CONTRAST
Education & Outreach
Summary

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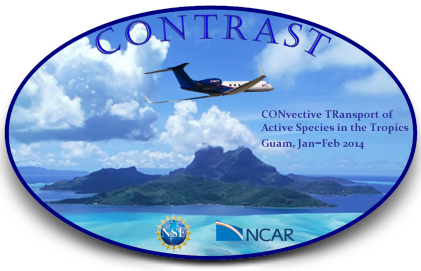

CONTRAST Education & Outreach Summary

1.0 Goals & Objective

The CONTRAST field project Public Information Program (PIP) was lead by the Earth Observing Laboratory (EOL) in collaboration with the Facility for Airborne Atmospheric Measurements (FAAM-UK), NASA, and several universities to develop and implement a multifaceted program of education and outreach activities.

The primary goal of the PIP was was to increase public awareness on a local, and national level of the CONTRAST science objectives and societal benefits. The secondary goal was to engage students into the field of atmospheric science by exposing them to field research methods and operations by means of online communications and experiential learning opportunities.

A variety of methods for disseminating and circulating information to targeted audiences were used for the CONTRAST outreach efforts. These included the use of the Web 2.0 platforms and websites; public speaking engagements; a public open house and media events; targeted student enrichment activities; printed materials for enhanced visibility of the project; and collaborations with UCAR and other involved agencies.

2.0 Outreach Events

Outreach events are an important aspect of any field campaign because it creates an environment where people can interact directly with project scientists, engineers, technicians, project managers, and a host of others involved with the project. These personal interactions are vital for connecting with taxpayers, voters and the next generation of the U.S. workforce. Several outreach and public engagement activities were organized during the CONTRAST field campaign in Guam to foster connections with the community and media, including a public open house, a media event, and 24 presentations at nine middle and high schools reaching close to 4,000 students.

2.1 Middle & High School Visits in Guam

10 - 25 February 2014

The highlight of the outreach events was reaching 3921 middle and high school students in Guam during a two-week period during the field project. 24 presentations were given at nine public schools, the education and outreach coordinator led eight of the presentations, while one was led by a Project Manager (See *Table 1*). When possible, several other CONTRAST and CAST staff co-presented (See *Figure 1*) which help to broaden the scope of the presentation and show the students the variety of careers that are available in atmospheric science and field work.

Figure 1 :: Students from Simon Sanchez High School pose with CONTRAST & CAST staff.

CONTRAST stickers, informational cards along with a variety of related material provided by UCAR Spark were given out at the schools to engage students with the science of CONTRAST and Earth science

in general. There were not enough hand-outs for each student so the materials were given to the teachers to hand out at their discretion.

Contact was made with the schools approximately six weeks in advance of the presentation to coordinate and schedule visits. The positive response from the schools was largely due to the timing of the field project which coincided with students being in school, and not on summer break. There were more requests than what was able to be met in the two-week period of the education and outreach coordinator's visit to Guam. There was a waiting list of schools interested in having a presentation, unfortunately we could not meet all of the requests in the given time that the education and outreach coordinator was in Guam.

>> View the CONTRAST School Presentation

Table 1 : CONTRAST School Visit summary of schools, grade levels, number of students that saw that presentation, and the CONTRAST and CAST staff who gave the presentation at each school.

School	# of Presentations	# of Students	Grade Level	Presenter(s)
JFK High School	6	420	9th-12th	Alison Rockwell, Maria Navarro, Ross Salawitch
University of Guam	1	60	undergraduate chemistry students	Alison Rockwell, Johnny Luo, Alfonso Saiz-Lopez
F.B Leon Guerro Middle School	3	197	6th-8th	Alison Rockwell
Jose L.G. Rios Middle School	3	900	6th-8th	Alison Rockwell
Agueda I. Johnston Middle School	3	900	6th-8th	Alison Rockwell
Vicente B.S. Benavente Middle School	2	180	8th	Alison Rockwell, Jody Williams, Becky Hornbrook, Stacey Hughes, Dan Riemer
Simon Sanchez High School	2	415	9th-12th	Alison Rockwell, Jim Moore, John Cowan, Mickal Filus
Inarajan Middle School	3	594	6th-8th	Alison Rockwell
Notre Dame High School	1	255	9th-12th	Jim Moore, Laura Pan, Jody Williams, Jim Bresch
TOTAL	**24**	**3921**		

2.2 Radio Talk Show

13 February 2014:: Guam

Listen to K57 Radio Show with Ray Gibson

CONTRAST Project manager Jim Moore did a live radio talk show interview on K57's Breakfast Show with Ray Gibson to tell listeners about the project as well as to invite them to the Research Aircraft Open House (See *section 2.4*).

2.3 KUAM TV

14 February 2014 :: Guam

Watch the KUAM TV Clip

CONTRAST PIs Laura Pan and Ross Salawitch did a pre-corded interview that was aired later in the day to help promote the public open house and the project in general.

Unfortunately, the host did not provide any warm-up questions and proceeded directly into the one-take recording. Additionally, the information that he provided about the Open House was incomplete.

2.4 Research Aircraft Open House & Media Event

15 February 2014 :: Guam

Research Aircraft Open House Flier

The Research Aircraft Open House (*Figure 2*) was open to the general public in Guam where visitors had the opportunity to board both the NSF/NCAR HIAPER and the FAAM BAe-146, as well as learn more about the NASA Global Hawk thought an informational exhibit. The Open House was promoted as an inclusive Research Aircraft Open House so that the three projects - CONTRAST, CAST, and ATTREX - could be shown together to demonstrate their collaborative research efforts.

Figure 2 :: Open House visitors mingle around the NSF/NCAR HIAPER and the FAAM BAe-146

The Guam International Airport Authority and the Aviation Concepts group were very instrumental in arranging the hangar layout and security, as well as helping to promote the event. During the communications and visits with the public schools the Open House was also promoted. The radio talk show and TV clip also served to promote the event.

It was estimated that approximately 300 people visited during the three-hour Open House. Visitors were greeted and offered informational brochures on the project and research aircraft. Project scientists gave tours of the aircraft, discussed research objectives, and answered questions from visitors. This provided a valuable opportunity for the Principal Investigators (PIs) to talk directly with the public.

Four media teams came for the media hour which was held just before the Public Open House. Scientists and staff were available for interviews, and tours of the aircraft were provided. The media teams ranged in size and several articles were published as a result of the Media Event and can be found on the CONTRAST in the News page.

An added benefit to the collaborative open house was that it gave project staff from all projects to get together during unsolicited "down" time, meaning no flights or planning meetings. Many comments were made that CONTRAST staff were happy to have the opportunity to see the CAST research aircraft, and vise-versa. The Open House provided the opportunity for staff to mingle with one another, informally discuss ideas, operations, software engineering, and future collaborations - something that does not typically happen during a project and was seen a positive and valued interaction by many.

3.0 Undergraduate & Graduate Student Involvement

Facilitated by several CONTRAST university professors, both undergraduate and graduate students had the opportunity to be directly involved with research activities. In all, there was one undergraduate student, seven graduate students, and one postdoctoral fellow involved with the project. These numbers may be limited due to the new Project Participant Profile tool that is filled out by each participant in advance to the field project. Participants are asked to self-select their role in the project, some may see their role as, for example, an instrument operator rather than a student.

Table 2: *A complete list of undergraduate and graduate participants, generated from* https://www.eol.ucar.edu/node/2897/project_participants

Undergraduate Students	
1	NCAR Earth Observing Laboratory
1	**Sub-Total**
Graduate Students	
2	University of Maryland
2	University of Colorado at Boulder
1	Georgia Institute of Technology
1	University of California-Irvine
1	NASA/GESTAR
7	**Sub-Total**
Postdoctoral Students	
1	University of Miami
1	**Sub-Total**
9	**TOTAL**

4.0 Internet-based Outreach

Internet-based outreach activities are crucial to any informal education program because it allows users to investigate and learn about the project at their own pace and interest level. Both the CONTRAST outreach website and Web 2.0 technologies use 21st Century skill sets that are being emphasized in classrooms today, to prepare the next generation of professionals effectively. Skills such as accessing useful and reliable information online; collaborating with others to share, advocate and compromise on critical issues; and using technology for global awareness in and outside of the classroom are all desirable to future employers[1].

The content on the CONTRAST Internet-based outreach platforms were designed to provide multiple levels of information ranging from a broad synopsis to in-depth scientific objectives, allowing students of all ages and backgrounds to follow researchers as they pursued their scientific ambitions and gained new insights into relevant science questions related to the chemistry of the atmosphere. The ultimate goal was to get students interested and excited about atmospheric science, and to gain a better perspective of how the research provides critical information that is beneficial to society.

[1]Center for 21st Century Skills at Education Connection http://www.skills21.org/

4.1 Outreach Website

The CONTRAST outreach website (*Figure 3*) provided a comprehensive survey of the project including science objectives, societal benefits of the research, project locations, and the research facilities. In the write-up below, website traffic metrics on the number of times a page was viewed is provided in Table 3.

The outreach site consisted of 7 informational pages, including a custom infographic depicting the research objectives of CONTRAST.

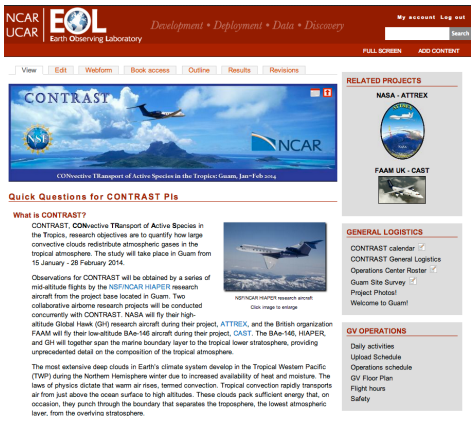

Figure 3 :: Screen shot of the CONTRAST outreach website

Quick Questions for CONTRAST PIs ::
https://www.eol.ucar.edu/content/quick-questions-contrast-pis
The landing page for the CONTRAST outreach website provided a public-friendly description of the research objectives, in a question and answer format. This page was designed to be an informal way to answer basic questions that readers may have regarding the project. The questions and answers covered topics such as what are the societal benefits of the the study, what are active species, short-lived species, and long-lived species, why is CONTRAST based in Guam, and why does the research need to be conducted in January and February.

CONTRAST Science Team :: https://www.eol.ucar.edu/content/contrast-science-team
The CONTRAST Science Team page provides basic information about who is involved in the project from the PIs to the participating universities.
CONTRAST HIAPER Payload :: https://www.eol.ucar.edu/content/contrast-hiaper-payload
This page provides a comprehensive and close up view of all of the instruments on board HIAPER. Where applicable, the instrument name on the webpage was linked to additional in-depth information.

CONTRAST PI Relevant Publications :: https://www.eol.ucar.edu/content/contrast-pi-relevant-publications
This collection of information has not been been used before in education and outreach pages. It served as an means for interested viewers to find high-level, related publications by the PIs.

Follow the NSF/NCAR HIAPER in Real Time :: https://www.eol.ucar.edu/content/follow-nsfncar-hiaper-real-time
Viewers have commented that this was one of their favorite pages. It allowed them to download a KML file so they could watch the NSF/NCAR HIAPER research flights in real-time on Google Earth.

CONTRAST Educational Resources :: https://www.eol.ucar.edu/content/contrast-educational-resources
The Educational Resources page is a compilation of downloadable and online resources for both teachers and students in middle school through graduate school. Links to materials by several groups including UCAR's Spark and MetEd.

CONTRAST In the News ::https://www.eol.ucar.edu/content/contrast-news
The public media outlets did a wonderful job of producing articles about CONTRAST and featuring the research objectives. The *In the News* page is one-stop location to find links to the articles and publications.

Table 3 : Google Analytics metrics of CONTRAST education and outreach page views from 1 December 2013 - 17 March 2014

Page Name	Page Views :: 1 Dec - 17 March 2014
Quick Questions for CONTRAST PIs	204
CONTRAST Science Team	154
CONTRAST HIAPER Payload	148
CONTRAST PI Relevant Publications	44
Follow the NSF/NCAR HIAPER in Real Time	108
CONTRAST Educational Resources	154
CONTRAST in the News	94
Total Page Views (106 days)	**906**

4.2 Web 2.0 Technologies

Web 2.0 technology places the user at the center of a learning experience and facilitates collaboration by sharing information. As a result, users are able to interact and engage with each other in a social media dialogue rather than a passive, one-way stream of information from the content provider to the viewer.

Most CONTRAST outreach web-based material was designed to drive traffic to each other, creating a network of media platforms. Each online location could be successful on its own, however driving traffic from one platform to another made each individual location stronger. For example, the website clearly promoted links (*Figure 4*) the social media outlets; while the Facebook page included posts that contained links back to the website. Each platform served a purpose and certain content was better positioned on a particular platform.

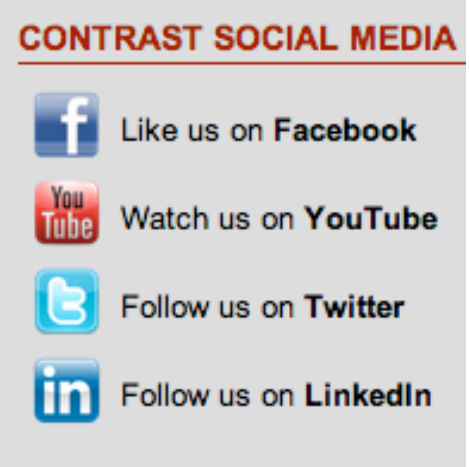

Figure 4 :: Social media links on the CONTRAST website

Facebook

https://www.facebook.com/ncareol

There were 24 CONTRAST related posts on the EOL Facebook page (*Figure 5*), as of mid-March 2014, with the first post on 10 September 2013.

The most Liked post was of the KQED article *3 of the World's Best Scientific Aircraft Team Up for Climate Science Research* with 17 Likes.

Twitter

https://twitter.com/ncareol

The NCAREOL Twitter feed was used to distribute CONTRAST tweets. The Twitter feed is linked to the EOL Facebook page, so posts on Facebook are pushed to Twitter. Some people prefer a certain type of social media, so having the same posts on each platform reaches as many people as possible.

YouTube
https://www.youtube.com/playlist?list=PLniYCv2y34EE35bTyJMkFeAWYJkK5wY_i

A CONTRAST Playlist was created on the EOL YouTube Channel that included the CONTRAST Research Flight 11 video and the NSF/NCAR HIAPER video. The CONTRAST specific video has had 280 views as of mid-March 2014, and is a time-lapse video of RF11 with sub-titles describing the overarching goals of the project. The main distribution method of the video was Facebook, where it was shared by 6 other people.

The CONTRAST Research Flight 11 video will be played in the UCAR Mesa Lab Visitors Center through the summer months on the Current Research exhibit that is prominently displayed upon entering the building.

5.0 Printed Material

Printed material served an important role in the CONTRAST outreach efforts because it provided information that people were able to take away and read at their convenience. This material provided a link to the website where people could learn more about the project at their own pace. Printed material also serves as a reminder to look into additional information once internet access is more convenient.

5.1 Brochure

View the CONTRAST Brochure

An 8.5" x 5.5" brochure was created to hand out to the general public as an informative overview of the CONTRAST project. The brochure was offered at each outreach event and the open house. An infographic of the project was included on the back side of the handout which showed the collaboration of the three research aircraft and what altitudes they were sampling.

5.2 Sticker

A sticker for CONTRAST was designed for public outreach, and were a great token to hand-out at different events.

6.0 Collaborations

A key to the success of the CONTRAST outreach program was the ability to effectively collaborate with groups both internal and external to UCAR. Collaborating with other groups and agencies not only benefited the CONTRAST program by being able to link to relevant material on their sites, but they could link back to and use the content on the many pages of informational content on the CONTRAST outreach website.

6.1 UCAR Communications

CONTRAST had widespread coverage in the media, largely due to support from the UCAR Communications Office. The Communications staff is dedicated to providing news about NCAR field research, and related educational and community engagement to the broader research community, the NCAR and UCAR staff, the media, and the public.

The initial CONTRAST news release, *Scientists to Examine Pacific's "Global Chimney"*, published on 7 January 2014, primed the global media channels for follow up coverage. Numerous articles, blog posts, public news channel videos, and other public media were as a result of that initial new release. The UCAR Communications Office was an essential driver in reaching out to many of the large-scale media channels.

>> See a complete list of CONTRAST media release coverage that was generated from the S*cientists to Examine Pacific's "Global Chimney"* news release in *Appendix B*.

6.2 UCAR Spark

Spark's overarching goal is to make an impact on public understanding of atmospheric science concepts and processes through alliances and partnerships to a national audience. Collaborating with and aligning outreach efforts with Spark benefits both program.

The *Educational Resources* page on the CONTRAST outreach website largely consists of links to educational pieces that the Spark team has developed. All activities related to the science of CONTRAST, which enhanced the CONTRAST online educational efforts, while exposing Spark's work to the general public and driving traffic to their website.

>> See the CONTRAST Educational Resources page

7.0 Summary

The two main objectives of the PIP, to increase public awareness of the CONTRAST science objectives and societal benefits and to engage students into the field of atmospheric science, were met and exceeded by the collaborative efforts that were implemented. The mix of internet-based outreach efforts; public and media events; targeted student and teacher enrichment activities; and printed materials proved to be an effect outreach campaign for communicating CONTRAST science.

7.1 Lessons Learned

A few minor challenges were encountered for planning education and outreach events, most of which were due to the significant time differences between Mountain Time Zone and and Chamorro Time Zone. Though the enthusiasm and interest of the community made for easy planning and scheduling of events, it just took more time than anticipated. Initial inquiry emails were only sent out to middle and high schools and the response was so tremendous that visiting elementary school and civic organizations was just not logistically possible due to time constraints. It is important to prioritize and organize events that have the greatest impact and reach the target audiences for the invested time an energy.

There were two instances where clear communication with the media created some issue. A reporter came to the Media event and Open House and was there for quite some time interviewing scientists and other people involved with the projects. He was asked to send his article and video to the outreach coordinator for review prior to publishing and he did not. When the article and video came out the science reporting was quite good, however there were some significant mistakes as far as the names of the scientists, aircraft and organizations despite . They were contacted immediately and asked to update the information, they pulled the article form their site and never followed up to correct the issues.

At the TV station interview the recording happened fairly quickly upon arrival, leaving little to no time to confirm details with the interviewer. It can not be assumed that they know all of the details if they do not ask. This situation reinforced the need to confirm and clarify details with all types of media before and after interviews and meetings. Public relations is a critical aspect of a comprehensive education and outreach program.

7.2 EOL Education & Outreach Strategic Plan Goals

Goal 1 :: Train and entrain new users to request Lower Atmospheric Observing Facilities (LAOF)

Several undergraduate and graduate students, and postdoctoral fellows had the opportunity to participate in and gain valuable experience by being involved with CONTRAST. They were exposed to project management; interagency coordination and collaboration; data collection and management; instrument maintenance in the field; flight planning and execution; and logistics coordination, among other things. The opportunity to be immersed in an experiential learning environment of this magnitude is a very powerful and effective way to train and entrain early career scientists to potentially request the available NSF lower atmospheric observing facilities.

Goal 2 :: Establish EOL as a trusted source of education and outreach

The CONTRAST outreach program established EOL as a trusted source of education and outreach materials by offering a variety of opportunities to the general public, a range of students, and teachers. The Public Information Program provided valuable information and opportunities to those who would otherwise probably have access to the learning opportunities. There was a high level of school interest, and was easily facilitated by the timing of the project and the school year calendar.

Goal 3 :: Increase the understanding of and public appreciation for observational research in the atmospheric sciences and its relevance to society

Goal 3 was clearly met by the shear numbers of people that were engaged both online and during outreach events. The nature of this field campaign allowed for exciting and captivating opportunities to engage the public, especially the middle and high school students in the Guam Public School System.

Appendix

Appendix A :: CONTRAST Media Release Coverage Report

CONTRAST Media Release Coverage Report

News Date	News Headline	Contact Name	Outlet Name
2/16/2014	Weather researchers open planes to visitors		Guam Pacific Daily News
2/16/2014	Scientists explain global warming projects	JASMINE STOLE	Marianas Variety - Guam
2/13/2014	Jim Moore with Ray Gibson		Pacific News Center
1/27/2014	Ocean's chimney effect studied in Guam		Radio New Zealand International
1/24/2014	Checking on Earth's 'chimney'	Wheeler, Timothy	Baltimore Sun
1/23/2014	Scientists to examine Pacific's “global chimney”		Environmentalresearchweb.org
1/16/2014	Scientists to examine Pacific's 'global chimney'		National Science Foundation
1/13/2014	Tropical Pacific to be studied as major contributor of global climate change		WaterWorld - Online
1/11/2014	CLIMATE: Scientists to examine Pacific's 'global chimney'		Lake County News
1/9/2014	40+ Scientists to Study Pacific Ocean's Global Chimney		Kansas City infoZine
1/9/2014	3 of the World’s Best Scientific Aircraft Team Up for Climate Science Research		KQED - Online
1/9/2014	Scientists study Pacific Ocean's 'global chimney'	Tyler O'Neal	Supercomputing Online
1/9/2014	SCIENTISTS TO STUDY PACIFIC OCEAN'S 'GLOBAL CHIMNEY'		US Fed News Service, Including US State News
1/8/2014	Tropical Pacific May Play Huge Role in Global Warming		Environmental Protection
1/8/2014	Scientists to study Pacific atmosphere	JASMINE STOLE	Marianas Variety - Guam
1/8/2014	Scientists to study Pacific Ocean's "global chimney"	Colorado Bob	Newsvine
1/8/2014	Scientists off to Pacific to study 'weather chimney' effect on climate		Space Daily
1/8/2014	Climate: Research mission to study atmosphere over western Pacific Ocean	Bob Berwyn	Summit County Citizens Voice
1/7/2014	Scientists to Examine Pacific's "Global Chimney" - KALB-TV News Channel 5 & CBS 2		KALB-TV - Online
1/7/2014	Scientists to Examine Pacific's "Global Chimney"		KFMB-AM (760 AM Talk Radio) - Online
1/7/2014	Scientists to Examine Pacific's "Global Chimney"		KTXD-TV - Online
1/7/2014	Scientists to Examine Pacific's “Global Chimney”		Newswise
1/7/2014	Scientists to Examine Pacific's "Global Chimney"	National Center for Atmospheric Research	Newswise
1/7/2014	Scientists to examine Pacific's 'global chimney'		Phys.org
1/7/2014	Scientists to Examine Pacific's “Global Chimney”		PRWeb - Online
1/7/2014	Scientists to study Pacific Ocean's ‘global chimney'		Science Blog

CONTRAST Media Release Coverage Report

News Date	News Headline	Contact Name	Outlet Name
1/7/2014	Experts Head Out to Study the Pacific Ocean “Chimney”		Softpedia
1/7/2014	Scientists off to Pacific to study 'weather chimney' effect on climate		UPI.com
1/7/2014	Tropical Pacific to be studied as major contributor of global climate change		WaterWorld - Online
1/6/2014	Scientists to examine Pacific's 'global chimney'		EurekAlert!
1/6/2014	Scientists to Study Pacific Ocean's 'Global Chimney'		Targeted News Service