

Title

19th GEIA Conference

The Global Emissions Initiative and Accelerating Social Transformations



Date

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Location

Virtual conference, hosted by the University of Chile

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Authors

Gregory Frost, National Oceanic and Atmospheric Administration (NOAA), USA

Paulette Middleton, Panorama Pathways, USA

Leonor Tarrason, Norwegian Institute for Air Research (NILU), Norway

Nicolas Huneus, University of Chile

Cathy Liousse, Laboratoire d'Aerologie, France

Claire Granier, Laboratoire d'Aerologie, France; NOAA & University of Colorado Cooperative Institute for Research in Environmental Sciences (CIRES), USA

Host Institutions



Funding



Participating Nations

Argentina, Australia, Austria, Azerbaijan, Belgium, Brazil, Canada, Chile, China, Colombia, Cote d'Ivoire, Cuba, Czech Republic, Egypt, France, Germany, Greece, India, Italy, Ivory Coast, Japan, Lithuania, Mexico, The Netherlands, Nigeria, Norway, Pakistan, Poland, Singapore, Spain, South Africa, Sweden, Switzerland, Thailand, United Kingdom, United States

Conference Summary

IGAC's Global Emissions Initiative ([GEIA](#)) organizes an international conference, generally every two years, where members of the large GEIA network share their work, experience and new ideas with their colleagues from all over the world. These discussions are organized around the main goals of GEIA: (1) promoting broad and consistent access to global and regional emissions data; (2) improving the scientific basis of emissions information by enhancing analysis of emissions processes; and (3) strengthening the global community of emissions stakeholders.

The 19th GEIA conference was first planned to take place in November 2019 in Santiago, Chile, with the title "**The Global Emissions Initiative and Accelerating Social Transformations**". Due to civil protests in Chile during the fall of 2020, the conference was rescheduled to April 2020 in Santiago. The COVID-19 pandemic forced the GEIA community to replace the in-person conference with a virtual conference. The virtual conference turned out a success. It was attended by more than 230 scientists representing 39 countries. The conference was adapted to an on-line format in the following way:

- During the first two weeks of June 2020, participants were invited to submit their presentations in the form of slides, posters and, if desired, videos of the scientists presenting their work. A detailed tutorial to record these videos was provided. All the online material (more than 120 presentations) was made available to the registered participants on the conference website at: <http://www.geia2019.cl>. Registered participants could also submit questions to presenters via an online chat system developed as part of the conference web site. This allowed participants to get acquainted with the materials before the actual on-line summary event.
- An on-line conference summary event was held on June 23rd, 2020. This event was designed to share reflections of the scientific materials that had been compiled in preparation for the conference. During this two-hour webinar, summaries with high lights of each conference theme were presented by the GEIA Scientific Steering Committee (SSC) members. During the summaries, the webinar participants were able to post questions and messages via the online chat system. At the end of each theme summary, and after having addressed the main questions obtained in the different chat systems, an audience poll was broadcast in order to gather the views of the participants on new directions for the future.

The on-line event was organized using the GoToWebinar platform, with excellent support from the Computing & Networking Resources group of the NOAA Chemical Sciences Laboratory in Boulder, Colorado, USA.

The conference was organized around four scientific themes:

Theme 1: Natural Sources, Fires, Dust and Agriculture

There were 32 presentations in this theme and they provided a wide overview of natural sources, focusing on dust, land-use changes, soils, vegetation, oceans and volcanoes. More than 19 new emission inventories were presented.

- Measurements of emission factors of several types of chemical compounds including atmospheric pollutants, greenhouse gases and harmful compounds (e.g. furans) from crop residue and waste burning were presented.
- The uncertainties in biomass burning inventory emissions and their long-term changes due to changes in relative humidity and drought severity were shown. Wood combustion was also discussed, and the importance of condensable organics in wood combustion was mentioned.
- Several presentations highlighted the complexity of nitrogen from natural and agricultural soils, and showed the importance of soil properties, details of land spreading of manure and fertilizer applications, and information on crop and cattle distributions for accurate quantification of emissions.
- Natural and anthropogenic dust emissions were studied, and new measurements of emission factors and emission datasets were presented.
- Studies of the emissions of biogenic volatile organic compounds (BVOCs) showed the impact of using different land cover datasets and meteorological fields on the magnitude and spatial distribution of the emissions. Estimates of the impact of urban greening on BVOCs emissions and on pollutants were discussed.
- Several presentations given in this theme highlighted the use of remote sensing for the development of emission datasets.
- The discussions in the session were followed by a poll, which showed that a majority of participants are interested in further studies on the breakdown of emissions into greater detail by source. Many participants also indicated their interest in developing and using emission datasets at higher resolution, with more studies on the different land cover datasets, and using new techniques for inventory development.

Theme 2: Top-down Emissions & Satellite Analyses

The 28 presentations in this theme focused on the improvement of methodologies to derive emissions, the use of remote sensing data for the quantification of emissions from fires, oil and gas extraction, and point sources, and emissions gridding.

- The presentations included studies at the global and regional scales using satellite observations from TROPOMI, OMI, CrIS, MOPITT, MODIS, and VIIRS, among other instruments. Improvements of NO_x and BC emissions using TROPOMI and VIIRS observations, both in the magnitude of the emissions and their location, including for point sources, were discussed.
- Using TROPOMI, the impacts of the COVID-19 pandemic and the associated lockdowns on surface emissions were evaluated.
- As also discussed in Theme 1, ammonia emissions are difficult to quantify accurately. It was shown that the use of ammonia observations by IASI and CrIS allow a better

quantification of these emissions, particularly in regions where no other data are available.

- The MOPITT instrument, which has been operating for two decades, was used to better quantify the trends in the CO emissions from anthropogenic, biomass burning and natural sources.
- Progress has also been made on inverse techniques in which the emissions of multiple species can be optimized at the same time. An example was shown for CO₂ and CH₄, using satellite, ground-based and aircraft observations.
- New global inventories based on updated determinations of the emission factors and with better spatial and temporal resolutions were also presented in this session.
- The poll following the summary and the questions/answers from the chat indicated that a large number of the participants are interested in the use of satellite observations to constrain emissions in regions where bottom-up inventories are non-existent or not very reliable. The audience was also interested in seeing best practices defined to explore the full potential of satellite information to improve the spatial and temporal distribution of emissions.

Theme 3: Development of Integrated Inventories & Evaluation of Air Quality Models

There were 32 presentations in this theme related to four emergent topics: the new information now available from Latin America, South Asia and Africa; the characterization of uncertainties; the challenges in improving inventories; and the use of information across scales.

- National inventories covering multiple sectors are now available for countries such as Argentina, Brazil, Colombia, Chile, Cuba, India and Mexico. Local inventories were also discussed for cities in Brazil, Ivory Coast and South Africa. Such new data will be very helpful for air quality studies and for defining mitigation policies.
- Regional and global inventories were assessed for different regions, with detailed sector-specific disaggregation. The evaluation of inventory uncertainties is always challenging since spatially and temporally resolved emissions require more data, and the spatial/temporal allocation methods themselves introduce uncertainties. The comparisons of inventory to atmospheric observations require the use of chemical-transport models that have their own uncertainties.
- The presentations highlighted several issues discussed in many past GEIA conferences, such as measurements of emission factors from road transportation, resuspension of particles from unpaved roads, the speciation of anthropogenic VOCs, and the downscaling of emissions both in time and space. Discussions demonstrated two main approaches: a bottom-up method with very detailed measurements of emission factors and activity levels, and a down-scaling approach starting with emission estimates at coarse scales combined with a disaggregation to finer scales using local information.
- The results of the poll after the theme summary and questions showed great interest in the questions “how do we facilitate information flow between the global and local scales” and “how do we facilitate and guide the use of uncertainty information between models and inventories”.

Theme 4: Climate Change & Air Quality Assessments

With 32 presentations, this theme discussed the current understanding of local emissions and air quality, the assessments of regional and global emissions, the links between air quality and climate, and the use of remote sensing to evaluate inventories.

- Studies of the emissions in megacities and the role of different sources were shown, focusing on species such as PM, PAHs, and VOCs, including VOC emissions from product use.
- The impact of wood burning on residential emissions and air quality in cities and regions was also studied.
- A new dataset providing the emissions of engineered nanomaterials was proposed.
- Health impacts from air pollution at the urban/local and regional scales were discussed.
- Global inventories, assessments and tools were shown to be useful for policy and validation, and it was noted that further improvements are needed for sharing the results and inputs.
- The participants voted in the post-theme poll for more studies on emerging sources in local and urban pollution, from transportation and residential activities, as well as from small-scale industries, fugitive dust, waste and agriculture. More studies on emission inventories and scenarios, as well as the communication of these studies to policy communities, were also suggested.

Moving forward, GEIA is committed to enhancing understanding of what we are learning from the dramatic change in emissions during the global pandemic and how we as the GEIA community can better communicate our understanding to decision makers.

The conference ended with recognition of Leonor Tarrason (NILU, Kjeller, Norway), who has stepped down as GEIA co-chair after serving for more than 8 years. The conference also introduced the new GEIA Co-chair, Cathy Liousse (Laboratoire d'Aerologie, Toulouse, France), along with five new members of the GEIA Scientific Steering Committee: Monica Crippa (Joint Research Center, Ispra, Italy), Marc Guevara (Barcelona Supercomputing Center, Barcelona, Spain), Sekou Keita (University Peleforo Gon Coulibaly, Korhogo, Ivory Coast), Brian McDonald (NOAA Chemical Sciences Laboratory, Boulder, USA), and Katerina Sindelarova (Charles University, Prague, Czech Republic).

The entire online summary event was recorded and is available publicly at: <https://youtu.be/dCa7PrMaO8k>

This 19th Conference demonstrated that GEIA has been able to gather a vibrant community despite the current challenges to organize a virtual conference with participants from all over the world. GEIA is particularly grateful to our Santiago team (University of Chile and www.4iD.science) for their stellar organization. The next in-person meeting is scheduled in September 2022 at the Belgian Royal Academy of Sciences, Letters and Fine Arts of Belgium where the GEIA community has been invited by the Royal Belgian Institute for Space Aeronomy.

