IAMAS e-Newsletter

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Content

Secretary-General's Message

In this issue of the IAMAS e-Newsletter, we are pleased to introduce two Members at Large who serve on the IAMAS Executive Committee: Lisa Alexander and Keith Alverson. In future newsletters, we will introduce the other three Members at Large.

Inside, you will also find information on the activities of the IAMAS Early Career Scientist Committee, a summary of a recent workshop "The Power of TROPOMI to Bridge African Science and Policy," as well as a reminder of upcoming meetings of interest to the IAMAS community.

IAMAS is one of the Scientific Associations of the International Union of Geodesy and Geophysics (IUGG), focusing on providing the scientific community with platforms to present, discuss and promote the newest achievements in meteorology, atmospheric science and related fields. The IUGG Annual Report 2021 (http://www.iugg.org/publications/reports/report2021.pdf) is available and provides a comprehensive summary of the activities of the Union including its Associations, Union Commissions, and Programs.

We are about one year away from the next IUGG General Assembly meeting to be held 11-20 July 2023 in Berlin, Germany. Mark your calendar and look for more information coming later this fall!

Introducing Lisa Alexander, Member at Large

I completed a BSc (Hons) and MSc in Applied Mathematics at Queens University Belfast in Northern Ireland before becoming a research scientist for the UK Met Office Hadley Centre. After spending a year on secondment at the Australian Bureau of Meteorology I went on to complete a PhD at Monash University in 2009, winning the Mollie Holman medal for best doctoral thesis. I have spent my postdoctoral career at UNSW Sydney where

I am now a Professor in the Climate Change Research Centre and a Chief Investigator in the ARC Centre of Excellence for Climate Extremes.

My research has concentrated on understanding the variability and driving mechanisms of climate extremes. My primary work aims to improve our understanding of observed changes in these events using multiple research tools ranging from station observations to climate model output. Much of my work has been focused on the creation of high-quality global datasets and their comparison with state-of-the-art climate models as well as projected changes. Of particular significance is my work on the production and assessment of global datasets of temperature and rainfall extremes under the auspices of the World Meteorological Organization's (WMO) Expert Team on Climate Change Detection and Indices (ETCCDI) and more recently the Expert Team on Climate Information for Decision-making (ET-CID) which I co-Chair. These datasets have made substantial contributions to the IPCC Assessment Report statements around observed changes in extremes. I have led regional capacity building and development workshops on behalf of WMO in numerous developing countries which has included developing the climpact software to calculate and analyse climate extremes. Climpact is widely used by National Hydrological and Meteorological Services as well as other climate researchers around the world. None of my achievements however would have been possible without the many collaborators I have worked with around the world and particularly the students and postdoctoral researchers I have supervised.

My first introduction to IUGG and IAMAS was as a PhD student when I co-convened a symposium on extreme weather and climate at the general assembly in Perugia in 2007. This was a very memorable meeting not only because of the beautiful setting and its coincidence with the annual Umbria jazz festival but because it made accommodation very hard to find! I ultimately stayed in the beautiful historical town of Assisi so didn't mind the hour bus ride each way for the two weeks of the conference. Over subsequent years I convened several other IUGG and IAMAS symposia until getting elected as a Member at Large for IAMAS in 2015. In addition to my role in the IAMAS Executive Committee, I sit on several other international scientific steering groups including the WMO-IOC Joint Collaborative Board and the Joint Scientific Committee of the World Climate Research Program. My favourite part of these committees is that I get an overview of the great science that goes on all over the world and I'm also given the opportunity to help steer it so that our most pressing scientific questions can be addressed collaboratively. While much needs to be done to improve our diversity and equity in science representation, IAMAS is taking its responsibilities in this area seriously. For example, a good step in the right direction is to have an Early Career Representative on the IAMAS Bureau. The greatest progress will be made when a wide range of research voices are heard.

Webinar Series

The IAMAS Early Career Scientist (ECS) monthly webinar series started in June 2021, with the first webinar held on June 22nd, 2021. Our speakers are all ECS, mostly young faculty and postdocs. The topics of the webinars are organized according to the IAMAS commissions, and the IAMAS ECS representative from each commission takes turns to host the webinar. The information of our webinars is distributed through our mailing list (sign up at https://iamas.us1.list-manage.com/subscribe?u=d9387e96047ba18f7e9767e91&id=dc9d66467a). The audience of our webinar typically ranges from 20-40 participants. Due to the location of the speakers, most of our webinars are organized during the working hours of European or American time zones. In future, we plan to pay more attention to Asian time zones, and may start regional webinars.

So far, the eight webinars that we have organized are:

June 22, 2021
Joyce Penner, An Introduction to IAMAS
Jiale Lou, South Pacific Ocean Climate Dynamics and Predictability

August 25, 2021
Edward Gryspeerdt, Quantifying the Human Impact on Climate by Doing "Experiments" on Clouds

September 21, 2021
Xi Zhang, Diverse Clouds and Hazes in Planetary Atmospheres

October 20, 2021
Fernando Iglesias-Suarez, On the multi-decadal variability of the tropical stratosphere

November 23, 2021
Georgios Gkatzelis, Knowns and unknowns on the impacts of COVID-19 lockdowns on urban air quality: A glimpse into what the future may hold

March 9, 2022
Qing-Xiang Li, Differences in persistence explain the unevenness of warming at continental scales

March 25, 2022
Marlene Kretschmer, The plausible role of Barents and Kara sea ice loss in driving future polar vortex changes

April 26, 2022
Carina Schumann, Lightning in slow motion: The Johannesburg Lightning Research Laboratory

Workshop: The power of the TROPOspheric Monitoring Instrument (TROPOMI) to bridge African science and policy

by Refilwe Kai, University of the Witwatersrand
Professor Mary Scholes, University of the Witwatersrand
Professor Stuart Piketh, North West University

From the 11th to 15th of April 2022, a workshop that served as an avenue to establish a community of practice for researchers, policy-makers, and practitioners in Africa using satellite data for air quality was held at the Lorentz Centre (Netherlands).

The in-depth discussions and feedback sessions centered on how air pollution reinforces climate change and how urbanisation is the main driver of land degradation, poor waste management, and transport-associated emissions in Africa. The use of satellites is important in determining how to mitigate air pollution and climate change. **Case studies**: South Africa has used satellite data to investigate trace gas concentrations in the atmosphere and dust storms. Uganda (AirQo) has air quality research that uses low-cost ground sensors, while Ethiopia uses solar-induced fluorescence (SIF) data to investigate air quality impacts on agriculture (air pollution injury can be seen on plants/crops).

TROPOMI data assists us in highlighting pollution hotspots, particularly in the lower troposphere. It gives a detailed picture of pollution and provides insight into which species are of most concern, which will enable us to point to the sector based on the origins of the pollution. Satellite data are central to air quality research; however, emissions cannot be measured directly; therefore, emission estimate algorithms (DECSO) are used to get daily emission estimates. Africa has great potential for air pollution research. However, the continent lacks real-time air quality data that could inform policy decisions.

Combining ground-based and satellite data is pivotal in air quality research because these data complement each other. Unfortunately, some areas have no ground-based instruments to provide high temporal resolution data. Geostationary satellites can be used in these areas since they also give hourly measurements. However, the disadvantage is that most geostationary satellites are in the developed countries.

A concern that was raised was that policy-makers tackle climate change and air pollution separately; however, air pollution reinforces climate change. In addition, the true cost of modelling emissions and the air quality footprint are under-researched.

Poster Presentation: I had the opportunity to present a poster of my PhD research titled "The concentrations, sources, transport, and fate of nitrogen oxides in the Mpumalanga Highveld." My research addresses the use of ground-based and satellite data to monitor NO_2 concentrations in the Mpumalanga Highveld and establish NO_2 emission estimates for 2020 and 2021.

Prof. Levelt from NCAR gave a public lecture on Air quality from space and highlighted the use of TROPOMI and other satellites in air quality research (forecasting, environmental monitoring, calculation of emissions, and the health impacts on the population in Africa) and the importance of combining satellite and ground-based data. The lecture emphasised the need to invest more in air quality research in Africa due to the expected

population and air pollution increases.

Data access and management challenges were discussed under three headings of access to data, representation of the world as data, and control over data flow. This discussion led to the importance of translating data into useful information which will assist policy-makers in communicating the findings.

Technical sessions focused on using Google Earth Engine (GEE) to access and analyse TROPOMI data, how to access TROPOMI data from the sentinel hub, and using reprocessed data. Processors for TROPOMI data change after major product upgrades and therefore using data from different processors leads to inconsistent data analysis. Different data access platforms were discussed in great detail, these being the Jupyternotebook from the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) and the TROPOMI monitoring portal to access the latest orbit (http://mps.tropomi.eu/orbit) and archived orbits to access TROPOMI data (http://mps.tropomi.eu/calendar).

The "African perspective: policy and science users" panel discussion produced the following points.

- Training is needed to equip policy-makers to make more informed decisions regarding climate change mitigation and address complex problems focusing on societal needs.
- Policy-makers should better understand how the research is done and how to communicate this information to the communities better.
- The accessibility of data will assist in understanding air quality research.
- Community involvement - get communities involved using monitoring sensors in workplaces and school children using easy-to-use instruments to validate TROPOMI data using ground-based data (Citizen science).
- Capacity building in Sub-Saharan Africa using the Clean Air Monitoring and Solutions Network (CAMS-Net) to facilitate the exchange of knowledge, ideas, and data to improve the use and application of low-cost sensor air quality data.
- Can we take the combination of satellite and ground-based data too far and miss important information by combining data at the country level?
- Consider indoor and outdoor scenarios when combining data.
- Consider temporal resolution when combining data.

Upcoming Meetings

June 2022
30 May-3 June, IAGA, IAMAS, Helsinki, Finland, 11th International Workshop on Long-Term Changes and Trends in the Atmosphere

July 2022
- 4-8 July, International Radiation Symposium (IRS2022), Thessaloniki, Greece (IAMAS, IUGG)
- 11-15 July , SCOSTEP, Sopron, Hungary, 8th Workshop on Vertical Coupling in the Atmosphere-Ionosphere System (VCAIS) (IAGA, ICMA, IUGG)
- 16-24 July, Athens, Greece, COSPAR 2022. 44th Scientific Assembly (COSPAR, IUGG)

IUGG General Assembly 2023
- 11-20 July 2023, IUGG General Assembly 2023, Berlin, Germany. (https://www.iugg2023berlin.org/)

Introducing Keith Alverson, Member at Large

I am currently an independent professional in the fields of oceans, climate and environment. From 2016 to 2020, I was Director of the UNEP International Environmental Technology Center in Osaka, Japan. At the Center I worked on waste management challenges, including plastic in the ocean and greenhouse gas emissions from the waste sector. Prior to that I served for five years as the Director of the Freshwater, Land and Climate Branch at UNEP Headquarters, in Nairobi, Kenya, where I oversaw UNEP's global portfolio of projects in climate change adaptation and ecosystem-based climate change mitigation as well as terrestrial and freshwater ecosystem management. From 2004-2011, I was Head of Ocean Observations and Services at the Intergovernmental Oceanographic Commission of UNESCO, based in Paris, France, which included serving as Executive Director of the Global Ocean Observing System. Prior to 2004, I was Executive Director of the International Geosphere Biosphere Programme's Past Global Changes (PAGES) project in Bern, Switzerland, coordinating global cooperation in paleoclimatic and paleoenvironmental research.

I have a degree in Mechanical and Aerospace Engineering, with a concentration at the Center for Energy and the Environment, along with a certificate in East Asian Studies, from Princeton University (1988) and a doctorate in Physical Oceanography from the Joint Program of the Massachusetts Institute of Technology and the Woods Hole Oceanographic Institution (1995). My PhD thesis was a theoretical and primitive equation modeling study of how isolated bottom topography, through formation of a 'Taylor Cap', can precondition areas of the Southern Ocean for deep ocean convection driven by ocean-atmospheric interactions, and can thereby explain occasional large, mid-winter open-ocean polynya formation in the Weddell Sea. My postdoctoral research was in the Physics Department at the University of Toronto, Canada. There I worked on upscaling ice core data using atmospheric reanalysis datasets and explaining glacial-interglacial variations in atmospheric carbon dioxide levels. Over my subsequent twenty-odd years of professional life I have worked in climate reconstruction, modeling, observations, adaptation and mitigation.

My first engagement with IAMAS, and IUGG, was at the IUGG congress in Sapporo, Japan in 2003, at the invitation of then IAMAS President Mike MacCracken. I have been actively engaged with both IUGG and IAMAS ever since, including two terms as President of the IAMAS International Commission for Climate (ICCL) and currently as a member-at-large in the IAMAS Executive Committee. I am also currently Vice President of the IUGG Union Commission for Climatic and Environmental Change. In this latter role I am currently working to help put together a Union Session on how Earth Sciences contribute to Sustainable Development, for the 2023 IUGG Congress in Berlin and would be very glad to hear from IAMAS members regarding possible invited speakers on this topic (email keith.alverson@gmail.com).