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Sea to Space Particle Investigation

Feb 9, 2017
"Greetings from Middle of Nowhere, Pacific Ocean,

We successfully retrieved both the sediment trap and the Wirewalker yesterday. The weather was really bad, and the seas had that boiling look to them, one that provokes the fear and the awe. I am not sure who called the Pacific "pacific", because yesterday was anything but peaceful. HyperSAS has been well rinsed, and re-rinsed, and re-rinsed.*

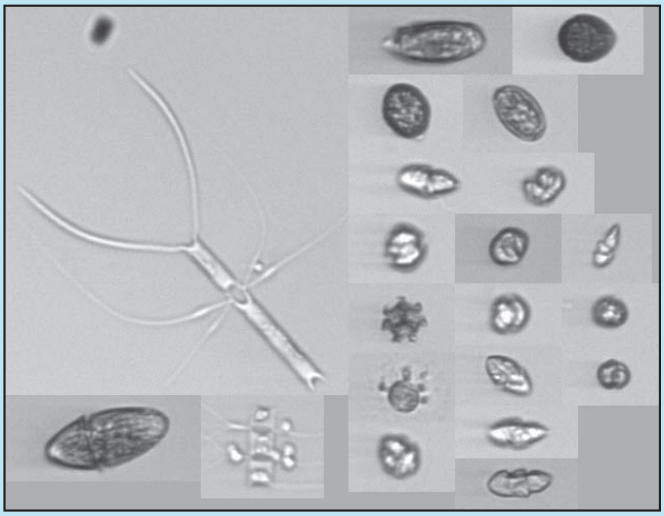
One of the sediment traps has a contraption that is housing a used iPhone, taking images of the settling particles. It is great to see how this … investment can provide an amazing view into the world down below. Although the video of the particles falling into the trap was quite amusing, what surprised me the most was the sunlight that was present in the video. During the sunny day, there were 3 hours of very blue, but significant, light at 180m depth. That gives you a really good idea how particle-poor these waters are. …" (abridged e-mail correspondence from Ivona Cetinić, Feb 9, 2017, reprinted with her permission)

**See the video "Rough Recovery", posted Feb 10, 2017, in which the Wirewalker and Sediment Trap resurface and are retrieved: https://www.youtube.com/watch?v=UTPmTz57ZrQ.*

Studying data and imagery from Ocean Color Satellites along with *in-situ* data from various instruments, which include the Wirewalker and Sediment Traps, provides a more comprehensive overview of the health of marine life and the ocean. Satellites from space will display certain colors of seawater and these ocean colors indicate the presence of specific particles. This past January and February 2017, **Ivona Cetinić** (616/USRA) was Chief Scientist of the Sea to Space Particle Investigation, working along with fellow members of NASA GSFC's Ocean Ecology Lab (Code 616): Antonio Mannino (GSFC), Aimee Neeley and Ryan Vandermeulen (both SSAI), and Stephanie Schollaert Uz (GST). Eleven other scientists completed the 16-member science team, plus Kirsten Carlson, Artist-at-Sea. The study was conducted on the Research Vessel (R/V) Falkor, owned by the Schmidt Ocean Institute, "a private non-profit operating foundation established to advance oceanographic research, discovery, and knowledge, and catalyze sharing of information about the oceans." (Visit https://schmidtocean.org/ for more information on SOI's mission and Falkor.) We recently discussed some of the experiences from the campaign with Dr. Cetinić.

You mention in your e-mail excerpt that the light there is "very blue, but significant, at 180m deep, which demonstrates how particle-poor the waters are." If the water was particle-rich rather than –poor, would the water not still be blue?

Measuring light at depths of 180m is really cool. In most oceans, sunlight disappears really fast and certain portions of the spectra (blue) disappear really fast; only the green/yellow portions of the spectra get transferred deep into the ocean. The deeper the light propagates in the ocean, the deeper the phytoplankton can be in the ocean and still survive (they need light to photosynthesize). I have measured light at those depths before (e.g., mid-Adriatic, very clear water), but I've never seen it. It's a different sensation when one sees light and measures light. I'm a scientist, but still a naturalist-I like to see things with my own eyes.
(cont'd on page 2)



Various types of phytoplankton. Image Credit: I. Cetinić

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(Sea to Space, cont'd)

What determined selecting this particular location for your team's research?
We were looking for diverse oceanic environments – this transect from Hawaii to the West Coast of US allowed us to sail through oceanic desert (oligotrophic ocean) and oceanic forest (coastal eutrophic ocean).

From an unscientific point of view, we might see a grey ocean and think it is grey because it's a cloudy day. Another example is shallow water is clearer, but a darker color indicates deeper waters. Your team's research is based on findings below the surface – how do these unscientific impressions compare to what the team was seeing?
The color of the ocean depends on many different things – if the sky is cloudy, the ocean will look different than on the sunny days, since the quality (spectra/intensity) of light that is reaching the ocean (and interacting with ocean and particles in it) is different in each of those two days. If you are in shallow waters, yes – the color of the ocean will be dependent on the reflection of the bottom – if it is sand, it will be lighter (e.g., Bahamas) or dark (e.g., Chesapeake). I work with the deep ocean, where the influence of the bottom's surface is not taken into consideration. But when we observe ocean from space we take into consideration all of these things, and try to extract knowledge about the particle (and dissolved material) composition in the water. That is why we are continually measuring everything (particle composition, in-water optical properties, sunlight, and ocean color) so we can make good algorithms afterwards.

In this Sea to Space Particle Investigation, the main particles studied were various types of phytoplankton; were there other particles that the team was researching? Were there any surprising discoveries?
We looked at the whole suite of the oceanic particles – inorganic particles (either sediment, or inorganic detritus), organic detritus – parts of decomposing bodies of plankton, and bacteria. All of them contribute to ocean color. However, phytoplankton is what we were mostly after. I was surprised by the composition of the living particles in the surface waters close to Hawaii: while larger phytoplankton abundance was low, a significant number of them belonged to coccolithophores, beautiful algae that have shell made of calcium carbonate. On the other hand, the composition of the exported particles, captured in the same waters, showed a completely different composition, one dominated by radiolarians, zooplankton that contains symbiotic algae (which was not abundant in the surface). This is just one occurrence that confirmed the complexity of plankton's role in oceanic carbon cycle – something that I hope to study for many years to come.

Would you share some of the team's challenging moments? Also, having instruments onboard allowed for quicker data analysis, correct?
We had a couple of interesting things happen: a shark attack on the Wirewalker (the platform was fixed, thanks to Falkor's amazing engineers), parts of the systems melted, or just stopped working. We had to disassemble a couple of instruments, and fix and rebuild them within a day or two. All of us have different backgrounds, but being operational oceanographers, we were ready to improvise. An oceanographer's best friends are duct tape, zip ties and electrical tape. Having such a large number of instruments onboard the ship not only allowed us to analyze and view the data on the spot, but also it allowed us to inform the sampling – targeting certain features. If you look at our cruise track, it might seem that on certain portions of the cruise, we were doing [silly] zig-zags, but we were actually following a specific water mass, and navigating the ocean using the real-time data provided by our instruments.

What will the team do with the results?
The dataset that we have collected is really big. It will be used to address how to connect ocean color and phytoplankton diversity in order to understand the role that certain phytoplankton groups have in the oceanic carbon cycle. [We] will focus on exploring the connection of phytoplankton diversity and hyperspectral measurements of ocean color.
(cont'd on page 3)

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(Sea to Space, cont'd)

Throughout the campaign, updates on the Falkor cruise were provided at https://schmidtocean.org/cruise/sea-space-particle-investigation/, a blog post on NASA Earth Expeditions detailed the field work here: https://blogs.nasa.gov/earthexpeditions/2017/01/30/why-ocean-particles-why-nasa/, and scientists from Falkor contributed to the Sea to Space Blog on Earth Observatory: https://earthobservatory.nasa.gov/blogs/fromthefield/category/sea-to-space/. The team also posted engaging and informative YouTube videos; Week 1: Introduction is posted here: https://www.youtube.com/watch?v=XJi9M8wfQXg. We encourage readers to view the videos for more insight into the research, collaboration, instrumentation and operations behind the Sea to Space Particle Investigation.

Feb 1, 2017
"… As a side note, the URI and Brown team [S2S scientists] have started loading holographic imagery of phytoplankton and real-time oceanographic data into the virtual reality. I cannot find words to explain how cool it is to dive into the phytoplankton sample or to walk through the curtains of temperature data profiles. Just out of this world. We are hoping in the next couple of days to combine Wirewalker profiles (as soon as they process them) with ocean color images and multibeam-based bathymetry, and then - we will have a true 3-D ocean holodeck. … New generation oceanography. We are already there and it is awesome."
(e-mail correspondence from Ivona Cetinić, Feb 1, 2017, reprinted with her permission)

Digging into Snow Ex

A key term to know when it comes to the SnowEx field campaign is SWE, which stands for Snow-Water Equivalent. Snow in another form is water, which is necessary for sustaining life, for growing crops, for generating power; snow and water are needed for enjoying outdoor sports, activities and exercise. The SnowEx campaign, a multi-year project, began in mid-2016 with background research, discussion, and planning. According to the campaign's site, "The first year focuses on testing multiple sensing techniques in forested environments — a challenging situation for snow retrievals. Overall, more than 100 people from other government agencies, universities, and other countries are participating. Members of the SnowEx airborne campaign include Edward Kim - Project Scientist, **Charles Gatebe** (613/USRA) - Deputy Project Scientist, and Jerry Newlin - Project Manager. **Ludovic Brucker** (615/USRA), Chris Crawford, D.K. Kang, and Dorothy Hall are also members of the organizing team for Year 1."

Year 1 activities, which began in February 2017, were held in Grand Mesa, Colo. and a second site in Senator Beck Basin, Colo. From Feb. 6-24,
(cont'd on page 4)

Density measurements being performed by Gus Goodbody. A 1000 cc sample of snow is extracted and weighed to calculate its water equivalent. Picture by HP Marshall. From SnowEx Winter Campaign 2017, Flickr site.

(Snow Ex, con'td)

a variety of remote sensing instruments were employed to acquire the SWE data measurements. This data will be compared to measurements obtained in the same area without snow (from September 2016). Data acquired in Year 1 will be analyzed in Year 2, and will inform future planning. The remainder of data collection will occur in 2019-2021. During February's field campaign, ground data and airborne data were collected daily. Analysts known as "data wranglers" verified the accuracy of the data collection, ran the data through respective models, conducted comparisons and reported back to the team the following day in order to make any necessary adjustments to field operations and the next day's data collection.

As explained on the SnowEx site, "[Scientists] will use a unique combination of sensors, including LiDAR, active and passive microwave, an imaging spectrometer and infrared sensors to determine the sensitivity and accuracy of different remote sensing techniques for measurement of SWE. Ground-based instruments, snow field measurements and modeling will all also be required to help address the science questions. … The overarching question that SnowEx will address is: How much water is stored in Earth's terrestrial snow-covered regions?" See https://snow.nasa.gov/snowex.

As with many campaigns, capturing data from more than one source or sensor does not provide a comprehensive view. With SnowEx, relying on synthetic aperture radar (SAR) alone to retrieve SWE in forested areas would not provide an accurate picture; this specialized field campaign uses a multi-sensor approach, which includes SAR. Additionally, "a similar problem exists in the temporal domain, where the snow melt period … is of primary interest for practical reasons. Wet snow is radiometrically "opaque" in the microwave frequencies, making [it difficult to measure] SWE. However, lidar is insensitive to the snow wetness and can provide a measure of snow depth even when the snow surface contains a high fraction of liquid water."

Charles Gatebe looking at snow crystals at Grand Mesa. Shared by Amaya Odiaga. Image credit: SnowEx Winter Campaign 2017, Flickr site

According to the NASA iSWGR website (International Snow Working Group Remote Sensing), "[Snow] is equally important in our efforts to predict the future trajectory Earth's climate, in which snow plays an outsized role. Snow properties like albedo, surface roughness and thermal conductivity control the surface energy budget when the ground is snow-covered. We can succinctly summarize the importance of snow to life on earth by stating *Snow: it quenches our thirst and cools our planet.*"

Many news articles about this campaign have been published and are posted at this link: https://snow.nasa.gov/news. Additionally, further information is available in the video "NASA Investigates Water Supply in Snow" – posted Feb 16, 2017 (credits include **Joy Ng** as Lead Producer and **Katie Mersmann** as Support, both 130/USRA) at https://svs.gsfc.nasa.gov/12511.

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maniac talks

GESTAR thanks the following scientists who presented talks over the winter: Venkat Ramaswamy (NOAA/Princeton University) – Nov; **Michael Kurylo** (614/USRA) - Nov; and Arlin Krueger (614/GSFC) – Feb 2017. If you missed any of these or other past talks, you can view them online at the NASA Goddard Atmospheric Sciences page: http://atmospheres.gsfc.nasa.gov/ext/maniacs/. **Assaf Anyamba, Charles Gatebe** and Bill Hyrbyk are the team behind this successful seminar series.

New Hires

GESTAR welcomes the following members:
Angie Espiritu, Advisory Contract Specialist
Maudood Khan, Short-Term Visiting Scientist
Jana Kolassa, Scientist II
Pukar Amatya, Visiting Scientist
Ian Paynter, Visiting Scientist
Sandeep Chittimalli, Visiting Scientist
Abigail Seadler, Senior Science Communicator

As of February 13, 2017, **Angie Espiritu** joined USRA as Advisory Contract Specialist and supports GESTAR. She has experience with senior-level federal, state and commercial contracts, subcontracts, and various compliance matters. Any issues and/or questions regarding grants or CADs for GESTAR should come to Angie. She will work out of USRA Headquarters as well as Goddard - please stop by Building 33, Room H104 to say hello and introduce yourself!

Moving On

Yuekui Yang (Civil Servant-NASA Goddard)
Charles Malespin (Civil Servant-NASA Goddard)
Kerry Meyer (Civil Servant-NASA Goddard)
David Lagomasino (Univ of MD)
Zbynek Malenovsky
Monique Walker
Jason Sippel
Stacey Kannon
Debra Matthews

Grants Awarded

NASA ROSES-16 Aura Science Team and Atmospheric Composition Modeling and Analysis Program (ACMAP) Proposal Awarded: "Constraining the global and hemispheric abundances of the hydroxyl radical (OH): A search for methyl chloroform (CH3CCl3) alternative", PI: **Qing Liang**; Co-I's: Eric Fleming and Paul Newman; P.O.P: 2/17/17-2/16/20.

NASA ROSES-16 Aura Science Team/ACMAP Proposal Awarded: "Understanding stratospheric water vapor and ozone feedbacks and their impacts on global warming", PI: **Feng Li**; Co-I and Collaborator: Paul Newman and Margaret Hurwitz; P.O.P.: 3/01/17-2/29/20.

NASA ROSES-16 Aura Science Team/ACMAP Proposal Awarded: "Quantifying the effects of stratosphere - troposphere exchange on tropospheric ozone interannual variability and trends, radiative forcing, and air quality", PI: **Junhua Liu**; Co-I's: **Mark Olsen**, **Sarah Strode**, Joanna Joiner, and Bryan Duncan; P.O.P.: 3/01/17-02/29/20.

NASA ROSES Upper Atmospheric Composition Observations (UACO) Program Proposal Awarded: "TICOSONDE: Balloon Sonde Observations of Tropical Water Vapor and Ozone at Costa Rica in Support of Continued Capability for Calibration and Validation of Satellite Measurements", PI: **Henry Selkirk**; Science PI: Holger Vömel: Co-Is: Anne Thompson and Jorge Andrés Diaz; Collaborators: Gary Morris, Sean Davis, Leonhard Pfister and **Ghassan Taha**; P.O.P.: 1/01/17-12/31/20.

Terrestrial Ecology: An Airborne Campaign for the ArcticBoreal Vulnerability Experiment (ABoVE) Proposal Awarded: "GEOS-5 Forecasting and Modeling in support of ABoVE airborne research", PI: **Abhishek Chatterjee**, Co-Is: Ben Poulter, Jeff Masek, Lesley Ott, Charles Miller, Eugenie Euskirchen; Collaborators: Bryan Duncan, Steven Pawson, and Joshua Fisher; P.O.P.: 1/01/17-12/31/20.

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Awards Ceremonies

On November 2, 2016, the Earth Sciences Division - Atmospheres (Code 610AT) Awards Ceremony was held at NASA GSFC. Four GESTAR members were recognized with Performance Awards.

Yuekui Yang (613/USRA), Outstanding Performance – Outreach: "For contributions to generating enhanced DSCOVR/EPIC RGB images".

Nayeong Cho (613/USRA), Outstanding Performance – Science: "For performing high quality analysis on coincident data from A-Train and other datasets".

Edward Nowottnick (614/USRA), Outstanding Performance – Science Software Development: "For development and testing of the CATS-ISS aerosol typing algorithm".

Melanie Follette-Cook (614/MSU), Outstanding Performance – Technical Support: "For outstanding scientific performance on the DISCOVER-AQ field campaign and post-mission analysis and modeling".

In December, **Lok Lamsal** (614/USRA) and **Cecile Rousseaux** (610.1/USRA) were each selected to receive a USRA President's Award, which recognizes outstanding achievements. Awards fall into three categories: USRA Distinguished Service Award, USRA Individual Excellence Award and USRA Team Excellence Award. This is the inaugural year for these awards. They will be recognized along with others at a ceremony in March 2017.

Dr. Lamsal received a USRA Individual Excellence Award: "Lok Lamsal's work on global nitrogen dioxide monitoring has had a marked effect on pollution control efforts worldwide. He was honored twice this year by NASA, receiving the Robert H. Goddard Exceptional Achievement Award for Science, and the Laboratory for Atmospheres' Award for Outstanding Performance in Science. Lok's work resulted in one of the most downloaded papers in 2015 in the journal Atmospheric Science, and was featured prominently in the recent video "President Obama Explains How Pollution Affects Our Planet - YouTube."

Dr. Rousseaux also received a USRA Individual Excellence Award: "Cecile Rousseaux's contributions to oceanographic biogeochemistry include co-authoring 15 peer-reviewed articles since GESTAR's inception in 2011, helping to elucidate the complex interactions between atmospheric carbon and the oceans. As a scientist, Cecile exhibits extraordinary energy and passion for discovery, serving as Principal Investigator (PI) on two NASA-funded proposals and co-PI on five others. She has also played an exceptional role in the National Academy of Sciences 2017 Decadal Survey, and is leading the NASA Goddard Ocean Focus Group."

On January 13, 2017, Goddard's Climate and Radiation Laboratory (Code 613) held its annual party and awards ceremony at the Goddard Rec Center. Three GESTAR members received a certificate and monetary award.

Jie Gong (613/USRA), For Best First-Authored Paper: "For her creative study revealing the importance of horizontally oriented ice particles in the transfer of polarized microwave radiation though ice clouds."

Benjamin Marchant (613/USRA), also For Best First-Authored Paper: "For his paper documenting significant improvement to the MODIS phase algorithm, an essential first step in obtaining useful cloud optical property retrievals."

Sergey Korkin (613/USRA) received a Special Award for an Act of Exceptional Merit, Beyond the Call of Duty: "For the development of the polarized radiative transfer code SORD and its integration into the AERONET v3 processing algorithm."

On February 6, 2017, Goddard's Mesoscale Atmospheric Processes Laboratory (Code 612) held its awards ceremony at NASA GSFC; this year, one GESTAR member was recognized for his work. Each awardee received a plaque, a certificate and a monetary award.

Mircea Grecu (612/MSU) was honored with a Contractor Award for Best Scientific Paper: "For an outstanding paper describing the remote sensing of precipitation using a combination of satellite-based radar and passive microwave radiometer data." The paper's citation reads as follows: **Mircea Grecu**, William S. Olson, Stephen Joseph Munchak, Sarah Ringerud, **Liang Liao**, Ziad Haddad, Bartie L. Kelley, and Steven F. McLaughlin (2016), "The GPM Combined Algorithm," J. Atmos. and Oceanic Tech., 33 (10), 2225-2245, doi:10.1175/JTECH-D-16-0019.1.

(Awards Ceremonies, cont'd)

On February 23, 2017 NASA Goddard's Global Modeling and Assimilation Office (GMAO) held its annual Peer Awards Ceremony. This year's awardees included three GESTAR scientists, who each received a certificate and individual monetary awards.

Allison Collow (610.1/USRA), For Outstanding Scientific Contribution by a New GMAO Member: "Your insightful use of MERRA-2 data to develop an analysis of the influences of the large-scale weather on extreme precipitation events in the North East United States."

Abhishek Chatterjee (610.1/USRA), For Outstanding Scientific Contribution by a New GMAO Member: "For helping advance the status of GMAO's carbon modeling efforts by becoming a PI on two NASA proposals and for organizing sessions at AGU, AMS and the North American Carbon Program (NACP) meeting."

Clara Orbe (610.1/JHU), For Scientific Achievement: "In recognition of your ongoing and recent contributions to the diagnosis and understanding of constituent transport in the GMAO's systems that have strong implications for our studies of atmospheric chemistry and the carbon cycle."

In the Press

Hiren Jethva (614/USRA), interviewed for The Hindu newspaper article titled "Crop Fires in Punjab and Pakistan fuelled Delhi Pollution" (Nov 9, 2016): http://www.thehindu.com/news/cities/Delhi/%E2%80%98Crop-fires-in-Punjab-and-Pak.-fuelled-Delhi-pollution%E2%80%99/article16441712.ece

(In the Press, cont'd)

Assaf Anyamba (618/USRA), interviewed by the Microbiology Society for a Microbe Post article titled "On the Horizon: Rift Valley Fever" (Nov 15, 2016): https://microbepost.org/2016/11/15/on-the-horizon-rift-valley-fever/

Ivona Cetinic (616/USRA), quoted in an Earth Observatory Image of the Day (EO IOTD) article titled "Aglae Bloom or Swirling Sediment," (Nov 23, 2016): https://earthobservatory.nasa.gov/IOTD/view.php?id=89154&src=eoa-iotd

Pawan Gupta (614/USRA), interviewed for Bloomberg article "The World's Most-Polluted Region Faces a Conundrum" (Dec 14, 2016): https://www.bloomberg.com/news/articles/2016-12-14/good-rains-that-lead-to-bad-pollution-highlight-india-s-dilemma

Andy Sayer (613/USRA), quoted in EO IOTD article titled "Smog Puts Dozens of Chinese Cities on Red Alert," (Dec 24, 2016): https://earthobservatory.nasa.gov/IOTD/view.php?id=89344&eocn=home&eoci=iotd_title

Hiren Jethva (614/USRA), interviewed for EO News article titled "Using Satellites to Size Up the Severity of Crop Fires in Northern India," (Feb 8, 2017): https://earthobservatory.nasa.gov/blogs/earthmatters/2017/02/08/the-crop-residue-fires-in-northern-india-were-the-most-severe-in-more-than-a-decade/

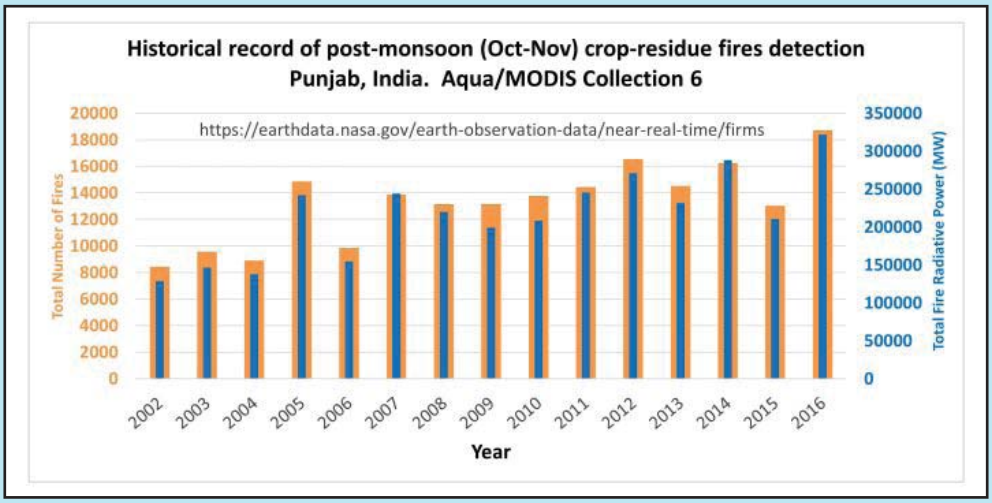

*Chart by **Hiren Jethva** (614/USRA) based on MODIS data. Included in the Earth Observatory News article referenced above, "Using Satellites to Size Up the Severity of Crop Fires in Northern India". Credit: H. Jethva.*

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Science Highlights

2016 & 2017 – Atmospheric Sciences

November: "Validation of Nonspherical Ice Particle Models for Precipitation Remote Sensing", W. Olson, **Lin Tian** (612/MSU), **Mircea Grecu** (612/MSU), K.-S. Kuo, B. Johnson, A. Heymsfield, A. Bansemer, G. Heymsfield, J. Wang, and R. Meneghini

January: "Microphysically detailed precipitation retrievals using the GPM Combined Algorithm", **Mircea Grecu** (612/MSU), W. S. Olson, S. J. Munchak, S. Ringerud, **Liang Liao** (612/MSU), Z. Haddad, B. Kelley and S. F. McLaughlin

January: "Spectral observations support the hypothesis of inhomogeneous mixing", **Weidong Yang** (613/USRA) and A. Marshak (NASA/GSFC)

January: "Clouds at High Resolution: ASTER Cloud Optical Retrievals", F. Werner, G. Wind, Z. Zhang, S. Platnick, L. Di Girolamo, G. Zhao, N. Amarasinghe, and **Kerry Meyer** (613/USRA)

January: "The anomalous change in the 2015–2016 Quasi-Biennial Oscillation", P. A. Newman, L. Coy, S. Pawson, and **Leslie Lait** (614/MSU)

February: "Trends of Mean and Extreme Precipitation", **Yaping Zhou** (613/MSU) and W. K. Lau

2016 & 2017 – Hydrospheric and Biospheric Sciences

November: "Landslides and Precipitation for Hurricane Matthew: Status from 10-4-2016", D. Kirschbaum and **Thomas Stanley** (617/USRA)

February: "OIB Data Reveal New Pathway for Greenland Meltwater to Reach the Ocean", K. Poinar, I. Joughin, D. Lilien, **Ludovic Brucker** (615/USRA), L. Kehrl, and S. Nowicki

February: "Improved ice fraction model for sea surface salinity remote sensing", E. Dinnat and **Ludovic Brucker** (615/USRA)

Stay Tuned

- Planning is underway for two communications training sessions for GESTAR members, tentatively scheduled for May 2017. The first session will focus on tutorials for media use, writing, interviewing, video, storytelling, etc. The second session will be in a speed-dating format and consist of exchanges between communications professionals/trainers/advisors and those with technical/science backgrounds. Details and logistics are being worked out.

- May 11, 2017 will mark the start of GESTAR's Year Seven! GESTAR hopes to secure a date for an end-of-year celebration, to reflect on this past year's achievements and memorable moments and to look ahead to its seventh year. Watch your inbox for further information.

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SED Poster Party

This year marked the 10th Annual Sciences and Exploration Directorate (SED) Poster Party! The event was held in the Atrium of Building 28 on Wednesday, January 18th. Of the 155 poster presentations on display, GESTAR scientists were lead authors of 17 posters: **Sarah Strode** (614/USRA), **Manuela Girotto** (610.1/USRA), **Allison Collow** (610.1/USRA), **Melanie Follette-Cook** (614/MSU), **James Wang** (614/USRA), **K. Emma Knowland** (610.1/USRA), **Aakash Ahamed** (617/USRA), **Daniel Holdaway** (610.1/USRA), **Young-Kwon Lim** (610.1/IMSG), **David Lagomasino** (618/USRA), **Sergey Korkin** (613/USRA), **Kerry Meyer** (613/USRA), **Adrian Southard** (699/USRA), **Santiago Gassó** (613/USRA), **Brad Weir** (610.1/USRA), **Yingxi Shi** (613/USRA), and **Richard Damoah** (618/MSU). In addition, several GESTAR members were co-authors of 15 posters.

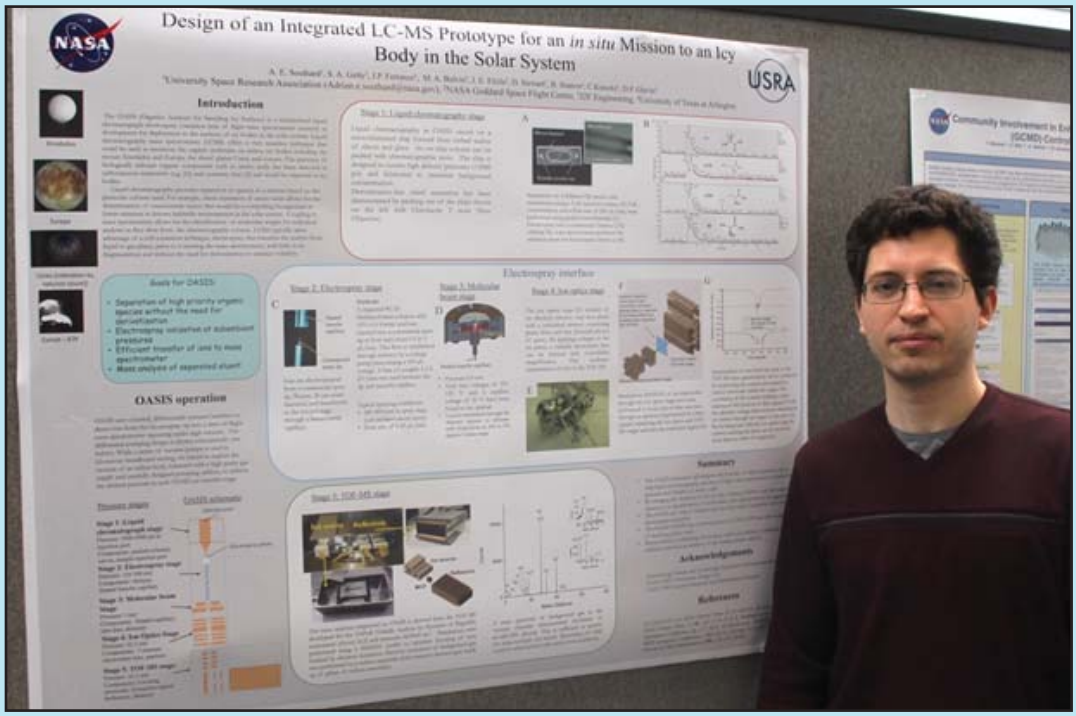
Hyperwall presentations were given on the second floor by Elizabeth Ferrara (Astrophysics), Giada Arney (Planetary), Alexa Halford (Heliophysics), and Steven Pawson (Earth). As always, the Science as Food Contest provided creative entries: items included a dark chocolate stout cake decorated as a lunar eclipse, a cake decorated with "NASA Worldview," and a culinary interpretation of an Active Galactic Nuclei, which the FERMI team made with cake, fondant, and marshmallows.

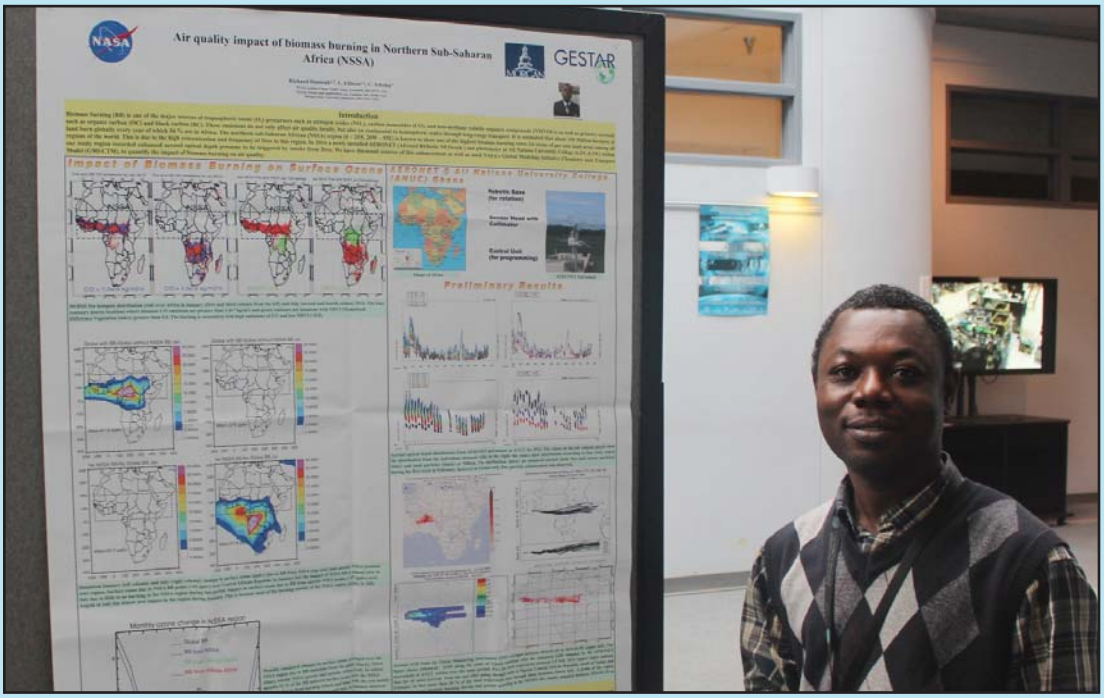
The first Piers J. Sellers Award for Interdisciplinary Science was presented to **Brad Weir** (610.1/USRA) for a poster titled "The Project formerly known as GEOS-Carb" (co-authors include **Tom Oda** and **Abhishek Chatterjee**, also of 610.1/USRA). See additional photos on the following pages.

Brad Weir (610.1/USRA) with the Cricket Bat, Lesley Ott (610.1/GSFC), Colleen Hartman (600/GSFC), and Conor Nixon (690/GSFC). Photo Credit: Jay Friedlander (605/TRAX/GSFC).

(SED Poster Party, cont'd)

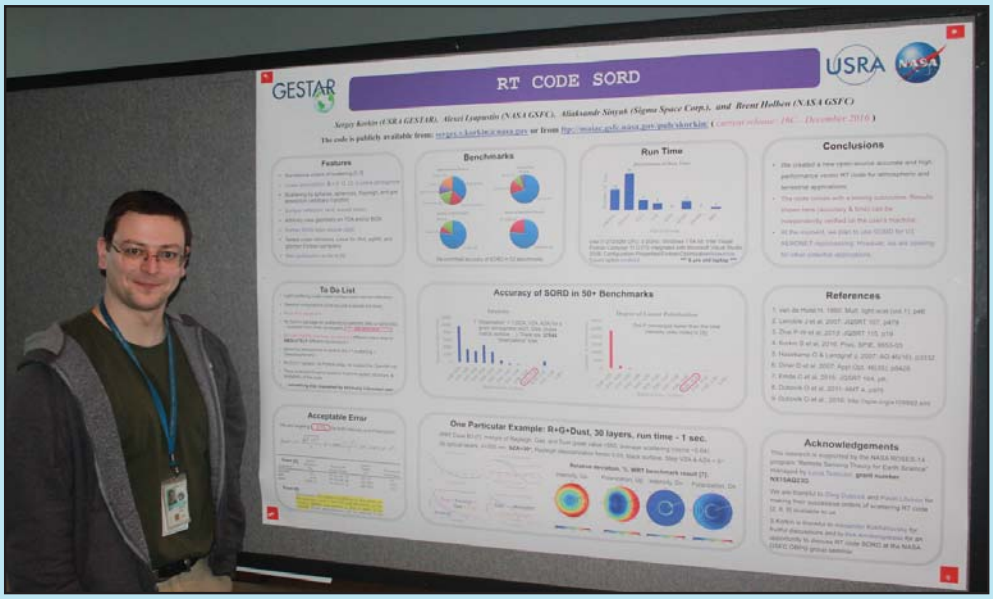
Adrian Southard (699/USRA) with poster "Design of an Integrated LC-MS Prototype for an in situ Mission to an Icy Body in the Solar System". (Image Credit: A. Houghton)





Richard Damoah (618/MSU) with poster "Air Quality Impact of Biomass Burning in Northern Sub-Saharan Africa (NSSA)". (Image Credit: A. Houghton)

(SED Poster Party, cont'd)



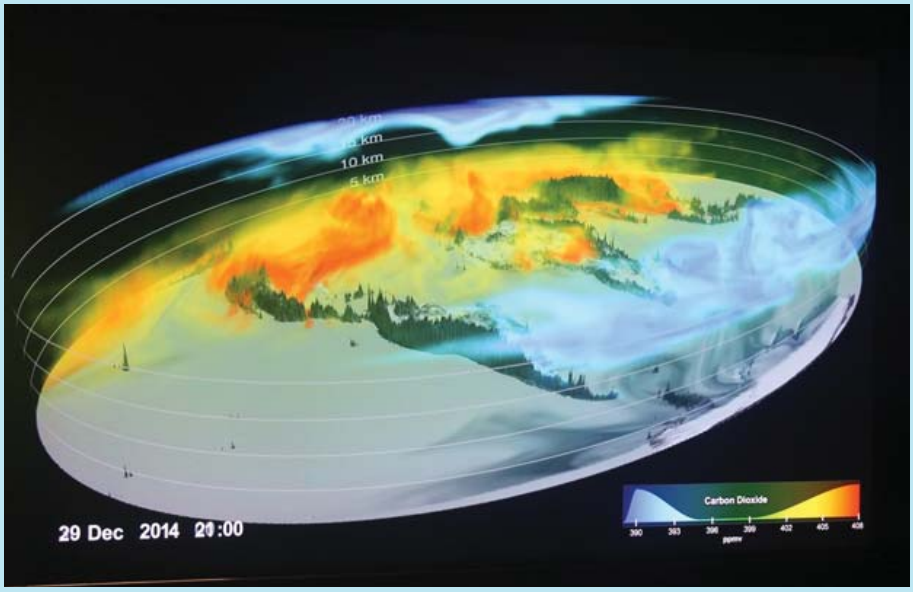
Sergey Korkin (613/USRA) with poster "RT CODE SORD". (Image Credit: A. Houghton)

Staff members of the Scientific Visualization Studio and the Conceptual Image Lab were on hand to discuss elements of visualizations, images, and equipment.

Ernie Wright (606.4/USRA) with a still from his visualization titled "2017 Path of Totality", available here: https://svs.gsfc.nasa.gov/4515. (Image Credit: A. Houghton)

(SED Poster Party, cont'd)

Trent Schindler (606.4/USRA) discussing Virtual Reality (VR) headsets, like Oculus Rift and Google Cardboard. (Image Credit: A. Houghton)



From "Carbon Dioxide in 3-D," this still was presented on-screen; the visualization in its entirety is available at https://svs.gsfc.nasa.gov/12478. Watch satellite observations of carbon dioxide rendered in 3-D travel throughout the world from Sept. 2014 to Sept. 2015. Visualizers/Animators were Greg Shirah and Horace Mitchell; Producers were ***Matt Radcliff*** *(130.1/USRA) and* ***Katie Mersmann*** *(130/USRA); Scientists were Lesley Ott, Steve Pawson and* ***Brad Weir*** *(610.1/USRA); and the Writer was Patrick Lynch. (Image Credit: A. Houghton)*

Recent Publications

Bosak, S., I. Bosnjak, **I. Cetinić**, M. Mejdandzic and Z. Ljubesic (2016), Diatom community in the depths of the south adriatic: an injection of carbon by biological pump, 41st CIESM Congress Proceedings, p. 274.

Bosnjak, I. Petric, **I. Cetinić**, S. Bosak, M. Mejdandzic and Z. Ljubesic (2016), In depth characterization of marine cyanobacteria community: targeting of prochlorococcus ecotypes, 41st CIESM Congress Proceedings, p. 275.

Fowler, D. R, and **H.-N. Kostis** (2016), Collaborative Computer Graphics Product Development between Academia and Government: A Dynamic Model, SIGGRAPH ASIA 2016 Symposium on Education, Article 3, doi:10.1145/2993352.2993358.

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Garfinkel, C. I., **V. Aquila**, D. W. Waugh, and L. D. Oman (2016), Time varying changes in the simulated structure of the Brewer Dobson Circulation, Atmos. Chem. Phys., doi:10.5194/acp-2016-523, in press.

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Kolassa, J., R. H. Reichle, and **C. S. Draper** (2017), Merging active and passive microwave observations in soil moisture data assimilation, Remote Sens. Environ., 191, 117-130, doi:10.1016/j.rse.2017.01.015.

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Lau, W. K, K. Kim, **J. J. Shi**, T. Matsui, M. Chin, C. D. Peters-Lidard, and W. Tao (2016), Impacts of aerosol-monsoon interaction on rainfall and circulation over Northern India and the Himalayan Foothills, Climate Dynamics, doi:10.1007/s00382-016-3430-y.

Polvani, L. M., L. Wang, **V. Aquila**, and D. Waugh (2016), The impact of ozone depleting substances on tropical upwelling, as revealed by the absence of lower stratospheric cooling since the late 1990s, J. Clim., in press.

Mok, J., N. A. Krotkov, A. Arola, O. Torres, **H. Jethva**, M. Andrade, G. Labow, **T. Eck**, Z. Li, and R. Dickerson (2016), Impacts of atmospheric brown carbon on surface UV and ozone in the Amazon Basin, Sci. Rep., 6, 36940; doi: 10.1038/srep36940.

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Orbe, C., D. W. Waugh, H. Yang, J. F. Lamarque, S. Tilmes and D. E. Kinnison (2017), Tropospheric Transport Differences Between Models Using the Same Large-Scale Meteorological Fields, Geophys. Res. Lett., http://dx.doi.org/10.1002/2016GL071339.

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Provençal, S., **V. Buchard**, A.M. da Silva, R. Leduc, N. Barrette, E. Elhacham, and S-H. Wang (2017), Evaluation of PM2.5 Surface Concentrations Simulated by Version 1 of NASA's MERRA Aerosol Reanalysis over Israel and Taiwan, Aerosol and Air Quality Research, 17(1), doi:10.4209/aaqr.2016.04.0145.

Reichle, R. H., **C. S. Draper**, Q. Liu, **M. Girotto**, S. P. P. Mahanama, R. D. Koster, and G. J. M. De Lannoy (2017), Assessment of MERRA-2 land surface hydrology estimates, J. Climate, doi:10.1175/JCLI-D-16-0720.1, in press.

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Stanley, T. and D. B. Kirschbaum (2017), A heuristic approach to global landslide susceptibility mapping, Natural Hazards, 1-20, doi:10.1007/s11069-017-2757-y.

In Remembrance Of
PIERS SELLERS
1955 - 2016

Several gatherings were held in January 2017
to celebrate Dr. Sellers' life and experiences,
his sense of humor, his passion for the Earth
and Space, and his love of exploration and inspiration.

https://www.nasa.gov/feature/goddard/2016/piers-sellers-1955-2016

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GESTAR's End-of Year Holiday Party, November 21, 2016 at the NASA GSFC Rec Center

Benita Bell *(606.3/MSU) and* ***Bill Corso****, GESTAR Director. (Image Credit: A. Houghton)*

Amir Ibrahim, Bridget Seegers, Ivona Cetinic *and* ***Javier Concha*** *(all 616/USRA). (Image Credit: A. Houghton)*

This poster was framed, signed and presented to ***Stacey Kannon*** *(former Contracts Specialist, USRA) at the party as a going-away memento. Several GESTAR members and staff were on hand to thank her and wish her well. (Image Credit: A. Houghton)*

The GESTAR Team:
Universities Space Research Association (USRA), Morgan State University (MSU),
I.M. Systems Group (IMSG), Johns Hopkins University (JHU), Global Science & Technology, Inc.(GST),
and Science and Technology Corporation (STC).
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The GESTAR Newsletter is published by GESTAR/USRA. Any comments/suggestions/ideas can be forwarded to Amy Houghton, Editor at ahoughton@usra.edu.