A001. Advances in an Integrated Global Observing System for Air Quality

Remote sensing data are increasingly used in air quality analysis and prediction, and improvements in trace gas and aerosol remote sensing and models are enabling advances in air quality applications. The emerging global constellation of air quality satellite missions (Sentinel-5P/TROPOMI, Sentinel-5, Sentinel-4, GEMS and TEMPO) provides measurements at unprecedented spatial and temporal resolutions. Maximizing the science and ultimate societal benefits from these missions requires integration with other measurements in advanced modeling frameworks. Field campaigns such as DISCOVER-AQ, KORUS-AQ and AROMAT are actively exploring multi-perspective strategies. Presentations on all aspects of these important challenges are invited, including:

- First results from Sentinel-5P/TROPOMI
- Advances in satellite, airborne and ground-based remote sensing of trace gases and aerosols
- Preparatory field campaigns
- Harmonizing and validating data products from multiple sensors/platforms
- Modeling at fine spatio-temporal resolutions
- Chemical data assimilation and inverse methods
- Boundary layer characterization and relationship to near-surface pollution
- High-density surface observations
- Emission calculations

A009. Aerosols and Air Quality over South Asia and the Hindu Kush-Himalaya

The densely populated Indo-Gangetic Plains (IGP), south of the Hindu Kush-Himalaya (HKH), is subjected to persistently high loadings of aerosols and key air pollutants, which lead to poor air quality and impact the regional atmospheric chemistry, climate, public health and agriculture. Dense smog associated with crop burning, urban/industrial emissions and residential heating/cooking, during the dry autumn-winter period, often results in alarming degradation of air quality. Whereas extensive dust emissions in the spring-summer months, combined with carbonaceous aerosols, can potentially affect summer monsoon processes and lead to enhanced vertical pollution transport over Asia. Emissions originating from the IGP can also be transported across other parts of south Asia including surrounding oceanic regions, and even the relatively pristine HKH. We invite presentations discussing various observational, modeling and impact studies over south Asia; with topics ranging from aerosols and trace gases characterization including aerosol-radiation and chemistry-climate interactions, and public health and agricultural impacts.

A022. Atmospheric Oxidation Capacity Constraints: Laboratory Investigations, Field and Remote Sensing Observations, and Modeling Studies

This session focuses on the investigation of atmospheric oxidation processes of VOCs, initiated by various oxidizing agents, including the OH, O3, NO3 and Cl. Observational constraints of these oxidizing agents are sparse, particularly for OH, the atmosphere's primary oxidant. We solicit presentations that highlight novel studies using laboratory kinetics, in situ and satellite observations and models that provide insight into the temporal and spatial distribution of these

oxidants, their constraints and the factors that control their distributions from local to global scales. Satellite data have the unique advantage of spatial coverage; so space-based observational constraints on OH and the factors that control OH are particularly encouraged. Additional processes of interest include oxidant impacts on the formation of secondary products (e.g., O3, PAN and SOA) and their subsequent feedbacks on climate. Modeling studies investigating the impacts of non-linear chemistry on the formation of radiatively active gasses and climate are particularly encouraged.

A040: Data Assimilation and Inverse Modeling of the Atmospheric Composition
This session aims to bring together recent studies in local, regional, and global data assimilation (DA) and inverse modeling of the sources and sinks of trace gases and aerosols. We invite contributions related to: 1) advances in variational, ensemble, and hybrid methods to estimate emissions as well as to integrate observations at diverse spatial and temporal scales; 2) applications of DA systems in studies related to air quality, biogeochemistry, and weather/chemistry interactions; 3) novel methods in assimilating 'big' data, complex, and/or new observations; 4) characterization of model and observation errors and uncertainties and reconciliation of top-down and bottom-up estimates; 5) transition to operational or near-real time applications of these tools; and 6) related studies.

A049: Extreme Wildfires and Smoke Plumes: Past, Present, and Future
Recent boreal wildfire seasons have punctuated an apparent evolution toward greater anomalies in wildfire behavior, explosive pyroconvection, and hemisphere-scale smoke plumes. A 2017 wildfire complex in Canada generated pyrocumulonimbus storms and a stratospheric smoke plume comparable to a large volcanic eruption. Fires in Oklahoma this year consumed 127,880 ha, destroyed 60+ buildings, and generated a smoke plume transported at least 4,500 km. Such fire-behavior and fire-weather extremes may become more commonplace in a changing climate. This session will assess the impact of these and other extreme fire events on communities, weather, and climate. We solicit reports on specific fire events and anomalous smoke plumes in general. Contributions to this session will address the challenges imposed on remote sensing systems by extreme fire events, the hemispheric atmospheric impact, and our modeling/predictive capability. We solicit contributions on measurement and modeling perspectives into extreme wildfire phenomena: past, present, and future.

A056. Improving the Science of Emissions Through Inventories, Observations and Models
Inventories that comprehensively and accurately represent emissions sources at the process level are critical tools for understanding atmospheric composition and for designing effective environmental regulation. Emissions estimates derived from atmospheric in-situ and remote-sensing observations and chemical-transport models can help to identify information gaps and increase confidence in inventories. This session invites research aimed at improving the scientific understanding of emissions through inventory development, ambient observations, and atmospheric modeling. We welcome studies of emissions from anthropogenic or natural sources at a variety of spatial and temporal scales relevant to air quality or climate.

A074. Multi-sensor, Model, and Measurement Synergy: Aerosol Sources and Their Environmental Effects

Aerosols perturb Earth's radiation budget and hydrological cycles, impact climate air quality, and health. Changing land-cover, wildfire occurrence, agricultural practice, and fuel consumption, alter aerosol concentrations and composition. In places, efforts aim at reducing aerosol loading; in others, loading is increasing due to drought, desertification, over-grazing, deforestation, and expanding industrialization.

Characterizing aerosol sources is a prerequisite for representing them in climate and air quality models. Diverse measurement techniques have been applied for this purpose, along with methods that combine measurements and models. Yet, adequately prescribing aerosol source strength, injection height, and microphysical and chemical properties remains a forefront area of research. Additionally, spatial sampling mismatch between measurements and models creates discrepancies that require attention.

We welcome presentations discussing synergies among measurement techniques and/or models, that characterize aerosols and their environmental effects on regional-to-global scales. This year we are placing special focus on representing aerosol sources, past, present, and/or future.

A088. Recent and Anticipated Measurement Campaigns: Foci, Results, and Opportunities for Analysis and Collaboration

This session is a forum to present recent, ongoing, and future atmospheric datasets. It is meant to promote sharing of results and to initiate collaborations across institutions, national agencies, and international groups on analysis and synergistic observations. Welcome are submissions focused on: mission overviews; highlighted results; reanalyses; and even campaigns in the proposal stage. All manner of data-collection activities are relevant, including intensive airborne, shipborne, and land-based field campaigns, data coming from experimental facilities, permanent and/or long-term measurement networks/infrastructure, and covering both in-situ and remote efforts including space-based activities. Abstracts concerning international efforts among countries are welcome; especially encouraged are those focused on datasets with open sharing policies.

A113: what difference to atmospheric composition do criegee intermediates make in the troposphere

This session focuses on the sources and fate of Criegee intermediates (CIs) in the atmosphere. Recent work has shown that they can be generated in laboratory systems and their chemistry is now the subject of intensive research. CIs have a significant impact on the oxidizing capacity of the Troposphere. They are a significant source of HOx and it has been shown that they can accelerate the formation of sulphate and nitrate but they also react rapidly with moieties that have a C=O, CO-H and C(O)OH grouping, adding to these species. Therefore, increasing the mass of the product and its O:C ratio, thereby enhancing its ability to condense and form secondary organic aerosol. We solicit presentations that assess the role of CIs in atmospheric oxidation through characterisation of their reactive properties using laboratory studies, impact

studies using models, reference to existing field measurements, and exploration of new methods for CI detection.

C022. **Ice Core Records of Environmental Change**
Ice cores record environmental variability over seasonal to orbital timescales often at a resolution unmatched by other archives. This session seeks to integrate ice-core records from around the world with climate models and other paleoclimate archives to gain insight into past and future environmental change.

We invite contributions on, but not limited to: new results from ice core campaigns, new analytical techniques, advances in proxy interpretations, paleoclimate reconstructions that integrate ice cores with other natural archives and/or climate model simulations, inferences of past ice dynamics as well as glaciological studies that help to inform ice core interpretation. We encourage contributions over a range of temporal scales spanning the past decades to glacial-interglacial cycles.

GC039. Ensemble Modeling Approaches to Studying the Earth System Response to Anthropogenic Forcing
The detection of secular trends within the Earth system in response to anthropogenic forcing is complicated by the presence of natural forced and internal climate variability. With the advent of large ensemble initial condition simulations with CMIP5-generation Earth system models over the last several years, such questions are now being explored in a unified modeling framework by a wide array of scientists and disciplines, with applications spanning the atmosphere, the ocean, the land surface, the cryosphere, and biogeochemistry.

This session welcomes novel applications of ensemble methods to the study of climate change and the interpretation of observational records, as well as efforts to optimize observing network design. Abstract are particularly welcomed that cross disciplinary boundaries, and consider newly emerging topics including event attribution and emergent constraints in the climate system.

GC093. Understanding the Climatic and Societal Impacts of Past and Future Explosive Volcanism
Stratovolcanic eruptions drive regional and global climate changes on seasonal to annual timescales, with clusters of eruptions or exceptional events potentially creating multidecadal climate anomalies. Because of the scarcity of observable large-magnitude, explosive eruptions in the satellite era, characterization of volcanic climatic impacts relies heavily upon a combination of aerosol radiative forcing reconstructions, historical and paleoclimate evidence, and global aerosol and climate model simulations, all of which have inherent limitations and uncertainties. The session focuses on five key areas: (1) the reconstruction of volcanic forcing; (2) climate reconstruction and identification of mechanisms of volcanically-forced climate variability; (3) uncertainties in the simulations of volcanic events by current global aerosol

models (including their evaluation against stratospheric aerosol observations and proxy reconstructions); (4) volcanic impacts on human societies; and (5) the role of volcanic eruptions in understanding future climate variability and predictability. Studies that bridge multiple focus areas are particularly welcome.

GH02. Airborne Particulate Matter: Linking sources and composition to specific health outcomes.
Airborne fine Particulate Matter (PM) from anthropogenic, biogenic and geogenic sources have been strongly associated with negative health impacts. Understanding the complex interplay between chemical composition of gas phase and PM, atmospheric processes and biological effects is crucial for designing effective mitigation strategies and predictive models. In this multidisciplinary GeoHealth session, we invite the researchers working in atmospheric sciences, aerosol physics and chemistry as well as aerosol toxicology, biochemistry and health effect induction to contribute to the discussion on PM health impacts. Topics include but are not limited to: atmospheric sources and processes that affect PM toxicity; in vitro and in vivo studies that elucidate links between PM composition and structure with specific health effects; mechanisms that lead to PM toxicity, including oxidative stress and inflammation; novel biological tools used in the laboratory or field to understand PM toxicity as well as novel measuring technologies for health relevant aerosol properties.