Science & Technical Advisory Committee
Zoom Online Meeting
February 28, 2025 – Meeting Summary

In Attendance:
STAC Members: Jim Ammerman, Vince Breslin, Chris Conroy, Michele Golden, Dianne Greenfield, Shauna Kamath, Jason Krumholz, Kamazima Lwiza (New York Co-chair), Robin Miller, Jim O'Donnell, Suzanne Paton, Evelyn Powers, Rebecca Shuford, Paul Stacey, Kelly Streich, Mark Tedesco, Maria Tzortziou, Jamie Vaudrey, Penny Vlahos (Connecticut Co-chair), Nils Volkenborn, Laura Wehrmann, Chester Zarnoch

CAC Liaisons to STAC: Sarah Crosby (The Maritime Aquarium), Mickey Weiss (Project Oceanology)

Others: Stephanie Arsenault (SBU), Zofia Baumann (UConn), Krystina Braid (SBU), Robert Burg (LISS/NEIWPCC), Finnian Cashel (EPA), Sara Cernadas (NYSDEC), Yong Chen (SBU), Craig Connolly (EPA), Emma Cross (SCSU), Alex DuMont (NEIWPCC), Syma Ebbin (CTSG), Marisa Fajardo (The Maritime Aquarium), Richard Friesner (NEIWPCC), Richard Fulford (EPA), Kurt Gottschall (CTDEEP), Anya Grondalski (LISS/NEIWPCC), Tom Harner (Environment and Climate Change Canada), Elizabeth Hornstein (NYSG), Alison Kocek (USFWS), Meghan Lally (CTDEEP), Peter Linderoth (STS), Bill Lucey (STS), Cara Manning (UConn), Jon Morrison (USGS), Esther Nelson (EPA), Claire Ober (SBU), Katie O'Brien-Clayton (CTDEEP), Jimena Beatriz Perez-Viscasillas (NYSG), Matthew Pruden (Cornell), Maria Rodgers (NCSU), Leonel Romero (UConn), Judith Sarkodee-Adoo (NYCDEP), Samarra Scantlebury (NYSDEC), Sarah Schechter (CTSG),Youngmi Shin (EPA ORISE), Lane Smith (NYSG), Cayla Sullivan (EPA), Nikki Tachiki (EPA), Elizabeth Tanzi (EPA), Samantha Wilder (IEC), Gregory Wilkerson (NYCDEP), Kimarie Yap (NYSDEC)

Program Updates: CCMP Revision, Management Conference Organization, Name Change: Mark Tedesco, EPA LISO
The STAC co-chairs introduced Mark Tedesco, Long Island Sound Study (LISS) Director, to discuss the status of the new CCMP. He noted that the first plan was written in 1994, and a major revision was completed in 2015, this new 2025 CCMP is also a major revision. This new CCMP involved the participation of many people over 14 months, since January 2024, and included two joint meetings of the STAC and CAC to discuss details of the plan. There was a lot of input into the plan, especially focused on making it more concise and therefore more publicly accessible. The 20 Ecosystem Targets of the 2015 plan were reduced to 15 Objectives, and the 136 Implementation Actions were reduced to 47 Actions. The Objectives were incorporated into a SMART framework (Specific, Measurable, Achievable, Relevant, Time-bound) with an emphasis on specific actions to achieve quantitative measurements of success. The plan also includes identifying extreme weather events and addressing resilience to them as required by the PRAE Act, an amendment to the Clean Water Act. The structure of the plan includes four major goals, as well as the objectives and actions to achieve those goals. He also listed the four goals and their

specific objectives. Mark showed the specific example of the Clean Waters and Healthy Watersheds goal with a descriptive objective and quantitative measures of success which can be tracked and reported, as well as the specific actions that support them.

In addition, the program needed a new name and logo. It will be the Long Island Sound Partnership with a new more abstract logo. The Management Committee approved the new CCMP on January 16th but with the new administration came some executive orders, particularly related to DEIA, environmental justice, and climate. It was therefore necessary to make some adjustments to the plan which was developed under the guidance of the previous administration. The draft plan was revised to conform to the new executive orders, for example the "SMARTIE" goals became the "SMART" goals, removing equity and inclusion. The Executive Steering Committee approved the modified CCMP on February 10th, and the EPA Region 2 Regional Administrator (RA) approved the plan on February 11th, and the Region 1 Regional Administrator will be briefed on the plan once appointed. The Region 2 RA supported the scheduling of the Policy Committee meeting to approve the plan, and the plan was approved on March 20th. He has also supported the planning for a formal CCMP release and celebratory event on June 20th, 2025, which is tentatively scheduled.

The program hopes to invite Lee Zeldin, the EPA Administrator, to the event as well as the Connecticut and New York Governors and Environmental Commissioners and the EPA Region 1 and 2 RAs who would likely host the event. The arrangements for this event are still under discussion. Mark emphasized that the heart of the plan, the goals, objectives, and actions have not changed despite other changes. The EPA Administrator, Lee Zeldin, was co-chair of the Long Island Sound Congressional Caucus when he was a Congressman from the East End of Long Island and was aware of and supportive of the program. He has already visited the New York EPA office and expressed his interest. Mark concluded with a discussion of the new work group structure under the plan, restructuring the new work groups around the goals to align the program structure with the plan. In addition, there is a new modeling group, the indicators review team continues, and numerous cross-cutting issues will also continue to be addressed.

Discussion

Paul Stacey asked if the CCMP would be posted. Mark said it would be posted when completed. Mark said that the program is in the strongest position when it is addressing issues in the law. The PRAE Act requires that the program must assess future vulnerabilities from extreme weather conditions and develop ways to address them.

Paul also asked about the agreement between the states and federal government and Mark replied it was the plan outlined in the CCMP.

Paul finally asked about potential reductions in the budget and the fact that recent past expenditures have not resulted in obvious progress. He said that the program needs to show improvement in ecosystem and watershed health.

Penny Vlahos commented that the LISS is a bipartisan agreement and has bipartisan support. She noted that the program is in a strong position if it is to some degree respectful of the executive

orders. There are rumors about potential budget cuts, and some may occur, but the program has strong support on both sides of the aisle. Kamazima also commented that results of management actions take a long time to appear so that we will likely see future improvements from past management actions.

Note that Mark Tedesco retired as Director of the LISS in early April after 38 years with EPA.

LISS Social Media: Anya Grondalski, LISS/NEIWPCC

Anya wanted to provide a social media update since her last update was at the joint STAC-CAC meeting in September 2024. She noted the LISS LinkedIn page, the newest LISS social media site, had recently surpassed more than 500 followers. The account was created in January of last year and 500 followers is the normal LinkedIn benchmark (higher numbers are not listed on LinkedIn's site) and was achieved in early January 2025. The most recent total was 530 and the more professional organizations follow LISS the better for the program. LISS has experienced 20% growth every year on Instagram which has not changed for the past few years. She suggested that those who do not follow LISS on Instagram should join as the program is just about 120 followers shy of 2000. A series of posts and collaborative posts are good ways to increase our followers as demonstrated by some of the program's recent posts, including a series on stormwater and collaborative posts with the Lake Champlain Basin Program. LISS has also made a major effort to improve the accessibility and inclusiveness of its social media platforms, website contents, and other communications using commonly accepted formatting and fonts. Finally, she talked about how LISS communications could facilitate science communication discussions on the platform Reddit such as run by NOAA. Anya also mentioned a new effort to publicize LIS scientific research called "Long Island Sound Science Saturdays" on social media. Contact her if you are interested in participating.

Discussion

Kamazima added that he liked the Science Saturday ideas and said it could be tailored to both adults and younger folks. Kelly Streich added that she had seen younger people using Reddit for discussions and Anya noted that while the program's prime social media demographic is ages 35 to 45, a significant fraction is younger. Mark Tedesco stated that the LISS had in the past been proud of its printed reports and then its emailed communications, but that social media was now the way to communicate with the public and that he greatly valued Anya's efforts in this area.

Note that Anya Grondalski left the LISS in early April to take another position.

Evolving The STAC Mission and Operations to Increase Science Applications In the 2025 CCMP: Penny Vlahos, UConn

Penny reminded everyone that at the last STAC meeting the co-chairs had proposed changes to some STAC bylaws and other activities. There was also discussion about possible subcommittees within the STAC and potential additional administrative support for the STAC to enable new activities. But first she reviewed the results of the survey conducted at the last meeting. Of the

20 responses, 40% of the STAC members were from academia, 20% from the federal government, and smaller numbers from state agencies and NGOs. When asked about the length of the term for STAC co-chairs, half supported the current two-year term, while the other half supported three- or four-year terms. Sixty-five percent said that the co-chairs should be able to serve two consecutive terms, while the remainder were divided between 1 or 3 terms or unlimited.

There were seventeen responses to the question of what changes would be recommended to the agenda of STAC meetings and other activities. They included releasing the schedule of meetings at the beginning of the year, better relating STAC presentations to the CCMP, and a greater focus on emerging issues, upcoming problems, and the synthesis of topics of interest. Additional recommendations included increased communication between the STAC and the technical work groups, attention to what other NEP STACs are doing, better communication of STAC activities, member input, and recommendations to the management committee. Additionally, a calendar and website of activities, workshops, and relevant reports which could be downloaded. Further, the STAC and research community could advocate for research funding, produce important deliverables, and provide more input and transparency for STAC meeting planning and topics. Finally, the STAC could have shorter presentations of five minutes, a possible student symposium, and hear more input from the management side like CTDEEP, NYSDEC, and NYCDEP.

A question about establishing STAC ad hoc committees solicited the response that the STAC could engage more with the existing technical work groups and have more formal communication with them. The STAC could also have a fellow and/or an ad hoc committee review, summarize, and assess past research and develop future science needs. There were also comments about having STAC discussions with the new modeling work group and perhaps an ad hoc STAC committee to examine modeling and measurements used to develop water quality and aquatic life goals.

Discussion

Paul Stacey said that he never gets much out of even fifteen-minute presentations, so does not like the five-minute ones. He prefers more of a seminar approach but also with plenty of time for questions. Kamazima responded that Paul made a good point and that the presentations might need to be separated from the STAC meetings, perhaps requiring an additional meeting. Penny replied that a potential seminar series on hot topics and emerging issues is a great idea. The regular STAC meetings could present an “appetizer” and then the seminar could go deeper into a subject. Paul suggested a “shark tank” approach where proposers could make their case to help strengthen proposals, discuss the science, and highlight management implications. Penny also repeated the idea of meeting with state and local legislators, complimentary to the CAC’s outreach in Washington, especially over the next four years.

Penny then asked Jim O’Donnell about his time as STAC co-chair. She asked if he served twelve years, he could not remember but said that it was a long time. Jim said that two years was not long enough, but the real limitation was the lack of support, and he was encouraged to hear that support may be coming. He said that the support issue was more important than the length of

service in making the chair effective. It is hard to sustain momentum between the meetings when the chairs have the day-to-day issues of their regular jobs to address. Both Penny and Kamazima agreed. Jim O'Donnell said that administrative support was critical for continuity over time and that students were not appropriate for the role. He suggested that a full-time FTE was not needed but at least a quarter-time to a half-time FTE was.

Penny liked the idea of working with other NEP STACs since the benefits could go both ways. Kamazima remarked about the comment that some presentations have little to do with the CCMP goals. One reason is the new investigator talks, where investigators new to the area talk about their expertise which may not be directly related to the CCMP goals. It does, however, allow STAC members to learn about their areas of expertise and Penny pointed out that several new investigators are collaborating and funded to work on LIS. Penny asked if there were any more questions and noted that she and Kamazima were open to inquiries and questions at any time outside of STAC meetings. She said that they were going ahead with a committee to meet with state legislators and would probably also go forward with a committee on ecosystem modeling. She invited suggestions for other possible committees related to the new CCMP.

Paul Stacey said that the new CCMP is a nice ten-year plan but does not bring users to an endpoint. He suggested updating the Science Needs document to include endpoints and providing periodic reports on progress being made like the Chesapeake Bay Program and the Piscataqua Region Estuaries Partnership do. This is a job for the STAC as the technical component of the program. Kamazima commented that he had read the Science Needs document, and it is useful, but he saw it as Connecticut-centric, and it needs to be revised with a broader viewpoint. Paul noted that the Local Watershed Assessment Tool (LWAT) that he developed with collaborators was Connecticut-based, and no one else had developed a similar tool for the rest of the watershed.

Kamazima then said he would launch a poll and that it was intended only for STAC members because it is a change in the bylaws. There was a question about details of the poll, the bottom two choices are just like the first two choices but with no limit for terms. Choice three is 3 years with no limits for terms and choice four is 2 years with no limits for terms. Penny said that 3 years for a maximum of two terms was clearly the strong majority choice of the poll. So, this result will be put into language for a suggested amendment to the bylaws.

Exploring the impact of temperature and PFAS exposure on fish health: Maria Rodgers, North Carolina State

Maria started by saying that she is an assistant professor at North Carolina State but was previously at the University of Connecticut and is now leading a LISS grant to study the impact of temperature and PFAS exposure on fish health, using both lab and field experiments. She reviewed the potential stressors on fish including chemical (pollution, hypoxia), biological (bacteria, parasites), and abiotic (temperature, salinity) stressors, all of which can evoke a variety of responses. The project is focused on the combined impacts of some of these stressors on fish and her presentation will focus on the highlights of the results to date.

PFAS (per- and polyfluoroalkyl substances) have been in global use for decades and are found in firefighting foams, food packaging, water and stain-resistant fabrics and coatings, and nonstick cookware. There are globally ubiquitous contaminants, found in soil, water, and air everywhere. There are over 10,000 types of PFAS, and they have different effects, some can decrease fertility, and others cause cholesterol and hormone interference. This study focused on two compounds, PFOS (perfluorooctanesulfonic acid) and PFOA (perfluorooctanoic acid), the two most found in the environment and in the highest concentrations, including in Long Island Sound. They are detected in all parts of the human body, can bioaccumulate, and have no current large-scale remediation methods since the carbon-fluorine chemical bond is so hard to break. They are still manufactured but not in the United States.

Her study addressed the issue of increased exposure of fish to both higher temperatures and PFAS over the next several decades. They measured PFAS in Long Island Sound in both water and fish and then did lab experiments. The maximum LIS temperature they measured in late August was 24 degrees C and they assumed future increases of almost a half degree per decade. Their lab experiments include adult sheepshead minnows (~20 per tank) exposed to 50 ng/ml PFAS and PFOA at three different temperatures, 24, 26.25, and 28.5 ^{o}C for 28 days as compared with unexposed controls. These temperatures were chosen as the current highest LIS temperature and those anticipated in 50 and 100 years in the future. They measured the gonadosomatic index (% of body in gonads), egg production, and PFAS uptake into muscle along with several other parameters.

There was no difference in gonadosomatic index in male fish, but in female fish the index was lower at the highest temperature but was not affected by PFAS exposure. For muscle PFOS uptake, the highest temperature showed the lowest uptake, an unexpected finding which appeared to be primarily driven by female fish, with no significant differences among temperatures in male fish. With PFOA, the muscle update pattern was the opposite, with the increasing uptake at increasing temperatures in both females and males. This experiment is currently being repeated. Egg production was highest at the lowest temperature in the controls, but in the PFAS treatments there was an overlap among the three temperatures. At the lowest temperature (24 ^{o}C) the clean or control treatment fish produced more eggs than the PFAS-treated fish. However, at highest temperature (28.5 ^{o}C) the opposite was true, the PFAS-treated fish produced more eggs, the females may be offloading PFAS into their eggs due to the combined stress of temperature and PFAS. The highest temperature eggs had significantly more PFOS at 28 days of exposure than the two lower temperatures, however, there was no significant difference for PFOA. They plan to repeat these experiments as well as investigate what impact the high PFOS levels in eggs have on hatching and development but plan to explore it.

Discussion

Penny Vlahos asked about the concentrations of PFOS used in the experiments as compared to the values in LIS. The experimental concentrations were generally higher than most LIS concentrations but lower than most experimental studies and not outside of the range seen in the environment after a spill.

Zosia Baumann asked about the route of exposure such as through the water or the diet. Maria responded that the exposure was from the water and might have been different if from the diet. Someone asked if the fish acclimatized to the higher temperature and is there a temperature effect on the bioavailability of PFOS? Maria replied that the fish were acclimated to their experimental temperature for at least a month. The bioavailability question is still under investigation.
Kamazima asked if 28 days was long enough for the exposure and wouldn't it be easier to unload PFOS through feces rather than eggs. The 28-day period was to simulate a typical summer temperature exposure. PFOS stays in proteinaceous tissues of the fish rather than fatty tissues so maybe offloaded with eggs. Kamazima also asked if the control water was clean since PFOS is widely distributed and Maria responded that they took extra steps to make sure that it was as clean as possible.

Evaluating changes in suitable habitat and biogeography of cold- and warm-adapted fish species in a changing Long Island sound to inform ecosystem-based management: Claire Ober, S. Arsenault, Y. Chen; Stony Brook
Long Island Sound is changing, aside from seasonal change it is warming due to climate change. Cold-adapted species are declining, and warm-adapted species are becoming more dominant. This is clearly shown for both spring and fall in the Connecticut DEEP trawl survey. The main objective of this study is to evaluate distributional changes of warm-adapted and cold-adapted species in a warming LIS ecosystem to inform their monitoring and management. The five subobjectives include: 1. Understanding changes in fish abundance and distribution over time, 2. Identifying key influential environmental variables, 3. Developing models, 4. Evaluating impacts of changes on monitoring and management, and 5. Engaging stakeholders for outreach and feedback. Of the 15 species studied, the warm-adapted species included Scup, Butterfish, Summer flounder, Black sea bass, Striped sea robin, Northern sea robin, and Blue crab. The cold-adapted ones included Windowpane flounder, Little skate, Four-spot flounder, Winter flounder, Spotted hake, Silver hake, Red hake, and American lobster.

For the first objective to understand the distribution they used the center of gravity or the mean location of the population as well as inertia, positive area, and evenness. Three cold-adapted species were described, including the winter flounder distribution, which is becoming patchy and shifting to the southwest but evening out over time, the little skate dramatically shifted to the northeast but also evened out, and the red hake which did not show major changes in distribution, all showed declines in abundance. The warm-adapted species were distinctly different, the striped sea robin, scup, and black sea bass all showing increases in abundance, and varied shifts in center of gravity. Overall, the LIS fish community is shifting to dominance by warm-adapted species whose distribution is expanding with the distribution of cold-adapted species contracting and becoming patchier.

They next developed a Habitat Suitability Index Model after identifying the key environmental factors impacting fish abundance: depth, temperature, salinity, and sediment type. In the spring, May was the most suitable habitat for cold-adapted species throughout the Sound but not near

shore and with less suitability in the fall. The warm-adapted species showed the greatest suitability in June and September. In summary, the warm-adapted species all showed increased catch with stable or increasing habitat suitability, the cold-adapted species all showed decreased catch and a decrease in habitat suitability, particularly in the recent time frame.

The management and monitoring implications of these results (Objective 4) suggest modification of monitoring to account for changes in species distributions, such as increased sampling in the western Sound where the current sampling locations are sparse. An additional area for focus is the potential areas of thermal refuge for cold-adapted species to aid in conservation. For outreach activities (Objective 5), this study was the subject of a news segment on ABC TV 7, an online article published by the LISS, presentations at a couple of recent science meetings, and a workshop at Stony Brook University to bring together stakeholders and PIs. The study is also encouraging inquiries from others who are interested in it. Claire concluded by thanking the funders and the project team.

Discussion

Paul Stacey asked if the species were selected on the level of exploitation. Claire responded that they were chosen after discussion with the PIs and a literature review. They specifically wanted to include scup and black sea bass due to their recreational importance but also a variety of species with different life history strategies. Paul also asked about other factors not included in the habitat suitability model, like food availability and other biological interactions. Claire agreed that issues like predator-prey interactions and other biological factors were not addressed and were a limitation of their study. Paul concluded with the question about looking at some of the historical trawl data and whether some of the small sample sizes in this study would limit the power of the analyses. Claire admitted that the limited trawl locations from the western Sound and the data limitations of some of the hake species make interpretation more challenging, but in general all the cold adapted species showed similar trends and all the warm-adapted species the opposite trends. Paul concluded that the loss of lobsters and resurgence of blue crabs also demonstrated the same biological changes due to increasing temperatures.

Kamazima asked about why sometimes both warm and cold species went in the same direction, such as the southwestern shift. Claire responded that it could be a depth preference rather than temperature and salinity or perhaps biological interactions such as predator-prey that are not included in the model.

New Sediment Quality Index Data from the EPA National Coastal Condition Assessment: Youngmi Shin, EPA ORISE

The EPA National Coastal Condition Assessment (NCCA) is conducted every five years and there is a recent update or data from 2020 and 2021 (2021 sampling completed unfinished work from 2020). Youngmi showed the station locations from 2005, every five years through 2020 and 2021. Then she discussed the Sediment Quality Index (SQI) and compared it over time, followed by discussion and questions. The NCCA sampled 50 stations in the open Sound in 2005, 22 in 2010, 23 in 2015, and 128 total stations in 2020 and 2021 when embayment stations were added. Some

stations overlap between sampling years. In 2020/2021 there were 32 open Sound stations, 45 stations in Connecticut embayments, and 51 stations in New York embayments.

The Sediment Quality Index (SQI) is the combination of the Sediment Toxicity Index (STI) and the Sediment Contaminant Index (SCI). STI is determined by the survival rate of benthic amphipods exposed to sediment samples, and the SCI is determined by the concentrations of certain toxins (metals, PAHs, PCBs, etc.) measured at sample sites. The SQI is most highly correlated of all the 2020/2021 NCCA parameters with all the other NCCA parameters. These include the STI, the SCI, as well as a water quality index, chlorophyll a, water clarity, dissolved inorganic nitrogen, and dissolved oxygen.

Maps of the SQI distribution as good, fair, or poor were shown for the four NCCA surveys from 2005 to 2020/21 with improvements in the western Sound and a decline in the central Sound in 2020/2021. Looking only at the open Sound stations, the SQI improved from 53% good in 2005 to 72% good in 2015, but declined to 56% good in 2020/21. For the SQI in the 2020/21 embayment stations 47% were good, including 45% of the Connecticut embayments and 49% of the New York embayments. Embayment stations had higher fair SQI percentages than open Sound stations, 48% vs. 23%, with the opposite for poor SQI percentages, 5% vs. 21%.

So why did the SQI decline in the central Sound in 2020/21? One possibility is that the decline is due to dam removals, allowing contaminated sediment to move downstream into the Sound. At least five Connecticut dams were removed in 2020/21 between the Mianus River near Greenwich in western Connecticut and the Thames River near New London in the east. However, more information is needed to clearly make this case. USGS data for toxic contaminants in the watershed and total suspended solids measured in LIS CT DEEP could be analyzed in addition to the NCCA sediment quality data. She concluded with acknowledgment of co-authors, EPA, and EPA partners.

Discussion

Penny thanked Youngmi for clarifying the potential reasons for contaminant increases and asked USGS participants for comment. Jon Morrison responded that the central Sound would be most impacted by the Thames and Connecticut River tributaries in the eastern Sound and their dam removals. But in addition, high flows during strong storm events can winnow sediments from behind dams and deposit it downstream. Some of the recent storms have caused extreme sediment deposition from the Connecticut River, particularly during the Vermont floods, and those could be a source of contamination to the central Sound.

Penny added that this demonstrated the impact of the tributaries far downstream on the Sound. Paul Stacey noted that NCCA samples were infrequent, once and year at most such as during 2020 and 2021, and typically only every five years. He did add, however, that sediments retain toxic chemicals and should be a good indicator of them. Paul asked Youngmi if she had examined any of the older toxicity data going back to the 1970s or before. Youngmi responded that she had just started this analysis last month and that it would be useful to further analyze the historical

data. Rob Burg asked if the increase in the central Sound required additional research into potential impacts of human fish consumption and new fish consumption advisories. Jim Ammerman asked whether the measurements in meters associated with the dams indicated the height of the dams and Youngmi agreed that they did.

Mark Tedesco mentioned that Youngmi's analysis was limited to the NCCA Sediment Quality Index (SQI) and did not include other historical data of the fish tissue analysis that is also done by the NCCA. Mark also noted that the LISS has provided additional support for data collection by the 2025 NCCA to collect samples in the embayments as well as the open Sound, much like 2020/21, and should provide additional information on the apparent recent decline in SQI. Kamazima added that this seemed like an important issue and the STAC may want to explore ways of increasing the sampling frequency beyond every five years, and he would follow up on it.

Tracking PFAS and other Contaminants in Global Air under the GAPS Network: Tom Harner, Environment and Climate Change Canada

Penny introduced the speaker, Tom Harner, by stating that while sediments integrated over long periods of time, the fastest changes are seen in the atmosphere. Tom started the Global Atmospheric Passive Sampling network that he will discuss, and a Groton site is part of the network. It provides a time-series of atmospheric contaminants to the LIS and describes how this area relates to the rest of the world.

Tom started by stating that the reason for the global network was the Stockholm Convention on Persistent Organic Pollutants (POPs). He showed a timeline of the chemicals listed by the Convention, which now has three times the original 12 from 2004. The goal is to track concentrations over time in air and human tissues to determine if pollution regulations are causing a decline over time. PFAS chemicals were added in 2009 and 2022, and long-chains PFAS chemicals have been recently nominated for addition. Their distributions are also measured in water, where they are highly soluble, as well as air. PFAS chemicals are different from some of the other POPs because they are ionizable and have different fate and transport properties.

There are important industrial PFAS emissions and since many commercial products contain PFAS, indoor air is also an important source to the outside. They can originate from precursor chemicals, and sea spray and wastewater treatment plants are also important PFAS sources. Penny Vlahos collected air samples in a transect across the North Atlantic from Europe to Canada and showed high concentrations of PFAS precursors which were converted to the acid forms, PFOS and PFOA. Concentrations were within an order magnitude of the concentrations in major cities, demonstrating long-range transport. PFOS concentrations increase from oceans to coasts to lakes and to rivers, and sea spray aerosols are an important source of PFOS to the air. Wastewater treatment plants and landfills are also important sources, especially of precursor compounds.

The Global Atmospheric Passive Sampling (GAPS) network dates to 2005 and consists of 60 sites in a variety of environments which collect quarterly samples. In 2018 the network added GAPS-Megacities which samples 23 large cities around the world. New York City has some of the highest concentrations of POPs, including flame retardants, found anywhere. The GAPS network currently has global PFAS data from 2009, 2013, and 2015, and additional global samples from 2017 and 2022, so it should have a better understanding of any trends when those data are available. To reiterate, the purpose of this monitoring is to provide information to evaluate the effectiveness of the Stockholm Convention. Model data for the North Atlantic shows high coastal sources in 1980 and 2000 followed by a decline of the sources and a dilution throughout the surface water. PFOS was also mixed both further north and into deeper water over time. In conclusion, New York City is a major source of POPs and emerging chemicals to air. Global trends for PFASs in air, increasing or steady from 2009-2015, will soon have additional data from 2017 and 2022. There is also a new program called AQUA-GAPS to track PFASs in water with passive samplers.

Discussion

Paul Stacey asked about his confidence in deposition rates, particularly at low concentrations. Tom replied there is a lot of information that goes into it, and some of it is modeled not measured. Gas vs. particle deposition rates are different as well and different deposition rates are also found over water vs. land. Paul also asked about the deposition of old chemicals recycled in the atmosphere vs. new sources. Tom replied that it was a difficult question but there were limited time markers for old PFAS.

Penny asked about the total number of chemicals Tom analyzes. He mentioned 36 different classes of POPs, some of which have hundreds of isomers. It is difficult to keep up with all the new chemicals though instrumental methods are improving rapidly. The sampling part is simple, but the lab work is complex because of low concentrations and chemical differences requiring different analytical procedures. Penny noted that the passive samplers collect the chemicals at about the same rate as human lungs. She mentioned that follow-up discussions on sthis topic are welcome after the meeting.