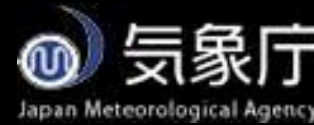


Aerosol Observability Workshop: Monterey 2010- The first ICAP meeting

A perspective three years ago.....

27-29 April, 2010
Monterey CA



<http://bobcat.aero.und.edu/jzhang/ICAP/>

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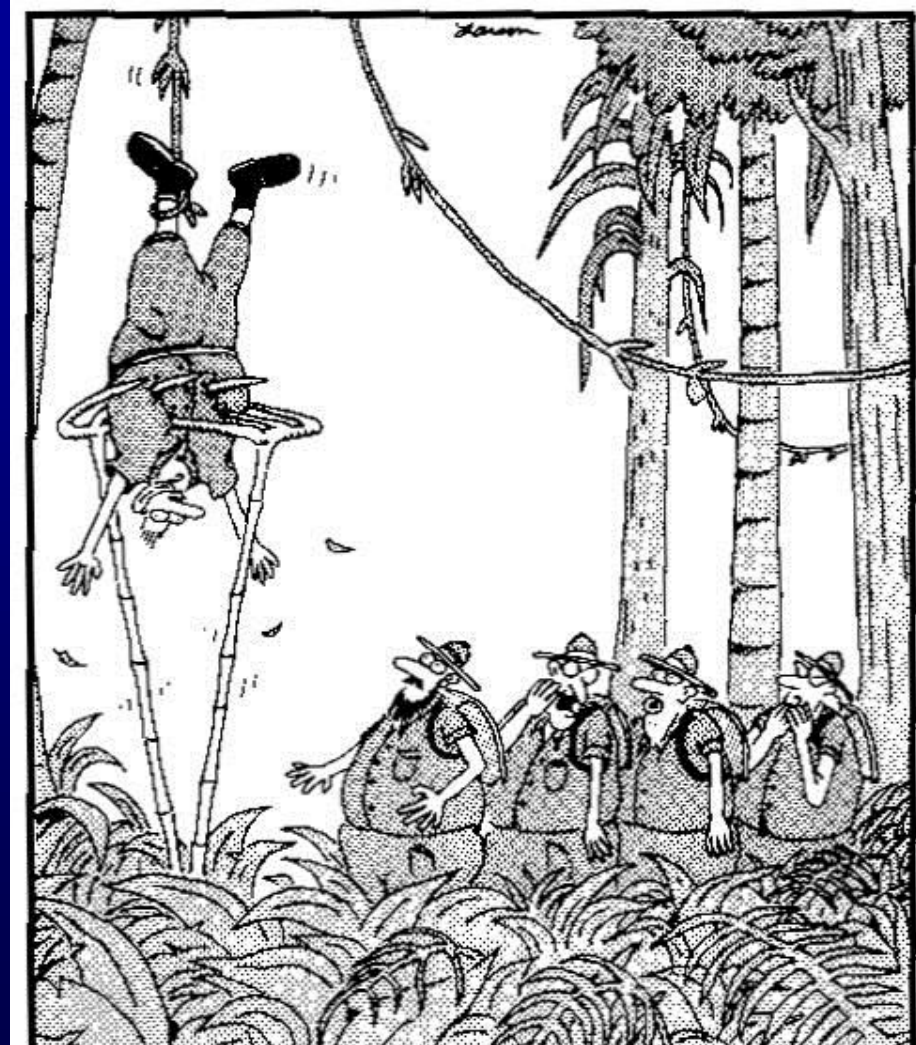


The First ICAP Meeting



In 2010 many of us gathered in Monterey to answer three questions:

1. Where do forecasting centers and satellite data providers stand in regards to current capabilities? (Impressive but unorganized)
2. Have we now reached the critical mass to form a community? (Yes)
3. Where are we going to get satellite data to support aerosol forecasting? (the future is here)



“That’s why I never walk in front”



Significance



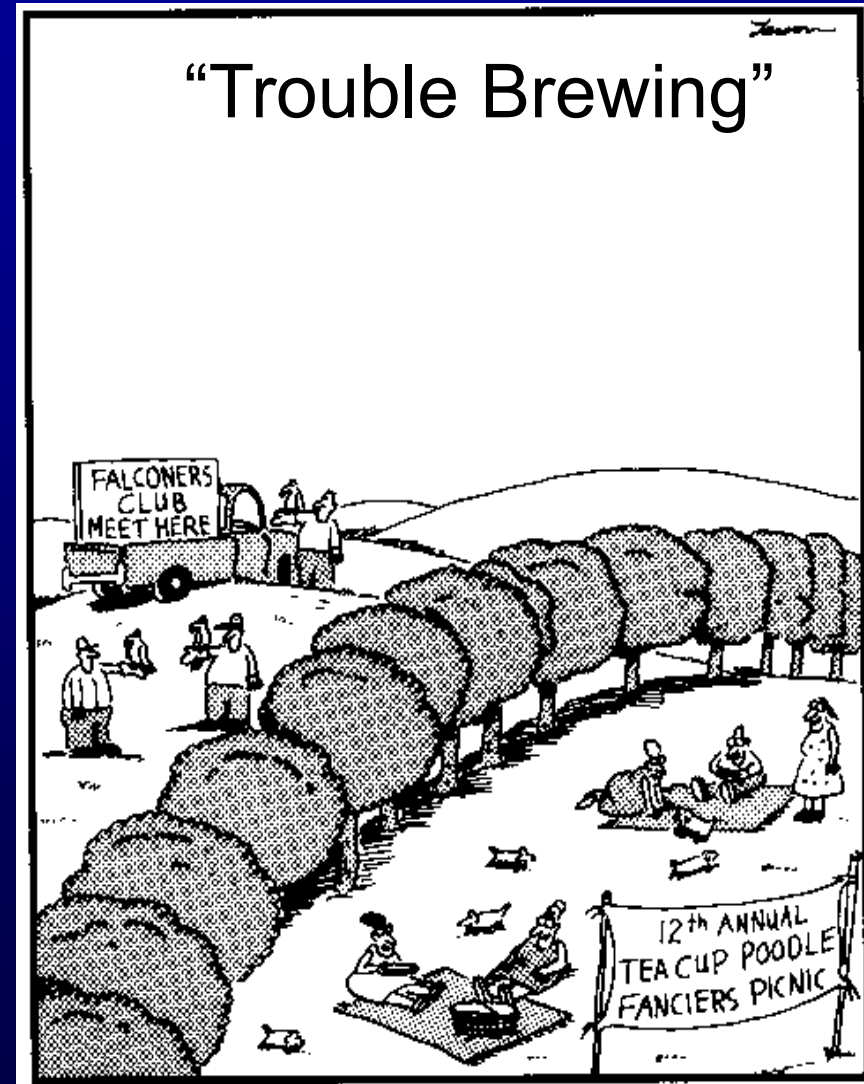
- This was the first time all of the developers for operational centers with global aerosol forecasting requirements are in one room (ECMWF, FNMOC, GMAO, JMA, NCEP, UKMO)
- A wide array of near-real time remote sensing data providers for passive and active sensors gave a comprehensive view of the current and future constellation of aerosol data streams (ESA, EUMETSAT, JAXA, NASA, NESDIS, NRL).
- “The air was cleared” between the operational and climate communities as to what operational developers really need.
- Laid the groundwork for 3 years of productive ‘across the isle” collaboration on everything from data QA to groundbreaking lidar applications.
- We now have a community....



Often people think “Research to Operations” or is it “Operations to Research?”



- Quality/efficacy schism may be forming between rank and file and center level work.
- Climate science, and NASA data policies ushered in a new age of observations which in part enabled aerosol forecasting capabilities.
- But, operational centers can harness teams and computational resources. Plus, centers emphasize core metrics, standardization and efficiency. This has led to the cutting edge of aerosol analyses and forecasting.
- Bottom line is the two communities are not so different, and sometimes role reversal.





Challenges we faced in 2010. Perhaps some residual concerns today.



- **Future aerosol products:** Terra/Aqua has been a good ride. What can we really get out of NPP, JPSS, EarthCARE, Decadal Survey, GOES-R etc...? We don't even have real uncertainties now...
- **Model needs:** Even with current aerosol products, most are not designed with model customers in mind (climate and operational). Error models and propagation of error are hardly ever addressed by developers.
- **Multi-sensor fusion:** You think working with one sensor is hard? Try 2, 3 or 4... How do we deal with the changing constellation of sensors and products with regards to initialization and data assimilation? Product versus radiance assimilation?
- **Competition:** Competitive products from the same data source is often seen as a bad thing by agencies. Actually, there is nothing farther from the truth-as long as they are available and supported. Ultimately, just like other fields, the ensemble approach scores best.

Three things developers for operational systems agrees on

- **Satellite Product QA:** Every center emphasized the need for better product verification and bias removal.
- **Faster is better:** Approx times <90 min for nowcast, 3-6 hours for data assimilation, 12 hours for a sweep, any greater it's a reanalysis or verification. Some are willing to trade efficacy for speed.
- **The future is in a constellation approach:** All centers need consistent data from multiple sensors. These sensors need not be operational. Look at MODIS, AIRS, CALIOP. As long as it is fast, consistent, and well characterized, centers will take it.

Three things everyone in climate development agrees on

- **Satellite Product QA:** Climate data users emphasized the need for better product verification and bias removal.
- **Faster is better:** Multi-sensor products such as from EarthCARE are going to change the processing dynamic. As models and sensor products become more closely aligned, climate centers will look more like operational centers (look at GMAO).
- **The future is in a constellation approach:** Nearly all future aerosol missions have some tie in with other sensors and models. Multi-sensor products are the future (e.g., EarthCARE, ACE, GeoCAPE, maybe NPP.).

Hey, wait a minute.....

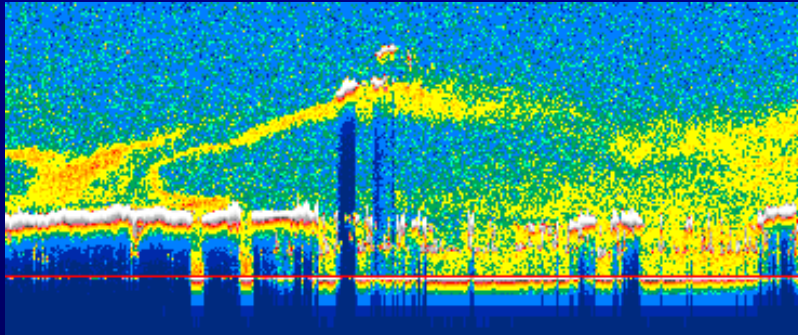


Subsequent meetings



- 2010-Oxford: Verification and Metrics
- 2011-Boulder: Ensembles and Ensemble Data Assimilation
- 2012-Frascatti: Sources and Sinks, plus ESA satellite day
- 2013-Tsukuba: Aerosol observability 3 years on-what have we achieved and where are we going?
- 2014: Back to verification? Seems like we are ready for an expanded discussion on satellite and model error and how we deal with it.

Important NRT Developments for Climate Sensors



- **LANCE:** New NASA <3 hr capability for AIRS, AMSR-E MLS, MODIS, and OMI. Unlike the NRTPE LANCE can be way station for new NRT products.
- **CALIOP:** A new operations grade CALIOP product is now available from NASA LaRC.
- **AERONET:** AERONET has committed to a new version 1.5V product which will aid with more rapid verification needs (level 2 still recommended for most purposes).
- **GAW:** Field data starting to integrate into systems for verification.
- **EarthCARE:** Science committee has recommended to ESA to establish NRT capability.



Joint Products in Development

- ICAP Multi-Model Ensemble: ICAP-MME- Friday Morning
- Need to finish the CLIPER
- AERONET and MPLNET verification grade products-
-Thursday
- CALIPSO/EarthCARE/CATS products for operational use.
-Thursday

Time to start?

- Benchmarks
- Radiance aggregation requirements
- Satellite analysis
- Joint ICAP OSSEs

ICAP shows what can be done if the community has a mind to do the right thing....

<http://journals.ametsoc.org/doi/abs/10.1175/2010BAMS3183.1>



CIMSS



気象庁

Japan Meteorological Agency



INTERNATIONAL OPERATIONAL AEROSOL OBSERVABILITY WORKSHOP

BY JEFFREY S. REID, ANGELA BENEDETTI, PETER R. COLARCO, AND JAMES A. HANSEN

While the last three years have seen rapid operational implementation of aerosol and pollution models around the world, the key to further development of aerosol forecasting systems is aerosol observational data from satellites for model evaluation and data assimilation. However, although the dynamical meteorology community has a well-developed, near-real-time observing system to support forecasting, the aerosol community is only beginning to address its needs. This meeting was the first ever to combine the lead aerosol model developers and remote sensing data providers from around the globe in discussing state-of-the-art technologies and operational requirements for aerosol forecasting. Participants included representatives from the operational centers of ECMWF, FNMOC, JMA, NCEP, and the Met Office; remote sensing data providers from EUMETSAT, ESA, JAXA, NASA, and NOAA NESDIS; and additional developers from

INTERNATIONAL OPERATIONAL AEROSOL OBSERVABILITY WORKSHOP

WHAT: Approximately 15 developers for many of the world's operational numerical weather prediction centers with aerosol forecasting mandates met with an equal number of representatives for the satellite data providers to discuss the aerosol observability issues facing the next generation of aerosol forecast systems.

WHEN: 27–29 April 2010

WHERE: Monterey, California

NASA GMAO, NGST, NOAA, NRL, and several universities.¹ Overviews were given by operational participants as to their centers' current forecasting status and projected data needs. Remote sensing agencies described current and planned relevant space missions. Last, developers provided an overview of future directions in aerosol data assimilation.

Much of the development of operational aerosol systems has relied on climate satellite datasets, predominantly from the MODIS instrument on the NASA *Terra* and *Aqua* spacecraft. With near-real time data available from the joint NASA–NOAA NRTPE (aka “bent pipe”) beginning in 2002 and the recent implementation of the NASA LANCE data server, operational centers have developed a near-total reliance on MODIS aerosol, fire, and albedo

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