



National Aeronautics and Space Administration

Airborne Science Newsletter



Spring 2013

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ATTREX 2013

Science Flights Begin

In Brief ...

AirMOSS

TAirMOSS flights resumed on January 28th, 2013 with trips to California and Costa Rica. The JSC GIII has flown a total of 56.4 engineering and science flight hours so far this year through mid March. Numerous additional deployments are scheduled. See the G-III web site, <http://jsc-aircraft-ops.jsc.nasa.gov/GIII/index.html> for more information.

Contributed by Jim Alexander

MIZOPEX

The SIERRA UAV will be supporting MIZOPEX instead of Ikhana because of staffing shortages at DFRC this summer. The mission will be flying out of Oliktok point Alaska to collect data on sea ice and ocean surface conditions.

Contributed by Matt Fladeland

ASCENDS

DC-8 ASCENDS 2013 (Active Sensing of CO₂ Emissions over Nights, Days, And Seasons) mission flights were flown from NASA's Palmdale DAOF facility during Feb/Mar. ASCENDS 2013 is a third year DC-8 airborne lidar instruments development effort in support of future active atmospheric CO₂ measurements from space.

Contributed by Frank Cuttler

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The Airborne Tropical Tropopause Experiment (ATTREX), managed by NASA Ames Research Center, is an Earth Ventures mission focused on understanding the physical processes occurring in the tropical tropopause layer (TTL; ~14-19 km) and their impact on the Earth's climate. Air ascends into the stratosphere through the TTL, and therefore the composition of the TTL provides a boundary condition for the stratospheric composition. Thin cirrus clouds forming near the cold tropical tropopause limit the humidity of air entering the stratosphere. It has been shown that small changes in stratospheric humidity

have large impacts on the Earth's radiation budget. ATTREX is providing high-resolution measurements of TTL composition, clouds, tracers, water vapor, and radiation using the long-duration, unmanned NASA Global Hawk. The overarching objectives of ATTREX are to improve our understanding of TTL processes and to improve their representation in climate models.

During February-March, 2013, the first ATTREX science flights were conducted out

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DISCOVER-AQ

DISCOVER-AQ recently completed its second deployment in a series of four airborne campaigns aimed at improving the use of satellite observations to diagnose near-surface air quality.



This time the target was California's central valley during winter where cold, stagnant conditions encourage the accumulation of fine particles to reach unhealthy levels exceeding national air quality guidelines. Flying from the Dryden Aircraft Operations Facility in Palmdale, NASA's P-3B and

P-3B conducting a missed approach at the Visalia Airport

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DISCOVER-AQ

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King Air research aircraft sampled air quality across the valley, ranging from Bakersfield to Fresno. Airborne sampling was conducted in close coordination with ground monitoring sites operated by the San Joaquin Valley Air Pollution Control District and California's Air Resource Board.



PI Jim Crawford on board the NASA P-3B at Baltimore/Washington International Thurgood Marshall Airport, June 28, 2011.

Sampling was conducted on a total of 10 days during the period of 16 January to 6 February. During the first week of the deployment, the team was able to use five flights to document an extended period of pollution build-up as particulate levels in the southern end of the valley tripled. After a storm system flushed the valley, a second period of build-up was observed with the remaining flights.



Reporter Tim Sheehan of the Fresno Bee took this photo through the NASA P-3B's cockpit window as they flew over Fresno, Calif. on Jan. 22, showing a very hazy atmosphere over the area.

Director's Corner



Welcome to the Spring 2013 ASP Newsletter. I want to take a second to thank the crews from the WFF P-3 and the DFRC C-20 who have been deployed for several weeks now collecting valuable science data. The C-20 has been working up and down South America studying volcanoes, glaciers and vegetation while the P-3 has been flying in Greenland and Alaska studying the Arctic land and sea ice. Those dedicated folks have missed out on spring break as well as holidays with family and friends to do the job of ASP and I'm grateful for their dedication and hard work, so THANKS! That isn't to say that the rest of the ASP team hasn't been busy (and I'm grateful to them too!!) since in the 6 months of this FY we've flown almost 1600 science hours. Please take some time to recognize your deserving people by nominating them for a program award. An award announcement is due anytime now from Randy. We're also getting into another busy 6 months so please make sure you pay attention to safety and look out for each other at all times. Fly safe and I hopefully (depending on travel budget realities) will be able to get out and see some of the great work you do.

*Bruce Tagg
Airborne Science Program*



A map of the DISCOVER-AQ 2013 California Field Mission.

The intensification of the pollution episodes was aided by the shallowness of the polluted layer which was almost always limited to the lowest 2000 feet above the surface. This created a challenge for the aircraft, normally restricted from flying below 1000 feet over populated areas. The problem was mitigated by performing missed approaches with the P-3B down to 100 feet over six different airfields across the valley and in close proximity to ground monitors.

For more information, visit the project website at <http://discover-aq.larc.nasa.gov/>

Contributed by Jim Crawford

In Brief (continued from page 1)

Dragon Eye

In support of ASTER SO₂ algorithm validation, Ames staff acquired several small electric Dragon Eye UAVs from the Marine Corps and successfully collected SO₂ concentrations from a volcanic plume in Costa Rica to support PI Dave Pieri (JPL)

Contributed by Matt Fladeland

UAVSAR Update

NASA's C-20A aircraft recently completed an early January mission to study active volcanoes in Hawaii, completing 5 flights/30 hours in the six-day campaign. The Uninhabited Aerial Vehicle Synthetic Aperture Radar (UAVSAR), developed and operated by NASA's JPL, collected 100% of the planned data lines. In addition, the crew for the Weather Channel's new show, *Hacking The Planet*, joined us in Kona and flew with NASA502 to document the UAVSAR program and volcano research. (Check your local listings for the upcoming "Volcano" episode.)

The C-20A just completed a month long deployment to Central and South America. During the 28 day campaign, NASA502 flew over 15 different countries to research volcanoes, glaciers, SMAP, wetlands, and forests.

Contributed by John McGrath

PODEX

PODEX is the Polarimeter Definition Experiment. It occurred from January 14 to February 6, 2013, from the Dryden Aviation Operations Facility in Palmdale. The period was chosen such that PODEX could benefit from in-situ (P3) and remote sensing (B-200) aerosol observations for DISCOVER-AQ that operated from DAOF during this time. The goal of PODEX was to acquire quality aerosol and cloud scenes to support algorithm development and maturation for three distinct airborne polarimeters that serve as early concepts for a polarimeter envisioned to fly on the Aerosols, Cloud and Ecosystem (ACE) mission in the next decade, i.e., a pre-formulation activity. The ER-2 payload included the three polarimeters: the Research Scanning Polarimeter (RSP, Brian Cairns/GISS), the Airborne Multiangle SpectroPolarimetric Imager (AirMSPI, Dave Diner/JPL), and the Passive Aerosol and Cloud Suite (PACS, Vanderlei Martin/UMBC). Also flown was the Cloud Physics Lidar (CPL, Matt McGill/GSFC) and the Autonomous Modular Sensor (AMS, Jeff Myers/Ames). AMS enables retrievals of cloud and aerosol

properties using methods similar to those used to process MODIS data from Terra and Aqua while CPL, a CALIPSO simulator, provides definitive measurements of aerosol and cloud location in the vertical and an independent estimate of aerosol optical properties. Ten PODEX ER-2 missions were flown including 7 flights at least partially coordinated with DAQ over the San Joaquin Valley, 2 flights focused on stratus clouds over the ocean, 2 flights attempting clear scenes over the ocean and one flight focused on cirrus over the ocean. The SJV samples provided excellent aerosol targets ($AOD \sim 0.1-0.25$) over a variety of surface types (agricultural to urban) and brightness, including a case where the scene was somewhat obscured by cirrus. One stratocumulus case was excellent and well supported by the D-AQ P3. Overall, PODEX acquired most of the desired scenes and conditions. The performance of the aircraft and crew was great, as was the cooperation with D-AQ.

Contributed by David Starr



During a test phase for the PODEX experiment, engineers and the crew at Dryden Aircraft Operations Facility loaded the Research Scanning Polarimeter into the "superpod," for placement under the wing of the ER-2. Credit NASA/Matteo Ottaviani

ATTREX

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of Dryden Flight Research Center (DFRC) in southern California. The 24+ hour flights targeted the deep tropics over the central and eastern Pacific. The primary sampling strategy used involved profiling vertically through the TTL between about 45000 and 60000 feet. Over 100 TTL vertical profiles were obtained. Some of the flights were designed to survey the TTL composition versus latitude, including sampling deep into the southern hemisphere. Other flights targeted relatively recent detrainment from deep tropical convection. The numerous tracers measured on the vertical profiles will provide information about TTL dynamics, transport pathways, and transport time scales. Regions with anomalously cold tropopause temperatures and thin cirrus were targeted on multiple flights. These flights will provide case studies for evaluating how effectively the cirrus freeze dry air ascending across the cold tropical tropopause. A combination of factors resulted in extremely cold tropopause temperature and low humidity

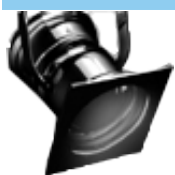


The 2013 ATTREX team

during January-February, 2013. The in situ measurements provided by ATTREX will be combined with satellite measurements and modeling studies to understand the cold temperatures and dry conditions that prevailed in the 2013 winter.

During 2014, the Global Hawk will be deployed to Guam for ATTREX flights. The location of Guam will permit extensive sampling of the TTL in the western Pacific, which is the region of the tropics with coldest tropopause temperatures and most rapid vertical transport into the stratosphere. Flights will be conducted both in late winter (January-February) and early summer (May-June), permitting assessment of the seasonal cycle in TTL temperature and water vapor.

Contributed by Eric Jensen



Spotlight On

Dr. Emily Schaller and the 2012 Student Airborne Research Program

Dr. Emily Schaller is the project manager of the Airborne Science Program Student Airborne Research Program (SARP). Emily joined ASP in 2011 and has managed SARP in 2011 and 2012. Emily received her PhD in astronomy from Cal Tech and her past experience includes being an instrument team member on a few ASP missions as an undergraduate, an internship at the Ames NASA Academy, and an organizer of a subsequent Ames NASA Academy. She is currently preparing for SARP 2013, an 8 week internship program, which will take place in June to August.



Dr. Jack Kaye at the introductory SARP student poster session



Dr. Emily Schaller giving the introductory lecture at SARP 2012.



Dr. Ken Jucks giving a lecture on Atmospheric Composition at SARP.



Dr. Melissa Yang of LaRC explains the AVOCET instrument to a SARP student.



SARP student collects ground truth ocean data in Santa Barbara Channel.



Dennis Gearhart working with SARP students on the MASTER instrument data feed.



SARP students giving a final research presentation at the conclusion of SARP 2012.



The 2012 SARP students and research mentors in front of the NASA Wallops P-3B

NASA SMD ESD Airborne Science Program 6-Month Schedule

ASP SUPPORTED	Apr	May	Jun	Jul	Aug	Sep
DC-8		K-Tec IRIS L	SEAC4RS SARP SEAC4RS	SEAC4RS Upload	SEAC SEAC4RS Deployment Singapore (approx. dates)	
ER-2 #806	AVIRIS/MASTER: HySP	LAC Ded'ctd Flts.	AVIRIS/MASTER:HySPIR		AVIRIS, MASTER	
ER-2 #809	SPI SPI Flights	NPP (eMAS, NAST-I +)	LAC Ded'ctd Flts	809 SEAC4RS Upload	809 SEAC4RS Deployment	
G-III (D)	Cnt & So Amer	CA Fault Lines/CO Landslides	Maintenance	Gulf Co	Local	Cascade +
G-III (J)	AirMOSS CA	AirMOSS Decor Recon	AirMOSS	AirMOSS	AirMOSS	Decor DirRet Recon 992
G. Hawk #871	UAVSAR/LVIS	UAVSAR, Down			HS3 Deployment - Wallops	Dwnld
G. Hawk #872	Aircraft Maintenance	Hawkeye Upload Hawk Hawk	Aircraft mods	HS3 Uploads	HS3 Deployment - Wallops	Dwnld
P-3	Operation Ice Bridge	Annual Maint. & Upgrades	ECOSAR Upload	ECOSAR Main.	DISCOV Upload	DISCOVER-AQ, TX OIB Up

Other NASA Aircraft	Apr	May	Jun	Jul	Aug	Sep
UC-12	XVS					DISCOVER-AQ
B200 (D)	AirSWOT Local FL	Local/Deployed Flights	Arctic Hydrology Flights - Alaska Deploy.	FBOS		Arctic HydroFlight
B200 (L)	XVS					DISCOVER-AQ TX
C-23 Sherpa	CARVE Phase1	CARVE Phase2	CARVE Phase3 RMOTC	CARVE Phase4	CARVE Phase5	CARVE Phase6 CARVE 7
Cessna						
Falcon/HU-25C		SCIFLI		GEO-TASO		GEO-TASO NAVA
Ikhana	DB-110 pod					UAS in the NAS
Lear 25			NAIMS			NAIM
S-3B						
SIERRA			Predeploy maint. MIZOPEX MIZO	MIZOPEX Sci Deployment		OCEANIA
T-34C		Maintenance			Maintenance	
T. Otter			NAIMS	Inspection		
WB-57 #926	Paint Aircraft	Payload I&T				
WB-57 #928			Deployment			
Commercial Aircraft						
Twin Otter						

= Aircraft Modification
 = Stateside Deployment
 = Flight
 = Maintenance
 = Foreign Deployment
 = Reimbursable

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

ASP Upcoming Events

- * Tactical Fire Remote Sensing Advisory Committee (TFRSAC) Spring meeting
Autonomous Modular Sensor (AMS) workshop
April 17–18, 2013: NASA Ames Research Center
Contact Vince Ambrosia (Vincent.g.ambrosia@nasa.gov) or Everett Hinkley (ehinkley@fs.fed.us)
- * NASA Carbon Cycle and Ecosystem (CCE) Program, Terrestrial Ecology Science Team Meeting
April 30 - May 2, 2013
Scripps Seaside Forum, San Diego, CA
http://cce.nasa.gov/meeting_te_2013/index.html
- * AGU Ocean Sciences Meeting of the Americas
May 14-17, 2013; Cancun, Mexico
moa.agu.org/2013/
- * GEO-CAPE community meeting
Week of May 20 - TBD
- * 2013 HYSPIRI SCIENCE SYMPOSIUM
May 29-30; Goddard Space Flight Center, Maryland
<http://hyspiri.jpl.nasa.gov/events/2013-hyspiri-symposium>
- * IGARSS 2013
July 21-27, 2013
Melbourne, Australia
www.igarss2013.org/
- * AUVSI North America "Unmanned Systems 2013"
August 12-15, 2013; Washington, DC
Registration is open:
<http://www.auvsishow.org/auvsi13/public/enter.aspx>
- * AIAA Infotech@Aerospace 2013
August 19-22, 2013; Boston
<https://www.aiaa.org/Boston2013/>
- * Alaska Unmanned Aircraft Systems (UAS) Interest Group Annual Meeting:
Anchorage, Alaska
DELAYED to October 22-23, 2013
Now accepting presentation proposals
Leonard.ligon@ataero.com

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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	ER-2	NASA-DFRC	12	2,900	40,000	>70,000	410	>5,000	http://www.nasa.gov/centers/dryden/research/AirSci/ER-2/
	WB-57	NASA-JSC	6	7,200	72,000	65,000	410	2,500	http://jsc-aircraft-ops.jsc.nasa.gov/wb57/
	DC-8	NASA-DFRC	12	30,000	340,000	41,000	450	5,400	http://www.nasa.gov/centers/dryden/research/AirSci/DC-8/
	P-3B	NASA-WFF	12	16,000	135,000	30,000	330	3,800	http://wacop/wff.nasa.gov
	Gulfstream III (G-III) (mil: C-20A)	NASA-DFRC	7	2,610	45,000	45,000	459	3,400	http://jsc-aircraft-ops.jsc.nasa.gov/GIII/index.html
	Gulfstream III (G-III)	NASA-JSC	7	2,610	69,700	45,000	459	3,400	http://jsc-aircraft-ops.jsc.nasa.gov/GIII/index.html
	Global Hawk	NASA-DFRC	31	1500	25,600	65,000	335	11,000	http://airbornescience.nasa.gov/platforms/aircraft/globalhawk.html
NASA Catalog Aircraft	King Air B-200 AND UC-12B	NASA-LARC	6.2	4,100	12,500	35,000	260	1250	http://airbornescience.nasa.gov/platforms/aircraft/b-200.html
	DHC-6 Twin Otter	NASA-GRC	3.5	3,600	11,000	25,000	140	450	http://www.grc.nasa.gov/WWW/AircraftOps/
	Learjet 25	NASA-GRC	3	3,200	15,000	45,000	350/.81 Mach	1,200	http://www.grc.nasa.gov/WWW/AircraftOps/
	S-3B Viking	NASA/GRC	>6	12,000	52,500	40,000	450	2,300	http://www.grc.nasa.gov/WWW/AircraftOps/
	Ikhana (Predator-B)	NASA-DFRC	30	3,000	10,000	52,000	171	3,500	http://airbornescience.nasa.gov/platforms/aircraft/predator-b.html
	SIERRA	NASA-ARC	11	100	445	12,000	60	550	http://airbornescience.nasa.gov/platforms/aircraft/sierra.html
	Cessna 206H	NASA-LARC	5.7	1,175	3600	15,700	150	700	http://www.nasa.gov/centers/langley/pdf/70892main_FS-2004-07-92-LaRC.pdf
	HU-25C Falcon	NASA-LARC	5	3,000	32,000	42,000	430	1,900	http://airbornescience.nasa.gov/aircraft/HU-25C_Falcon
	C-23 Sherpa	NASA-GSFC	7	7,000	27,000	20,000	190	1,800	http://airbornescience.nasa.gov/aircraft/C-23_Sherpa

ASP Upcoming Events

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* IGARSS 2013
Sun, July 21, 2013– Sat, July 27, 2013
Melbourne, Australia
www.igarss2013.org/

* SPIE Remote Sensing 2013
23-26 September 2013
Dresden, Germany
http://spie.org/x6262.xml?WT.mc_id=RERS13CE

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 Steve Wegener (650/604-6278, steven.s.wegener@nasa.gov) or Matt Fladeland (650/604-3325, matthew.m.fladeland@nasa.gov).

