National Aeronautics and Space Administration

Airborne Science Newsletter

October 2016

What's Inside...

Call for Content

Working on something interesting, or have an idea for a story? Please let us know, we'd love to put it into print.

Contact Susan Schoenung (650/329-0845, susan.m.schoenung@nasa.gov) or Matt Fladeland (650/604-3325, matthew.m.fladeland@nasa.gov).

EVS-2 Missions well under way

Earth Venture Suborbital-2 missions, all 6 of them, have been recently active. Three of them, ATom-1, ACT-America and CORAL are featured in this issue. The others are ORACLES, NAAMES and OMG. ORACLES, utilizing the newly re-winged P-3 and an ER-2, is are currently flying out of Namibia, Africa. ORACLES is focused on measurements of aerosols and cloud microphysics. NAAMES flew on the C-130 in June to capture a phytoplankton bloom in the Atlantic. It also flew earlier in the year (see April newsletter), and is planning for its next mission in 2017. OMG also flew extensively earlier in 2016 and has been flight-testing the GLISTIN Ka-band radar and dropsonde deployment on the JSC G-III, getting ready for the next upcoming set of activities.

ATom

The main goal of ATom is to learn about how the most remote parts of the atmosphere are affected by pollutants emitted on land. Some stunningly dirty air was observed, even in the middle of the ocean, in the subtropics, and in the Arctic, with a lot of pollution coming from biomass fires. Clean air was also observed, especially in the Southern Pacific outside of New Zealand. However, even in the remote region of the Antarctic polar vortex, traces of pollution were detected.

ATom studies the movement and chemical processes that affect the top three greenhouse agents after carbon dioxide – methane,

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The NASA DC-8 in American Samoa during the Summer 2016 ATom field campaign

Operation IceBridge 2016

Operation IceBridge finished up a successful year in the Arctic with a series of campaigns taking measurements of the Greenland ice sheet and Arctic sea ice. The traditional Arctic spring campaign was conducted this year in April and May in conjunction with NOAA using their P-3 hurricane hunter aircraft and the IceBridge suite of laser, radar, optical, and infrared instruments. The campaign conducted 16 science flights totaling 142 flight hours to continue the time series of measurements of ice thickness change to bridge the gap between the end of the ICESat laser altimetry mission and the upcoming launch of ICESat-2.

As a prelude to better understanding seasonal changes in the Earth's ice cover with the year-round measurements of ICESat-2, IceBridge undertook a new campaign this year to measure Arctic sea ice at the height of the melt season in July. The campaign was based out of Barrow, AK using the LaRC HU-25C Falcon equipped with a laser altimeter, and visible and infrared imagers. Spectacular views and measurements of sea ice melt ponds were acquired, and images and interview statements from the campaign were used in a number of prominent media outlets such as the New York Times. After a brief rest back at Langley, the campaign was then relocated to Kangerlussuaq, Greenland in late August to conduct repeat surveys of lines flown earlier in the spring to assess the impact of the summer melt season on the Greenland ice sheet. In total, the summer campaign achieved 23 science flights totaling 109 hours.

Ingia Glacier Terminus as seen from the Langley Falcon. (Jeremy Harbeck, NASA/GSFC)

In mid-September the Falcon transited from Kangerlussuaq to NASA's Armstrong Flight Research Center to quickly transfer the IceBridge laser altimeter and thermal imager to the NASA DC-8 in preparation for the upcoming Antarctic campaign. This careful coordination between NASA centers allowed the project to maximize science hours while in Greenland and ensure smooth transfer of instruments between aircraft for the Antarctic campaign. The Antarctic campaign with the DC-8 will begin in October and will be based out of Punta Arenas, Chile.

Contributed by Nathan Kurtz

A large melt pond as seen from the cockpit of the Langley Falcon (Rick Yasky, NASA LARC)

Directors' Corner

Another Fall season is upon us and I'm sorry to be repetitive for those following the newsletter closely, we've had another busy year. I'm amazed at the scope of missions we have and the places we go to get the science data. As I write, I'm watching (on the ASP asset tracker with special thanks to Aaron Duley and his team) the Global Hawk making its way back to AFRC after spending a month or so at WFF, the JSC GIII flying 2,000 feet over the water around Greenland, the P-3 at Royal Air Force Station Ascension, the ER-2 in Namibia, and the Tempus GIV in Australia. As an added bonus other aircraft like NOAA, NSF and even the DLR GV pop up on the tracker every now and then. Wonder what they are doing… sorry, I digress. Besides updates on the numerous missions, of special note in this edition is the completion of our 8th Student Airborne Research Program class. It's been another busy year with 3598 and counting Earth Science Division flying hours all over the world. I hope everyone gets back safely and is ready for down time with family and friends as the holiday season is sneaking up on us again! Seriously, it's a pleasure working with all of you and both Randy and I can't thank the ASP personnel enough for making it look easy when its not. You spend long hours and ensure that whatever needs doing gets done. On that subject, note that you will also find in this edition recognition of numerous program team members who've been awarded by NASA, their centers and the program for their stellar performances and contributions to the Airborne Science mission. We are proud and appreciative of the Airborne Science team and the way they support our NASA Earth science partners and stakeholders. Be safe and I'll end with my customary "As always, if you have any feedback about this newsletter or the Program – good or bad – please let Randy and me know."

Bruce Tagg and Randy Albertson
Airborne Science Program

EVS-2 *(continued from page 1)*

tropospheric ozone, and black carbon. This series of field campaigns will be the first time scientists will do a comprehensive survey of over 200 gases and aerosol particles all over the world. The majority of the air sampled will be over the Pacific and Atlantic oceans. This summer's trip was the first of four deployments, one in each season over the next three years.

The ATom team back in Palmdale after completion of the first ATom field campaign

Data were collected that not only show where these hundreds of trace gases are hanging out and where they are going, but also how they interact with each other – creating new compounds or destroying others, like methane, and effectively removing them from the atmosphere. Taken together, the data will give the science community a better understanding of how these gases, many of which are pollutants, affect global climate change.

Twenty-two science instruments were onboard the DC-8 for the first ATom field campaign, operated by scientists from NASA's Goddard Flight Research Center, Langley Research Center, and Ames Research Center, as well as scientists from NOAA, NCAR, CIRES, Penn State University, University of Vienna, Caltech, Harvard University, Scripps Institution of Oceanography, University of New Hampshire, and UC Irvine. The ATom Principal Investigator, Steve Wofsy, and Deputy Principal Investigator, Michael Prather, hail from Harvard University and UC Irvine respectively. The ATom project management team is from NASA Ames Research Center's Earth Science Project Office (ESPO), while the DC-8 management team is based at NASA Armstrong Flight Research Center.

The NASA DC-8 launching from Ascension Island during the Summer 2016 ATom field campaign

Contributed by Erin Czech

ACT-America

The Atmospheric Carbon and Transport – America (ACT-America) Earth Venture Suborbital 2 (EV-S2) mission concluded its first measurement campaign on August 29 after 6 weeks of science flights based out of LaRC, WFF, Lincoln Nebraska, and Shreveport Louisiana. The campaign gathered over 111 hours of data with in situ sensors on the LaRC B-200 aircraft and over 151 hours with in situ and remote sensors on the WFF C-130 aircraft. More than 270 vertical profiles of the atmosphere were collected between the two aircraft. Two of the more than 20 joint science flights were coordinated with overpasses of the Orbiting Carbon Observatory-2 (OCO-2) satellite. The team is now ramping up science analysis of the campaign data and preparing for the next campaign, scheduled to begin in January 2017.

The AC-130 sits on the tarmac before takeoff. Photo: NASA/Joe Atkinson

Inlets on the belly of the NASA B-200 collect samples of carbon and methane during flight.

The B-200 meets up with the C-130 aircraft in coordinated flights over the Mid-Atlantic region this month

Principal Investigator Ken Davis (Penn State) selected the Midwest region for this mission because it is ripe with greenhouse gas fluxes, areas where lots of greenhouse gases are exchanged between the biosphere on land and the atmosphere.

ACT-America includes significant contributions from LaRC personnel for aircraft operations, instrument operations, Atmospheric Vertical Observation of CO2 in the Earth's Troposphere (AVOCET) and ASCENDS Carbonhawk Experiment Simulator (ACES) teams, and management.

Contributed by Bruce Fisher, Mike Obland, and Joe Atkinson, NASA LaRC

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EVS-2 *(continued from page 3)*

CORAL

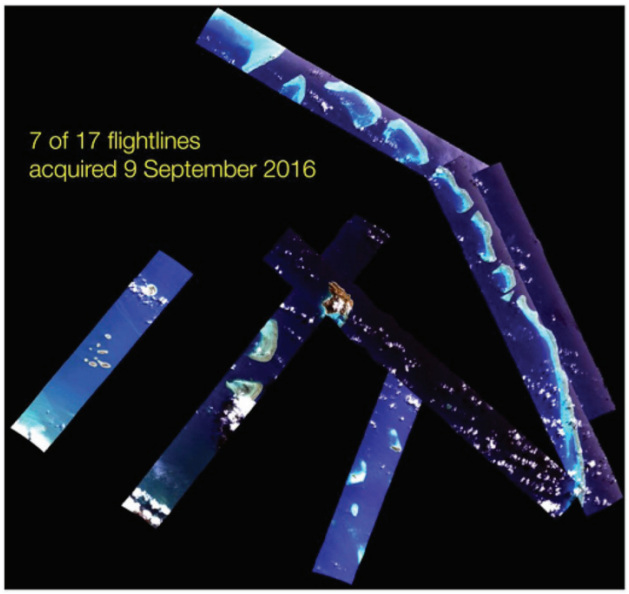
CORAL, an Earth Venture Suborbital mission has set up shop in Australia for a two-month investigation of the Great Barrier Reef, the world's largest reef ecosystem. A NASA airborne mission designed to transform our understanding of Earth's valuable and ecologically sensitive coral reefs, CORAL's three-year mission combines aerial surveys using PRISM, a state-of-the-art airborne imaging spectrometer technology developed by NASA's Jet Propulsion Laboratory, Pasadena, California, with in-water validation activities. The mission will provide critical data and new models for analyzing reef ecosystems from a new perspective. According to PI Eric Hochberg of the Bermuda Institute of Ocean Sciences "CORAL addresses an urgent need in the face of ongoing worldwide reef degradation, and also serves as a pathfinder for a future satellite mission to globally survey the world's reefs."

Mounted in the belly of a modified Tempus Solutions Gulfstream IV aircraft, the Portable Remote Imaging Spectrometer (PRISM) surveys reefs from an altitude of 28,000 feet (8,500 meters) to generate calibrated scientific data products. The aircraft was selected and specifically engineered so the PRISM instrument could be installed and operated from the plane while meeting strict requirements in terms of both airplane and instrument performance and preparedness (e.g., having on board systems that reduce the ambient temperature such that the PRISM instrument can stabilize prior to flight, etc.)

In June, in Hawaii, CORAL completed its Operational Readiness Test (ORT) and met all the criteria required for a successful field campaign, including coordinating efforts between airborne and in-water validation activities, completing multiple successful flight lines over target areas, and daily chain-of-communication protocols to ensure the seamless deployment of both airborne and in-water assets. Basically, the ORT was the "dress rehearsal" for the first full field campaign now underway in the GBR

From Australia, CORAL will continue on to survey portions of reef systems in the main Hawaiian Islands, the Mariana Islands and Palau.

Contributed by Ali Hochberg and Bill Mateer



Mosaic of CORAL flight lines from September 9, 2016.

KORUS-AQ

The Korea-US Air Quality (KORUS-AQ) mission, a joint effort between NASA and Korea's National Institute of Environmental Research (NIER), was conducted in May and June of this year. The study integrated observations from aircraft, ground sites, and satellites with air quality models to understand the factors controlling air quality and to determine how observations from the future constellation of geostationary air quality satellites can be best interpreted and used to inform air quality mitigation strategies. The air quality constellation will include satellites from both NASA (TEMPO) making observations over North America and South Korea (GEMS) making observations across Asia.

The mission employed three aircraft, each fulfilling a key role.

NASA Armstrong's DC-8 served as the primary aircraft for direct atmospheric sampling of gases and aerosols affecting air quality. It flew extensively across the Korean peninsula and surrounding waters at multiple altitudes providing information on the vertical distribution, chemistry, and transport of pollutants. The DC-8 payload included 26 instruments, 5 of which were from Korean investigators. Specific details can be found on the KORUS-AQ website provided below.

Flying high overhead, NASA Langley's King Air remotely sensed conditions below the aircraft using NASA Goddard's Geostationary Trace gas and Aerosol Sensor Optimization (GEO-TASO) spectrometer, and Ball Aerospace's Multi-slit Optimized Spectrometer (MOS). As the airborne simulator for TEMPO, Geo-TASO provided observations replicating the type of information that will be available in the future from geostationary satellites.

Onboard Hanseo University's King Air, Korean scientists deployed an in situ payload to measure pollutants directly observable from space (ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, and fine particles). This aircraft also hosted NASA Goddard's Compact

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KORUS-AQ *(continued from page 4)*

Airborne Formaldehyde Experiment (CAFÉ). This smaller, more nimble aircraft was able to provide information on key pollutants in areas less accessible to the DC-8.

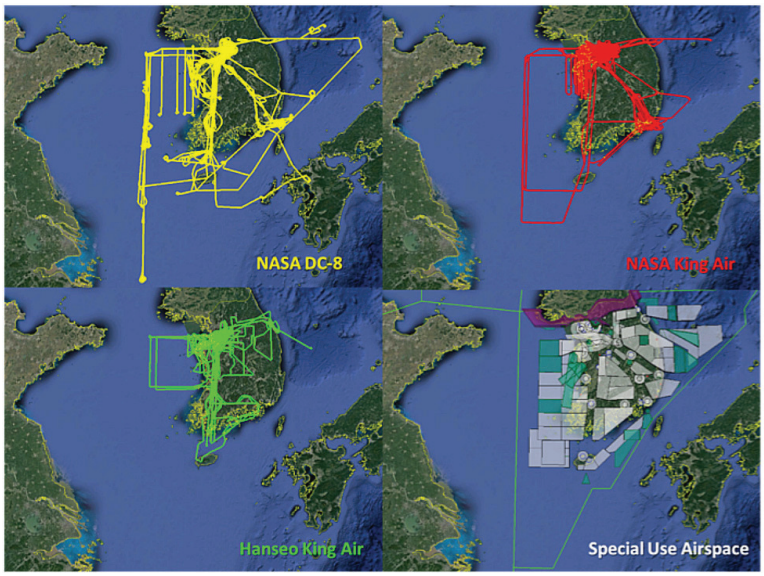
Flying from Osan Air Base in South Korea, these aircraft overflew a network of Korean ground sites spanning from the Seoul Metropolitan area to locations across the peninsula and nearby islands. These ground sites included intensive measurement sites hosting both Korean and U.S. researchers as well as the several hundred regulatory air quality monitoring sites. Additional observations over the water came from research vessels participating in a companion effort called the Korea-United States-Ocean Color (KORUS-OC) study. These observations provided key information on water quality as well as air quality and its effect on remote sensing of water conditions.

The multi-perspective observations provided by the aircraft and ground sites constitute the most complete characterization of air quality ever obtained. The observations of pollution under a wide range of conditions across urban, rural and coastal interfaces provide the basis for detailed analysis. Results will provide Korean colleagues at NIER with key information that will be useful to Korea's Ministry of the Environment for development of air quality mitigation strategies. Results will also lead to improved air quality models and readiness for using observations from the upcoming geostationary satellites.

The image (right) depicts the flight lines for the three research aircraft. The DC-8 flew 21 science flights totaling 170 hours. The LaRC King Air flew 30 science flights totaling 125 hours. The Hanseo King Air flew 32 science flights totaling 118. Flight planning and execution required extensive coordination given the complicated Special Use Airspace over the Korean Peninsula.

More information on KORUS-AQ is available at: https://espo.nasa.gov/home/korus-aq/content/KORUS-AQ

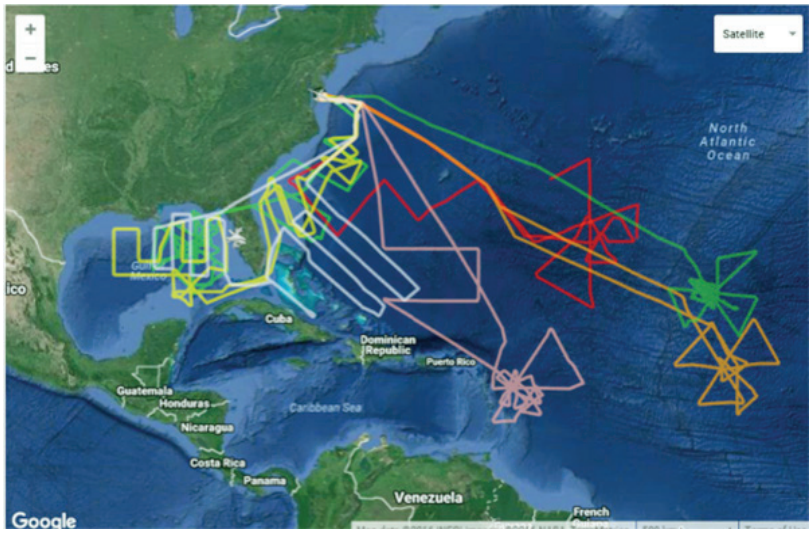
Members of the KORUS-AQ Science Team attending the Media Day at Osan Air Base are pictured above. In all, 300 people from 5 NASA centers and more than 10 US and 14 Korean research institutions participated in Operations at Osan AB.



Submitted by Jim Crawford (NASA LaRC), Jay Al-Saadi (NASA LaRC), Jhony Zavaleta (NASA ARC-ESPO), and Bruce Fisher (NASA LaRC)

SHOUT on the Global Hawk Succeeds in the Atlantic

Flights of the NASA Global Hawk were conducted this August–September from the Wallops Flight Facility in support of the NOAA-led Sensing Hazards with Operational Unmanned Technology (SHOUT) mission. The goal of SHOUT is to determine the potential ability of observations from unmanned aircraft such as the Global Hawk to improve forecasts of high-impact weather events like hurricanes and tropical storms, particularly in the unlikely event of a gap in our current satellite coverage. The instrumentation being flown includes the High-Altitude Monolithic Microwave Integrated Circuit (MMIC) Sounding Radiometer (HAMSR) from the Jet Propulsion Laboratory, the High-Altitude Imaging Wind and Rain Airborne Profiler (HIWRAP) from NASA Goddard, and the Airborne Vertical Atmospheric Profiling System (AVAPS), a dropsonde system developed by the National Center for Atmospheric Research (NCAR) with support from NOAA. The combination of the comprehensive payloads with the aircraft's high altitude and long endurance enables an exceptionally detailed picture of the storms not readily possible from other observing systems.

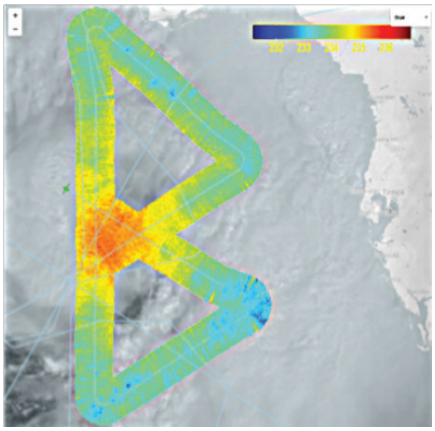


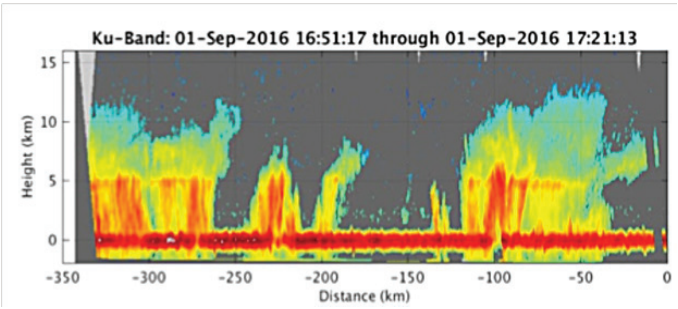
Flight tracks from the SHOUT hurricane and tropical storm missions conducted with the NASA Global Hawk in 2015 and 2016. Graphic generated using NASA's Mission Tool Suite.

The current SHOUT campaign studying hurricanes and tropical storms follows a similar mission last September and sampling of large precipitation-producing storms in the Pacific last February during the large El Nino event. To date this fall, four very successful missions have been flown probing Hurricanes Gaston and Hermine in the Atlantic, Caribbean and and Gulf of Mexico. The SHOUT tropical flight tracks from this year and last are displayed above, highlighting the coverage possible from the platform. l.

Highlights from this year's flights include deploying a record 90 dropsondes during a single flight and providing the observations that enabled the National Hurricane Center to first declare Gaston a hurricane. The fourth flight also documented the intensification of Hermine from a tropical storm to a hurricane in concert with other NOAA and Air Force aircraft. The detailed horizontal and vertical structure of Hermine measured by the HAMSR and HIWRAP instruments is shown below. Data from the flights are being studied by multiple groups within NOAA to quantify the impact of the observations. Initial results are demonstrating a positive impact of the observations on numerical weather prediction model forecasts of storm evolution and the resulting effects on parameters such as precipitation.

Contributed by Gary Wick, NOAA





Horizontal temperature structure measured by HAMSR (left) and a vertical reflectivity profile sampled by HIWRAP (right) from Tropical Storm Nadine. HAMSR results provided courtesy Mathias Schreier, JPL, and HIWRAP results provided courtesy Matthew McLinden, NASA Goddard.

AJAX 2016

The Soberanes mega-fire has been burning in California for over 60 days, and the AJAX team at NASA Ames Research Center has sampled its emissions 5 times. This ability to revisit sites in California, Nevada, or above the Pacific Ocean over an extended period of time is one of the unique characteristics of the Alpha Jet Atmospheric eXperiment (AJAX). With an ongoing five-year data set, the team has sampled over 160 vertical profiles, a dozen wildfires, and numerous stratospheric ozone intrusions. AJAX works with other teams at NASA, as well as NOAA, EPA, JAXA, and at the California Air Resources Board, to provide observations in support of studies of trans-Pacific transport of ozone, exceptional events petitions, and satellite validation.

Based at Moffett Field, CA, AJAX is a partnership between NASA and H211, LLC, which offers pilot proficiency flight hours throughout the year to carry our trace gas payload that measures ozone, carbon dioxide, methane, water vapor, and formaldehyde. The Alpha Jet is also equipped with a Meteorological Measurement System that measures 3D winds, temperature, pressure, and location.

The Alpha Jet, based at Moffett Field, carries the AJAX payload in two unpressurized wing-mounted sensor pods. The trace-gas payload measures ozone, formaldehyde, carbon dioxide, methane, water vapor, and three-dimensional winds. Available window ports can be seen on the underside of each white sensor pod.

Since its first science flight in 2011, AJAX has developed a wide a variety of mission types, combining vertical profiles (from approximately 8km to near surface), boundary layer legs, and plume sampling, as needed. Most recently, flights were designed and executed in conjunction with the California Baseline Ozone Transport Study (CABOTS) from May to August 2016. These flights captured ozone vertical profiles along east-west or north-south transects to provide information between the fixed-location ozone measurements in Bodega Bay and Visalia. By providing an airborne data set, AJAX was able to assess the spatial heterogeneity of ozone structure across the Coastal Mountains or along the coastline, contributing to the CABOTS goal of understanding how well global models reproduce the content and daily variability of ozone vertical profiles as they enter California from the Pacific.

AJAX team: Warren Gore, Ju-Mee Ryoo, Josette Marrero, Laura Iraci, Emma Yates

AJAX recently celebrated Flight #200 and shows no signs of slowing down. Missions currently in development include lower tropospheric sampling in the San Francisco Bay Area, coordination with A-Train satellite overpasses – particularly over water, and additional in-situ profiling over the TCCON instrument located at NASA Armstrong Flight Research Center. AJAX flights can be tracked in real-time using the Airborne Science Program's Mission Tools Suite. More information about the AJAX project can be seen at http://geo.arc.nasa.gov/ajax/ajax_index.html, and data requests should be directed to Laura.T.Iraci@nasa.gov.

Submitted by Laura Iraci

SMAPVEX16

A calibration and validation campaign for the SMAP mission

NASA's Soil Moisture Active Passive (SMAP) mission has been successfully providing global volumetric soil-moisture estimates for nearly a year and a half. Soil moisture information is provided by brightness temperature measurements from the passive radiometer instrument operating at L-band (1.4GHz). In order to validate and improve the retrieval model giving soil moisture estimates from SMAP brightness temperatures, the mission has a comprehensive calibration and validation (Cal/Val) ground-based network that provides sensor measurements over various soil-types and vegetation density.

The SMAP Validation Experiment 2016 (SMAPVEX16) airborne campaign was recently undertaken to satisfy multiple mission objectives. SMAPVEX-16 will provide measurements of Cal/Val sites at a much higher spatial resolution that will allow further investigation of anomalous SMAP retrievals. SMAPVEX-16 was performed over two Cal/Val sites (Iowa-IA and Manitoba, Canada-MB) that exhibited larger errors with respect to the passive soil moisture retrievals. These domains exhibit a variety of soil moisture and vegetation conditions. The higher spatial resolution data provided by an aircraft campaign also allows the evaluation of alternative disaggregation approaches from the current 36-km scale to a finer spatial scale.

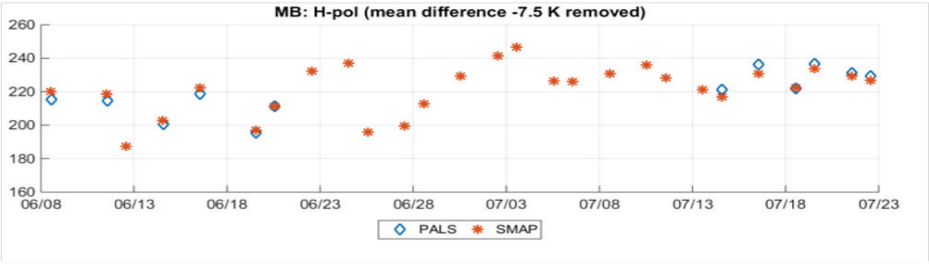
The SMAPVEX-16 campaign was conducted from May 24th to August 16th, 2016. Each domain was visited twice for a two-week period, providing data during different stages of crop growth. A total of 27 science flights and over 130 flight hours were conducted. The airborne grids were based on the SMAP grid dimensions (about 40 km by 30 km). SMAPVEX-16 was conducted with the JPL Passive Active L-band System (PALS) scanning instrument. The PALS instrument makes measurements similar to the SMAP instrument. PALS was installed on a DC-3 aircraft owned and operated by Airborne Imaging, Inc. (see Fig. 1).

Airborne Imaging Inc., N737H DC-3 with the PALS radome underneath the aircraft

Preliminary analysis shows that SMAPVEX-16 produced exceptional high-resolution soil-moisture change data within the experiment regions that correlate well with the SMAP measurements.

Figure 2 gives a preliminary comparison between the relative change in brightness temperature observed by PALS and SMAP over the Canadian location grid during the airborne campaign period. This result will be used to analyze retrieval errors in the soil moisture algorithm.

Contributed by Sidharth Misra, Andreas Colliander, Thomas Jackson and Simon Yueh



PALS-SMAP relative brightness temperature (Kelvin) variation compared over Carman, MB during the SMAPVEX-16 mission period. The units are in Kelvin. (PALS – diamond, SMAP – asterisk)

2016 NASA Student Airborne Research Program (SARP)

The eighth annual NASA Student Airborne Research Program (SARP) took place June 12-August 5 at the NASA Armstrong Flight Research Center and the University of California, Irvine. SARP provides a unique opportunity for undergraduate students majoring in science, mathematics or engineering fields to participate in a NASA airborne science research campaign. The 32 SARP 2016 participants came from 32 different colleges and universities in 23 states. They were competitively selected based on their outstanding academic performance, future career plans, and interest in Earth system science.

Students assisted in the operation of over 20 different instruments onboard the DC-8. These instruments were previously used to collect air quality data over South Korea as part of the

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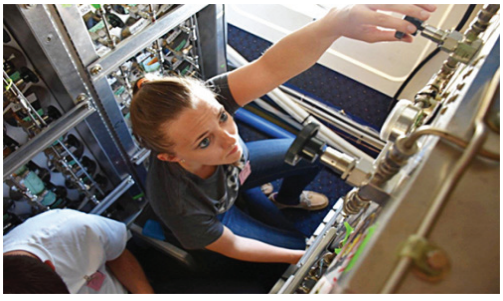
The 32 SARP participants pose in front of the DC-8 at NASA Armstrong Hangar 703.

Dr. Ben Nault (University of Colorado and SARP alumnus from 2010) explains the operation of the High Resolution Aerosol Mass Spectrometer to SARP Participant Ariana Tribby onboard the NASA DC-8

Students prepared signs to welcome the KORUS-AQ team back from Korea before their own research fights on the DC-8.



SARP Participant, Dakota Crane, operates the Whole Air Sampler in flight onboard the NASA DC-8.

2016 SARP *(continued from page 8)*

Korea U.S. Air Quality mission (KORUS-AQ) in the weeks before the start of SARP. Two SARP alumni, Benjamin Nault (SARP 2010) and Tamara Sparks (SARP 2012), were KORUS-AQ instrument scientists. For the SARP flights, the DC-8 aircraft overflew dairies, oil fields and crops in the San Joaquin Valley, parts of Los Angeles, and the Santa Barbara Channel at altitudes as low as 1,000 feet. The students also used remote-sensing data collected by instruments onboard the ER-2 to study the response to drought on vegetation and changes in the ocean biology along the California coast. In addition to airborne data collection, students also took measurements at field sites near Santa Barbara and California's Central Valley.

The final six weeks of the program took place at the University of California Irvine where students analyzed and interpreted data collected aboard the aircraft and in the field. From this data analysis, each student developed a research project based on his or her individual area of interest. In addition to the new data collected during the program, students had the opportunity to use data gathered by SARP participants in previous years as well as data from other aircraft and satellite missions. In December, eight students will be funded to give presentations on the results of their SARP research at the American Geophysical Union Fall Meeting in San Francisco.

Submitted by Emily Schaller

TRANSITIONS

Werner Winz is the newly assigned Chief of Flight Operations and Aircraft Office Chief at Goddard Space Flight Center's Wallops Flight Facility (WFF). WFF operates a P-3, two C-130s, C-23, UH-1, B-200 and T-34 aircraft. In his capacity as Aircraft Office Chief, Winz is responsible for the planning and execution of aircraft support for Airborne Science missions. The Aircraft Office is a busy place that is currently supporting three Earth Venture missions in ORACLES, ACT-AMERICA and NAAMES. Winz recently joined NASA after serving almost 30 years in the US Coast Guard as a pilot and aeronautical engineer. He earned a Masters in Aeronautical Engineering from Purdue University and is a licensed engineer and airline transport pilot.

Matt Fladeland has been named Acting Division Chief of the Earth Science Division at Ames Research Center. Matt continues his role as Airborne Science director at Ames.

Airborne Science Program and Center 2016 Awards

Career Sustained Excellence
Dennis Gearhart

Faithfully served the Airborne Science Program as a Senior Sensor technician for over 30 years.

NASA Outstanding Leadership
Mike Thompson

For outstanding leadership of Armstrong's Earth Science mission resulting in critical scientific discoveries in support of an improved global system understanding

Career Sustained Excellence
Mike Craig

For over 20 years of superior sustained support and leadership of some of the most complex NASA Airborne Science missions world-wide.

GSFC Customer Service Award
GSFC WFF NAAMES EV Mission Support Team

For outstanding leadership For excellent performance in airborne science research aircraft engineering, modification, maintenance, and mission execution of the 2016 NAAMES EV missions on the NASA GSFC WFF C130 aircraft.

Sustained Excellence
Scott Silver

For Sustained Excellence Ensuring DC-8 Flight Safety, Science Mission Success and On-Time Deployments for 18 years.

Continued on page 12

2016 ASP Awards *(continued from page 11)*

Administraive
Wendy Breda

For outstanding DC-8 aircraft logistics support at home and on the road!

Administraive
Anne Odenthal

As the "gatekeeper" for every AFRC-involved Airborne Science mission for the past eight years, she made a tremendous contribution to NASA, the nation, and the planet. Her professionalism and can-do attitude have literally opened the door to Earth research on a global level!

Group Award
Global Hawk AV-6 Towing Accident Repair

For the team's dedication and timely response to the substantial repair of Global Hawk AV-6 after its towing accident. Their actions directly contributed to the success of the Airborne Science Program's Global Hawk capability and specifically in enabling our NOAA partner to execute their El Nino Rapid Response Experiment on schedule.

GFSC Exceptional Service Medal
Mark Russell

For exceptional service as GSFC's Aviation Safety Officer and as WFF research pilot flying the ORACLES EV mission to Africa on the NASA P3 aircraft.

GSFC Exceptional Achievement Medal
Alan Barringer

For exceptional service as lead pilot for the GSFC Wallops C23 aircraft program and flying as the lead research instructor pilot for the 4 year CARVE EV science mission to Alaska and Canada.

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2016 ASP Awards *(continued from page 12)*

Sustained Excellence
Martin Nowicki

For extraordinary performance as lead aircraft airworthiness engineer and aircraft configuration manager at ASP's GSFC WFF Aircraft Office.

JSC Aircraft Operations Division Aviation Safety Award
Don Darrow

Dedication to customer satisfaction and innovative ideas for enhancing mission success paid significant dividends for the WB-57 Program and our Airborne Science customers.

Upcoming Events

* 2016 HyspIRI Science and Applications Workshop
  October 18-20, 2016; CalTech
  http://hyspiri.jpl.nasa.gov/events/hyspiri-science-and-applications-workshop

  2016 Unmanned Systems Canada Annual Conference
  1-3 November 2016; Edmonton, Alberta, Canada
  https://unmannedsystems.ca/events-2/
  https://www.unmannedsystems.ca/content.php?doc=182

* Alaska UAS Interest Group Meeting
  November 8-10, 2016
  Anchorage, AK
  http://www.uasalaska.org/registration

* 2016 UAS TAAC
  12-15 December 2016; Santa Fe, NM
  https://taac.psl.nmsu.edu/

* American Geophysical Union (AGU) 2016 Fall Meeting
  12-16 December 2016: San Francisco, CA
  Registration Deadline: 3 November, 11:59, P.M., EDT
  http://fallmeeting.agu.org/2016/

* AIAA SciTech17
  9-13 January 2017; Grapevine, TX
  https://www.aiaa-scitech.org/

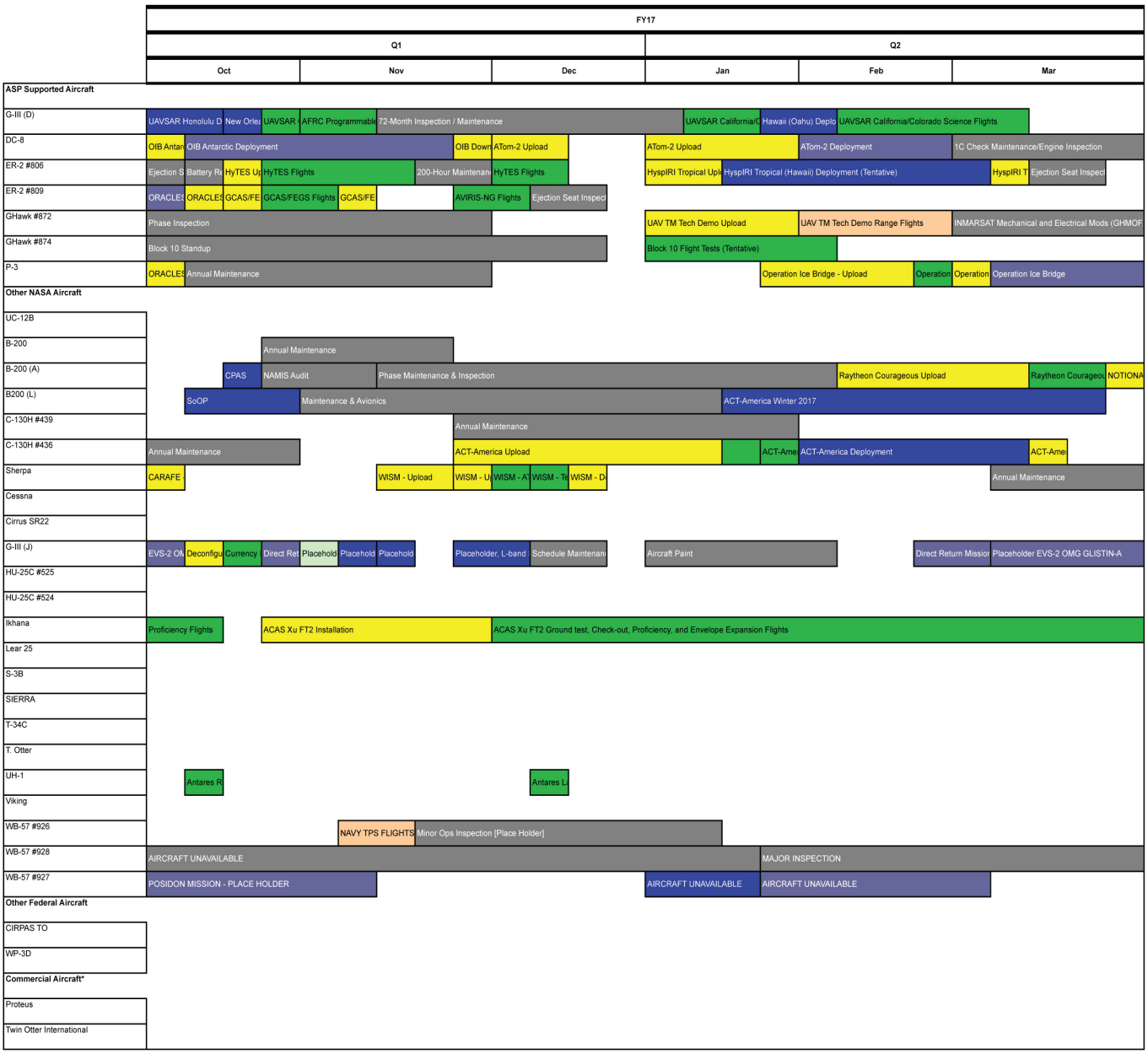
* American Meteorological Society Annual Meeting 2016
  22-26 January 2017; Seattle, WA
  annual.ametsoc.org/2017/

* IEEE Aerospace Conference
  March 4-11, 2017; Big Sky, Montana
  https://www.aeroconf.org/

* ASPRS Annual meeting
  March 11-17, 2017; Baltimore, MD
  http://conferences.asprs.org/Baltimore-2017/

* 3rd International A-Train Symposium 2017
  18-21 April 2017, Pasadena, California
  Registration is now open
  https://atrain2017.org/

NASA SMD ESD Airborne Science Program 6-Month Schedule



- Foreign Deployment
- Stateside Deployment
- Flight
- Reimbursable
- Aircraft Modifications
- Maintenance
- Aircraft Configuration

Source: ASP website calendar at https://airbornescience.nasa.gov/aircraft_overview_cal

For an up-to-date schedule, see
http://airbornescience.nasa.gov/aircraft_detailed_cal

Airborne Science Program

Platform Capabilities

Available aircraft and specs

Airborne Science Program Resources	Platform Name	Center	Duration (Hours)	Useful Payload (lbs)	GTOW (lbs)	Max Altitude (ft)	Airspeed (knots)	Range (Nmi)	Internet and Document References
ASP Supported Aircraft*	DC-8	NASA-AFRC	12	30,000	340,000	41,000	450	5,400	http://airbornescience.nasa.gov/aircraft/DC-8
	ER-2 (2)	NASA-AFRC	12	2,550	40,000	>70,000	410	>5,000	http://airbornescience.nasa.gov/aircraft/ER-2
	Gulfstream III (G-III)(C-20A)	NASA-AFRC	7	2,610	69,700	45,000	460	3,400	http://airbornescience.nasa.gov/aircraft/G-III_C-20A_-_Dryden
	Global Hawk	NASA-AFRC	26	1,500	26,750	65,000	335	9,000	http://airbornescience.nasa.gov/aircraft/Global_Hawk
	P-3	NASA-WFF	14	14,700	135,000	32,000	400	3,800	http://airbornescience.nasa.gov/aircraft/P-3_Orion
Other NASA Aircraft	B-200 (UC-12B)	NASA-LARC	5	2,000	13,500	28,000	220	1,000	http://airbornescience.nasa.gov/aircraft/B-200_UC-12B_-_LARC
	B-200	NASA-AFRC	5	1,700	13,420	28,000	270	1,400	http://airbornescience.nasa.gov/aircraft/B-200_-_DFRC
	B-200	NASA-LARC	5	2,000	13,500	28,000	220	1,000	http://airbornescience.nasa.gov/aircraft/B-200_-_LARC
	B-200 King Air	NASA-WFF	6.0	1,800	12,500	28,000	275	1,800	https://airbornescience.nasa.gov/aircraft/B-200_King_Air_-_WFF
	C-130 (2)	NASA-WFF	12	36,500	155,000	33,000	290	3,000	https://airbornescience.nasa.gov/aircraft/C-130_Hercules
	C-23 Sherpa	NASA-WFF	6	7,000	27,100	20,000	190	1,000	http://airbornescience.nasa.gov/aircraft/C-23_Sherpa
	Cessna 206H	NASA-LARC	5	646	3,600	10,000	150	700	http://airbornescience.nasa.gov/aircraft/Cessna_206H
	Cirrus SR22	NASA-LARC	6.1	932	3,400	10,000	175	970	http://airbornescience.nasa.gov/aircraft/Cirrus_Design_SR22
	Dragon Eye	NASA-ARC	<1	1	6	1000	34	3	http://airbornescience.nasa.gov/aircraft/B-200_-_LARC
	Gulfstream III (G-III)	NASA-JSC	7	2,610	69,700	45,000	460	3,400	http://airbornescience.nasa.gov/aircraft/G-III_-_JSC
	HU-25C Falcon	NASA-LARC	4.5	2,000	32,000	36,000	350	1,600	http://airbornescience.nasa.gov/aircraft/HU-25C_Falcon
	Ikhana	NASA-AFRC	20	2,000	10,500	45,000	171	3,000	http://airbornescience.nasa.gov/aircraft/Ikhana
	Learjet 25	NASA-GRC	2	2,000	15,000	45,000	350	1,000	http://airbornescience.nasa.gov/aircraft/Learjet_25
	Learjet 35	NASA-GRC	2.5	4,200	19,600	45,000	350	2,300	
	S-3B Viking	NASA-GRC	6	12,000	52,500	40,000	350	2,300	http://airbornescience.nasa.gov/aircraft/S-3B
	SIERRA	NASA-ARC	10	100	400	12,000	60	600	http://airbornescience.nasa.gov/platforms/aircraft/sierra.html
	T-34C	NASA-GRC	3	100	4,400	25,000	150	500	http://airbornescience.nasa.gov/aircraft/T-34C
	Twin Otter	NASA-GRC	3	3,000	11,000	25,000	140	450	http://airbornescience.nasa.gov/aircraft/Twin_Otter_-_GRC
	UH-1	NASA-WFF	2	3,880	9,040	12,000	108	275	https://airbornescience.nasa.gov/aircraft/UH-1_Huey
	Viking-400 (4)	NASA-ARC	11	100	520	15,000	60	600	https://airbornescience.nasa.gov/aircraft/Viking-400
	WB-57 (3)	NASA-JSC	6.5	8,800	72,000	60,000+	410	2,500	http://airbornescience.nasa.gov/aircraft/WB-57