The Brightest Idea: New Capabilities for Infusing Satellite Data into Environmental Applications--International (IDEA-I)

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• Infusing Satellite Data into Environmental Applications (IDEA, https://www.star.nesdis.noaa.gov/smcd/spb/aq/) is a satellite based aerosol forecasting, visualization, and data synthesis tool for use by the US air quality forecasting community [Al-Saadi, et al., 2005].

• IDEA-International (IDEA-I) provides a open source portable version of IDEA.

• By the end of this Webinar participants will have a better understanding of new capabilities that have been added to IDEA-I and where to go to obtain software and instructions for installing IDEA-I as well as real-time IDEA-I forecasts.
FIREX-AQ Case-Studies

• We will demonstrate the new IDEA-I capabilities by considering case-studies during the 2019 NASA/NOAA Fire Influence on Regional to Global Environments Experiment - Air Quality (FIREX-AQ) field campaign

• FIREX-AQ provided measurements of trace gas and aerosol emissions for wildfires and prescribed fires to better understand chemical transformation and air quality impacts.
New IDEA-I Capabilities: MODIS/VIIRS

- The MODIS/VIIRS IDEA-I is globally configurable and uses **aggregated** Terra, Aqua, SNPP, and JPSS aerosol optical depth (AOD) retrievals to identify local regions of high aerosol loading from which trajectories are initialized.

- Trajectories are predicted using the NOAA Global Forecasting System (GFS) 0.5° winds

- The forecast trajectories are color coded **red** if the aerosols are expected to affect people at the surface.
IDEA-I VIIRS Forecast on July 22, 2019

Initial VIIRS AOD  
18hr Trajectory Forecast  
30hr Trajectory Forecast
IDEA-I trajectory forecast verifies based on July 23, 2019 VIIRS AOD
IDEA-I July 23, 2019 Forecast verification

July 23, 2019 VIIRS AOD enhancements are not associated with enhanced PM2.5

VIIRS AOD Verification

Observed AirNOW surface PM2.5 AQI (https://www.airnow.gov/index.cfm)
IDEA-I July 23, 2019 Forecast verification

Surface PM2.5 enhancements occur one day after IDEA-I forecast prediction

Observed AirNOW surface PM2.5 AQI
(https://www.airnow.gov/index.cfm)
IDEA-I trajectory forecast assumes that the aerosols are within the planetary boundary layer.

This was not the case on July 22, 2019.

Need additional information about the vertical distribution of the smoke.

Observed AirNOW surface PM2.5 AQI (https://www.airnow.gov/index.cfm)
New IDEA-I Capabilities: NUCAPS

- The NOAA Unique Combined Atmospheric Processing System (NUCAPS) was developed to generate retrieved products such as profiles of temperature, moisture, trace gases and cloud-cleared radiances from the Cross-track Infrared Sounder (CrIS).

- IDEA-I NUCAPS uses carbon monoxide (CO) retrievals to identify altitudes of pollution layers from which trajectories are initialized.

- The forecast trajectories are color coded red if the smoke is expected to affect people at the surface.
IDEA-I NUCAPS CO forecast shows that smoke stays aloft during July 23, 2019
IDEA-I NUCAPS CO forecast shows that smoke reaches the surface during July 24, 2019.
New IDEA-I Capabilities: High Res VIIRS

- IDEA-I high-resolution forecasts use **full resolution** SNPP, and JPSS aerosol optical depth (AOD) retrievals to identify local regions of high aerosol loading from which trajectories are initialized.

- Uses **high resolution** (3km) North American Model (NAM) forecasts for trajectory calculations.

- Allows for **multiple** forecast domains

- The forecast trajectories are color coded **red** if the aerosols are expected to affect people at the surface.
The Milepost 97 Fire began on July 24, 2019 and burned 13,119 Acres

Observed AirNOW surface PM2.5 AQI
(https://www.airnow.gov/index.cfm)
# IDEA-I High Res VIIRS Implementation

## Configuration

<table>
<thead>
<tr>
<th></th>
<th>IDEA-NYS</th>
<th>IDEA-I_aerosolEntHR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Domain</strong></td>
<td>Lon: -90, -65</td>
<td>Lon: -96, -64</td>
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<tr>
<td></td>
<td>Lat: 35, 50</td>
<td>Lat: 34, 51</td>
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<tr>
<td><strong>Met input</strong></td>
<td>GFS 0.5°, 3hr (forecast 0-60hr)</td>
<td>NAM 3km, 1hr (forecast 0-36hr)</td>
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<tr>
<td><strong>AOD</strong></td>
<td>VIIRS EDR 6km (5x5)</td>
<td>VIIRS EPS 6km (8x8)</td>
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<td><strong>Clouds</strong></td>
<td>AVHRR Extended (CLAVR-x)</td>
<td>(CLAVR-x) files</td>
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<td>Input</td>
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<td>Met: 46G</td>
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<td></td>
<td>Satellite: CLAVR-x (7.9G)</td>
<td>Satellite: CLAVR-x (7.9G)</td>
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<tr>
<td></td>
<td>VIIRS (80M)</td>
<td>VIIRS (1.9G)</td>
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<td><strong>Output</strong></td>
<td>42M</td>
<td>632M</td>
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<tr>
<td>Computing time</td>
<td>17min</td>
<td>120min (&gt; 80min downloading data)</td>
</tr>
</tbody>
</table>

*Slide provided by Sheng-Po Chen (University at Albany)*
New IDEA-I Capabilities: Summary

• IDEA-I MODIS/VIIRS software and installation instructions are available at: https://cimss.ssec.wisc.edu/imapp/ideai_v1.2.shtml

• A North American version of IDEA-I MODIS/VIIRS forecasts are available at: http://smoke.ssec.wisc.edu/idea-i-aerosol-live-test/

• A US version of IDEA-I NUCAPS forecasts are available at: http://smoke.ssec.wisc.edu/idea-i-carbonmonoxide-live-test/

• Multi-domain IDEA-I High Res JPSS VIIRS forecasts are available at: http://smoke.ssec.wisc.edu/idea-i-aerosolEntHR-live-j01/

• Multi-domain IDEA-I S-NPP High Res VIIRS forecasts are available at: http://smoke.ssec.wisc.edu/idea-i-aerosolEntHR-live-test/
Questions?

Use the question function at the lower right of your screen

Be sure to check out our upcoming webinars. For all info, visit haqast.org/haqast2020