrIS measurements can provide this information on atmospheric SO_2.

UV Aerosol Products

- The UV Absorbing Aerosol Index (a by-product of the total ozone retrieval) is useful for identifying/classifying aerosols even in cloudy conditions.

- Quantitative information on aerosols (optical depth and single scattering albedo) can be obtained independently but work even better when combined with visible measurements.

- The HySplit model forecasts are a user for this and the SO_2 products.

- Higher spatial resolution products are needed to match the model capabilities.

Atmospheric NO$_2$

- ARL is improving models and working with existing OMI data.

- OMPS products can provide continuity for EOS Aura OMI products.

- ARL has a requirement to update forecast emissions. Products are available from GOME-2 but for the 9:30 orbit. The 13:30 orbit is preferred as the NO$_2$ production is high at that time.

NO$_2$ (10^{15} cm^{-2})

Charge

Basic questions

- Describe how SNPP/JPSS products provide continuity from legacy POES, METOP, DMSP, EOS?
  - Or is SNPP/JPSS a new capability for our application?
- What benefits or improvements do you expect from SNPP/JPSS?
  - Expected impact (low, medium, high) and why?
- Provide Details on:
  - when do you plan to use the SNPP/JPSS Product?

Is there an actionable plan?

- Is it funded?
- What is the priority?
- Have you thought about how you will get the data and have you identified the issues with your operational use of SNPP/JPSS ?

– Are the current legacy products well utilized?

– Is the SNPP/JPSS product part of a blended product?

– What additional work needs to be done to ensure that the SNPP/JPSS product is/will be well utilized?

Are enhancements needed for:

- Accessibility (data flow, latency, format)
- Product performance (accuracy, precision)
- User applications (modifications to modeling , decision tools, visualization to use the new products)

VIIRS "Aerosol Assimilation" Breakout Session Report

Shobha Kondragunta, Sarah Lu, and Julie Price

Thursday May 15 10:30 – 2:30

Participants

Product developers: Ciren, Huang, Huang Kondragunta, Laszlo, Liu,Remer, Superczynski, Zhang

User Leads: Da Silva, Hyer, Liuz, Lee, Lu, Pagowski, Pierce, Stajner, McQueen, Zhang

PEATE: Oo

NCDC: Zhao

Overarching goal

- We want SNPP/JPSS data , combined with other data if needed, to improve NOAA /Partner services.
  - Yes for monitoring and forecasting applications
  - Global (NGAC, GEOS5, NAAPS, RAQMS) and regional model applications (CMAQ, WRF, HARR, HYSPLIT)

- We need you the user of SNPP/JPSS data to demonstrate the value of SNPP/JPSS data and if there are issues we want to know and we want to help.
  - All users who participated in the session are willing to demonstrate the value of SNPP/JPSS data and work with product developers

Thread Analysis

NWS/NCEP global model applications: **Thick**
NWS/NCEP regional model applications: **Light but thick when the system moves towards operational data assimilation that currently has developmental constraints due to budget**
NOAA/ESRL global and regional model applications**: Thick**
NOAA/NESDIS global and regional model applications: **Thick**
NRL: **Thick**
AFWA & NCAR: Thick
EPA: **Light**
NASA/GMAO**: Thick**

Basic questions (1)

- Are the SNPP/JPSS product continuity for products that you get now from POES, METOP, DMSP, EOS?
  - NWS/NCEP global model applications: **EOS MODIS**
  - NWS/NCEP regional model applications: **EOS MODIS**
  - NOAA/ESRL global and regional model applications**: EOS MODIS**
  - NOAA/NESDIS global and regional model applications: **EOS MODIS**
  - WFOs
  - NRL: **EOS MODIS, MISR, CALIPSO**
  - AFWA & NCAR: **EOS MODIS**
  - EPA: **EOS MODIS, MISR, CALIPSO**
  - NASA/GMAO**: EOS MODIS**
  - Others: **EOS MODIS**

Basic questions (2)

- If yes,
  - NRL: ASAP but waiting to finish software development. Also product improvements.
  - NASA: on the list. Need complete dataset (product and metadata) so careful bias correction can be made w.r.t MODIS. Current output format is an issue.
  - NWS: new capability and will be high impact but need funding to develop
  - AFWA/NCAR: testing the assimilation in a regional model (WRF_Chem)
  - NESDIS: re-analysis and real time forecasting using a global model (RAQMS)
  - ARL: re-analysis using regional model
  - What improvements do you expect from SNPP/JPSS?
    - NRL: data coverage issues
    - NASA: need aggregated data (radiances) etc. that needs offline discussion
    - NESDIS: better understanding of cloud mask effects on AOT, snow mask improvements
    - NCAR/AWFA: better understanding of quality flags, especially compared to MODIS
  - Are the current products (MODIS?) well utilized?
    - NRL: yes
    - NASA: yes
    - NWS: no
    - NESDIS: yes
  - Is the SNPP/JPSS product part of a blended product?
    - Yes along with MODIS for NRL, yes for NASA and no for NWS
    - Yes along with MODIS for NESDIS

Basic questions

- If yes,
  - Will the SNPP/JPSS product be well utilized?
    - Is there a plan?
      - Yes for all users
    - Is it funded?
      - Yes for all users except NWS global and regional model applications. NWS regional air quality forecasting program wants to assimilate but needs support. They want to leverage from research development (GSI) at ARL, ESRL, NCAR and implementation will require funding.
    - What is the priority?
      - High for all users

Are enhancements needed for:

- Accessibility (data flow, latency, format)
  - Only issue is format/data content & parameters for NASA/GMAO applications
  - HDF5 output need for NASA and other applications. BUFR good only for NWS.
  - Reprocessing needed for re-analysis of global and regional models
- Product performance (accuracy, precision)
  - Reduce over land bias
  - snow/ice flag, coverage over bright surface, cloud mask, increase measurement range
- User applications (modifications to modeling , decision tools, visualization to use the new products)
  - Visualization tools developed for MODIS EOS-HDF format do not work.
  - CRTM support to the aerosol assimilation community is critical (e.g., CMAQ speciation). CRTM lead work with us to make the LUT computation flexible (user provided optical properties)

Miscellaneous Questions

- How do you envision using suspended matter (dust, smoke, volcanic ash)
  - NWS smoke and dust forecasting currently uses MODIS dust and smoke products for verification and want to transition to VIIRS
  - Global and regional modelers are interested in knowing the composition to help with the assimilation system. But this is a research topic because the SM product is not a legacy product for many users and need to assess the quality of the product.
- Any interest in Angstrom Exponent (aerosol particle size parameter)?
  - No by most users. NRL and NCAR expressed interest but this is also a research topic and product not mature for operational applications
- Is there a need for RGB? Where to get it from?
  - Yes for looking at historical case studies and need access to archived imagery products. Where are the global images available other than PEATE?
- If product updates happen, do you want to be informed via email or once a year through a workshop?
  - Yes. Web page updates and email notifications

Ocean Color Users Feedback

- Participants from
  - **Fisheries**
    - Northeast – **Kim Hyde**
    - Atlantic/Florida – represented by **Ron Vogel**
    - Pacific -- **Cara Wilson**
      - Surveys (NRT)
      - Long term model predictions
  - **NWS – Tony Siebers**
    - Ecosystem Forecasting – moving toward operational - **Chris Brown**
    - EMC - **Sudhir Nadiga**, **Eric Bayler**;
  - **NOS – Rick Stumpf**
    - HAB
    - Sanctuaries
  - **OAR** (e.g., **D. Tong**, Isoprene emission)
  - **NESDIS** ecosystems – Chris Brown
  - **AOML/AOR** (not present but discussed)

Non-NOAA downstream users of NOAA produced data

Maryland DNR

Commercial Fisheries

Recreational Fisheries

Science/Research Users

Latency Needs

- Surveys, NRT for cruise tracks (~12h ok)
- Epsidodic Events Management (i.e., oil spill, sediment plumes – NRT – 12 h not good enough, **3 h** much better)--- **Require DB data**.
- Modelling
  - Forecasting – fast (12 h minimum; 3 h acceptable)
  - Projections – long term, high quality, gapless
- Direct Broadcast Users -

What VIIRS doesn't have that users need

- High resolution blue and green (469 and 555 nm) – Will need **S3-OLCI** data (NOS, etc.)

PRODUCT Needs

- Current Operational products all need to be regularly reprocessed with VIIRS, to provide high quality data **time series** (expressed by ALL users).

- **Required** Products: **nLws**, **Chlorophyll-a**, **Kd(490)**, Kd(PAR) (from EMC). Anomaly products. Global data.

- New products desired
    - Primary Productivity
    - Chromophoric Dissolved (Organic) Matter (CDM or CDOM)
    - Suspended Particulate Material
    - Particulate Inorganic Carbon (PIC)
    - Chlorophyll Frontal Product

PRODUCT Needs, Cont'd

- Highest Quality
  - We need high data quality.
- Re-iterate advocacy for mission-long high-quality calibration ability, e.g., lunar maneuver, lunar calibration (for J-1, J-2), need to reprocess mission-long SDR.

PRODUCT Needs, Cont'd

- Consistency – long term
- Merged data from multiple satellites
  - Temperature anomaly/thermometer analogy
- Uncertainties documented along with products
- Climatological anomalies (e.g., since SeaWiFS)

Formats, Data Flow

- NETCDF4

- GRIB for future

- Some discussion about longer term planning for "translation" (any format you want)

- FTP or WGET access

SST Users Breakout Report Back

Sasha Ignatov

With inputs from Domestic/NOAA Users
NOAA STAR – Eileen Maturi
NOAA NOS & STAR – Chris Brown
NOAA NCDC – Viva Banzon
NOAA CRW – Mark Eakin
NASA JPL – Mike Chin

International Users
CMC, Canada – Bruce Brasnett
BoM, Australia – Helen Beggs
JMA, Japan – Shiro Ishizaki
UK MO, UK – Emma Fiedler
DMI, Denmark – Jacob L. Høyer

NASA and NOAA JPSS SST Users

Current users and/or Polled

- NOAA STAR (/GEO/POLAR Blended L4) – Eileen Maturi / L2, using

- NOAA STAR (Coral Reef Watch) – Mark Eakin / L3

- NOS/NESDIS (Chesapeake Bay Ecosystem analysis) – Chris Brown / L2&3

- NCDC (Reynolds SST L4) – Viva Banzon L2&3

- NASA JPL (JPL MUR L4) – Mike Chin L2&3

- NOAA NODC (Archive) – Ken Casey, Deirdre Byrne L2&3

- NCDC (CLASS)

To be polled

- Coast Watch – Kent Hughes L2

- NMFS – Cara Wilson L2/destriping

- NCEP – Bob Grumbine, Avichal Mehra

- OPC/CPC – Joe Sienkiewicz

International JPSS SST Users

Current Users and/or Polled

- Canadian Met Centre (CMC L4) – Bruce Brasnett L2&3, using

- Australian Bureau of Meteorology (GAMSSA L4) – Helen Beggs, L3

- UK Met Office (OSTIA L4) – Emma Fiedler, L2

- Japanese Met Agency (MGD L4) – Shiro Ishizaki, L2&3

- DMI, Denmark (DMI L4) – Jacob L. Høyer, L2&3, high latitudes

- EUMETSAT (EUMETCAST) – Simon Elliott, L2

- JPL/PO DAAC (Archive) – Ed Armstrong, L2&3

To be polled

- IFREMER, France (ODYSSEA L4) – J-F Piolle, Emmanuelle Autret

- Other users to be identified at GHRSST Meeting, June 2014, Cape Town

Focus Areas Suggested by Users

- Need archive at JPL PO.DAAC / NODC

- Need Level 3 ACSPO product

- Focus on coastal areas, including improved cloud mask

- Focus on high latitudes

- Need destriped imagery for Fisheries and Ocean Dynamic Apps
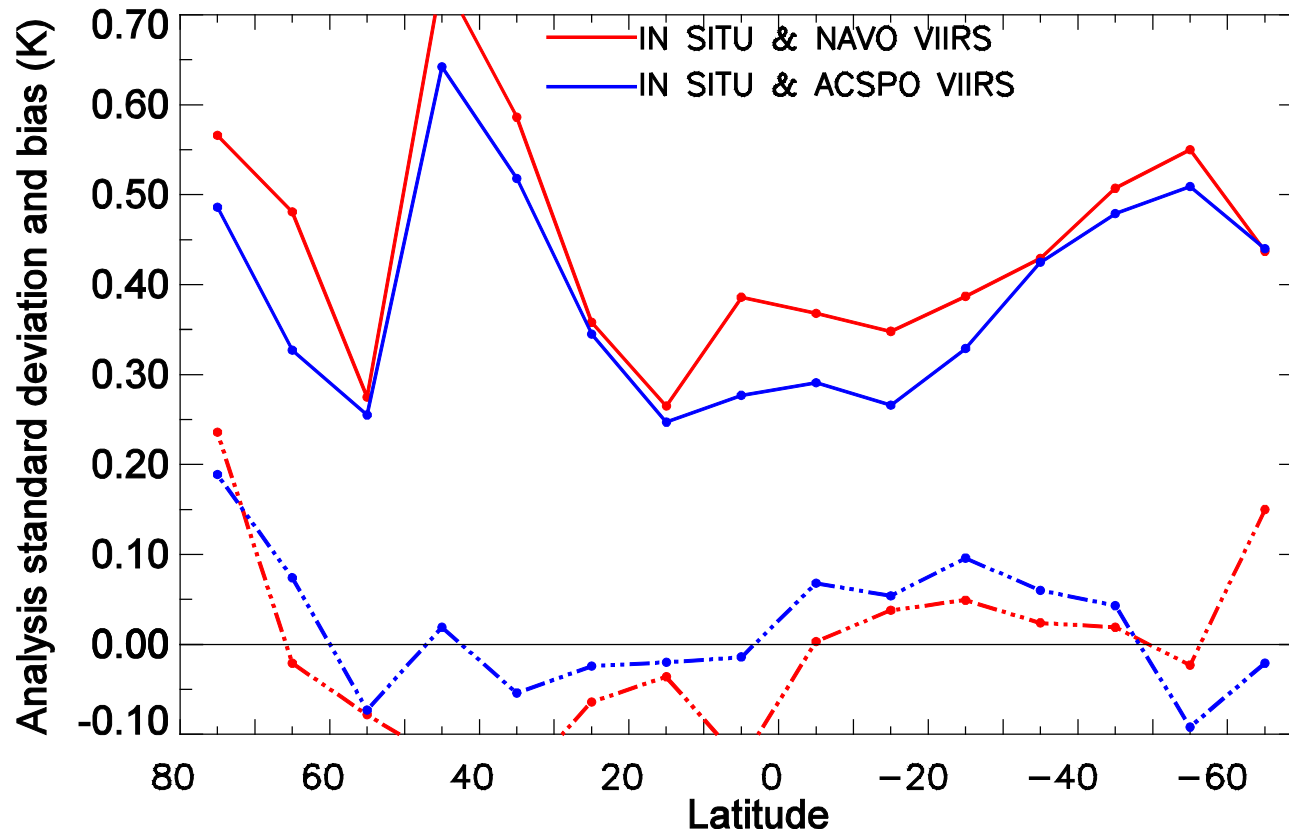
- Compare performance with NAVO SST

Some Early Results Assimilating ACSPO VIIRS L2P Datasets

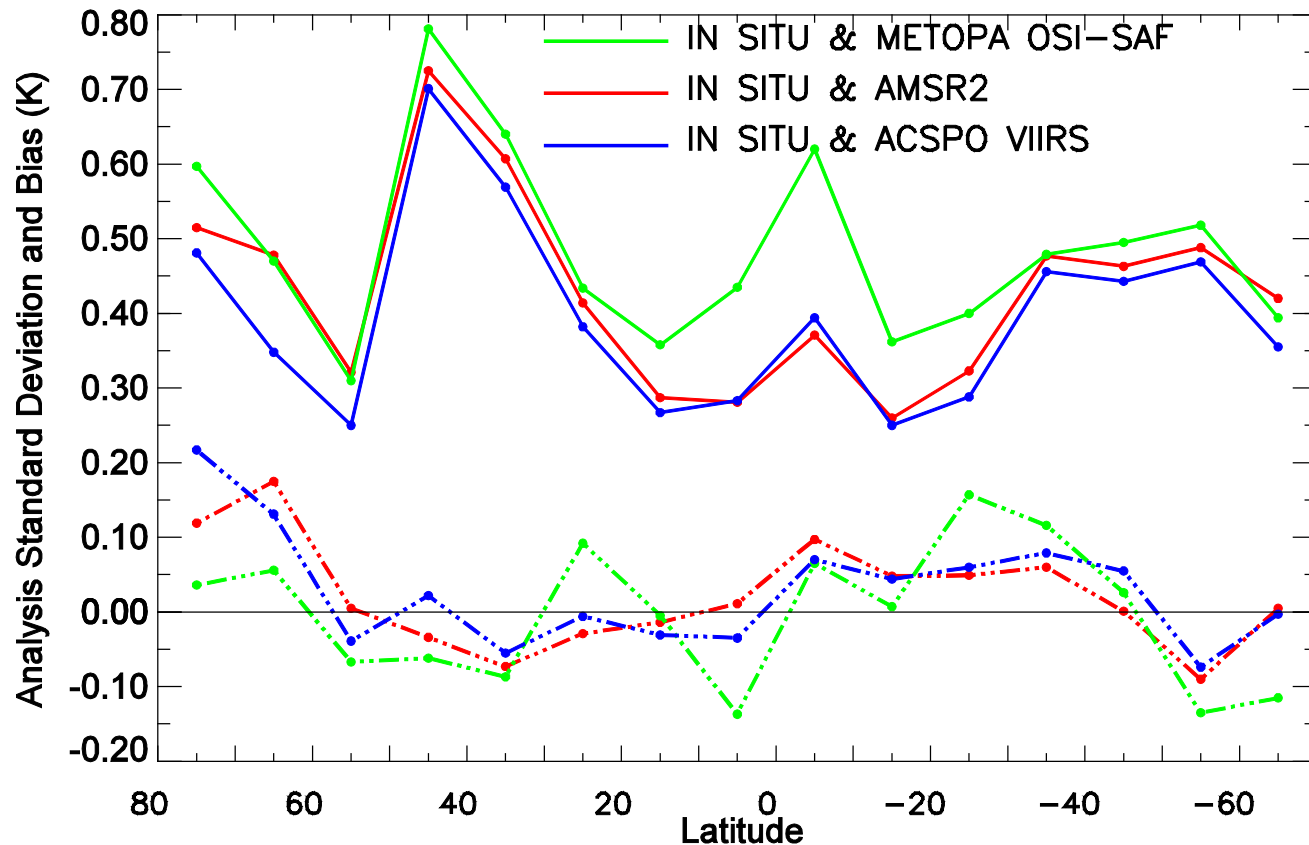**Bruce Brasnett**

Canadian Meteorological Centre

May, 2014

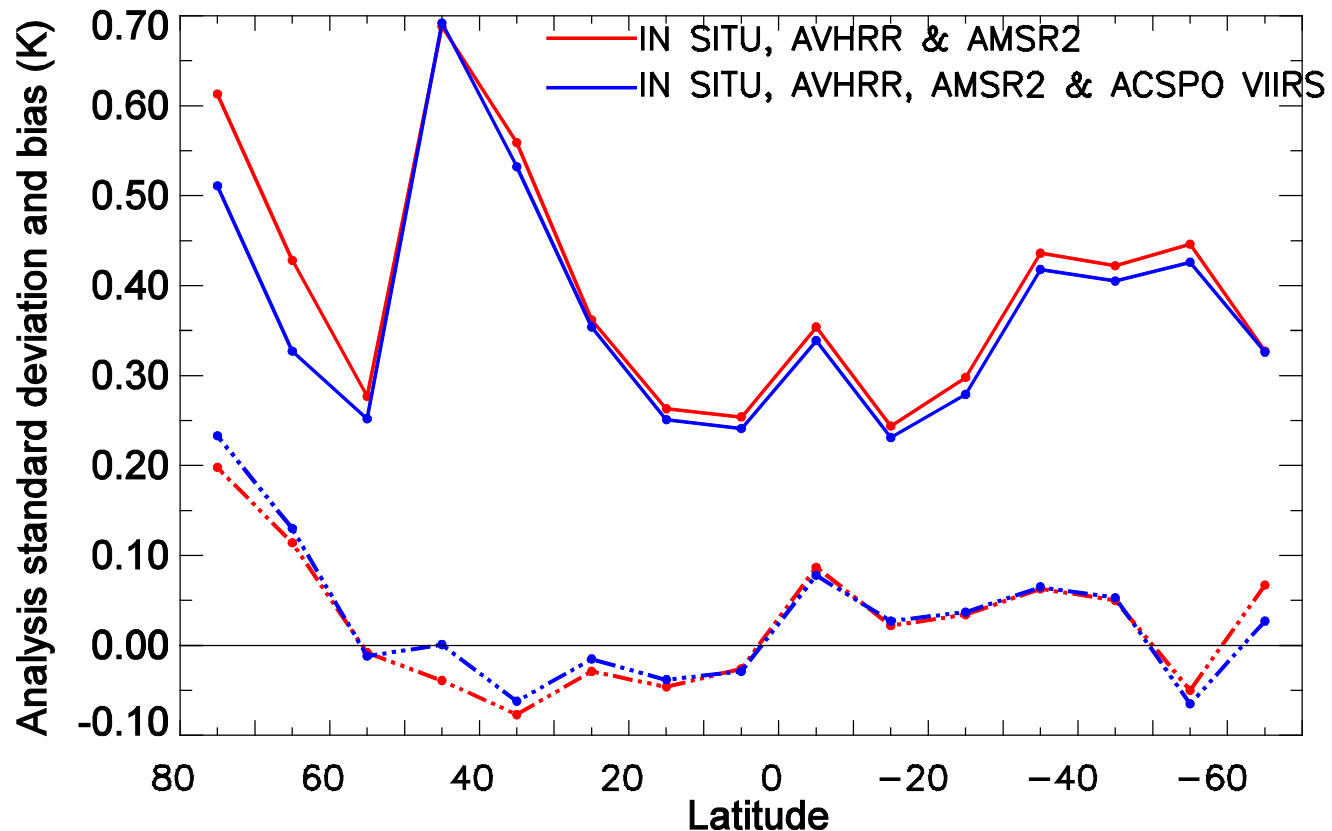# Assessing relative value of 2 VIIRS datasets: NAVO vs. ACSPO

Using ACSPO instead of NAVO improves assimilation

Assessing the relative value of 3 datasets for January-March 2014

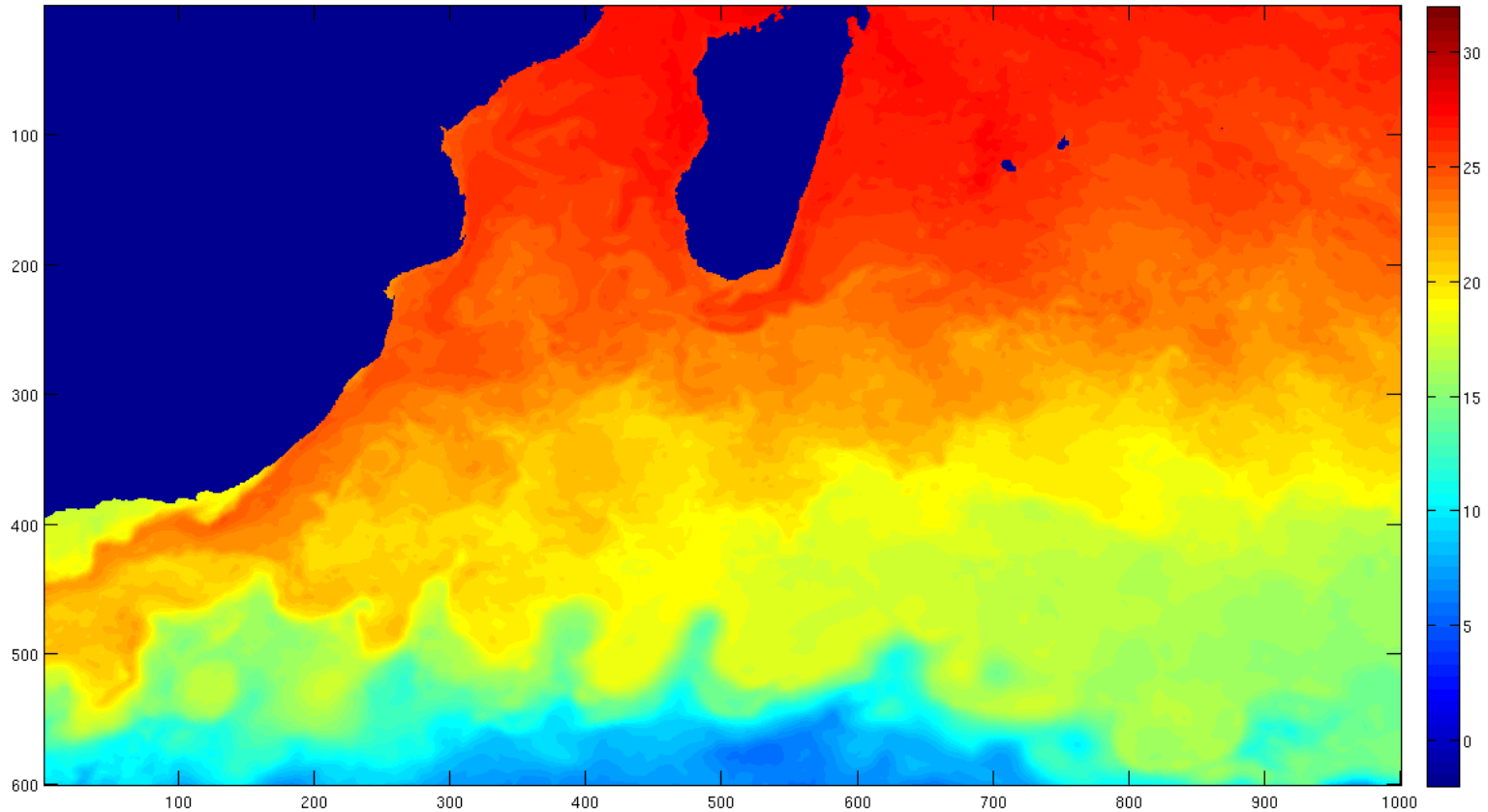Using ACSPO improves STD in all LAT bands, except at 10°S

Assessing potential benefit of adding VIIRS to CMC analysis

ACSPO improves assimilation in all LAT bands, except hi-lat North (high bias)

NOAA Geo-Polar Blended L4 SST

- VIIRS successfully incorporated into Geo-Polar Blended 5-km global SST analysis

Super-ob's VIIRS SST
Final SST analysis data

Australia, Bureau of Meteorology: 1/2
Helen Beggs

- Are the SNPP/JPSS product continuity for products that you get now from POES, METOP, DMSP, EOS? - **Yes: VIIRS data replacing AVHRR data in the coming years**

- When do you plan to use them? -**As soon as the ACSPO VIIRS L3U products are available we will test for ingestion into SST analysis and ocean model systems.**

- What improvements do you expect from SNPP/JPSS? -**Higher resolution of mesoscale features from 0.01 degree HRAC VIIRS L3U product compared with 9 x 4 km GAC AVHRR L2P products.**

- Are the current products well utilized? -**NOAA-18 and NOAA-19 NAVO L2P products are very important to the Bureau's operational ocean and NWP systems. We do not yet use VIIRS SST products.**

- Is the SNPP/JPSS product part of a blended product? -**In future it will be part of blended global and regional optimally interpolated SST analyses (GAMSSA and RAMSSA).**

- Will the SNPP/JPSS product be well utilized? -**Yes, if available in a level 3 format.**
  - Is there a plan? Is it funded? –**Yes to both. BLUElink funding will continue until 2025 to sustain the current operational ocean model system (OceanMAPS).**
  - What is the priority? -**VIIRS L3U products are second priority to ingest into OceanMAPS and RAMSSA/GAMSSA after AMSR-2 L2P.**

- If not well utilized, what enhancements are needed for SNPP? -**The Bureau of Meteorology cannot download VIIRS L2P files due to download cost, time and data storage constraints. Therefore it is very important to the Bureau that we have access to a gridded level 3 VIIRS product such as GHRSST GDS2 L3U.**

- Accessibility (data flow, latency, format) **- Require VIIRS SST in GHRSST GDS2 L3U format (at 0.01 to 0.05 degree resolution) in order to utilize at the Bureau of Meteorology. Require latency of 3 hours for L3U files for ingestion into real-time SST analysis systems.**

- Product performance (accuracy, precision) **- VIIRS SSTs must be at least equivalent in accuracy and precision to currently available NAVOCEANO NOAA-19 L2P products.**

- User applications (modifications to modeling , decision tools, visualization to use the new products) **- Some modifications to the ocean data assimilation and SST analysis systems will need to be made but these will be minimal if VIIRS SST data are provided in GHRSST L3U format.**

Canada, Canadian Meteorological Centre: 1/2
Bruce Brasnett

- Are the SNPP/JPSS product continuity for products that you get now from POES, METOP, DMSP, EOS? - **Yes: VIIRS L3U SST will provide continuity for NAVOCEANO NOAA-19 and NOAA-18 GAC AVHRR L2P products used operationally in the Bureau of Meteorology's global and regional SST analyses and global ocean**

- When do you plan to use them? -**As soon as the ACSPO VIIRS products is available via JPL/NODC archive.**

- What improvements do you expect from SNPP/JPSS? **-We expect to see improved accuracy of our L4 due to VIIRS.**

- Are the current products well utilized? **-The current products are AVHRR from NAVO and are assimilated daily.**

- Is the SNPP/JPSS product part of a blended product? –**yes. It's a part of CMC global daily analysis , CMC0.2.**

- Will the SNPP/JPSS product be well utilized? -**Yes.**
  - Is there a plan? Is it funded? –**Yes.**
  - What is the priority? **-It is a priority to add VIIRS.**

- If not well utilized, what enhancements are needed for SNPP? **-It remains to be seen if bandwidth between us and JPL will be an issue. The files downloaded from STAR had no brightness temp layers, which makes them significantly smaller. We do not need brightness temperatures.**

- Accessibility (data flow, latency, format) **– 12hr.**

- Product performance (accuracy, precision) **– the ACSPO data provided by STAR for testing have sufficient accuracy, precision, and most important, global coverage.**

- User applications (modifications to modeling , decision tools, visualization to use the new products) - **All needed modifications have been tested with the test ACSPO data provided by STAR, and work well.**

United States, NOAA/NESDIS/STAR: 1/2
Eileen Maturi

- **Are the SNPP/JPSS product continuity for products that you get now from POES, METOP, DMSP, EOS? - Yes: We generate operational 5KM Geo-Polar Global SST analyses and use ACSPO AVHRR SSTs from NOAA and METOP.**

- **When do you plan to use them? –We are testing ACSPO VIIRS SST in our 5KM Geo-Polar SST analyses now.**

- **What improvements do you expect from SNPP/JPSS? -We expect to see improved accuracy of our L4 due to VIIRS.**

- **Are the current products well utilized? -The NOAA/NESIDS current products used in the 5KM Geo-Polar SST analyses are ACSPO AVHRR from NOAA and METOP satellites.**

- **Is the SNPP/JPSS product part of a blended product? –Yes, 5KM Geo-Polar SST analyses**

- **Will the SNPP/JPSS product be well utilized? -Yes.**
  - **Is there a plan? Is it funded? –Yes, Yes**
  - **What is the priority? –It is being added now**

- If not well utilized, what enhancements are needed for SNPP? **N/A**

- Accessibility (data flow, latency, format) **– 12hr.**

- Product performance (accuracy, precision) **– the ACSPO data provided by STAR for testing have sufficient accuracy, precision, and most important, global coverage.**

- User applications (modifications to modeling , decision tools, visualization to use the new products) - **All needed modifications have been tested with the test ACSPO data provided by STAR, and work well.**

US NOAA/NCDC: 1/2
Viva Banzon

- Are the SNPP/JPSS product continuity for products that you get now from POES, METOP, DMSP, EOS? - **Yes: VIIRS SST data will replace AVHRR data in the coming years**

- When do you plan to use them? – **When algorithm is stable and operational data supply is reliable, request to test will be initiated.**

- What improvements do you expect from SNPP/JPSS? – **L3 availability; reprocessing of early part of mission (because data was not stable); Demonstrated consistency spatially and temporally**

- Are the current products well utilized? – **Metop-A and NOAA-19 NAVO L2P currently used. Planning switch to Metop-B. We do not yet use VIIRS SST products.**

- Is the SNPP/JPSS product part of a blended product? - **In the future.**

- Will the SNPP/JPSS product be well utilized? – **Eventually.**
  - Is there a plan? Is it funded? – **No to both.**
  - What is the priority? – **Low; Switch to Metop-B is planned first.**
  - If not well utilized, what enhancements are needed for SNPP? – **L3 availability; Consistently reprocessed data from start of mission**

- Accessibility (data flow, latency, format) **– need to have previous day's passes by 6 a.m. EST.**

- Product performance (accuracy, precision) **- VIIRS SSTs must be at least equivalent in accuracy and precision to currently available NAVOCEANO NOAA-19 L2P products.**

- User applications (modifications to modeling , decision tools, visualization to use the new products) - **Our ingest and processing will require some modifications to transfer, read and convert L2 to L3. Final product not affected except metadata needs to be modified.**

Japan, Japan Meteorological Agency: 1/2
Shiro Ishizaki

- Are the SNPP/JPSS product continuity for products that you get now from POES, METOP, DMSP, EOS? – **Yes: VIIRS data are expected to be continuity for AVHRR data used in the JMA's operational SST analysis system**

- When do you plan to use them? – **After VIIRS products are available, we will test for incorporating into SST analysis.**

- What improvements do you expect from SNPP/JPSS? – **We expect accuracy and resolution of our SST analysis is improved due to use of VIIRS SST products.**

- Are the current products well utilized? – **We do not yet use VIIRS SST products.**

- Is the SNPP/JPSS product part of a blended product? – **In future it will be part of JMA's blended optimally interpolated SST analyses (MGDSST).**

- Will the SNPP/JPSS product be well utilized? -**Yes**
    - Is there a plan? Is it funded? – **Yes. JMA will continue to sustain the operational SST analysis system.**
    - What is the priority? – **VIIRS products are second priority to ingest into SST analysis after MTSAT and Himawari product.**

- If not well utilized, what enhancements are needed for SNPP? – **Download cost (data size) may be one of issues if we are not well utilized.**

Japan, Japan Meteorological Agency: 2/2
Shiro Ishizaki

- Accessibility (data flow, latency, format) **– Required latency is 3 hours, including download time, for ingestion into real-time SST analysis systems.**

- Product performance (accuracy, precision) **– VIIRS SSTs are expected to be at least equivalent in accuracy and precision to currently available NOAA-19/AVHHR products.**

- User applications (modifications to modeling , decision tools, visualization to use the new products) **– If VIIRS SST data are provided in GHRSST GDS2 format, required modifications to SST analysis system will be minimal.**

UK, Met Office: 1/2
Emma Fiedler

- Are the SNPP/JPSS product continuity for products that you get now from POES, METOP, DMSP, EOS? – **Yes, as VIIRS data replacing AVHRR data in the future.**

- When do you plan to use them? –**We will test the NOAA/NESDIS VIIRS L2P SST product as soon as possible after it becomes available over EUMETCast, for inclusion in our analysis product (OSTIA), and ocean forecasting system (FOAM) .**

- What improvements do you expect from SNPP/JPSS? –**New high resolution input data will be beneficial to our L4 SST analysis and ocean forecasting products.**

- Are the current products well utilized? -**NOAA-18 and NOAA-19 NAVO L2P SST products are used in OSTIA and FOAM. We do not yet use VIIRS SST products.**

- Is the SNPP/JPSS product part of a blended product? –**It is planned to be assimilated in OSTIA, a blended global SST analysis.**

- Will the SNPP/JPSS product be well utilized? –**Yes.**

- Is there a plan? Is it funded? –**Yes.**
  - What is the priority? **High priority, along with AMSR-2 L2P.**
  - If not well utilized, what enhancements are needed for SNPP? –**High data volume is a concern for us but we aim to use the VIIRS L2P product rather than L3U.**

- Accessibility (data flow, latency, format) - Require VIIRS SST in GHRSST GDS2 L2P format, available before 0600 UTC the following morning.

- Product performance (accuracy, precision) - VIIRS SSTs should be at least equivalent in accuracy and precision to currently available NAVOCEANO NOAA-19 AVHRR L2P products.

- User applications (modifications to modeling , decision tools, visualization to use the new products) – If VIIRS SST data are provided in GHRSST format, modifications to FOAM and OSTIA in order to assimilate the data will be minimal.

USA, NASA/Jet Propulsion Laboratory: 1/2
Mike Chin

- Are the SNPP/JPSS product continuity for products that you get now from POES, METOP, DMSP, EOS? – **Yes: VIIRS data are expected to augment and eventually replace MODIS data in the coming years in Multi-scale Ultra-high Resolution (MUR) SST analysis and high-resolution L3 product(s).**

- When do you plan to use them? – **When VIIRS L2 products become available at GDAC, ingestion tests will be initiated.**

- What improvements do you expect from SNPP/JPSS? – **For 1-km resolution features, we expect VIIRS to complement space-time coverage of MODIS.**

- Are the current products well utilized? – **NAVO VIIRS L2P product has been ingested into MUR analysis in an interim basis.**

- Is the SNPP/JPSS product part of a blended product? – **In the future.**

- Will the SNPP/JPSS product be well utilized? – **Yes; expected to be.**
  - Is there a plan? Is it funded? – **No plan; no funding.**
  - What is the priority? – **VIIRS products are the top priority for MUR, assuming high spatial resolution, global coverage, and real-time delivery.**

- If not well utilized, what enhancements are needed for SNPP? – **File size (data volume) could be an issue.**

USA, NASA/Jet Propulsion Laboratory: 2/2
Mike Chin

- Accessibility (data flow, latency, format) **– Highest spatial resolution possible in L2 format (lon, lat, time, SST).**

- Product performance (accuracy, precision) **– Knowledge on non-random noise sources, e.g., instrumental artifacts/patterns and regionally dependent biases, would be highly beneficial to L3 and L4 gridding/analysis.**

- User applications (modifications to modeling , decision tools, visualization to use the new products) **– Production line has been established for NAVO VIIRS L2P. Interpretations of the Single Sensor Error Statistics may be required, e.g.: What is "Bias" referenced to?**

United States, NOAA/NESDIS/STAR: 1/2
Christopher Brown

- Are the SNPP/JPSS product continuity for products that you get now from POES, METOP, DMSP, EOS? - No: This is a new project to test which of two assimilation techniques – 4D-VAR or LETKF -- are best at assimilating VIIRS SST into the NOAA Chesapeake Bay Operational Forecasting System (CBOFS).

- When do you plan to use them? - As soon as available.

- What improvements do you expect from SNPP/JPSS? - Improved accuracy and precision.

- Are the current products well utilized? – n/a.

- Is the SNPP/JPSS product part of a blended product? – No.

- Will the SNPP/JPSS product be well utilized? -Yes.
  - Is there a plan? Is it funded? –Yes.
  - What is the priority? – Yes, data assimilation into NOAA's operational hydrodynamic models is a priority for NOAA's Ocean Service.

- If not well utilized, what enhancements are needed for SNPP? – n/a.

- Accessibility (data flow, latency, format) – Require VIIRS SST in netCDF format for Chesapeake Bay region at latency of 6 hours or less.

- Product performance (accuracy, precision) – VIIRS SSTs must be at least equivalent in accuracy and precision to currently available satellite retrieved SSTs.

- User applications (modifications to modeling , decision tools, visualization to use the new products) – Modification to Chesapeake Bay Operational Forecast System (CBOFS) in order to assimilate VIIRS SST.

Denmark, Danish Meteorological Institute: 1/2
Jacob L. Høyer

- Are the SNPP/JPSS product continuity for products that you get now from POES, METOP, DMSP, EOS? - **Yes: ACSPO VIIRS SST will be evaluated to supplement current L2 SSTs in DMI L4 analysis**

- When do you plan to use them? – **When ACSPO VIIRS SST products are available via PO.DAAC.**

- What improvements do you expect from SNPP/JPSS? – **Improved global coverage, higher resolution of mesoscale features.**

- Are the current products well utilized? – **NAVO AVHRR and VIIRS products, as well as NASA MODIS and OSI SAF SEVIRI SST products provide critical inputs to the DMI L34 analysis.**

- Is the SNPP/JPSS product part of a blended product? - **NAVO VIIRS is a part of DMI L4 SST analysis. We do not yet use ACSPO VIIRS SST product but will explore when available via PO.DAAC.**

- Will the SNPP/JPSS product be well utilized? -**Yes, if available in a L2P/L3U GDS2 format.**
    - Is there a plan? Is it funded? –**Yes to both.**
    - What is the priority? – **ACSPO VIIRS products are low priority to ingest into DMI, as NAVO VIIRS is already assimilated. However, ACSPO VIIRS is expected to provide ×3 improved global coverage.**

- If not well utilized, what enhancements are needed for SNPP? – **Coverage and performance in high latitudes is critically important.**

Denmark, Danish Meteorological Institute: 2/2
Jacob L. Høyer

- Accessibility (data flow, latency, format) **- Require ACSPO VIIRS SST in GHRSST GDS2 format. Product from prior day should be available by 6am UTC of current day.**

- Product performance (accuracy, precision) **- VIIRS SSTs must be at least equivalent in accuracy and precision to currently available NAVOCEANO NOAA-19 L2P products. Improved global coverage, and solid performance in high-latitudes is required.**

- User applications (modifications to modeling , decision tools, visualization to use the new products) **- Modifications to the ocean data assimilation and SST analysis systems will be minimal if ACSPO VIIRS SST data are provided in GHRSST GDS2 format.**

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- Are the SNPP/JPSS product continuity for products that you get now from POES, METOP, DMSP, EOS? - **Yes: VIIRS data to improve the SST products received and to replace AVHRR data in the coming years**

- When do you plan to use them? -**As soon as the ACSPO VIIRS L3U products are available we will test for ingestion into sub-km scale coral bleaching products. L2 products are being used by the NESDIS Geo-Polar 5km blended team.**

- What improvements do you expect from SNPP/JPSS? -**Higher resolution of mesoscale features from 0.01 degree HRAC VIIRS L3U product compared with 4 km GAC AVHRR L2P products.**

- Are the current products well utilized? -**NOAA-19 L4 products are very important to the Coral Reef Watch operational and experimental products and the new 5km blended products.**

- Is the SNPP/JPSS product part of a blended product? –**Very shortly it will be part of blended 5km global SST analyses and is planned for use in 1km and sub-km regional products.**

- Will the SNPP/JPSS product be well utilized? -**Yes, if available in a level 3 format.**
  - Is there a plan? Is it funded? –**Yes to both.**
  - What is the priority? -**VIIRS L2 products are top priority for use in 5km blended products. VIIRS L3U products are second priority to develop polar-only sub-km products after AMSR-2 L2P.**

- If not well utilized, what enhancements are needed for SNPP? –**Coral Reef Watch needs access to a gridded level 3 VIIRS product such as GHRSST GDS2 L3U.**

Mark Eakin

- Accessibility (data flow, latency, format) **- Require VIIRS SST in GHRSST GDS2 L3U format (at 0.01 to 0.05 degree resolution) for Coral Reef Watch products. Require latency of 3 hours for L3U files. See input from Eileen Maturi for requirements for L2 files for blended products.**

- Product performance (accuracy, precision) **- VIIRS SSTs must be at least equivalent in accuracy and precision to currently available SST analyses provided to Coral Reef Watch.**

- User applications (modifications to modeling , decision tools, visualization to use the new products) - **Some modifications to the Coral Reef Watch coral bleaching thermal stress product systems will need to be made.**