Meeting Notes: 2025 TDep Fall Meeting

Date: Wednesday, December 3, 2025 **Time:** 10:00 am – 13:00 pm CT

Attendees:

Alain Robichaud (ECCC), Alissa Chrisekos (NPS), Amanda Cole (ECCC), Amy Christiansen (UMKC), Anna Hyland (WSP), Bret Schichtel (NPS), Chris Rogers (WSP), Christian Hogrefe (EPA), Colleen Baublitz (EPA, TDep Co-chair), Da Pan (Georgia Tech, TDep Secretary), Dana Grabowski (NADP), Dawei Lin (NCU), David Gay (NADP), Ella Osby (WSLH), Emmi Felker-Quinn (NPS), Gary Yip (ECCC), Greg Beachley (EPA), Hazel Cathcart (ECCC), Ian Rumsey (EPA), Ian Vanderkooi (Utah DEQ), Ishir Dutta, J. David Felix (Texas A&M Corpus Christi), Jason O'Brien (ECCC), Jayde Alderman (WSP), Jim Renfro (NPS), John Walker (USFS), Joseph Felix (UNCW), Kate Rodelli (CU Boulder), Katie Blaydes (WSLH), Ken Brice (ECCC), Kevin Mishoe (WSP), Krish Vijayaraghavan (Ramboll), Kristen Foley (EPA, TDep Co-chair), Kristopher Novak (EPA), Kulbir Banwait (ECCC), Liam Trinh Nguyen (WSLH), Lourdes Pineda (UNAM), Marcus Stewart (WSP), Margaret McCourtney (MPCA), Mark Kuether (WSLH), Martin Shafer (WSLH), Melissa Puchalski (EPA), Michael McHale (USGS), Michael Randall (WSLH), Mike Barna (NPS), Mike Bell (NPS), Naomi Tam (Alberta Gov), Nate Topie (WSP), Noel Deyette (USGS), Patrick Campbell (NOAA), Ralph Perron (USDA), Rebecca Dalton (EPA), Richard Tanabe (NADP), Rick Haeuber, Ryan Fulgham (EPA), Ryan McCammon (BLM), Sarah Benish (WSLH), Selma Isil (WSP), Stuart Weiss (Creekside Science), Sydney Schultz (MPCA), Timothy Sharac (EPA), Yayne Aklilu (Alberta Gov), Yuan You (ECCC), Zac Najacht (WSLH), Zhen Liu (EPA).

1. Introductions and Updates

- **Opening:** Colleen Baublitz (Co-chair) provided a high-level overview of the agenda. She acknowledged the leadership committee: Co-chair Kristen Foley and outgoing Secretary Da Pan (Georgia Tech), along with Richard Tanabe for administrative support.

- **2024 Annual Report:** The 2024 annual report is finished, led by former co-chair Amanda Cole, but is pending final affirmation by the steering committee before release.

- **Survey Results:** Kristen Foley presented results from a survey gathering member interests. The results showed a diverse distribution of attendees across government, industry, academia, and students.

2. Secretary Election

- **Nomination:** Mike Barna, a physical scientist with the Air Resources Division of the National Park Service, was nominated for secretary. His work focuses on identifying emission sources impacting air quality at national parks and sensitive ecosystems using regional air quality models.

- **Result:** Mike Barna was elected to serve as the TDep Secretary for the coming year with 31 votes in favor and no opposition.

3. Icebreaker Breakouts

Breakout sessions were used to facilitate networking. Attendees split into smaller groups to introduce themselves and share what brought them to the TDep meeting.

4. Working Group (WG) Updates

- **Measurement WG:** Bret Schichtel (NPS) reported that Kristi Morris has left the group to take the DRP role.

    o **Field Study:** A study by Jeff Collett's group (CSU) to measure phosphate and total nitrogen in wet deposition using SNIPIT samplers was delayed. The samplers were found to be contaminated with phosphate embedded in the plastic. David Gay is fabricating new samplers from Delrin for summer deployment.

    o **Southeastern US Study:** The study on ammonia, NOx, and particle nitrate formation has concluded and is in the data analysis phase.

    o **Research:** Bret highlighted a paper by graduate student Lily Naimie (https://doi.org/10.5194/acp-25-15245-2025) regarding the sensitivity of simulated ammonia fluxes to time-integrated measurements.

- **Stakeholders WG:** Ian Rumsey (EPA) provided an update on the "Atmospheric nitrogen deposition sources impacts and management" webinar series.

    o Two webinars occurred in late 2024.

    o A third webinar focusing on best management practices (with USDA) was planned but paused due to federal agency reorganizations.

5. Special Presentation: TDep Earth Engine Tool

- **Presenter:** Stuart Weiss (Creekside Science).

- **Overview:** Stuart presented a new web application developed in collaboration with Justin Huntington (DRI) and produced with Climate Engine and Google Earth Engine

(https://space-geographer.projects.earthengine.app/view/tdep) that allows users to visualize TDep grids via Google Earth Engine.

- **Features:** The tool allows users to click on a map location to generate time series data for various deposition components (e.g., Total N, NH3 dry).

- **Goal:** The tool aims to make TDep data accessible to "mere mortals" and help researchers and managers visualize cumulative loads and trends.

- **Feedback:** Greg Beachley and Mike Bell noted the tool's potential value for QA/QC of maps and for site operators to understand their data's context. Stuart shared that Justin is open to doing further development on the app to add more types of plots and features.

6. Network Optimization Update

- **Presenter:** Mike Bell (NPS).

- **Context:** The group was tasked with evaluating potential cost savings while maintaining spatial coverage and data integrity.

- **Completed Actions:** Allowed MDN samplers to have 1- or 2-week exposures, removed mercury speciation from AMNet, and stopped methyl mercury and litterfall measurements. AMoN switched to ALPHA samplers.

- **Analysis:** Mike presented a "leave one out" analysis (led by Greg Beachley) to assess network resilience.

  - Maps showed areas of high resilience (dark blue, >15 sites within 500 km) versus low resilience (red/orange).

  - Western sites generally have lower density and resilience compared to the East.

- **Prioritization:** A scatter plot analysis categorized sites by density and "loss impact." High density/high loss sites (e.g., California, complex terrain) are priorities for research, while low density/high loss sites need protection to prevent data gaps.

7. TDep Measurement Model Fusion (MMF) Updates

- **Presenter:** Greg Beachley (EPA).

- **Status:** The 2024 grids (v2025.01) are available.

- **Protocol Changes:** A minor correction to the alignment of weekly CMAQ aggregation periods to sampling periods was implemented. The impact of the correction was minor with differences ranging between ±5% in dry species and occurring only in 2005-7, 2011-12, 2017-18.

- **Challenges:** Deposition estimates for 2020-2021 from CMAQv5.4 simulations were evaluated for possible use in TDep maps for those years. The model data was compared to observations and to current TDep maps which are based on EQUATES CMAQv5.4.2 modeling for 2002-2019. The new simulations showed large differences (200-400%) in particulate matter species (calcium, chloride, nitrate, ammonium) compared to the EQUATES estimates. The large changes reflect differences in CMAQ inputs (emissions, meteorology, boundary conditions), model configuration, and updates of scientific algorithms in version 5.4 compared to v5.3.2. While these updates are scientifically valid, they create an artificial 'step change' in the TDep maps. To avoid confusing trends for the public, the team reverted to using EQUATES CMAQv5.3.2 data (2002-2019). Additional model evaluation is planned to better understand the model biases in both sets of simulations and decide how to proceed for TDep maps of more recent years.

- **Future Work:** A MMF workgroup meeting is planned for January. An annual fused wet deposition product is nearing completion.

8. Data Inference for Missing Measurement Periods

- **Presenter:** Liam Trinh Nguyen (WSLH, APHL Fellow.

- **Methodology:** Liam presented his work on improving the TDep application by restructuring the code and workflow to make it more user-friendly for development and application. He also presented on using machine learning (computer vision, autoencoders) to handle missing data (imputation).

- **Results:** He has successfully added a new module to the TDep python code that is able to efficiently categorize different types of missing data, e.g., missing data at a single site for one pollutant or multiple pollutants, missing data at a cluster of monitoring sites. The module will select and implement the appropriate Machine Learning technique based on the type of missingness.

- **Application:** This approach aims to fill gaps, such as the 2022 wet deposition gap, and handle completely missing (i.e. "missing not at random") data.

9. Content Breakouts

Participants self-selected into breakout groups for the second round. Facilitators provided summaries:

Topic: Communicating TDep's Value Externally (Facilitator: Kristen Foley)

- **Tools:** Confirmed that Earth Engine has great potential to expand TDep data access.

- **Website:** Suggested improvements to the TDep page for downloading files, included clearer file naming, batch download options, and a webpage linking to FTP files with descriptive metadata.

- **Biodiversity:** Recommended adding a section to the website highlighting papers on biodiversity challenges to engage the conservation community.

- **Outreach:** Proposed reaching out to state and local stakeholders and organizing a TDep session at a future AGU meeting.

Topic: Non-Federal Agencies & Education (Facilitator: Da Pan)

- **Education:** Discussed reaching out to high schools and colleges to sponsor sites. Mentioned a donated N-CON sampler being used by students.

- **Challenges:** Discussed maintaining data consistency given student summer breaks and curriculum integration.

- **Idea:** Proposed the concept of a "classroom deposition monitor" similar to a classroom pet.

Topic: Uncertainties in Deposition (Facilitator: Bret Schichtel)

- **Focus:** Direct measurements of ammonia dry deposition fluxes.

- **Technology:** Noted that technology for direct measurements (e.g., eddy covariance) is now available for deployment.

- **Needs:** Long-term measurements are needed for model evaluation, along with measurements of inputs like friction velocity.

Topic: Network Optimization Data Products (Facilitator: Mike Bell)

- **Emissions:** Discussed identifying high-emission areas that lack monitoring.

- **Operator Engagement:** Jim Renfro shared that Great Smoky Mountains National Park created resource briefs to help site operators understand the value of their work and share it with park staff.

Topic: Measurement Model Fusion (Facilitator: Greg Beachley)

- **Methods:** Discussed incorporating satellite data (NO2, AOD) to constrain model results spatially.

- **Urban:** Considered handling urban monitors as a separate entity/surface to improve fusion accuracy.

10. Closing Remarks

- **Upcoming Webinars:**

  - **February 24 (Maybe):** Jesse Bash will present on modeling ammonia deposition.

  - **Late Spring:** Glenn Wolfe (NASA) will present on the FarmFlux campaign.

- **Acknowledgments:** Kristen Foley thanked Colleen Baublitz for her two-year tenure as Co-chair. Colleen recognized David Gay, who is retiring, for his significant contributions to TDep.