



# Aerosol Detection Product



- Qualitative indicator of presence of dust or smoke/smog in the atmosphere
  - It provides binary yes/no for dust or smoke/smog in the atmosphere. Smoke/dust aerosol index (semi-quantitative) is also provided to quantify the intensity of dust/smoke plumes.
  - It is a new algorithm based on the work we did with MODIS (Ciren and Kondragunta, JGR, 2014) and GOES-R ABI. No IDPS counter part. The IDPS product (*named Suspended Matter*) was frozen at beta maturity level. The name **Aerosol Detection** is to keep product name consistent with GOES-R ABI.
- Team members
  - Shobha Kondragunta and Istvan Laszlo (co-leads)
  - Pubu Ciren (IMSG)
- Users
  - **NWS:** Aerosol imagery is used by operational field forecasters, incident meteorologists in their daily forecasting activities. **Enterprise algorithm is running in near real time on VIIRS Direct Broadcast (DB) data over CONUS and Alaska to facilitate NWS applications. Also running on Himawari in real time.**
  - **State/local agencies:** (1) aerosol imagery is used by operational air quality forecasters to provide code red/orange warnings, (2) exceptional events monitoring for waiver applications with Environmental Protection Agency (EPA)
  - **NWS/NCEP:** Dust and smoke mask used to verify forecasts. *Assimilation work is coming soon.*
  - **Researchers in academia/industry:** Aerosol assimilation studies, exceptional events analysis, etc.
  - **EPA:** Exceptional events analysis



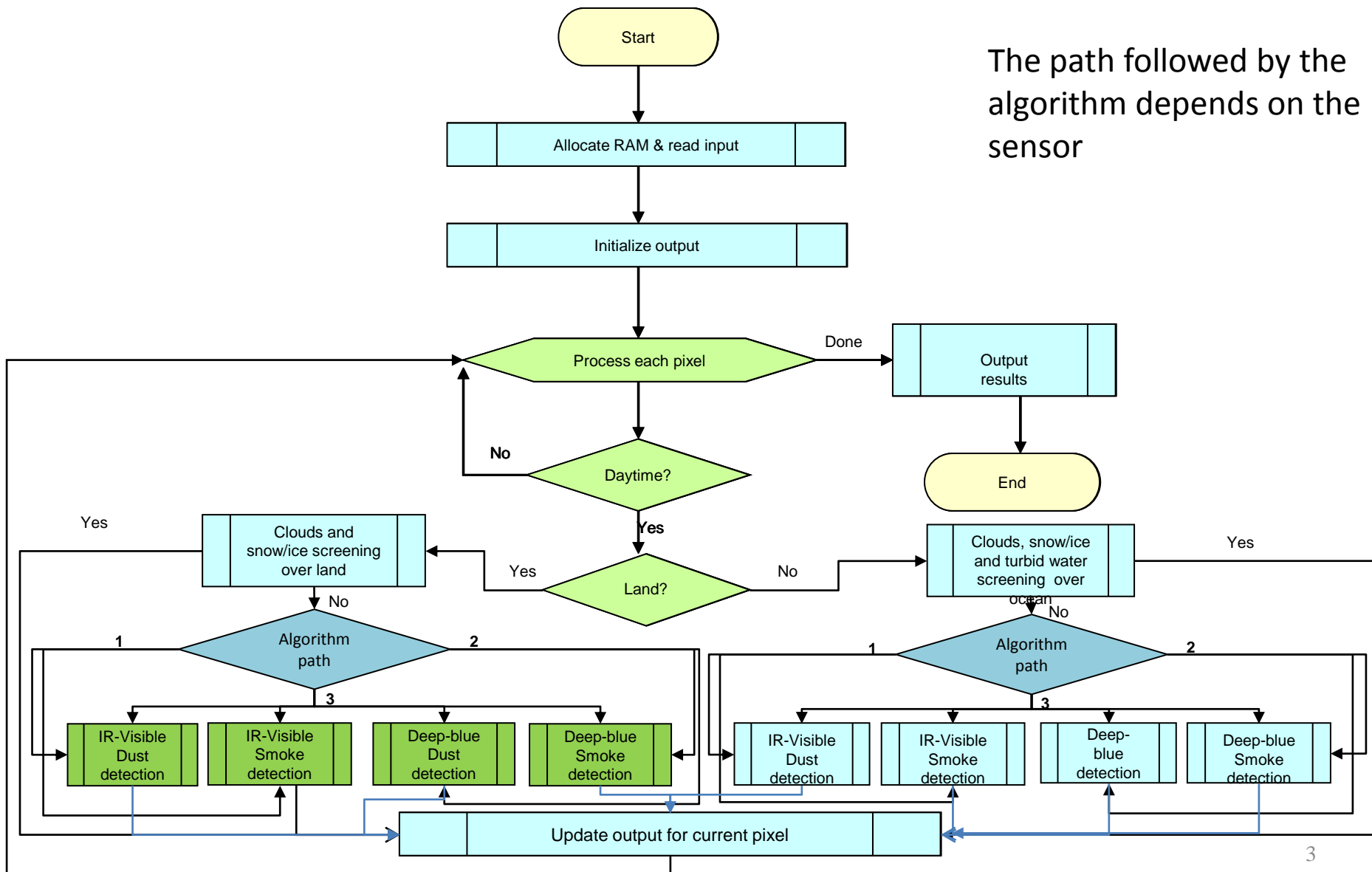
# Current Operational Product



- Enterprise algorithm to be implemented in NDE in July 2016.
  - A generic software that can currently run on VIIRS, ABI, and AHI
  - Depending on the availability of different channels, different spectral and spatial variability tests are done to identify smoke and dust; volcanic ash is generated externally by a separate independent algorithm
  - If certain bands (e.g., deep blue bands) are not available, aerosol index cannot be generated. Only a binary (yes/no) flag is generated (**requirement is for a binary flag**)
  - Output in netCDF4 format but output content is close to what is available from IDPS

# Current Operational Product

The path followed by the algorithm depends on the sensor





# Lessons Learned



- **Product precedence issues:** Instability and confusion with the cloud mask algorithm in testing/running the aerosol detection algorithm on ABI, AHI, and VIIRS.
- **Data formats:** netCDF4 format a big issue for users who already got used to hdf5 format.
  - Users have to re-learn the new algorithm, product content, product output format etc. – *none of this is transparent really*
  - Metadata content – *different from IDPS*
- NWS expects product in BUFR or GRIB format.
  - Have to convert netcdf4 files to BUFR
- Software tools developed to visualize and analyze products need to be modified to accommodate the new product format.
- Overlap of activities involving algorithm migration from IDPS to NDE, algorithm evolution (*IDPS->RR->Enterprise*), and testing on AHI was very taxing to the team members. Better planning would help.



# Lessons Learned (cont.)



- **Standards:** Need to have some standard convention for file names, variable names, etc.
- Documentation need to be reviewed/approved by algorithm developers.
  - **Recent example:** user's manuals written by AIT staff and obtained by AWIPS-II developers were inconsistent with Enterprise algorithm output files.
- Implement conventions for upstream/downstream code changes to minimize impact on products that have precedence.



# Path Forward



- Anticipated developments
  - Sensor dependent thresholds will be implemented for spectral tests
  - Documents will be reviewed/updated to reflect Enterprise products
  - Will engage users early on to understand the product
- Upcoming Deliveries/Reviews
  - Waiting for July 2016 implementation in NDE
- Risks
  - None that we know of



# Final Thoughts



Teams have done a good job to reach this stage. However, one caution before we congratulate ourselves: it took 3 years of hard work for STAR aerosol team to understand the performance of the IDPS aerosol algorithm and cloud mask. We are pushing the Enterprise algorithm straight to operations for users. Hope there won't be any surprises as we are going to get busy with GOES-R and J1.





# eIDEA: Overlays

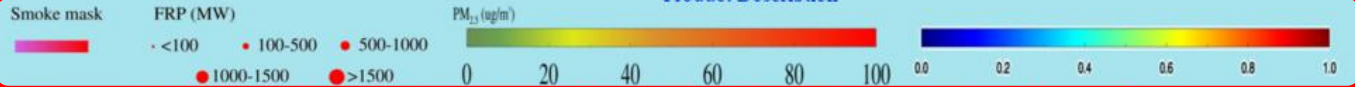
Product legends

## SNPP VIIRS Blended Fire and Smoke Products

Select Date

VIIRS RGB and smoke/fire products 20150827

Product Description

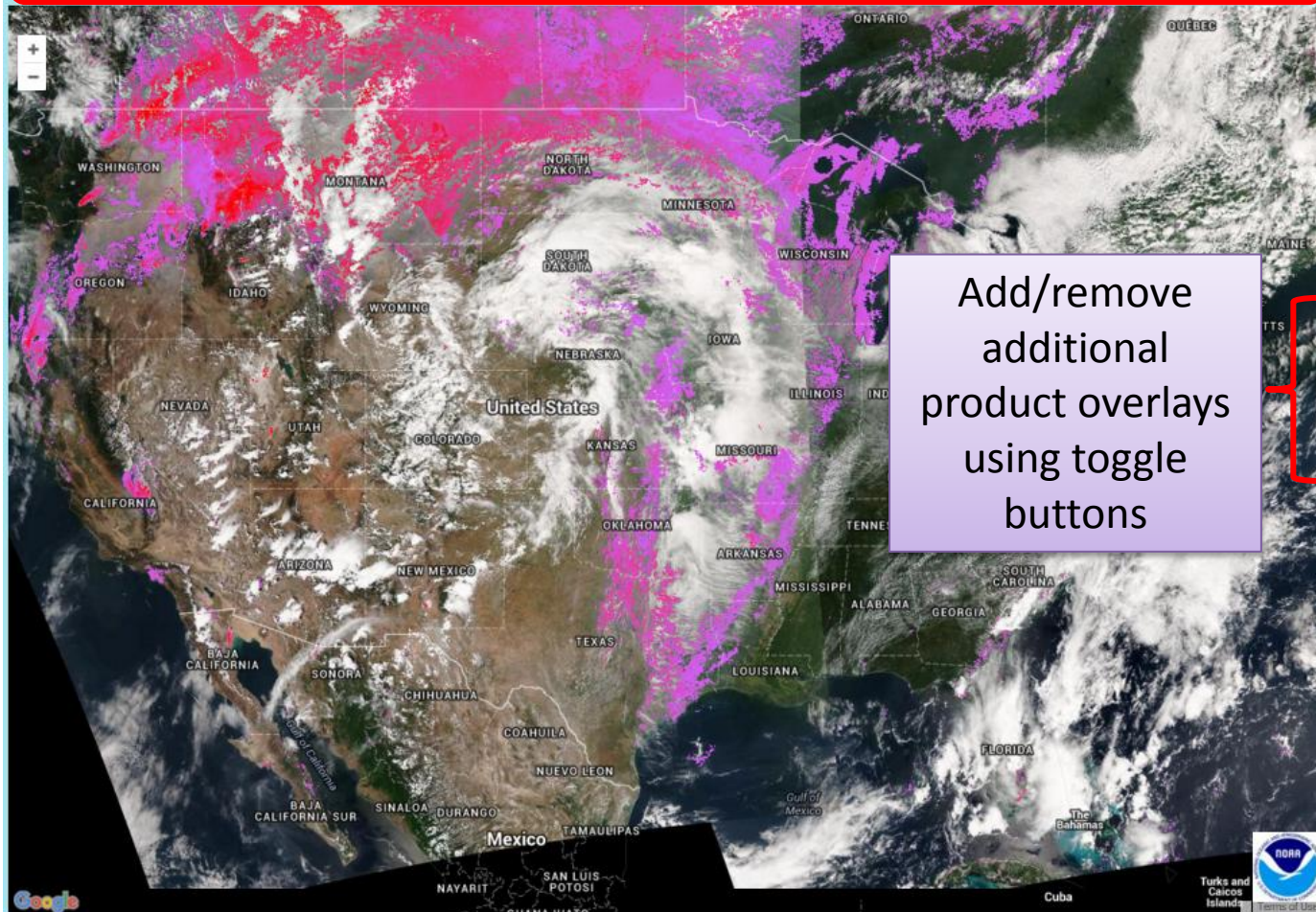


“Smoke Mask” is default smoke product; click on “AOT” or “Satellite Derived PM<sub>2.5</sub>” to switch b/w smoke products

Slider bars adjust opacity of RGB and smoke products

Add/remove additional product overlays using toggle buttons

Click “Save Image” to save configuration as a graphics file



Select smoke products

- Smoke Mask
- AOT
- Satellite Derived PM<sub>2.5</sub>

RGB Opacity

Smoke Products Opacity

Toggle

- AIRNOW PM2.5
- Fire Radiative Power
- County
- Labels