ICAP 2022: Welcome!

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U.S. NAVAL RESEARCH LABORATORY

Send comments
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Welcome!

- Thanks for being here, it has been tough to get the whole crowd together as we emerge out of the pandemic.
- It has been over a dozen years since we first convened in Monterey in April 2010. (It should have been a decade, thanks COVID).
- For the few rookies here, informality is the rule at ICAP. This is your chance to get to know your counterparts and ask any question you want.
- And remember "Don't Ask Don't Get." ICAP has been a productive venue to communicate aerosol customer needs to potential data providers. Likewise, data providers can get a glimpse as to what customers are looking for.

Way back machine: April 2010 meeting slide

BIG Problems which bring us here "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 are often seen as a bad thing by agencies. Actually, there is nothing farther from the truth-as long as they are available and supported.
- **The world is a complicated place:** It is difficult to understand the inner workings of other agencies and hence it is difficult to collaborate.

Way back machine: April 2010 meeting slide

Now, where are we at?

- **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… *EOS: "I'm not dead yet. In fact I think I am getting better…." Is 2023 really the end?*
- **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. There is at least awareness, and next gen products do have error models in mind.
- **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 & data assimilation? Product versus radiance assimilation? Operationally MODIS is still king.
- **Competition:** Competitive products from the same data source are often seen as a bad thing by agencies. Actually, there is nothing farther from the truth-as long as they are available and supported. More AOD products than ever are out there, but few other NRT products easily available. For coverage, see MODIS and now VIIRS. New geo product development
- **The world is a complicated place:** It is difficult to understand the inner workings of other agencies and hence it is difficult to collaborate. That is why we meet most years.

What do “We” want? From 2019 ACCP Review

ICAP Continues to voice needs for operational aerosol developers.

WMO convened a panel asking “What we want?” The response is in Benedetti et al, 2018. To quote

Regardless of data type, whether in situ or from remote sensing, there are three guiding principles that should be considered.

- **Make it easy!** **“**Data should be easily accessible, publicly available, reasonably well documented, and, for baseline quantities, encoded into a similar format. Currently data distribution is diffuse and potential users have difficulty maintaining and evaluating global-scale data outside of the largest and most consistent networks…”

- **Make it fast!** “Timeliness requirements also vary by center. Based on the consensus of centers, 3 h latency is preferred, and 6 h is adequate, especially for satellite products. There is nevertheless value in 12 h or even multiday delivery for evaluation and model refinement purposes, including surface particulate matter monitoring. Timeliness should be a goal, but not necessarily a requirement…”

- **Make it well characterized!** **“**Realistic error bars and error models must be provided. The operational community can easily cope with uncertain data, provided that uncertainty is known on a data point-by-data point basis...”

Plus-Work as part of a system! The community recognizes it needs a constellation approach and sensors have unlooked for applications….

Benedetti, A., Reid, J. S., Knippertz, P., Marsham, J. H., Di Giuseppe, F., Rémy, S., et al.: Status and future of numerical atmospheric aerosol prediction with a focus on data requirements, Atmos. Chem. Phys., 18, 10615–10643, https://doi.org/10.5194/acp-18-10615-2018, 2018.

Current Happenings

- First and foremost, ICAP continues to get the word out on data needs, availability, and transparency.
- Participants are likewise tied into other interagency/international work.
- Continued sharing of best practices.
- ICAP consensus has a strong 9 year history and is currently being refactored for flexibility and expanded capabilities.
- Going beyond polar orbiter AOD assimilation has been a tough nut to crack, but we are working on next gen observations that have significant potential (e.g., geo, ATLID, OA&B, UV, polarimetry) if we can get NRT

What does the aerosol community want from upcoming satellite missions? Here are just a few, and yes, a simplification.

Increasing difficulty

What we want	Why we want it	What we have
TOA/Surface Solar & LW Flux	Direct forcing	AOD_λ; CERES; SRB/FlashFlux
Aerosol type/speciation	Aerosol sources & lifecycle, constrain models	Fine mode fraction; sphericity/depolarization; some spectral signatures
ω_o/b_{abs} vertical profile	Heating rates, forcing implications	More vs less absorbing from MISR & models. Limited vertical.
Surface PM	Air quality monitoring, health, operations	Qualitative CALIOP, model, or regression/ML based
CCN concentration, especially at cloud base & cloud properties	Indirect effects, the biggest uncertainty in forcing,	Qualitative, some waving hands

All of these are much more tractable with a combination of appropriate HSRL and multi-angle polarimeters… Plus the program of record & likely model are needed as input.

New Observations a dozen years later? Lets try this again.

- MODIS->VIIRS: Lots of fussing, but straightforward.
- Geostationary: Demonstrated and well on its way, but hard to implement due to systematic diurnal geometry and data processing/volume.
- Object based products and passive height/chemistry: Maturing.
- PACE: A lot riding on polarimetry demonstration.
- EarthCARE: Please sir, may I have a ride? ATLID is a crucial HSRL demo
- ACE->ACCP/AOS: Community concern on lidar selections. Continuity in profile data is essential.
- Dozens of sensors out there/soon to be: But what obs rise to the bar of access/speed/characterization for implementation *above the baseline*.
- Networks: Other than AERONET, MPLNET, and Airnow, slow to get into fully open and quasioperationalized data into global data streams. And we need to support what little we have.

So what is next?

- Well first, remembering our place, we are developers and don't necessarily speak for or commit our agencies.
- This said, community cooperation is organically moving in the right direction. This needs to continue.
- But the next year is one of transition in many organizations. Keep pressure up on new NRT products to go beyond AOD.
- Case in point, while data exchange is slowly getting better, it is still hindered by center specific "eccentricities" in data formatting and access. Active representation at the international meetings by ICAP participants can help keep progress moving.
- Many hands make light work: ICAP participants can be more active in the development of community baselines that can be used across centers.

The rest of the week:

Its been 3 years since we last met, so everyone gets 20 min plus 5 min questions/transitions

- Rest of Tuesday: Model and Satellite Center Updates
  - After today, Monterey Farmers market on Alvarado and Cebo hangout
- Wednesday:
  - AM1: Networks
  - AM2: Satellite Product Lines
  - PM1: Data Assimilation and Probabilistic Prediction
  - PM2: Data processing, *the cloud*, and Open Science, oh my.
- Thursday:
  - AM1: New tools and products
  - AM2: New missions
  - PM1: New model development/findings
  - PM2: Working groups and consensus products.

Friday: Room open AM for other discussions. We may be able to find some aquarium passes for the afternoon. Let me know.

Getting to downtown

20 min walk or Uber to Alvarado. Plus many of us have cars

Ask any of us locals for recommendations