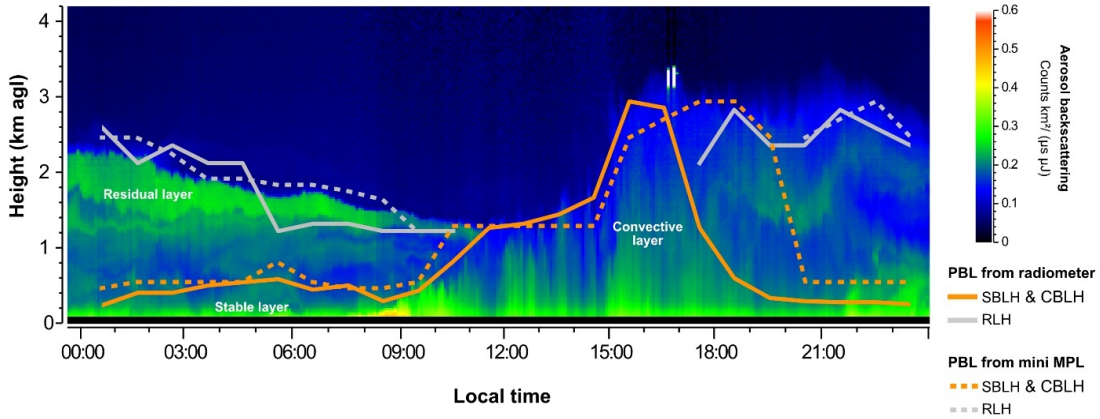
***Institute for Climate & Atmospheric Science***
***Department of Earth & Atmospheric Sciences***
***University of Houston***

***https://www.icas.uh.edu/***

The **Atmospheric Sciences Program at UH** is about sixteen years old and we are building a world-class foundation that couples measurements and numerical modeling on regional-to-global scales. We operate air quality monitoring sites that encompass the metropolitan region. Real-time data collected at these sites allows us to study urban emissions, a diverse suite of industrial emissions, and the complex chemistry involving these mixtures mingling with natural terrestrial and marine emissions. In particular, we are interested in radical chemistry intersecting with reactive nitrogen, ozone, organic compounds and other trace gases. We are uniquely poised to be leaders in this area. The group has extensive experience using data from satellite platforms to study numerous trace gases including carbon dioxide. We operate a suite of remote sensing instruments, and some from mobile platforms. We are doing atmospheric research in many parts of the world. Together our faculty, postdoctoral fellows, graduate and undergraduate students form a solid team with diverse experience and knowledge to study important issues impacting planet Earth on various scales.

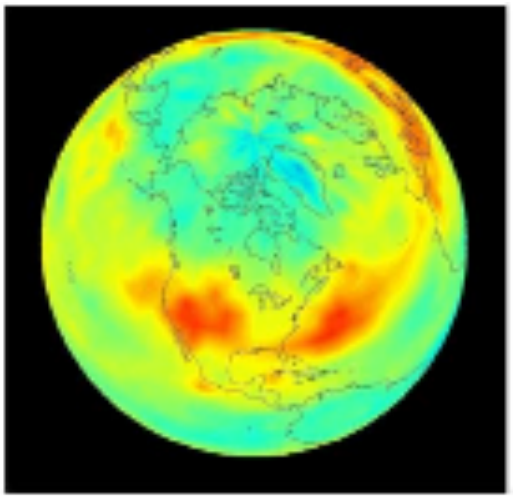
**Dr. BERNHARD RAPPENGLUECK** is a professor of Atmospheric Science and acts as the Director of the Institute for Climate and Atmospheric Science (ICAS). His research interest combines the fields of meteorology and atmospheric chemistry. It involves both experimental field work and numerical modeling. Main research targets include (1) study of trace gases in atmospheric photochemical processes, their origins and fates in the unpolluted and polluted atmosphere, (2) atmospheric radical chemistry involving formaldehyde [HCHO], hydrogen peroxide [$H_2O_2$] and nitrous acid [HONO], (3) boundary layer processes and mesoscale meteorology (the figure below shows recent boundary layer data in Mexico City), (4) the application, validation and development of chemistry-transport modeling and (5) climate change studies. Dr. Rappenglueck has been involved in many pathbreaking urban air quality studies worldwide (Berlin, Athens, Santiago de Chile, Mexico City, Los Angeles, Houston), but also in elucidating wintertime $O_3$ in remote areas. He has published more than 100 papers in peer reviewed journals (current h-index: 44).




Dr. Rappenglueck pioneered online measurements of volatile organic compounds in the early 90s. He has recently set up an unrivaled GCxGC/MS facility to determine volatile and semi-volatile organic compounds to elucidate processes involving emerging intermediate organics in air. The lab also includes isotopic $\delta^{13}C$ measurements for both $CH_4$ and $CO_2$ to determine biogenic and anthropogenic sources of these carbon-containing greenhouse gases.

Phone: (713) 743-2469; Email: brappenglueck@uh.edu
Website: http://easd.geosc.uh.edu/rappenglueck/index.php

**Dr. XUN JIANG** is a professor of Atmospheric Sciences. Her primary research is elucidating the carbon cycle through the satellite data (*e.g.*, AIRS, TES, GOSAT, OCO-2, and OCO-3) and chemistry-transport models (*e.g.*, GEOS-Chem, MOZART-2, and IMATCH). An example of the AIRS mid-tropospheric $CO_2$ in July 2007 is shown in the figure. She is particularly interested in exploring the variability of $CO_2$ and utilizing the models to simulate and inverse the $CO_2$ sources and sinks. She is also interested in investigating the influence of global warming on extreme weather through satellite data and general circulation models. Other topics she is pursuing include the dynamical coupling between the troposphere and the stratosphere, the role of ozone in global climate change, the influence of the solar cycle on the climate, air quality, and planetary atmosphere.



Phone: (713) 743-3156; Email: xjiang7@uh.edu
Website: http://easd.geosc.uh.edu/xjiang/

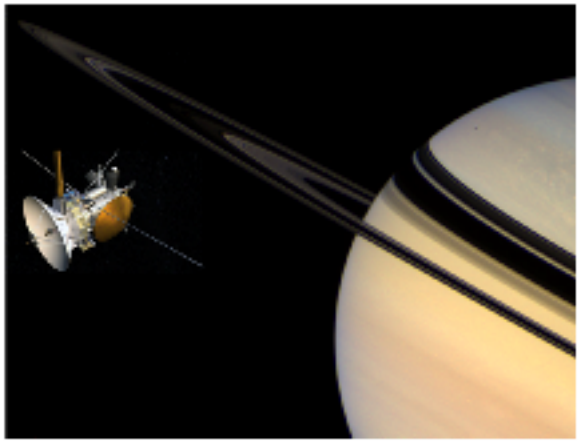
**Dr. Yunsoo Choi** is a professor with research interests in atmospheric science using AI deep learning modeling and numerical air quality modeling. The main research targets include (1) air quality forecasting applications: It is often imperative to forecast air pollution in real-time so that communities can be forewarned to take decisions beforehand. For example, if there is significant pollution on a highway, drivers can decide to take a cleaner route; (2) AI deep learning: We are currently using AI deep neural network, convolutional neural network, and deep reinforcement learning for air quality forecasting, climate change impact, energy availability, Hurricane track forecasting, and remote sensing application for atmospheric sciences; (3) regional chemical transport modeling applications: Multi-year trends in tropospheric ozone and aerosol concentrations are the results of both inter-annual variations of meteorological conditions by climate change and their precursor's emission changes due to regulatory policy implementation; (4) Remote sensing application: Data from satellite measurement is crucial for establishing a long-term monitoring system of the Earth's health. We are targeting these atmospheric remote sensing data. These remote sensing data will be used to investigate the impacts of cloud convection, lightning activity, biogenic change, air pollution regulation, energy resource change, ocean/atmospheric phenomena, and extreme weather; (5) Energy policy: emissions from transportation sources, both gasoline and diesel vehicles, are a major source of both ozone and particulate matter pollution in urban regions. It is, therefore, imperative to understand the physical processes driving these emissions to develop appropriate control policies.

Phone: (713) 743-9748; Email: ychoi6@uh.edu
Website: https://uh.edu/nsm/earth-atmospheric/people/faculty/yunsoo-choi/

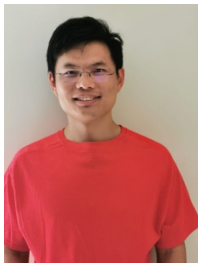
**Dr. YUXUAN WANG** is an associate professor of Atmospheric Chemistry. The Wang Lab aims at improving understandings of atmospheric composition in a changing world, its coupled relationship with the climate system and societal choices such as energy, and the use of such understanding to improve model predictive capability and to aid in societal decision-making. To accomplish this research, we use a combination of advanced modeling, satellite and in situ observations, and data analysis/data mining methods. We currently have five research areas: (1) urban air quality; (2) interactions between extreme climate events and atmospheric composition; (3) quantifying anthropogenic and natural emissions using modeling and atmospheric observations; (4) long-range transport of air pollution (e.g. from wildfires, dust, anthropogenic emissions); and (5) model development. The Wang Lab has been funded by federal agencies including NSF, NASA, NOAA, and DOE; state agencies including the Texas Commission on Environmental Quality (TCEQ) and Texas Air Research Center; and internal sources. Regular members of the Wang Lab include 1-2 postdocs, 4-7 PhD students, and 1-3 undergraduate students. Dr. Wang normally recruits 2 Ph.D. students each year.

Phone: (713) 743-9049; Email: ywang246@central.uh.edu;
Website: https://www.yxwanggroup.net

**Dr. LIMING LI** is a professor with research interests in the exploration of planetary atmospheres by combining observations, theories, and numerical models. He is particularly interested in atmospheric dynamics, global heat budget, and climate change on the outer planets (i.e., Jupiter, Saturn, Uranus, and Neptune) and Titan. One of his studies is to explore the equatorial winds and stratospheric oscillation on Saturn (Li et al., *Nature-Geoscience*, 2011), which is based on the multi-instrument observations from the spacecraft-Cassini (shown in the adjacent figure). Dr. Li also has interests in the atmospheric and oceanic sciences on the terrestrial planets (i.e., Venus, Earth, and Mars) with emphasizing atmospheric energetics and hydrological cycle.



Phone: (713) 743-3283; Email: lli13@uh.edu
Website: http://ps.phys.uh.edu/



**Dr. Honghai Zhang** is an assistant professor of Climate Dynamics and Modeling. His group aims to understand the processes that shape our climate and drive its variability and changes from synoptic to climatic timescales. The group focuses on tropical climate dynamics, extratropical regional hydroclimate and tropics-extratropics interactions. In the tropics, the group is interested in atmosphere-ocean coupling and its role in the Intertropical Convergence Zone (ITCZ) and El Niño South Oscillation (ENSO) phenomena; in the extratropics, the group investigates precipitation variability and changes in a number of regions such as North/South Americas and South Asia. The group is particularly interested in how the tropics and extratropics affect each other—a teleconnection that provides climate predictability beyond a few seasons. To conduct these researches, the group combines observations and numerical models. Observations are used to analyze climate variability and changes and form hypotheses about the associated physics; these hypotheses can be tested either by different observations or by numerical experiments conducted with models. The group uses a wide range of models, from simple conceptual models that can be solved analytically with a pen and paper, to intermediate complexity models that can be solved on personal laptops, to climate models that can only be solved on supercomputers. The group does not only use models developed by others (such as NCAR, GFDL, etc.) but also develops their own models to achieve the goal of understanding the processes that shape our climate and drive its variability and changes.
Phone: (713) 743-4701; Email: hzhang83@central.uh.edu
Website: https://uh.edu/nsm/earth-atmospheric/people/faculty/honghai-zhang/

**Dr. YOUTONG ZHENG** is an assistant professor of atmospheric science. He studies cloud formation and turbulence and their roles in climate and climate change, using a hierarchy of approaches ranging from pencil-and-paper theory to comprehensive computer models to satellite and experimental observations. A cornerstone of his work is an emphasis on developing physical intuition using theory and idealized models. He then uses intuition to understand more complex phenomena in observations and comprehensive climate models and apply the improved understanding to address practical issues of societal importance. Recent topics of interest include human impacts on clouds, climate modeling of clouds, arctic cloud feedback, and extreme weather impacts on public health. He was awarded the 2023 Department of Energy (DOE) Early Career Grant to study the air pollution impacts on coastal storms using the DOE's global storm-resolving model and field campaign observations.

Phone: (301) 526-5086; Email: yzheng18@uh.edu
Website: https://zhengyoutong.wixsite.com/mysite

Dr. Kunxiaojia (Tammy) Yuan is an Assistant Professor in the Department of Earth and Atmospheric Sciences at the University of Houston. Her research investigates how ecosystems respond to climate dynamics and disturbances (e.g., wildfire, deforestation, flooding) through carbon-water-energy nexus, with a particular focus on wetland and forest ecosystems. Her group aims to assess ecological and climate risks, and advance nature-based solutions to improve ecosystem resilience and services. To achieve this, her lab integrates a range of tools, including advanced machine and deep learning, causal inference, Earth system modeling, remote sensing, and field measurements (e.g., eddy covariance, chambers, and isotopes). Current research areas include: 1) ecosystem carbon-water-energy cycles; 2) AI model development for earth and environmental sciences; 3) Coastal resilience; 4) Wildfire processes, modeling, and impacts.
Email: kyuan@Central.UH.EDU
Website: https://ecoai-yuanlab.github.io/

**Dr. JAMES FLYNN** is a research associate professor with research interests in field measurements of atmospheric chemistry with an emphasis in urban air quality and the impact of transport to remote regions around the world. The group employs a wide variety of platforms (ground stations, mobile laboratories, boats, aircraft, balloons, and drones) to collect measurements of ozone, ozone precursors, and other inorganic trace gases and the meteorological processes which impact the formation of ozone and aerosols. Small sensor development for balloon and drone platforms is a growing area of research which has resulted in several successful deployments of an $SO_2$ sonde to volcanoes in Hawaii and Costa Rica as well as to study anthropogenic emissions of $SO_2$ in the Athabasca Oil Sands region of Alberta, Canada. Frequent collaborating domestic partners include Baylor University, Rice University, St. Edward's University, while international collaborations are growing in Costa Rica, Cyprus, France, and the Philippines. Funding for these programs comes from a variety of State and Federal agencies such as the Texas Commission on Environmental Quality, NASA, NOAA, EPA, Department of Energy, in addition to private companies.

Phone: (713) 743-3262; Email: jhflynn@uh.edu
Website: http://easd.geosc.uh.edu/cv/james_flynn_cv.pdf

**STUDENTS:** Institute for Climate and Atmospheric Science at the University of Houston has expertise in satellite remote sensing, regional-to-global air quality, and development of scientific instrumentation. State-of-the-art facilities include advanced instrumentation and computing resources. Students interested in numerical modeling, field measurements, and data analyses are encouraged to apply. Students with a strong background in mathematics, chemistry, and physics are highly desirable.

**Applying for Admission**

Questions pertaining to application documents, procedure, and status should be addressed to the advising assistant, Summer Crawley (sdcrawle@central.uh.edu). Questions pertaining to academic program and requirements should be addressed to the graduate advisor, Dr. Xun Jiang (xjiang7@uh.edu).

**Website for M.S. and Ph.D. in Atmospheric Sciences Program**

**https://uh.edu/nsm/earth-atmospheric/graduate/overview/**

**Deadlines:**

**Fall Semester Admission:** January 5; **Spring Semester Admission:** October 7

**Financial Aid**

Each year the Institute awards a number of graduate teaching and research assistantships.