**New Applications in the Use of Satellite Data Monitoring for Population Health**
Meeting Summary

Hosted by
University of Alabama in Huntsville College of Nursing
University of Alabama in Huntsville College of Science,
Department of Atmospheric and Earth Sciences

Huntsville, Alabama

## Conference Purpose and Objectives

On October 10, 2019, the College of Nursing and College of Science, Department of Atmospheric and Earth Sciences, at the University of Alabama in Huntsville held the conference *New Applications in the Use of Satellite Data Monitoring for Population Health* to expand the scientific activities that began in July 2016 with the first Applications Workshop of the Tropospheric Emissions: Monitoring Pollution (TEMPO). The purpose of the conference was to offer end users from healthcare communities a preview of data products that the TEMPO mission will provide, and to discuss how these data products can be most effectively used in health studies. This conference provided a unique setting where atmospheric and health scientists were able to share information in an effort to realize new capabilities of TEMPO data during the pre-launch phase of the mission. The conference was a necessary follow up to the first TEMPO Applications Workshop, which stressed the need for further discussions on the potential uses of TEMPO data in acute health effect studies requiring high spatiotemporal resolution and accuracy for pollutants linked with disease exacerbations ($O_3$, and $NO_2$). Objectives of the conference were:

- Review the potential use for TEMPO data products in improving the monitoring, assessment, and chemical understanding of air quality over North America
- Demonstrate strategies for transforming TEMPO data products into actionable information for end users in the health community
- Discuss potential application of TEMPO data products for advancing health studies and, consequently, the understanding the impacts of pollutants on human health
- Provide a common ground for conversations between TEMPO science team and the public health community, while also promoting future collaborations between these communities

## Conference Organization

The organizing process of the *New Applications in the Use of Satellite Data Monitoring for Population Health* was facilitated through representation from the applications and healthcare end-user community. Members of the organizing committee included:

| **Committee Member:** | **Affiliation:** |
|---|---|
| Susan Alexander (Chair) | UAH College of Nursing |
| Michael J. Newchurch (Co-Chair) | UAH Department of Atmospheric Sciences |
| Aaron Naeger (co-Chair) | UAH, NASA SPoRT |
| Dean Marsha Adams | UAH CON |
| Kelly Chance (TEMPO PI) | Smithsonian Astrophysics Observatory |
| Yang Liu | Rollins School of Public Health, Emory University |
| Bart Prevallet | Alabama Quality Assurance Foundation |
| Mike He | Columbia University, Mailman School of Public Health |
| Abbey Nastan | NASA JPL Goddard |

The single-day agenda assembled by the organizing committee focused upon demonstrating the scientific relevance of TEMPO data products in combined health/AQ research to the healthcare community (Appendix A). The progress of the TEMPO mission and Early Adopter Program were highlighted in Session 1, along with the complementary Multi-Angle Imager for Aerosols (MAIA) mission to be launched near the same time as TEMPO in 2022. TEMPO data products for air quality and health studies and synergy with MAIA was discussed in Session 2. Sessions 3 and 4 consisted of end user perspectives on use of current and future (i.e., TEMPO) satellite data for health-related studies. A combination of short presentations followed by Q&A sessions was used in the conference. The workshop agenda is provided in the appendix.

## Conference Summary

The primary objectives of the conference were focused upon raising awareness of TEMPO data products utility in healthcare applications, reviewing methods of applying data products into health/AQ research, and building collaborations for future work in a highly-specific applications niche. The conference was attended by an international audience of 50 participants including stakeholders from health-related settings, state and federal government agencies, commercial partners, non-government organizations, and academic researchers. It was livestreamed to an additional 40 participants, who were able to ask questions using the live interface. Funding for the conference was awarded by the National Institutes of Health/National Institute of Environmental Health Sciences, and NASA Health and Air Quality Applications Areas. Additional support for conference activities was contributed by MITRE Corporation, Google Cloud, Onix, Sigma Theta Tau International (Beta Phi Chapter), Harvard Smithsonian Center for Astrophysics, and NASA SPoRT.

## 1. Improving understanding of current atmospheric chemistry by using TEMPO data

Speakers described the current state of the TEMPO mission and provided a detailed summary of TEMPO data products for the attendees. TEMPO is a state-of-the-science spectrometer with a planned launch date in summer 2022 for being hosted on a commercial geostationary communications satellite, with a Field of Regard (FOR) over North America (Fig. 1). The spectrometer will measure tropospheric ozone ($O_3$), nitrogen dioxide ($NO_2$), sulfur dioxide ($SO_2$), and other trace pollutants [e.g., formaldehyde ($H_2CO$), glyoxal ($C_2H_2O_2$)] and aerosols, which have been associated with health impacts in previous work. The ability of the TEMPO to distinguish between 0-2 km and free tropospheric $O_3$ concentrations provides an added level of detail that will be of high interest to the health community. Furthermore, TEMPO will monitor these pollutants at unprecedented spatial and temporal resolution due to its high spatial resolution of 2.1 km in the north-south direction and 4.7 km in the east-west direction at the center of the FOR and hourly scanning frequency during the daytime over North America. Water vapor ($H_2O$) retrievals from TEMPO will provide an opportunity to assess how $H_2O$ evolves with pollutant and aerosol concentrations. Altogether, the high spatiotemporal resolution of TEMPO data will be capable of monitoring changes in emissions and chemistry that influence AQ conditions at sub-urban scales (Fig. 2). This robust data from TEMPO will reduce uncertainties in current AQ modeling and health impact research by improving current modeling approaches for exposure estimates.

TEMPO is required to spend 75% of its observing time scanning the complete FOR measuring required pollutants throughout the daylight portion of the diurnal cycle. Speakers emphasized that the other 25% of observing time is available for non-standard operations, which means observing a portion of the FOR at higher temporal resolution down to 10 min. A handful of high-time studies are planned for the TEMPO mission, which include lightning $NO_x$, pollution transport during upslope flows, tidal effects on estuarine circulation and outflow plumes, and agricultural soil $NO_x$ emissions (Chance et al., 2019). Research investigators can build upon this list of planned high-time studies by proposing innovative ideas for using the non-standard

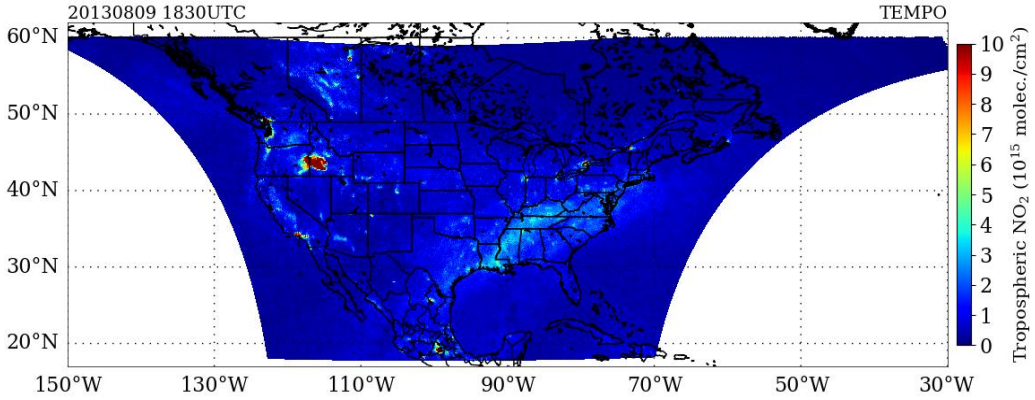



***Figure 1****. Hourly scan coverage over TEMPO FOR. Example of tropospheric $NO_2$ from synthetic TEMPO data on 9 August 2013. Note there has been a recent shift in the TEMPO FOR to cover Puerto Rico, which has not been updated here. Synthetic data source code provided by C. Chan Miller, Harvard.*

observing time of TEMPO. The high-time studies can further enhance our understanding of atmospheric chemistry to inform pollution science and, as a result, health effects.

## 2. Strategies for Delivering TEMPO Data Products to Healthcare Users

The TEMPO mission has a commitment to deliver level 0 and 1 data products consisting of raw instrument data and calibrated and geolocated radiances. Derived geophysical level 2 data products will consist of trace gas concentrations, in addition to aerosol and cloud parameters. Gridded geophysical products will also be provided via level 3 data. The derived geophysical data products will be delivered in Network Common Data Form (netCDF), and separate files will be provided for individual slices or granules of information for each of the trace gases along the TEMPO FOR (Fig. 3). These files will contain retrieval algorithm parameters (air mass factors, scattering weights, etc.), surface meteorology (humidity, temperature), cloud information (pressure, fraction), and uncertainties and flags, which can all be important to the scientific research community. For the trace gas quantities, both slant and vertical column density amounts will be provided in the files. These data intensive files may be overwhelming to the healthcare users, who are interested in the pollutant concentrations at the surface. Thus, there is a need to develop specialized data products from the level 2 files to allow effective use of TEMPO data by the healthcare users (Fig. 4). This need was further stressed through discussions with the healthcare users at this TEMPO health conference.

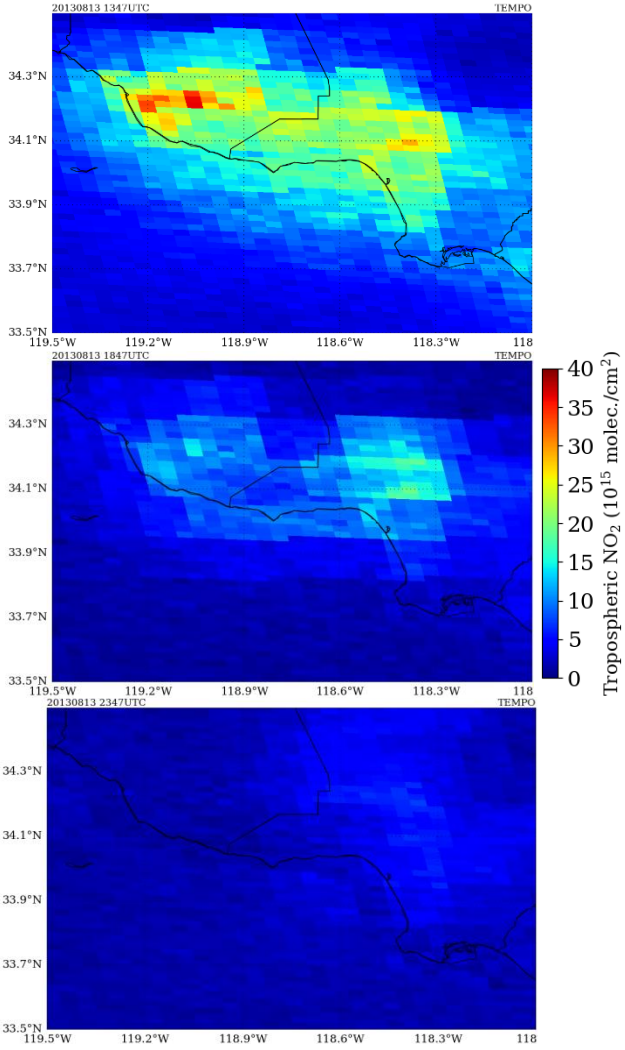



***Figure 2**. Synthetic TEMPO data showing high-resolution tropospheric $NO_2$ column density during morning (top; 1345 UTC), midday (middle; 1845 UTC), and evening scans (bottom; 2345 UTC) on 13 August 2013).*

The conference included presentation of a platform designed to enable effective download of gridded Comma Separated Value (CSV) files containing vertical column trace gas concentrations from TEMPO with geolocation information and subsetting capabilities (time, region, and species). These specialized files will be provided to the healthcare users during the pre-launch phase of the TEMPO mission to help recognize their data needs prior to the launch date of TEMPO. Strategies for transforming TEMPO data products into actionable information were presented by speakers from NASA's Earth Science and Systems Technology Center and

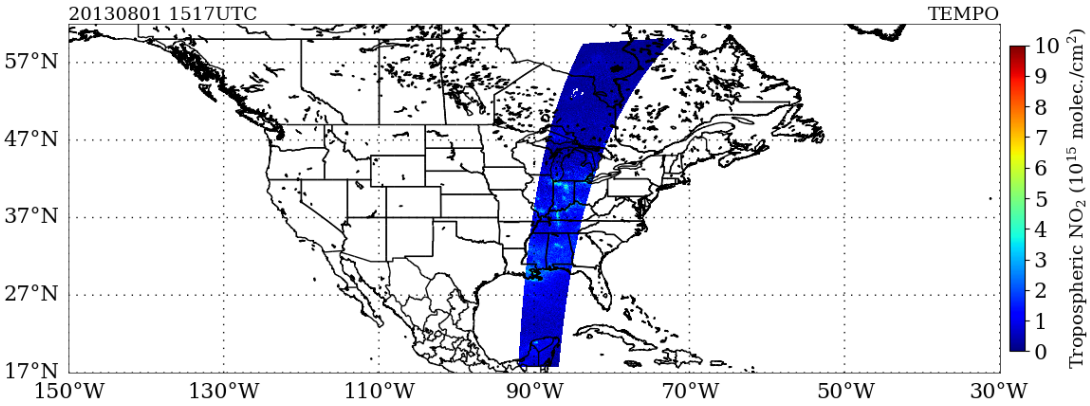



***Figure 3**. Synthetic tropospheric $NO_2$ for single granule within the TEMPO FOR at about 1517 UTC 1 August 2013. Individual netCDF files are provided for each granule and trace gas species.*

NASA SPoRT. Proxy products for rapid access of TEMPO-generated AQ data were also demonstrated. There is a real opportunity to better engage with the healthcare community on their use of satellite data, but we need a coordinated effort to ensure this is accomplished for the TEMPO mission.

## 3. Application of Satellite AQ Data into Healthcare Use Cases

Presentations emphasized the anticipated improvements in the accuracy and prediction of AQ/health impacts supported by TEMPO data, and described how TEMPO data could be applied within existing and new epidemiological and translational health research efforts. Presenters highlighted the Tropospheric Monitoring Instrument (TROPOMI) onboard the Sentinel-5 Precursor (Sentinel-5P) satellite, since the polar-orbiting instrument was launched in 2017 and has similar spatial resolution (~5.5 x 3.5 $km^2$) as TEMPO. The level of detail provided by trace gas retrievals from TROPOMI allows for the characterization of distinct emission sources down to the urban-scale, which were often poorly represented by single overpasses from legacy AQ satellite missions, such as the NASA Ozone Monitoring Instrument (OMI; e.g., Fig. 5). Methodologies have been developed to oversample TROPOMI data to even higher spatial resolution than provided by the operational data product, which can lead to an even clearer depiction of the spatial extent of emission sources (Fig. 6).

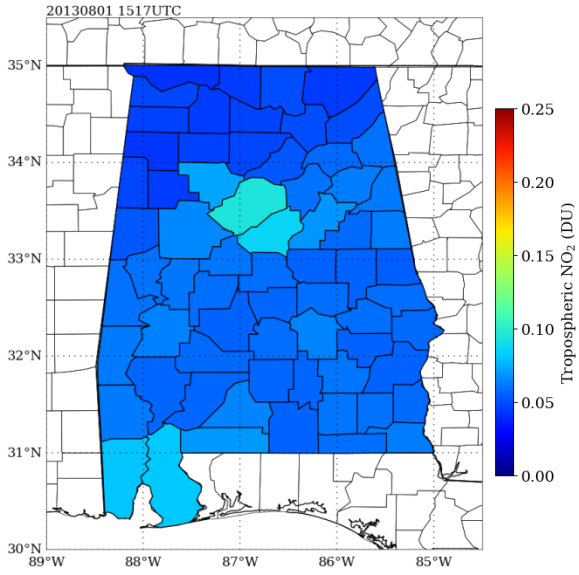



***Figure 4**. Synthetic tropospheric $NO_2$ (Dobson Units) spatially interpolated to county level throughout AL at about 1517 UTC 1 August 2013. Higher $NO_2$ concentrations are shown in the more populated and industrial areas of Jefferson and Shelby counties of Birmingham, AL.*

Similar techniques can be developed for data produced by the TEMPO mission, which can foster intensive healthcare studies down to neighborhood scales if applicable. Presenters noted several reasons why future TEMPO data will be capable of advancing AQ and health studies including: (1) even higher spatial resolution than TROPOMI; (2) hourly daytime scans rather than single mid-afternoon snapshot from polar-orbiting satellites; (3) cloud interference minimized through morning scans. In particular, the complex evolution of pollutants in large urban areas is poorly represented by the single mid-afternoon overpass from polar-orbiting satellites (Fig. 7). New York City and Mexico City were highlighted as two testbed areas for implementing future health studies, as the complexity of pollutants over these large population centers will be monitored by both the TEMPO and MAIA missions. The synergy of data from these missions will provide high-resolution detail on the spatial pattern of trace gas and particulate matter concentrations throughout the cities. The combination of satellite data with robust health data records from these cities will permit intensive investigations on the AQ impacts on public health.

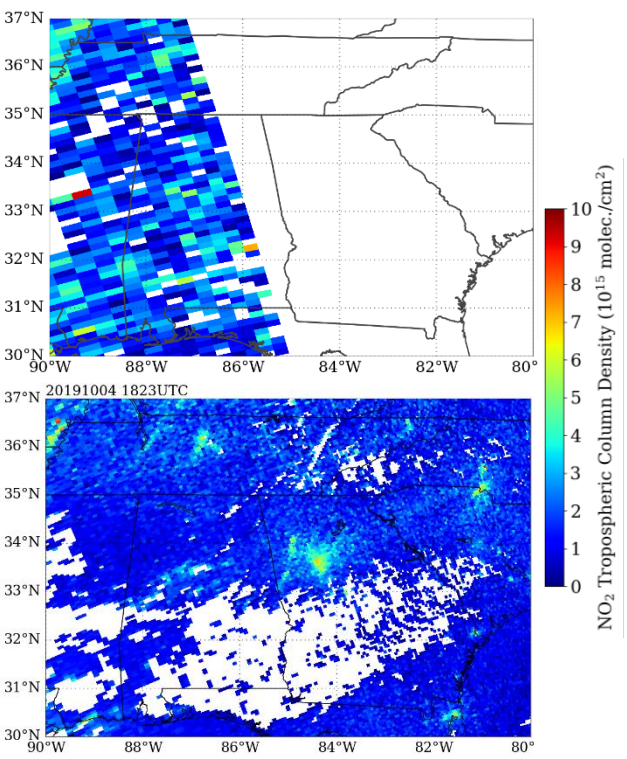



***Figure 5****. (top) Tropospheric $NO_2$ from OMI at spatial resolution of about 13 x 24 km$^2$ at ~1900 UTC 4 October 2019. (bottom) Similar to top panel, except TROPOMI at ~1830 UTC. Urban emissions from Atlanta, GA are clearly depicted in TROPOMI $NO_2$ imagery.*

## 4. Promoting Collaborations between Communities

An objective of the conference included promoting collaboration between communities, particularly end-users in healthcare who might be unaware of how TEMPO data products could be used in examining clinical questions. Comments from attendees support the successful achievement of the objective, as when asked about the greatest value of conference attendance one attendee replied, “Discussions and meeting faces in this area.” The diversity of affiliations represented by conference attendees suggests that widespread interest in acquiring and applying knowledge gained from the TEMPO mission. Attendees (45 live session, 39 remote) included members of national and international private and public sectors such as universities, state/county environmental and health departments, Centers for Disease Control and Prevention, Environmental Protection Agency, Health Effects Institute, and others (complete list of conference attendees follows conclusion of report). Most importantly, healthcare disciplines (UAH College of Nursing, Vanderbilt Medical Center, Mt. Sinai Icahn School of Medicine, Onix

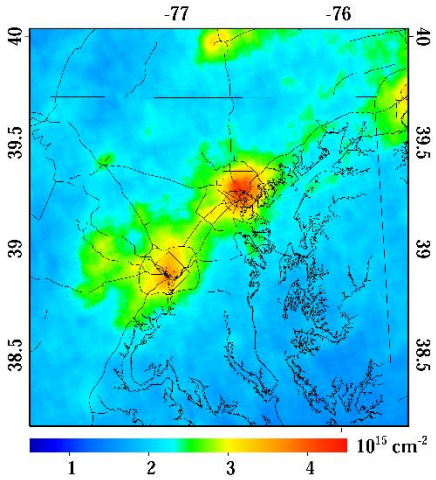



***Figure 6****. Oversampling of TROPOMI $NO_2$ at higher spatial resolution (~4 $km^2$) provides more spatial detail for health studies. Adapted from presentation by D. Goldberg.*

Health and Life Sciences, Alabama Quality Assurance Foundation) not previously represented at early adopters meetings such as physicians and nurses were also in the audience (Appendix B). Because of interest in the Huntsville community, the local CBS news channel affiliate (WHNT) visited the conference to hear a portion of the presentations and prepare a news segment featuring interviews with members from the TEMPO Science team, NASA, and conference organizers.

Feedback from end-users in the health community on use of the TEMPO data product platform was solicited at Q&A sessions following presentations and in a follow up evaluation. Responses from attendees support the necessity of designing methods to assist end-users, particularly those with fewer computational resources, to acquire, interpret, and apply TEMPO data for their use cases. End-users' needs that were commonly identified in discussions, networking, and other evaluation can be categorized as : 1) training activities congruent with technical expertise of the end-users, 2) personal support in selection and access of TEMPO data appropriate for clinical questions, and 3) a computationally feasible platform for acquiring/visualization TEMPO data.

Additional open-ended feedback on the value of the conference solicited from attendees was also positive, with respondents stating that the TEMPO mission overview and updates, diversity of presentation topics, updates on existing research and limitations of satellite-derived air quality data, inclusion of epidemiologists and examples from those who have worked with synthetic TEMPO data products were both informative and helpful to them in current research and work. When asked about the specific value of the conference to their own work and/or research, a conference attendee replied, "Discussion of the impacts on public health and how this improved ability to monitor pollution will aid in source attribution, and therefore the forecasting and exposure documentation/validation for health outcomes due to this exposure."

## 5. Summary and Outcomes of Conference

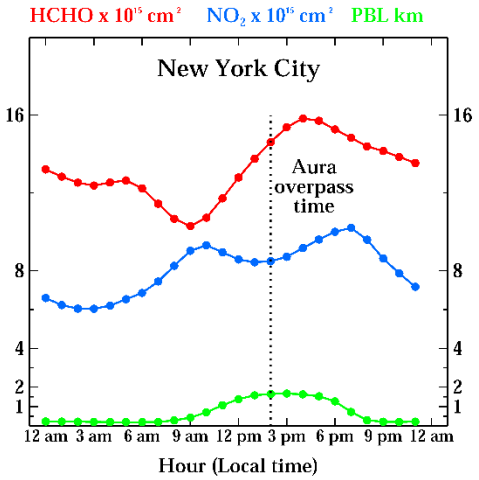



***Figure 7****. Diurnal evolution of trace gases over New York City, with time of Aura satellite overpass indicated by vertical dashed line, which highlights the limitation of using polar-orbiting satellite data for AQ and health studies. TEMPO will greatly improve upon polar-orbiting data. Adapted from presentation by D. Goldberg.*

Recent conferences designed to engage early adopters of TEMPO data have targeted attendees from atmospheric science research and regulatory communities. The October 10 conference represented the initial event dedicated to specific health-related applications of TEMPO data products, and addressed an existing gap in the need for collaborative strategies for application of TEMPO data products in healthcare use cases. Content presented at the content has assisted users in refining health applications use cases using TEMPO data products. Regionally appropriate tailored TEMPO products can be used in epidemiologic models that will provide more information about short-term variations of asthma exacerbations in urban areas. Internationally, TEMPO data products can extend studies of air pollutants and cause-specific mortality in areas with fewer ground stations and air quality monitoring systems.

Decision-makers and stakeholders in health/AQ research benefitted from the knowledge acquisition, networking, and initiation of dialogue about the upcoming TEMPO data on topics such as diurnal variability in atmospheric composition, details of tropospheric ozone and aerosol production, and source/transport relationships for emissions. In preparation for future sessions, attendees were queried about their interest and purpose for using trace gas product(s) from TEMPO. Respondents specifically identified needs for:

- PM (especially $PM_{2.5}$) and NOx for air quality modeling and validation
- Ozone for air quality/meteorological work and because ozone continues to be a significant pollutant in many areas of the U.S.
- Low resolution data for urban studies

One conference attendee cited a specific need for $NO_2$, "…because it has less noise than other products, it is an important contributor to tropospheric ozone production, and has adverse health effects itself." The importance of TEMPO data integration into current modeling efforts was noted by an attendee, stating, "Remote sensing information during the morning and late afternoon will be revolutionary, but there will be "growing pains" implementing this type of data into models that typically assume an afternoon overpass time (i.e., OMI and TROPOMI)."

Improving current understanding of how the wealth of data TEMPO will supply can be optimally used across a range of applications requires participation from potential users of the data. Conference attendees offered feedback on their perceptions of challenges related to integration of TEMPO data into their work/research and potential solutions to those challenges. Responses propose the use of multiple platforms and agencies to supply data for users combined with efforts to improve knowledge about the availability and processing of TEMPO data/imagery for both technically-skilled users and the general public. Stated one attendee when questioned

about potential solutions to barriers in use of TEMPO data, "Knowledge of availability and processing of TEMPO data and imagery. Simply working with the data and imagery to make it accessible and useful will be the solution…." The significance of accurate messages to diverse users was noted by one participant, "The challenges lie in communicating the availability of this data to professionals who may not be aware of it. Conferences like these are the solution. Air quality and health research must continue despite political challenges because the health of human beings is at stake."

To further engage end-users in the healthcare community, continuing education hours were awarded for attendees for both remote and in-person attendance at the event. The conference is an example of the need for continued pre-launch activities to support joint research efforts using pollution-monitoring satellites from Europe and Asia. Conference organizers hope to continue these efforts by extending outreach to international epidemiology organizations, maintaining regular communication with those involved in healthcare applications, and planning additional conferences that will include the MAIA Science team.

**Appendix A: Conference Agenda**

## *New Applications in the Use of Satellite Data Monitoring for Population Health*

**October 10th, 2019**

**University of Alabama in Huntsville**
**College of Nursing, Room 103**
**301 Sparkman Dr**
**Huntsville, AL 35801**

| Time | Description | Speaker |
|---|---|---|
| 8:00 – 8:30 | Registration & Coffee | |
| **Session 1: Introductions and Overview**<br>**Chair: Susan Alexander** | | |
| 8:30 – 8:40 | Welcome and introduction | Susan Alexander<br>Marsha Adams, Dean, UAH College of Nursing |
| 8:40 – 8:55 | NASA Health and Air Quality Program | John Haynes – NASA HQ |
| 8:55 – 9:10 | TEMPO Mission Overview | Kelly Chance – Smithsonian |
| 9:10 – 9:25 | TEMPO Early Adopters Program | Aaron Naeger – UAH / MSFC |
| 9:25 – 9:40 | MAIA Early Adopters Program | Abbey Nastan – JPL |
| 9:40 – 9:50 | TEMPO, MAIA, and TOLNet Synergy | Michael Newchurch – UAH |
| 9:50 – 10:00 | Group Discussion | |
| 10:00 – 10:30 | Break / Posters | |
| **Session 2: Future Remote Sensing Data for Air Quality and Health Studies**<br>**Chair: Mike Newchurch** | | |
| 10:30 – 10:50 | TEMPO Data Products for Air Quality Studies | Aaron Naeger – UAH / MSFC |
| 10:45 – 11:05 | TEMPO Data Products for Health Studies | Susan Alexander – UAH |
| 11:00 – 11:20 | TEMPO and MAIA synergy | Aaron Naeger & Abbey Nastan |
| 11:20 – 11:50 | Group Discussion | |
| 11:50 – 1:00 | Lunch | TBD |
| **Session 3: End User Perspectives I**<br>**Chair: Susan Alexander** | | |
| 1:00 – 1:20 | Using Atmospheric Modeling to Assess Human Health Impacts | Jason West – UNC-Chapel Hill |

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|---|---|---|
| 1:20 – 1:40 | Linking Diurnal Variation in Air Quality with Health: Opportunities with Geostationary Platforms | Allan Just – Icahn School of Medicine |
| 1:40 – 2:00 | Fine particulate matter and cardiovascular admissions in NY State: an assessment of exposure model choice sensitivity and spatial-temporal effect modification | Mike He – Columbia University |
| 2:00 – 2:20 | How can TEMPO make a difference in air pollution exposure assessment and health effects research? | Yang Liu - Emory |
| 2:20 – 2:40 | Facilitated discussion | |
| 2:40 – 3:10 | Break / Posters | |
| **Session 4: End User Perspectives II<br>Chair: Aaron Naeger** | | |
| 3:10 – 3:25 | Reconciling weather related data and influenza reports in East Central Mississippi: A Pilot Study | Heather Carter-Templeton – University of Alabama |
| 3:25 – 3:45 | Application of Innovative Technology in Measuring the Impacts of Urban Morphology and Air Quality on Human Health in Megacities | Maryam Karimi – UAB |
| 3:45 – 4:05 | Estimating Air Pollution Emissions, Exposures, and Public Health Impacts in Cities Worldwide | Dan Goldberg – George Washington U. |
| 4:05 – 4:20 | Low-cost AQ sensor network and AQI App | Udaysankar Nair & Ankur Shah - UAH |
| 4:20 – 4:50 | Facilitated discussion | Susan Alexander - UAH |
| **Final remarks** | | |
| 4:50 – 5:00 | Wrap-up | |

**Appendix B: Conference registrants/attendees**

| Name | Affiliation |
|---|---|
| Hunter Cowing | University of Alabama in Huntsville |
| Michael Newchurch | University of Alabama in Huntsville |
| Aaron N Naeger | University of Alabama in Huntsville |
| Dan Welsh | Colorado Department of Public Health and Environment |
| Pablo Mendez-Lazaro | University of Puerto Rico-Medical Sciences Campus |
| Carol Bohnenkamp | USEPA |
| Raj Lal | Georgia Tech |
| Steve Hall | NASA |
| Abbey Nastan | Jet Propulsion Laboratory |
| Somaya Falah | Female |
| Meytar Sorek-Hamer | NASA ARC |
| Amy Huff | NOAA/NESDIS/STAR |
| JOHN HAYNES | NASA |
| Karen Frith | University of Alabama in Huntsville/College of Nursing |
| Cheryl Emich | University of Alabama in Huntsville/College of Nursing |
| Yuanyuan Fang | Bay Area Air Quality Management District |
| Joshua Uebelherr | Maricopa County Air Quality Department |
| Mia Shrader | University of Alabama in Huntsville/College of Nursing |
| Yang Liu | Emory University |
| Michael Woodman | Maryland Department of the Environment |
| Matthew Densberger | California Air Resources Board |
| Or Vernik | Technion |
| Guanyu Huang | Spelman College |
| Gary Jedlovec | NASA |
| Richard Gilder | Texas Tech University Health Science Center - School of Nursing |
| John Babin | Louisiana Department of Environmental Quality |
| Kelly Chance | Smithsonian Astrophysical Observatory |
| Hyung Joo Lee | California Air Resources Board |
| Mike He | Columbia University |
| Richard Monteith | US EPA Region 4 |
| Dr Prakash Chandra Tewari | Dr RML Avadh University Ayodhya Uttar Pradesh India |
| Emily Prezzato | CDC |
| Ying Zhou | CDC |
| Margaret Horton | Colorado Department of Public Health and Environment |
| Yeow Chye Ng | University of Alabama in Huntsville/College of Nursing |
| Haley Hoy | Vanderbilt Medical Center |

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|---|---|
| Trey Corley | Huntsville Hospital Center for Lung Health |
| Johana Carmona | Tec de Monterrey: Monterrey Institute of Technology and Higher Education |
| Yang Liu | Emory University |
| Melanie Follette-Cook | MSU/GESTAR |
| Pawan Gupta | USRA/MSFC |
| Braxton Edwards | Oklahoma Department of Environmental Quality |
| Makhan Virdi | Atmospheric Science Data Center (NASA LaRC) |
| Timothy Larson | SSAI contractor to NASA Langley |
| Marie-Therese Oumba | AAMU |
| Kathy Jones | Chattanooga Hamilton County Air Pollution Control Bureau |
| Katherine D Walker | Health Effects Institute |
| Ruixiong Zhang | Georgia Institute of Technology |
| Yadong Xu | EPA |
| vasu kilaru | US EPA |
| Omobola Mudasiru | Trade association |
| Ravi Srivastava | EPA |
| Tim Dye | TD Environmental Systems |
| Anne Roubal | County Health Rankings |
| Archana Lamichhane | EPA |
| Jennifer Wei | NASA GSFC GES DISC |
| Hyung Joo Lee | California Air Resources Board |
| Courtney Blomme | UW Madison - County Health Rankings and Roadmaps |
| Neal Fann | U.S. EPA |
| Elizabeth Chan | US EPA |
| Scott Spak | University of Iowa |
| Susana B. Adamo | CIESIN-Columbia University |
| Davide De Santis | University of Rome Tor Vergata |
| Yaoxian Huang | Wayne State University |
| Dr. Maryam Karimi | University of Alabama at Birmingham |
| Jason West | University of North Carolina at Chapel Hill |
| Jason Simpson | WHNT News 19 |
| Caitlin Kennedy | CDC |
| Mikyong Meekie | CDC |
| Paul Romer Present | CDPHE |
| Dan Goldberg | George Washington University |
| Heather Holmes | University of Nevada, Reno |
| Laura Judd | NASA LaRC |
| Lu Hu | University of Montana |
| Angela Werner | CDC |

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|---|---|
| Xiong Liu | Harvard-Smithsonian Center for Astrophysics |
| Amit Kumar Adhikari | Research Scholar |
| Susana B. Adamo | CIESIN-Columbia University |
| John Langstaff | U.S. EPA |
| Samain Sabrin | University of Alabama at Birmingham |
| Jay al-Saadi | NASA Langley Research Center |
| Allan Just | Icahn School of Medicine at Mount Sinai |
| Corey Masuca | Jefferson County Department of Health |
| Angelique Demetillo | University of Virginia |
| Angelique Demetillo | University of Virginia |
| Caroline Black | University of Alabama in Huntsville |
| Adelaide Rhodes | Onix Networking |
| Sue Estes | NASA/UAH |
| Timothy Tinirello | Onix Presenter |
| Daniel Carrion | Icahn School of Medicine at Mount Sinai |
| Elijah Owoseni | African Regional Centre for Space Science and Technology Education in English (ARCSSTE-E) |
| Aba Crentsil | University of Ghana |
| Ian Chang | University of Oklahoma |
| Louise O'Keefe | University of Alabama in Huntsville/College of Nursing |
| Ankur Shah | University of Alabama in Huntsville |
| Udaysankar Nair | University of Alabama in Huntsville |
| Ross Nazari | University of Alabama at Birmingham |
| Helena Chapman | Associate Program Manager |
| Heather Carter-Templeton | The University of Alabama |
| Falguni Patadia | GESTAR / NASA GSFC |
| Bart Prevallet | Alabama Quality Assurance Foundation |
| Natalie Malak | University of Alabama in Huntsville |
| Elham Baranizadeh | Air Quality Specialist |
| Elena Becerril Salas | University of Washington, Pacific Wildland Fire Sciences Lab |
| Pat Dolwick | US EPA (OAQPS) |
| Matt Lacke | Jefferson County Department of Health |
| Jim Coyne | Onix Health & Life Sciences |
| Bob Lindquist | VPR |
| Cherise | Research and Development in Meteoroogical Services |
| Caroline Nowlan | SAO |
| Arastoo Pour-Biazar | University of Alabama in Huntsville |
| Alexandre Martinez | UC Irvine |