5/2/2023

AMSC Committee Meeting – Madison, Wisconsin

1. **Introductions and Welcome:**
   - Review of zoom logistics
   - Self-introductions by attendees.
2. **Approval of November 2022 meeting minutes:**
   - Jamie Schauer moved to approve the minutes; Kevin Mishoe seconded.
3. **Recap of activities since November 2022**
   - The state of Maine has purchased 4 PollenSense (PS) sensors, model 400, and are working with ARL (Aero Biology Research Labs) to sample with their GRIPS 9000 samplers. The PS sensors were received 1 month ago, and they were working on calibrating them.
   - David Gay and Jamie Schauer were at an acid rain meeting in Japan where aeroallergens were a big topic of discussion. Tried to bring visibility to these efforts with aeroallergens. We should think more globally. This is an opportunity for such a connection. They have an NADP- like network in Asia.
4. **Update on "Initial Comparison of Pollen Counts in Precipitation and Ambient Air Samples to Traditional and Artificial Intelligence Counting Methods for a National Pollen Monitoring Network";** publication in the journal Aerobiologia. (Greg Wetherbee)
   - Paper was submitted to Aerobiologia in November. There were lots of comments from reviewers which were addressed. Due to unavoidable circumstances paper had to be resubmitted and a second set of comments were addressed. Paper is now back at journal and waiting for green light for publication.
   - Andy asked if people could get unofficial copy of paper before publication. Greg would prefer to wait until publication. Andy asked for summary of paper for people in the meeting who may not have heard about the study yet.
   - Summary: Colocated sampling with rotorods, PS, and NADP precipitation sample filters, and collocated with a Hi Vol air sampler at 1 site.
     - Sites were at Duke Forest in NC, the University of Wisconsin (UW) campus, and at Utah State University in Logan.
     - NAB data obtained from closest monitoring stations to these sites.
     - Can NADP filters be used for pollen monitoring? Yes, but only for some applications.
     - How does PS correlate with NAB? Compares for some categories but not others.
     - Hi Vol filters? Some potential there for certain applications like phenology, but not human health.
     - Comparison of PS to traditional methods: some good correlations but others need a lot of tuning.
5. **NIFA Grant Opportunity:** (Greg Wetherbee):
   - David Gay would like to involve agricultural community and has submitted a letter of intent to USDA NIFA for a sustainable agricultural systems grant for a pathogen early warning system.

- PS, NADP sample filters, and traditional pollen sampling methods will be used. They are talking with other researchers like Noah Fiery at UC Boulder. He does PCR work with IMPROVE filters. Also, David Smith at UW Madison Department of Plant Pathology, Darrin Mueller, professor at Iowa State, as well as with Greg Wetherbee.
- They have not said no to the Letter of Intent. So waiting for green light to submit proposal.
- July 31 deadline for proposal. $40 million grant opportunity. Each grant $5-10 million.
- They have not done costing yet for proposal.
- Trying to take monitoring in a different direction by looking at pathogens.
- Andy mentioned that from day one AMSC has pointed out that this data can be used for much more than just human health impacts. Noah Fiery will be invited to present at Fall meeting on his research.

6. **Stakeholder updates:**
   - **Council of State and Territorial Epidemiologists (CSTE)** (Kyra Parks): Jeremy and Fiona are unable to make meeting, but they have a lot of work to do on their pollen project. They are generating estimates of pollen concentrations in areas with missing data using Fiona's model. Andy noted that CSTE was key in forming the AMSC.
   - **CDC** (Claudia Brown): She is in a new role as Acting Deputy Director for the Climate Health program. She will elaborate on Jeremy and Fiona Lo's work through CSTE:
     - They are filling in data gaps in NAB data where there are collection sites as there are no weekend data, breaks, holidays, etc. as collection is a manual process.
     - Model developed to fill in missing gaps with speciated pollen data and have validated these results.
     - They are also modeling pollen info on a gridded scale for the whole US. It has been validated and have developed products. They are in communication with NAB on how to make this data available. One option is to put it on CDC's Environmental Public Health Tracking Network which is a data repository for lots of environmental health information. They are currently waiting to hear back. They are continuing their collaboration with the Phenology Network.
     - Dan Coates wanted to know how missing data are validated. Claudia said she would look to see if this portion of the work has been published.
     - Andy said that both Fiona and Jeremy have been invited to the Fall meeting.
   - **NAB** (Dan Dalan)**:** Does not speak for the NAB but familiar with their work.
     - Dan is an allergy doctor;
     - Met with NAB Board of Directors. They want approval from people above them just to be able to work with the CDC project;
     - Dan is also wondering how you validate pollen counts. You can guess what is out there and go backwards, then predict for future and see how accurate by actually measuring during predicted year. i.e. validate with real data.
     - Looking forward to participating in the project.
     - Would like to improve management of NAB.
     - Dan has been working with Dan Coates and Landon Bunderson on a local level in Iowa and trying to get funding from non-profit orgs. There is a lot of education involved as there is lot of ignorance out there.

- Greg W: Perhaps the tide is turning and we are on the cusp of a lot of progress. We need to keep traditional counting going while training AI. AI info can then be fed into model. Produce modeled grid surface on which to base predicted pollen counts that are informed by real time pollen measuring which in turn is informed by quality assured traditional counting. A layered monitoring network where the foundation is the traditional pollen counting.
- Dan said they are here to help Landon improve his techniques, but it is all about funding, traction, etc.
- Andy reiterating how this is all about inclusiveness and connecting all the different key players and very glad to hear that this is happening.

- **ARL** (Dan Coates)**:**
  - There is lot of marrying going on between historical counting methods and future methods.
  - ARL has been around now for 29 years and selling their equipment worldwide. Their forecasting is 80% accurate but pollen is very unpredictable. They are working with all of the different stakeholders and trying to grow their network in Canada. They are doing lots of clinical trials and looking forward to continuing working with all and hoping to facilitate change in industry towards more real time.
- **PollenSense** (Landon Bunderson):
  - Has shifted his efforts to hiring a 'librarian' that interfaces with sensor owners and what models the owners want to improve.
  - Has deployed 30 more modules across the world.
  - View Tags Feature: anyone with sensor has access to portal, can look at pollen images from past 24 hours. Currently, anyone can go through these images and make changes. Feature has been available for a while but has been improved. Landon gets an alert that edits have been made and will then upload to his system. Can improve model in about 24 hours.
  - Pollen Hunter: an internal platform for right now but will be available to all customers by next year. Will allow for better and faster model building. People can develop their own algorithms.
  - Will ship sensors to half a dozen states in the next six weeks and these customers are all public institutions of some kind.
  - Very serious about getting their data out to anyone who needs it. Only way to make network grow are through partnerships like what is going on now.
  - Access to data will be made available to us by Landon. Wants to help move the ball forward.
  - Greg W: Concerned that anyone can edit data and would prefer people with expertise to be doing this. Is there password protection to keep people out that should not be in there.
  - No protections yet. Current people doing the editing are well trained and know what they are doing. Data could be submitted to ARL for QC. A QC system needs to be set up.
  - Greg: An incredible amount of data being collected which will result in storage issue. Need curator of data that is independent entity. Also, QA/QC center, ARL? Can also

be custodian. Data center should be independent, not feds. NADP would be well suited.

- Currently MS Cloud is hosting data. All in with NADP hosting this. This is a tool for researchers and others who care about the data. Not good business model to hoard data.
- Dan Dalan: Images are not the same as stained slides. Prefer confirmed people to make the corrections. Can correction process be automated?
- Landon is collaborating with researchers who are into specific types of pollen. The aggregate of contributing people is what will drive the automation. Instance of pine pollen not being accurate in SE of US. All pine pollen in the library was white, so they added the yellow pollen type that is seen in the SE.
- Dan Coates: They have own AI system for forecasting, but they still look at every single forecast. Wants to get with Landon to expand forecasting. Forecasting can be a good revenue generator.

- **CityDep Update** (Greg Wetherbee)**:**
  - CityDep has been merged with the TDEP Measurement work group.
  - Hope to move urban monitoring efforts through this group.
  - Study done and now need to continue momentum by producing products.
  - Andy will follow up with Greg on getting urban stakeholders into AMSC. Greg will provide email list.
- **EPA Update** (Melissa Puchalski):
  - Proposal presented during the Fall 2022 AMSC committee meeting to deploy PS sensors at EPA CASTNET sites.
  - Will look at how changes in air quality and climate are impacting pollen and mold.
  - Have a loaner PS sensor from Landon Bunderson.
  - Deploying PS at CASTNET sites would increase spatial and temporal coverage in rural environments.
  - Can feed into forecasting and modeling work.
  - EPA would produce seasonal and annual pollen maps and calendars; not daily but would focus on longer term changes.
  - Can assess climate impacts on pollen, timing, length of season, intensity, and vegetation composition. How will climate change impact plant communities? Evaluate correlation between aeroallergens and pollutants.
  - Testing at WSP lab with PS sensor. Hope to develop scripts for polling, aggregating, and displaying data through CASTNET website.
  - Would like to get input on proposal. There is some IRA funding to do small pilot study.
  - Can develop data visualization tools at EPA.
  - PS table developed by PS but downloaded by WSP; shown by Jayde Alderman from WSP; can look at date ranges and also plot them.
  - Would also establish procedures to deploy in network mode.
  - Jason Lynch has stepped in to fill in for Mike Kolian's role with the EPA PS project.
  - Draft white paper proposal to share with stakeholders. What is most effective way to communicate health risks to public as EPA is not the agency that deals with health risks.

- Is AMSC the forum to advance the science? Is there a better way?
- Collocate measurements with manual method; develop SOPs for site operators and for data validation; how to make improvements to algorithm?
- Map of CASTNET and NAB sites, looking at potential locations for deployment for pilot network.
- Longer term vision: To correlate with air quality data and meteorology and to design a standardized network to best present the data as well as to advance the science.

7. **Presentation: "The Pollen Monitoring Landscape in Maine – Latest Update.** (Andy Johnson)
    - Maine CDC successful in securing funding for pollen monitoring activities. Monthly planning sessions were held between Maine CDC and DEP to establish a Pollen Monitoring Network Advisory Group. Interagency MOU completed on October 2022. Four PS sensors ordered and received late March 2023.
    - Issues dealt with included goals of network, siting criteria (coverage for sensitive populations, cover a few populations or try to cover entire state?);
    - Goals:
        - Track changes brought on by climate change using pollen as a metric:
            - Elevated CO2 concentrations resulting in elevated pollen production;
            - Milder winters and early spring-like temps resulting in earlier pollen season start;
        - Develop pollen monitoring network to provide forecasters with ability to predict upcoming high allergen, i.e., severe, days.
    - Siting: Questions considered were:
        - Which areas would benefit the most?
        - Geographical variations (biophysical/ecoregions; growing seasons, temperature variations).
        - Urban versus Agricultural Areas?
        - Need to balance pollen monitoring coverage for those in need with the goal of tracking changes resulting from climate change.
    - Final site selection: Covering as many multiple goals as possible.
        - Inland Southern Maine: More rural with ozone monitoring
        - Central Maine (Gardner/Augusta area): Ozone monitoring here as well. Trying to get more resources for this network so being close to capital will allow for legislators to come and visit this site.
        - Rumford: long term monitoring site by pulp paper mill in a river valley.
        - Pleasant Point in eastern Maine; tribal location.
        - Hoping to put one in Ashland if CASTNET site gets going and potential to put one at the Acadia CASTNET site as well.
        - The Mi'kmaq tribe has a rotorod already deployed and wants to collocate with PS.
        - Need more density of sites for forecasting and better answers.
    - They will ramp up this year and next season will be the reporting season.
    - We don't know what scale of representativeness any monitoring site represents.
    - Dan Dalan: What is a counting station relevant to? How many kms?
      Also, very sensitive to serving the underserved and more vulnerable groups.

We are competing against diseases like diabetes, etc. to get funding from non-profits, but 20% of the population suffers from allergies which is significant.

- Yang Liu recently shared that in the Atlanta area 25% of hospital visits were made up by the black population.
- Rick Heuber: what is interest of other states doing the same as Maine and NACAA and AAPCA?
  - Andy: David and I presented at NESCAUM in beginning of April and the challenge for most states is that there is no regulatory requirement. No funding except maybe through IRA. CSTE put position paper together back in 2016 to ID need and value for national monitoring network and the data from it. The formal review process for this paper went to 12 federal agencies. Reviewers all agreed that this is good idea but there is no money. Maine got funding through Building Resistance Against Climate Effect (BRACE) grant. If EPA can get going through CASTNET then we can demonstrate value of this type of network.

8. **Topics for Further Discussion:** The following topics/questions were key points from the Fall 2022 AMSC committee meeting and formed the basis of the ensuing discussion.
   - What is the best way to bring everyone together to move forward for addressing identified goals, needs, etc.
     - Motion passed in the Fall for EPA/WSP to formulate a data management scheme.
     - Currently there is no unified way to aggregate, report and share all pollen data that are out there.
     - Can learn a lot from Canadian colleagues as they have been collecting and distributing such data for decades.
     - Andy thinking of forming a small work group (WG) to determine data parameters;
       - Will this group deal with siting criteria as well? Does NAB provide any siting criteria? NAB does provide some criteria such as sensor has to be at certain height, etc. This is published information but still seems hard to access.
       - Dan Coates: We collect every single day, so sampler at head level for convenience of change out, 10 yards plus away from bldg., large trees, not always representing exactly what is in the area.
       - Jamie: Be careful that siting criteria does not become a barrier for entry. If you want to be in the database then you need to have a, b and c. Agencies will have different needs that determine siting criteria. Focus on the data. Data set being shared has some commonality. Don't alienate people by very specific siting criteria.
       - Focus on data system with flexibility by having certain types of coding.
       - Andy will invite people to volunteer to be in the WG.
       - Data criteria will be developed with consensus from stakeholders (SH) but will still need uniformity and criteria which can be flexible.
   - Spatial representativeness: Can be difficult to determine with pollen due to nature of the flora. One tree can be major source of pollen.

- Need more data to understand representativeness. Uniformity will be needed to compare data over time and space. But can document exceptions.
- Chris Rogers: WSP is focusing on writing code to poll from numerous sites. Will be writing SOPs, etc. It would be really helpful to know how to deploy the PS sensors at air monitoring sites which have towers and shelter. The goal would be to deploy uniformly. Even just guidance would be helpful.
- Greg W: Site QA by EEMS for NTN. Can do similar with existing sites. Do it yourself site evaluation, an inventory of what is there. Document what sites look like. Regional air quality may not be representative of pollen due to differences in vegetation. However, we can document/survey what is in immediate area up to 5 km. Can help interpret the data.
- Andy: can have different site types like in air monitoring: Maine putting their 4 PS' at existing air monitoring sites due to existing infrastructure. There are different site types for air monitoring such as regulatory NAAQS, SLAMS, special studies/research sites, etc. Can make similar distinctions.
- Dan Coates: A pollen site can be operated by battery and solar panel; does not require a lot of power and their forecast radius is 50 km.
- Most pollen grains are 15 microns and up, so heavier the particle the less transport like PM10. Smaller pollen particles may go longer distances. But most deposit very quickly.
- Greg W noted that in Utah there was good correlation between the NAB sampler and PS even though they were 100 km apart. Landon pointed out that even though the distance is substantial pollen types are very similar in this region.

- AMSC Platform to hold quarterly calls with researchers and explore improvement of algorithms, data needs, etc. This would be a very focused conversation on a specific technical issue with the goal of advancing the science.
- How to best harmonize all data from different networks? WG can look into nuts and bolts of this.
  - Greg W: Wasn't WSP tasked with doing this? What does it take, how to structure database, how to crunch and summarize from 10-minute to hourly, etc.
    - Chris R: This work has started but need better handle on scope. Primary goal is to understand what is coming from PS and can ramp up to network deployment and deliver to EPA. Jayde is using combo of R and Python. We can call and collect data for anyone's PS. Outside of PS is a different story.
- Need for an FTE for aggregating NAB, CASTNET, and any other pollen data. Can identify differences and advise on how to pull all data types together. Any possibility of hiring such a person through NADP?
  - Jamie: If there is independent funding, yes but cannot come out of MDN/NTN budget. Need a big project like CASTNET to provide base funding. Want to make sure to be open and inclusive but realistic about resources.
  - David G: Not a possibility for this year but possible in future.
  - Melissa: EPA is focused on WSP collecting and moving data to EPA. This process

can be shared. Outside of scope to do it for NADP or any other network.

- Greg W: Can come up with basic program to screen data initially.
  - Landon: Have ability in their system already to notify individuals that their data do not make sense. Neck deep in building this part.
  - Chris R: Automate as many checks as possible, very similar goals to Landon's. How do those improvements get propagated out to all PS users? And how are changes tracked over time? Landon: most changes are admitted to master library. Can benefit locally or globally. CASTNET could not update by site, would need to be done on a global network level. Chris would like to learn more about how changes get propagated out in Landon's system. Currently, Landon makes decisions on whether to deploy globally.

- What are the challenges in getting IRA funding? What is the bandwidth for getting grants, money from other sources? NADP and universities are not government agencies. So can NADP get IRA money?
  - Jamie: Historically not eligible, would go thru Wisconsin DNR. Not a community based organization either. Wisconsin DNR is interested but lots of competing interests like PFAS. Go back to question of who is central lead party in this? EPA? CDC?
- Floor opened up to bring up any other topics/issues that people wanted to discuss:
  - Dan: what is biggest hurdle with NAB participating? Andy thinks NAB member is on mailing list but he has not personally reached out to anyone from NAB and maybe he should.
    - Dan: Need to keep foot in the door. He has been in NAB for a while and did not know about AMSC.
    - Melissa to Dan: is there a way for you to bring us to the NAB? Dan could put it up as a project but requires multiple levels of approval. Key is to find NAB people to champion the cause. Dan suggested Pam as a contact person at the NAB. It would be her job to add us to the agenda, get us to meet with her leadership, etc.
    - Greg W and David G have tried to get NAB data with no luck.
    - Landon thought that each NAB station owns and can share their data but Dan said the data are all owned by the NAB.
    - Andy and Melissa will both reach out to Pam to get an audience with NAB board and explain how we want to cooperate, not compete. EPA would like to collocate with an NAB site to better understand the data.
  - Study for spatial representativeness: Such a study would be instrument intensive. Can set up transect of instruments in different terrain like from urban to rural and compare traditional versus automated methods. Look for changes in characteristics over space.
    - State of Maine will use this summer to do spatial study with their 4-5 PS sensors.
    - Yang Liu is also applying for grant to set up 12 more stations. He is already seeing differences between existing sites. So potential work out there to help with this issue.

- Climate change and link to pollen: It has been stated that rising CO2 levels enhance pollen levels. Is this true?
  - Landon knows of growth chamber studies where CO2 has been pumped in and more pollen production was seen.
- Landon noted that the group of people that he is selling PS sensors to would love to be part of a group that deals with this topic as they do not know what to do with their data.
  - Andy offered for them to join AMSC as an option. Suggested that maybe Landon forward to them AMSC's mission, some information, etc.
  - Chris R: AMSC far enough along to produce fact sheet that could be used for this purpose. David Gay volunteered to help with this.
  - Based on ensuing discussion, AMSC will produce fact sheet. Will work on putting fact sheet together this summer with goal of having it ready to distribute during Fall meeting.
- Link to the data release for the pollen study that Greg W was part of:

  https://www.sciencebase.gov/catalog/item/62aa03b2d34ec53d277114de

9. Motion to Adjourn by Andy Johnson, seconded by Greg Wetherbee.

Meeting adjourned.

Attendance List

Name	Location
Jayde Alderman	On Line
Daimy Avila	On Line
Kulbir Banwait	On Line
Kenneth Brice	On Line
Claudia Brown	On Line
Landon Bunderson	On Line
Daniel Coates	On Line
Ashley Colon	On Line
Dan Dalan	On Line
Noelle Deyette	In Person
Paige Dugan	On Line
David Gay	In Person
April Hathcoat	On Line
James Hermanson	In Person
Selma Isil	In Person
Andy Johnson	In Person
Colin Kelly	On Line
David Lemery	On Line
Chris Lepley	On Line
Kevin Mishoe	In Person
Jason O'Brien	On Line
Kyra Parks	On Line
Melissa Puchalski	In Person
Chris Rogers	On Line
Jamie Schauer	In Person
Marcus Stewart	On Line
Gregory Wetherbee	On Line
Henry Anderson	In Person