UMBC ATMOSPHERIC PHYSICS FIRST ANNUAL EARTH DAY SYMPOSIUM

ORAL PRESENTATIONS:

Name: Dr. Belay Demoz
Title: The GCOS Reference Upper Air Network: concept, organization, accomplishment and its future
Abstract:
The concepts and problems that led to the establishments of the Global Climate Observaing Stations (GCOS) Reference Upper Air Network (GRUAN). How it started small and has grown to a recognized network of stations across the globe under the WMO. I will focus my discussion on the science issues of our climate system that led to GRUAN; interesting dynamic processes that led to better design of instruments and measurements systems and as well as better interpretation of climate data.

Name: Dr. Meng Gao
Title: How cephalopods use optics to camouflage?
Abstract:
Marine animals such as cephalopods have the ability to quickly and accurately camouflage in their living environment by matching the color, texture, and brightness of the background. The masterful control of light relies on the highly-sophisticated skin structure, which normally includes chromatophore, iridophore and leucophore cells. We studied the light scattering processes through ab initio simulations with a focus on the leucophore and iridophore cells. These cells can produce diffuse whiteness, essential in matching the background light intensity. Understanding the camouflage mechanism can expand our knowledge in light scattering and help to design novel materials with a similar ability.

Name: Dr. Tom Hanisco
Title: Improving Methane Lifetime Estimates by Knowing OH Better: Remote Sensing of Methane's Primary Sink
Abstract:
The growing significance of methane as a greenhouse gas drives the need for measurements of the sources and sinks that comprise the methane budget. The reaction with tropospheric OH is the largest sink of atmospheric methane, accounting for over 90% of the methane removal from the atmosphere. Model calculations of methane lifetime are uncertain because global OH is uncertain. A new approach to obtaining regional to global scale OH observations will be presented. The technique, integrated path differential absorption LIDAR, uses a tunable UV laser to measure OH with absorption spectroscopy and will provide a column OH measurement over the flight path of the instrument. Column OH measurements over large regions will better constrain models that calculate methane lifetime, substantially reducing uncertainty in the estimated lifetime.

Name: Adriana Rocha Lima

Title: Evaluation of the dust distribution in the Middle East and North Africa using GEOS-5 model
Abstract:
Dust particles are known to be important in a series of chemical and physical processes in the Earth's atmosphere, climate system, and biogeochemical cycles. Measurements and retrievals from the last decade have shown that there is a regional variability of dust optical properties, dependent mainly on soil mineralogy of the sources, but also likely on emission and transport processes. In this presentation, I will show global dust distributions simulations and I will talk about the new multi-component dust scheme implemented in the Goddard Chemistry Aerosol Radiation and Transport (GOCART) module within the Goddard Earth Observing System - version 5 (GEOS-5) Earth system model to investigate the relative importance of individual dust source regions in the Middle East and North Africa for the global aerosol budget.

Name: Sergio DeSouza-Machado
Title: Hyperspectral Infrared Sounding - from weather to climate
Abstract:
Data from the new generation of hyperspectral infrared sounders orbiting Earth have improved weather prediction capabilities, and are now on the cusp of providing a stable 16+ year record for climate trending. At UMBC the Atmospheric Spectroscopy Laboratory (ASL) headed by P.I. L. Strow is directly involved in working with NASA's AIRS (Sept 2002-now), NOAA's CrIS (Feb 2012-now) and Eumetsat's IASI (May 2007-now) instruments. In this talk we highlight some of the work being done at UMBC, which includes calibration, radiative transfer modeling, retrievals and climate studies.

Name: Dr. Vanderlei Martins
Title: Focus: Advancements in polarized remote sensing and in-situ measurements of clouds and aerosol

Name: Dr. Amita Mehta
Title: Overview of Global Precipitation Measurement (GPM) Mission Data and Applications

Name: Dr. Ana Prados
Title: NASA's ARSET program

Name: Dr. Andy Tangborn
Title: Data Assimilation and Forecasting

Name: Pengwang Zhai
Title: Radiative transfer theory and its applications in remote sensing of the Earth system
Abstract:
Radiative transfer theory, first formulated in astrophysics, has been developed and applied to many scientific disciplines including mathematical physics, neutron diffusion, atmosphere and ocean optics, and biomedical optics. In Earth science, radiative transfer is an indispensable tool to understand how light interacts with atmosphere-land or atmosphere-ocean system and how

it can be used to monitor and study environmental change. In this talk I will overview the radiative transfer theory, with an emphasis of the polarization nature of electromagnetic waves. A few on-going researches in our group will be given to illustrate the applications of radiative transfer theory, which include light scattering properties of Emiliania huxleyi, the use of polarized light for Secchi disk for water turbidity measurement, aerosol and ocean color remote sensing using multi-wavelength, multi-angle polarimetry.

Name: Dr. Zhibo Zhang
Title: We are ACROS: Aerosol-Cloud-Radiation Observation and Simulation group

POSTER PRESENTATIONS:

Name: Mike Battaglia Jr.
Title: Effects of the Urban Heat Island on Aerosol pH
Abstract:
The urban heat island (UHI) is a meteorological phenomenon where the temperature in an urban environment is higher than the surrounding rural and suburban environments. Aerosol pH is a critical parameter of the atmosphere determined by composition and atmospheric water content that plays and important role in atmospheric chemistry, and deleterious health effects of aerosols. In this study, we seek to evaluate how the UHI alone affects aerosol pH in the Baltimore area independent of aerosol composition.

Name: Anthony Bratt
Title: The Sensitivity of NIR Radiances Observed by OCO-2 with
Respect to Radiative Transfer Properties of Aerosols

Name: Brian Carroll
Title: Low-level jets and boundary layer event observations from the
Plains Elevated Convection at Night (PECAN) campaign

Name: Reed Espinosa
Title: Aerosol Retrievals from Imaging Nephelometer Scattering Measurements

Name: Anin Puthukuddy
Title: Microphysical properties of Volcanic ash

Name: Brent McBride
Title: Preparing to Launch UMBC's First Full Feature Earth Sciences Satellite: The Hyper-Angular Rainbow Polarimeter (HARP)
Abstract:
Advancements in polarized remote sensing and miniaturization of technology come together to provide an unprecedented view on aerosol and cloud microphysics, on UMBC's Hyper-Angular

Rainbow Polarimeter CubeSat instrument, with an eye towards reducing the uncertainty and increasing the confidence level of climate-related measurements. This poster explains the project motivations, the calibration procedure, and the science analysis of hyperangular cloud imagery provided by the HARP instrument suite.

Name: Dr. Amita Mehta
Title: Overview of Global Precipitation Measurement (GPM) Mission Data and Applications

Name: Dan Miller
Title: Using LES to understand the difference between si-spectral and polarimetric passive cloud remote sensing techniques

Name: Lipi Mukherjee
Title: Mixing Single Scattering Properties in Vector Radiative Transfer for Deterministic and Stochastic Solutions

Among the primary factors, which determine the polarized radiation, field of a turbid medium are the single scattering properties of the medium. When multiple types of scatterers are present, the single scattering properties of the scatterers need to be properly mixed in order to find the solutions to the vector radiative transfer theory (VRT). The VRT solvers can be divided into two types: deterministic and stochastic. The deterministic solver can only accept one set of single scattering property in its smallest discretized spatial volume. When the medium contains more than one kind of scatterer, their single scattering properties are averaged, and then used as input for the deterministic solver. The stochastic solver, can work with different kinds of scatterers explicitly. In this work, two different mixing schemes are studied using the Successive Order of Scattering (SOS) method and Monte Carlo (MC) methods. One scheme is used for deterministic and the other is used for the stochastic Monte Carlo method. It is found that the solutions from the two VRT solvers using two different mixing schemes agree with each other extremely well. This confirms the equivalence to the two mixing schemes and also provides a benchmark for the VRT solution for the medium studied.

Name: Chamara Rajapakshe
Title: Using CATS to understand the relative vertical distribution of smoke aerosols and MBL clouds in SE Atlantic

The relative distribution of smoke aerosols and Marine Boundary Layer (MBL) clouds in South-East (SE) Atlantic region is investigated by using new NASA's space-borne lidar CATS (Cloud-Aerosol Transport System) at ISS (International Space Station). The smoke layer is found to be much closer to the underlying clouds than previously expected from CALIPSO (Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation) Observations. This suggests potentially important microphysical indirect effects of smoke aerosols through cloud top entrainment.

Name: Dr. Hua Song

Title: Evaluation of CAM simulations of MBL clouds using satellite date: Conventional sub-grid scheme vs. CLUBB

Abstract:
This study presents a two-step evaluation of the marine boundary layer (MBL) cloud properties from two Community Atmospheric Model (version 5.3, CAM5) simulations, one based on the CAM5 standard parameterization schemes (CAM5-Base), and the other on the Cloud Layers Unified By Binormals (CLUBB) scheme (CAM5-CLUBB). In the first step, we compare the cloud properties directly from model outputs between the two simulations. In the second step, we use satellite observations from CERES, MODIS and CloudSat to evaluate the simulated MBL cloud properties by employing the COSP satellite simulators.

Name: Qianqian Song
Title: A Study of dust direct radiative effects over the whole spectrum: Background and Preliminary results

Name: John T Sullivan
Title: New Insights on "Next Day" Ozone Increases in the Northeastern U.S. using Continuous Vertical Profiles of Ozone

Abstract:
A unique multi-day air quality event occurred throughout the Mid-Atlantic region from June 9-12, 2015. The June event was coupled to the advection of widespread smoke and debris from western Canada throughout the region. Observations indicated that the aged smoke impacted the Planetary Boundary Layer (PBL) and greatly enhanced ozone concentrations at the surface. Many ground sites in the region, particularly in Maryland, recorded 8-hr ozone concentrations that were in exceedance of the 75 ppb EPA National Ambient Air Quality Standard (NAAQS). After the high O3 episode occurred, a nocturnal low-level jet developed throughout the Mid-Atlantic region, which was spatially correlated with next day high O3 at several sites within the New England region. During this event, nearly continuous vertical profiles of ozone are presented at Beltsville, MD from the NASA Goddard Space Flight Center TROPospheric OZone DIfferential Absorption Lidar (GSFC TROPOZ DIAL), which has been developed and validated within the Tropospheric Ozone Lidar Network (TOLNet). Lidar observations reveal a well-mixed polluted PBL, nocturnal residual layer, and subsequent mixing down of the residual layer in the morning. Additional measurements of surface ozone, aerosol lidar profiles, wind profiles, and balloon borne profiles are also presented. Model output and trajectory analyses are also presented to illustrate the complex flow regimes that occurred during the daytime and nighttime to help redistribute the polluted air mass.

Name: Marwa Al-Sayed
Title: A novel method for the characterization of the reversibility of secondary organic aerosol formed through aqueous processes (aqSOA)

Abstract:
The relative contribution of reversible and irreversible uptake processes is a major unknown in our understanding of atmospheric secondary organic aerosol formed in aerosol water (aqSOA).

A new method is presented for the characterization of the reversible/irreversible nature of aqSOA utilizing simultaneous measurements of water soluble organic carbon in the particle (WSOCp) and gaseous (WSOCg) phases. The central feature of this approach is the behavior of WSOCp under conditions of drying, reversible and irreversible aqSOA are defined based on the ratio of dry to ambient WSOCp during the periods where aqSOA is formed.

Name: Dr. Frank Werner
Title: Effects of cloud inhomogeneity on cloud property remote sensing

Name: Dr. Glenn Wolfe
Title: Airborne Eddy Covariance Measurement of Greenhouse Gas Fluxes: A Bridge from Flux Tower to Landscape Scales
Abstract:
The terrestrial biosphere is a significant source and sink of carbon dioxide and methane, two of the most potent greenhouse gases. Our group has assembled and deployed a powerful airborne system for direct measurements of surface-atmosphere exchange of CO2, CH4, H2O and heat at ecosystem and policy-relevant scales of 1 - 100 km. Here we review the mission concept and explore potential applications of this novel data set, which may provide both a benchmark for biophysical process models and a ground-truth reference for high-level remote sensing products.

Name: Dr. Leonid Yurganov
Title: Satellite remote sensing of current atmospheric methane trends: Arctic and USA. Abstract: Atmospheric methane plays an important role in the current climatic change.
Recent satellite results of CH4 remote sensing measurements in the Arctic and USA are presented and compared with NOAA global network data