

GEO Health Community of Practice (CoP)

Telecon: Focus on Air Quality Issues related to COVID-19 Activities

May 12, 2020

In Attendance: 60 participants

John Haynes (NASA HQ), Juli Trtanj (NOAA), Helena Chapman (NASA HQ/BAH), Laura Judd (NASA Langley/SSAI), John Balbus (NIH/NIEHS), Trisha Castranio (NIEHS), Ann Liu (NIEHS), Jeffrey Luvall (NASA Marshall), David Green (NASA HQ), Kartik Sheth (NASA HQ), Abigail Seadler (NASA HQ), Anna Borovikov (NASA GMAO/SSAI), Cynthia Hall (NASA Earth Science Data Systems), Ana Prados (NASA Goddard/U. of Maryland Baltimore County), Dorian Janney (NASA Goddard/GPM), Jennifer Wei (NASA Goddard/GES DISC), Helen Amos (NASA Goddard/SSAI), Sushel Unninayar (NASA Goddard/GESTAR/MSU), Michael Garay (JPL/California Institute of Technology), Aaron Naeger (U. of Alabama in Huntsville), Bob Chen (CIESIN/Columbia U.; NASA/SEDAC; GEO Human Planet and Data WG), Margot Charette (CDC/TEPHINET), Corey Hummel (HQ USAF, Directorate of Air Force Weather), Ray Kiess (USAF, 14th Weather Squadron), Bryan Richards (USGS National Wildlife Health Center), Lisa Conti (Florida Department of Agriculture), Ben Zaitchik (Johns Hopkins U.), Amanda Staudt (NASEM), Josh Colston (U. of Virginia), William Pan (Duke U.), Ali Akanda (U. of Rhode Island), Greg Carmichael (U. of Iowa), Susan Anenberg (George Washington U.), Augustin Vintzileos (U. of Maryland), Anil Kumar Roy (CEPT U, India), Joy Shumake-Guillemot (WHO/WMO), Rifat Hossain (WHO), Susanna Ehlers (Inter-American Institute for Global Change Research), Astrid-Christina Koch (European Commission, DG DEFIS – Copernicus), Jan Ramboer (European Commission), Jan Semenza (European Centre for Disease Prevention and Control), Juan Castillo (PAHO), Didier Davignon (Meteorological Service of Canada), Celine Audette (Environment and Climate Change, Canada), Rosa Wu (Environment and Climate Change, Canada), Melissa MacDonald (Environment and Climate Change, Canada), Chris McLinden (Environment and Climate Change, Canada), Serge Olivier Kotchi (Public Health Agency of Canada), Mireille Bedirian (Canadian Space Agency), Andreas Skouloudis (Joint Research Centre, Italy), Naledzani Mudau (South African National Space Agency), Fernando Belda (National Meteorological Service, Spain), Svetlana Zolotikova (UK National Centre for Earth Observation), Richard Pope (UK), Mercy Borbor Cordova (Escuela Superior Politécnica del Litoral, Ecuador), Kawa Shinbun, Stan Benjamin, Luis Altamirano, Rochelle Schneider, Rommel Caiza.

Summary Notes:

**Prepared by Helena Chapman (NASA HQ/BAH) and Helen Amos (NASA Goddard/SSAI)*

John Haynes (NASA HQ) and **Juli Trtanj (NOAA)** opened the telecon by welcoming all participants.

Rifat Hossain (WHO) stated that he had no specific updates regarding the COVID-19 indicator framework for the WHO Monitoring and Evaluation of COVID-19 Response. **Juli Trtanj (NOAA)** mentioned that after the initial dialogue to learn about the WHO Monitoring and Evaluation of COVID-19 Response and population movement, they planned to coordinate a follow-up telecon to further discuss the indicators related to population movement.

John Haynes (NASA HQ) mentioned that the UNOOSA Space4Health webinar would be held on Thursday, May 14, 2020. **Astrid-Christina Koch (European Commission, DG DEFIS – Copernicus)** mentioned that the webinar is open to all, but the virtual platform limits participation to 250 persons per session. Session 1 will be held from 10AM-12PM (UTC+2), and Session 2 will be held from 4-6PM (UTC+2). She recommended that CoP members [register](#) by Wednesday, May 13, 2020 at 12:00PM (UTC+2).

Juli Trtanj (NOAA) encouraged CoP members to share their updates, resources, and activities with **Helena Chapman (NASA HQ/BAH)** for the CoP listserv announcements.

Jeff Luvall (NASA Marshall Space Flight Center) provided an overview on a thermodynamic paradigm for studying disease habitats using NASA's NextGen remote sensing instruments. He described the strengths of satellite observations that measure environmental factors important to vector and disease life cycles (e.g. precipitation) and spatial context (e.g. time series over a large area). He said that in an ecological thermodynamic paradigm, epidemiological equations can be adapted and modified to incorporate environmental factors and interfaces. He described the thermal response number, an index that he developed to examine thermal data, using the change in surface temperature between two measurement times. He also mentioned that [ECOSTRESS](#) on the International Space Station provides day-night pairs at 70m resolution as well as more accurate surface temperature data.

Juli Trtanj (NOAA) asked about the balance of satellite vs in situ observations for his modeling efforts. **Jeff Luvall (NASA Marshall Space Flight Center)** responded that for his work, he has typically used only satellite data, but occasionally will incorporate surface meteorological data. He stated that albedo has been used to characterize surfaces in meteorological models, and you can observe dark cool surfaces (e.g. vegetation) or dark hot surfaces (e.g. asphalt).

Bill Pan (Duke U.) asked if there are any examples of how these approaches have been implemented to study vector-borne diseases. **Sushel Unninayar (NASA Goddard/GESTAR/MSU)** asked how he had connected remote sensing data to examine disease vectors and epidemiologic models. **Jeff Luvall (NASA Marshall Space Flight Center)** responded that we first need to understand essential environmental factors and vector sensitivities from epidemiologic studies, which we can then measure through remote sensing technologies. He provided one example of schistosomiasis and the importance to examine surface temperature and wet areas for snail habitats. He mentioned that several data products (e.g. surface temperature, water use efficiency models, stress index) have been generated from ECOSTRESS. He said that ECOSTRESS data are on the [EOSDIS Distributed Active Archive Centers \(DAACs\)](#), which was a venture project originally developed for a US dataset, but now has funding to process global data.

Didier Davignon (Meteorological Service of Canada) presented his colleagues, **Serge Olivier Kotchi (Public Health Agency of Canada)** and **Chris McLinden (Environment and Climate Change Canada)**, who shared updates on their respective agencies. **Serge Olivier Kotchi (Public Health Agency of Canada)** described the epidemiologic measures for COVID-19 and search for proxies to improve modelling and support public health surveillance tools development. These included direct metrics (e.g. number of cases), environmental factors (e.g. temperature, precipitation, PM_{2.5}, NO₂), in-situ measurements (e.g. presence of virus in air or water), indirect measures of the population's adherence to confinement measures (e.g. cell phone geolocation), and stringency index of government measures. **Chris McLinden (Environment and Climate Change Canada)** described some of their TROPOMI analyses of the COVID-19 impact of NO₂ in Canada, comparing pre-COVID (February 16–March 15, 2020) and COVID (March 16–April 30, 2020) periods. He stated that they used the GEM-MACH operational air quality forecast model output (“expected situation” as if no lockdown) compared to TROPOMI measurements (“observed situation”), noting agreement with TROPOMI pre-lockdown, but 20% lower than expected in Montreal, 30% lower than expected in Quebec, and 40% lower than expected in Edmonton/Calgary. **Didier Davignon (Meteorological Service of Canada)** mentioned that in addition to this modelling work, they are reviewing the ground-based air quality data and aim to examine the approach described by the [Harvard study](#) in order to assess the exposure to air pollution and COVID-19 mortality in Canada.

Helena Chapman (NASA HQ/BAH) thanked all presenters for their insightful presentations to the group. **John Haynes (NASA HQ)** and **Juli Trtanj (NOAA)** moderated the open discussion for GEO members to provide updates on their COVID-19 activities

John Haynes (NASA HQ) stated that the GEO Secretariat has invited the GEO Health CoP to present a 90-minute session, *GEO Community Response to the COVID-19 Pandemic*, at the upcoming [GEO Virtual Symposium 2020](#) (June 15-19, 2020). This symposium will be facilitated by himself, **Juli Trtanj (NOAA)**, and **Astrid-Christina Koch (European Commission, DG DEFIS – Copernicus)**. He mentioned that they may approach some GEO members to present as panelists in this symposium. If interested to attend this symposium, GEO members can complete the [pre-registration form](#).

Helena Chapman (NASA HQ/BAH) invited GEO members to join the Interagency COVID-19 Meeting, moderated by NASA, would be held after the GEO Health CoP meeting, at 11AM EDT (GMT-4), and provided the WebEx connection details.

Augustin Vintzileos (U. of Maryland) shared a brief update on his team's research on experimental real-time forecasting of weather/climate conditions that are potentially favorable to COVID-19. He shared his recent [paper](#) (*Temperature, Humidity and Latitude Analysis to Predict Potential Spread and Seasonality for COVID-19*), revised in April 2020. He stated that the team has launched a weekly experimental bulletin that aims to provide a platform to facilitate discussions between climatologists, virologists, and epidemiologists to develop the target forecast system.

Sushel Unninayar (NASA Goddard/GESTAR/MSU) asked about the decision to choose temperature and humidity ranges for the model. **Augustin Vintzileos (U. of Maryland)** stated that initial epidemiologic models predicted that Bangkok and Singapore would be the next hotspots after Wuhan. However, since the disease spread east-west, he noted that there may be correlations with temperature and humidity. **Sushel Unninayar (NASA Goddard/GESTAR/MSU)** asked if there could be any correlations with business or commercial interactions between China and other countries that have experienced outbreaks. **Augustin Vintzileos (U. of Maryland)** stated that they had not checked yet, but that they would like to integrate these variables in the epidemiologic model. He mentioned that the team hoped to expand the dialogue on these issues, which motivated the weekly epidemiologic bulletin. As a climatologist, he mentioned that he would be interested to explore what happens when air travel increases, and people travel from areas of favorable conditions to non-favorable conditions.

John Balbus (NIEHS) shared the upcoming webinar, [Preparedness and Social Resilience](#), by the Institute for a Sustainable Earth on Preparedness and Social Resilience, where he would serve as one of three panelists, on Tuesday, May 12, 2020 (2PM EDT/GMT-4).

Ana Prados (NASA Goddard/U. of Maryland Baltimore County) mentioned that [NASA ARSET](#) will hold an introductory training, *An Inside Look at how NASA Measures Air Pollution*, on May 26 and 28, 2020. This webinar will be held in [English](#) (10AM-11:30AM EDT/GMT-4) and [Spanish](#) (2-3:30PM EDT/GMT-4). Attendees will be able to list the pollutants that can be observed by NASA satellites, download imagery for NO₂ and aerosols and particles, and describe capabilities and limitations of NASA NO₂ and aerosol measurements.

Amanda Staudt (NASEM) shared that the National Academies' Water Science and Technology Board will be hosting two [webinars](#) related to water quality and COVID-19 on May 27, 2020. The first webinar (*Wastewater Monitoring for COVID-19 Disease Surveillance*) will be held from 11AM-1:30PM EDT (GMT-4), and the second webinar (*Reopening after COVID-19: Ensuring Safe Water Supplies at the Building Scale*) will be held from 2:30-4:30PM EDT (GMT-4).

Juli Trtanj (NOAA) shared that the National Academies' Board on Environmental Change and Society and the Resilient America Program will be hosting a [webinar](#) (*Environmental Extreme Events and COVID-19 in 2020: A Discussion of the Social Science Aspects of Decision Making for Compound Events*) on May 13, 2020, from 12-2PM EDT (GMT-4).

John Haynes (NASA HQ) shared the [webpage](#) to the COVID-19 NO₂ page that the NASA OMI team created recently to provide scientists with an easy way to examine how/if satellite NO₂ has changed in 2020 (compared to 2015-2019 average) for the same 14-day period. He mentioned that these data will be added to the ESA/JAXA/NASA dashboard.

Joy Shumake-Guillemot (WHO/WMO) provided a brief update that the Global Atmosphere Watch aims to examine the range of COVID-19 and atmospheric composition studies in the GAW community and beyond. She mentioned that CoP members are welcome to contribute their work to this inventory by completing a [short survey](#). She stated that 78 studies have been submitted to date.

John Haynes (NASA HQ) and Juli Trtanj (NOAA) introduced **Aaron Naeger (U. of Alabama in Huntsville, Earth System Science Center)** to moderate the group discussion on air quality issues related to COVID-19 transmission.

Aaron Naeger (U. of Alabama in Huntsville, Earth System Science Center) opened the dialogue by presenting some research findings on the impact of COVID-19 containment measures on air pollution in California. He showed TROPOMI L3 maps from different periods of the containment measures (e.g. pre-lockdown to post-lockdown). Compared to the analogous time period in 2019, he showed that tropospheric NO₂ levels were significantly lower across Los Angeles (47% reduction), San Francisco (24% reduction), Bakersfield (25% reduction), and Fresno (35% reduction). When reviewing NO₂ climatology from OMI observations, he noted that there were similar NO₂ reductions in Los Angeles and San Francisco, but smaller reductions over Central Valley. He stated that aggressive air quality regulations adopted in California to reduce emissions may explain part of the NO₂ decrease during this eight-year period. Then, he showed TROPOMI L3 imagery (pre-lockdown vs post-lockdown) over India, with strong NO₂ and HCHO reductions in north India and Pakistan. He mentioned that biomass burning and other natural emissions may have contributed to some increases in trace gases in west India, Myanmar, and Bangladesh.

Sushel Unninayar (NASA Goddard/GESTAR/MSU) asked what possible factors could have influenced reduced NO₂ emissions in north India when compared to other regions of India. **Aaron Naeger (U. of Alabama in Huntsville, Earth System Science Center)** mentioned that some active fires were enhancing NO₂ problems in the post-lockdown period.

Richard Poe (UK) asked that with the ozone pattern, does COVID-19 spread appear to be associated with seasonality or meteorological variables? He wondered what could be happening in central or south India, where there appeared to have increased HCHO levels, and whether it could be related to season cycles or vegetation. **Aaron Naeger (U. of Alabama in Huntsville, Earth System Science Center)** stated that he has not explored the impact of natural sources yet. He mentioned his interest to explore differences in the NO₂ and ozone trends.

Juli Trtanj (NOAA) said that by looking at pre- and post-lockdown imagery, she wondered how these data could be integrated into a decision-making framework focused on recovery efforts. She also wondered about the impact of heat waves and PM levels in summertime. **Aaron Naeger (U. of Alabama in Huntsville)** agreed that it is important to examine the air quality tracking and forecasting over these time periods. He said that these data could then be integrated into the COVID-19 dashboards.

Sushel Unninayar (NASA Goddard/GESTAR/MSU) asked if anyone had observed a relationship between COVID-19 incidence or fatality rates and air quality parameters. **John Haynes (NASA HQ)** mentioned the [Harvard paper](#), which reported relationships between morbidity and mortality rates of COVID-19 and PM_{2.5}. He stated that other air quality issues included the impact of smoke plumes from wildfires on human health as well as the potential of emergency evacuations, especially in light of COVID-19 spread.

John Balbus (NIEHS) mentioned that air quality data should consider the integration of data from personal PM_{2.5} monitors (e.g. hand held devices, traffic monitoring devices). Although NIEHS had used wrist band monitors, he believed that changes in personal PM_{2.5} exposure could be informative, while considering potential confounders related to human behavior and exposure profiles. **Juli Trtanj (NOAA)** stated that the addition of personal PM monitors would be an interesting data set.

John Haynes (NASA HQ) and **Juli Trtanj (NOAA)** mentioned that the deep dive discussions on air quality issues, especially as they relate to wildfires and potential evacuations, may be included for a future telecon. They stated the importance of public health management, especially planning for the heat season, wildfires, and effective shelters in a socially distant world. Since the initial telecon raised some talking points related to water quality issues, they confirmed that the next telecon would focus on water quality issues related to COVID-19 response.

John Haynes (NASA HQ) and **Juli Trtanj (NOAA)** thanked all GEO Health CoP members for their outstanding presentations, their continued contributions to the field, and engagement in the group discussion. They agreed that this telecon had provided an opportunity to share information, connect researchers, and leverage resources that can amplify current activities related to the COVID-19 response.

John Haynes (NASA HQ) and **Juli Trtanj (NOAA)** closed the telecon and mentioned that the next telecon would be scheduled for Tuesday, May 19th at 8:30AM EDT (GMT-4). The focus area would be water quality issues related to COVID-19 transmission.

Adjourned: 10:00 AM EDT (GMT-4)