

# ORCAS Education & Public Outreach Program



**Alison Rockwell**  
**EOL Education & Public Outreach Coordinator**

A world map in shades of blue, serving as a background for the title text.

# **ORCAS Education & Public Outreach Program**

A photograph of a sunset over the ocean, with a dark blue sky and scattered clouds. The sun is low on the horizon, creating a warm glow.

**DIGITAL & PRINT MEDIA  
EDUCATIONAL COLLABORATION  
ON-SITE ACTIVITIES**

A stylized world map in shades of blue and white, serving as a background for the title text.

# **ORCAS Education & Public Outreach Program**

A photograph of a sunset over the ocean. The sky is a mix of dark blue, purple, and orange, with scattered dark clouds. The water in the foreground is dark and textured.

**DIGITAL & PRINT MEDIA**

# Digital & Print Media

## ORCAS EDUCATION & OUTREACH

- Quick Questions for ORCAS PIs
- ORCAS Science
- ORCAS Science Team
- Follow the NSF/NCAR HIAPER in Real-time
- ORCAS Educational Resources
- ORCAS in the News

The screenshot shows the NCAR Earth Observing Laboratory (EOL) website for the WINTER 2015 project. The page features a navigation menu at the top with links for About EOL, Our Organization, Field Projects, Facilities & Instruments, Request Facilities, Data & Software, News & Events, and Help. The main content area includes a header for 'WINTER 2015 Wintertime Investigation of Transport, Emission, and Reactivity' with a background image of a research aircraft. Below this is a 'Quick Questions for WINTER PIs' section with a sub-header 'Tell us a bit about WINTER and why it's important to better understand wintertime air pollution?'. The text describes the project's goals and funding. A blue box lists three goals: (1) To increase understanding of chemical processes, (2) to assess pollutant formation and reaction, and (3) to identify wintertime emissions. Below this is a paragraph about atmospheric chemistry in winter and a small image of various emission sources. The right sidebar contains several sections: C130 OPERATIONS, EOL INFORMATION (STAFF ONLY), DOCUMENTS, MEETINGS & PRESENTATIONS, WINTER EDUCATION & OUTREACH, NASA INFORMATION, DATA DOCUMENTATION, PLANNING AND FORECASTING, and WINTER SOCIAL MEDIA.

UCAR NCAR Closures/Emergencies Locations/Directions Find People

About EOL Our Organization Field Projects Facilities & Instruments Request Facilities Data & Software News & Events Help

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development • deployment • data services • discovery

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### WINTER 2015

Wintertime Investigation of Transport, Emission, and Reactivity

#### Quick Questions for WINTER PIs

**Tell us a bit about WINTER and why it's important to better understand wintertime air pollution?**

WINTER, which stands for **W**intertime Investigation of **T**ransport, **E**missions, and **R**eactivity, is an atmospheric chemistry project studying the emissions and fate of pollutants during winter across the eastern U.S. WINTER is using the NSF/NCAR C-130 research aircraft, a flying laboratory, to conduct research flights in the Northeast Urban Corridor, the Ohio River Valley, and the Southeast Mid-Atlantic regions from 1 February - 15 March 2015. Flight operations will be based at the NASA Langley Research Center in Hampton, Virginia.

WINTER's efforts are funded by the National Science Foundation (NSF) and the National Oceanic and Atmospheric Administration (NOAA), and supported by the National Center for Atmospheric Research (NCAR). The project is led by Principal Investigators from the University of Washington, NOAA, University of Colorado, University of California, and Georgia Institute of Technology.

The project has three goals:

- (1) To increase understanding of the chemical processes that transform or remove pollutants during the short days and less intense sunlight of wintertime, and to assess the impact of such processes on the formation of secondary pollutants;
- (2) to assess how pollutant gases form and react with atmospheric solid and liquid particles during winter, and to better understand the geographical distribution of the particles, which are important for human health and climate; and
- (3) to identify the quantities of wintertime emissions of key pollutants for urban areas, power plants, oil and gas fields, and agricultural areas.

As atmospheric scientists, we spend a lot of time and effort studying the chemistry that happens in the summer when oxidation is rapid and certain impacts, such as photochemical ozone production, are more acute. So far, there have been very few investigations of atmospheric chemistry in winter. There are obvious differences in meteorology in winter, including colder temperatures, snow cover, lower absolute humidity, and fewer hours of sunlight. Due to colder temperatures, many plants are less active and produce less biogenic emissions, while people produce more emissions by using fuel to heat their homes. All of these factors lead to both a different mix of emissions and different atmospheric chemistry. The impact of these differences on air quality and climate are poorly understood, and large-scale measurement campaigns like WINTER are needed to improve our understanding of these processes in order to develop better computer models and support informed decision making.

Various sources of wintertime emissions  
Click to enlarge

WINTER will use the NSF/NCAR C-130 research aircraft to collect data, why is this aircraft particularly well-suited for this type of research?

#### C130 OPERATIONS

- C130 Floor Plan
- C130 Upload Schedule
- C130 Flight Hours

#### EOL INFORMATION (STAFF ONLY)

- Travel Guidelines
- Personnel Schedule

#### DOCUMENTS

- WINTER White Paper
- Project Safety Document

#### MEETINGS & PRESENTATIONS

- Science/Planning Meeting
- Latest Telecon Slides (1/7)

#### WINTER EDUCATION & OUTREACH

- Quick Questions for WINTER PIs
- WINTER Science Team
- WINTER Instrument Payload
- Follow the NSF/NCAR C-130 in Real-Time
- WINTER Educational Resources
- WINTER in the News

#### NASA INFORMATION

- NASA Access Instructions
- Finding NASA Langley
- Directions to NASA from Hotel

#### DATA DOCUMENTATION

- Dataset Documentation Guidelines
- Data Submission Instructions
- WINTER DRAFT Data Policy

#### PLANNING AND FORECASTING

- UW GEOS-Chem and GEOS-5 Tools

#### WINTER SOCIAL MEDIA

- Like us on Facebook

# Digital & Print Media

## ORCAS SOCIAL MEDIA



Like us on Facebook



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The screenshot shows the website for the WINTER 2015 project. The header includes navigation links for UCAR, NCAR, and various organizational sections. The main content area features a banner for 'WINTER 2015' and a 'Quick Questions for WINTER PIs' section. The sidebar contains several categories of information, including C130 operations, EOL information, documents, meetings, education, NASA information, data documentation, and social media links.

**WINTER 2015**  
Wintertime Investigation of Transport, Emission, and Reactivity

**Quick Questions for WINTER PIs**

**Tell us a bit about WINTER and why it's important to better understand wintertime air pollution?**

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Various sources of wintertime emissions  
Click to enlarge

**WINTER will use the NSF/NCAR C-130 research aircraft to collect data, why is this aircraft particularly well-suited for this type of research?**

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C130 Upload Schedule  
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**PLANNING AND FORECASTING**  
UW GEOS-Chem and GEOS-5 Tools

**WINTER SOCIAL MEDIA**  
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# ORCAS *In Brief* Article

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UCAR | **AtmosNews**

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[Home](#) » [In Brief](#)

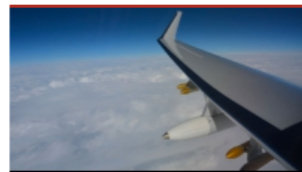
## IN BRIEF



### A heads up on air quality

March 11, 2015

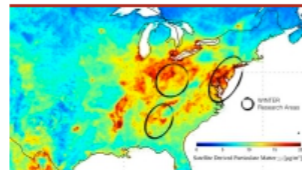
NCAR and its research partners have received a \$1.3 million NASA grant to develop the capability for detailed 48-hour forecasts of ground-level ozone and fine particulate matter.



### Nor'easter on the radar

February 09, 2015

Scientists flew the new HIAPER Cloud Radar above a major northeast snowstorm, obtaining critical data on its structure and dynamics.



### Cold facts of air pollution

February 02, 2015

A major field project in the Eastern United States, supported by NCAR, seeks to better understand air pollution during winter.



### What's behind urban heat islands?

January 13, 2015

Researchers are using specialized modeling techniques have learned how turbulence keeps the countryside cooler than urban areas on summer days.



### Ten top stories of 2014

December 16, 2014

We've assembled 10 of the most popular stories on AtmosNews from the last 12 months.



### Flipping the classroom paradigm

November 14, 2014

The urge to transform higher education through online technology is making its way into atmospheric science. Benefits as well as pitfalls came to light as faculty on the front lines of experimentation shared notes in a UCAR-hosted forum last month.



## SPOTLIGHT



### Snowfall, inch by inch

If predicting snow is a tough business, measuring it is no piece of cake either.

## GET ATMOSNEWS ?

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## FOR JOURNALISTS

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[News Releases](#)

[NCAR & UCAR at a Glance](#)

[Visuals & Multimedia](#)

[Backgrounders on Climate Change, Weather](#)

[News Release Archive by Year](#)

## RECENT PUBLICATIONS

de Foy, B, Y Cui, J Schauer, ..., 2015: *Estimating sources of*

# ORCAS Printed Material

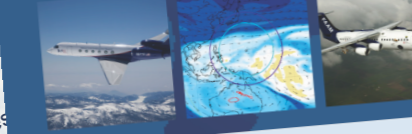
**DYNAMO 2011-2012**  
DYNAMO Online Resource  
Learn more about DYNAMO at [eol.ucar.edu/dynamo](http://eol.ucar.edu/dynamo)

Other Online Resources:  
facebook.com  
twitter.com  
youtube

Collaborative Research:  
DYNAMO is being conducted in collaboration with other agencies and field projects including:  
CINDY2011 - Cooperative Indian Ocean Experiment on Intraseasonal Variability in the Year 2011  
AMIE - Atmospheric Radiation Measurement Model Investigation Experiment

## CONTRAST

CONvective TRansport of Active Species in the Tropics :: January-February 2014 :: Guam



**RESEARCH OBJECTIVE**  
CONTRAST will quantify how large convective atmospheric gases in the tropical atmosphere has extremely low ozone, a unique chemical studied in detail by sensors on aircraft.

**COLLABORATIVE RESEARCH**  
CONTRAST will be a collaborative research project involving three research aircraft from the lower stratosphere and the tropical atmosphere.

- CONTRAST: NCAR, NASA Langley Research Center
- ATTREX: NASA Langley Research Center
- CAST: FAAM, University of Cambridge



## WINTER

WINTERTIME INVESTIGATION OF TRANSPORT, EMISSIONS, AND REACTIVITY  
FEBRUARY - 15 MARCH 2015

**WHAT IS WINTER?**  
WINTER is an atmospheric chemistry research investigation of the emissions and fates of pollutants that ultimately affect air quality and climate. WINTER's efforts are funded by the National Science Foundation (NSF) and the National Oceanic and Atmospheric Administration (NOAA), and supported by the National Center for Atmospheric Research (NCAR). The project is led by Principal Investigators from the University of Washington, NOAA, University of Colorado, University of California, Georgia Institute of Technology. The NSF/NCAR C-130 aircraft operations are based at the NASA Langley Research Center in Hampton, Virginia.

**WHAT HAPPENS TO AIR POLLUTION IN THE WINTER?**  
Summer is prime time for pollutants -- but what happens to air pollution in the winter? The main research objective of WINTER is to increase understanding of how pollution emissions are transformed by chemical reactions in the dark and cold of winter as they are transported throughout the region and beyond by the winds.

Decreased sunlight results in much slower photochemical reactions (oxidation).  
**WINTER Objective 1:** To increase understanding of the chemical processes that transform or remove pollutants during the short days and less intense sunlight of wintertime, and to assess the impact of such processes on the formation of secondary pollutants.

Cooler wintertime temperatures slow down the chemical reactions of gases in the atmosphere, and promote a larger role for liquid and solid particles in the winter pollution chemistry.  
**WINTER Objective 2:** To assess how pollutant gases form and react with atmospheric solid and liquid particles during winter, and to better understand the geographical distribution of the particles.

Emission sources differ between winter and summer from the biosphere and greater emissions from the atmosphere.  
**WINTER Objective 3:** To identify the emission sources of pollutants for urban areas, power plants, and industry.

Learn more :: [www.eol.ucar.edu/winter](http://www.eol.ucar.edu/winter)

## FRAPPÉ

POLLUTION & EXPERIMENT

July - 16 August 2014

FRAPPÉ and DISCOVER-AQ-1

this summer in the Colorado Front Range (NFRMA).

Develop in the atmosphere winter chemical convection, above the ocean energy that, on separates the stratosphere,

g of atmospheric outcome of these sphere and lower the TWP controls as well as air that to climate change.

Learn more :: [www.eol.ucar.edu/frappe](http://www.eol.ucar.edu/frappe)

## DEEPWAVE

NZ 2014

Collaborative Research

FRAPPÉ and DISCOVER-AQ

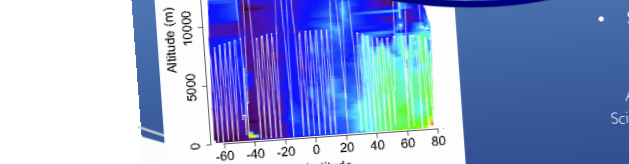
series of collaborated research flights.

DISCOVER-AQ flights will work closely through experiences elevated pollution above air quality monitoring sites across the effects on human health NFRMA. This will lead to better information for satellites in this area, including that face challenges in distinguishing between pollution in generation, oil emission sources and surface-level pollution sources.

FRAPPÉ flights will fly more broadly to sample specific and downwind to distinguish local pollutants versus those transported from regions outside of Colorado. All flights will be tightly coordinated with ground observations by the State of Colorado to provide monitoring of air quality and its provide.

Learn more :: [www.eol.ucar.edu/deepwave/eo](http://www.eol.ucar.edu/deepwave/eo)

**CONTRAST**  
CONvective TRansport of Active Species in the Tropics  
Guam, Jan-Feb 2014



**Front Range Air Pollution & Photochemistry Experiment**  
July - August 2014

**DEEPWAVE NZ**  
Deep Propagating Gravity Wave Experiment Over New Zealand

DEEPWAVE NZ is an atmospheric science research project funded by the National Science Foundation (NSF) and operated by the National Center for Atmospheric Research (NCAR), and in collaboration with NIWA (true?). DEEPWAVE NZ operations will be based in Christchurch, NZ from June - July 2014. The project is led by Principal Investigators from several US universities and research centers including Northwest Research Associates, Yale University, Utah State University, and the Naval Research Laboratory. DEEPWAVE will be in collaboration with a partner project conducted by DLR, the German Aerospace Center, also based in Christchurch.

**RESEARCH OBJECTIVES**  
The objective of the DEEPWAVE NZ project is to study the dynamics of gravity waves from the surface of the Earth to the upper atmosphere. Gravity waves are ripples of energy that move through the atmosphere and are widely recognized to play central roles in a broad range of thermal, chemical, and physical processes extending upward from Earth's surface to the upper atmosphere. Gravity waves that are being studied during DEEPWAVE NZ begin in the lower layers of the atmosphere after they encounter a trigger such as a mountain range or thunderstorm updraft, which gives rise to their vertical motion. It is this upward transport of energy and momentum and the range of interactions that cause them to play important roles at all altitudes, also affecting regional weather and global climate.

**SCIENCE SERVING SOCIETY**  
The data collected during this study will play a vital role in increasing computer modeling and forecasting capabilities of weather events and changes in climate across the globe. This study will allow researchers to gain a better understanding of the effects that gravity waves have on the atmosphere, and in particular weather and climate events that are affecting people and the environments around them.

**IMPORTANCE OF NEW ZEALAND**  
The southern hemisphere is an excellent laboratory for the study of gravity waves due to its reliable and consistent westerly wind circulation patterns. The Southern Alps, a mountain range creating a gravity wave "hotspot" in the southern hemisphere, is key to the research of the project. The high-altitude, cold-air jet found in this region allows the gravity waves to reach high altitudes (why?).

Learn more :: [www.eol.ucar.edu/deepwave/eo](http://www.eol.ucar.edu/deepwave/eo)

# Media Event at RAF?







# ORCAS Education & Public Outreach Program

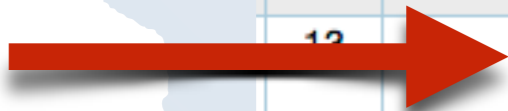


**EDUCATIONAL COLLABORATION**

# CU ATOC 5300

## The Global Carbon Cycle

| Week | Tuesday  | Thursday  |
|------|--|---|
| 1    | 8/27: Introduction   | 8/29: Carbon and Climate  |
| 2    | 9/3: A Primer on the Ocean Carbon Cycle                        | 9/5: Air-Sea CO <sub>2</sub> Exchange   |
| 3    | 9/10: Carbonate Chemistry I                                    | 9/12: Campus Closure - No Class   |
| 4    | 9/17: Carbonate Chemistry II                                   | 9/19: Marine Productivity   |
| 5    | 9/24: Marine Carbon Export                                     | 9/26: Net Community Production<br>(Dave Munro, <a href="#">INSTAAR</a> )            |
| 6    | 10/1: Marine Calcium Carbonate                                 | 10/3: Anthropogenic Carbon in the Ocean<br><b>Homework #1 Due</b>                   |
| 7    | 10/8: Ocean Acidification                                      | 10/10: <b>Ocean CO<sub>2</sub> Paper Discussions</b>                                |
| 8    | 10/15: Ocean CO <sub>2</sub> and Paleoclimate                  | 10/17: Ocean Ecosystem Modeling<br>(Keith Lindsay, NCAR)                            |
| 9    | 10/22: No Class  | 10/24: A Primer on the Terrestrial Carbon Cycle<br><b>Final Paper Topic Due</b>     |
| 10   | 10/29: Terrestrial Productivity                                | 10/31: Land Use Change  |
| 11   | 11/5: The Missing Sink   | 11/7: <b>Terrestrial CO<sub>2</sub> Paper Discussions</b><br><b>Homework #2 Due</b> |
| 12   | 11/12: Modeling Terrestrial Ecosystems<br>(Gordon Bonan, NCAR) | 11/14: Measuring Atmospheric CO <sub>2</sub><br>@NOAA/ESRL                          |
| 13   | 11/19: Atmospheric CO <sub>2</sub><br>(Britton Stephens, NCAR) | 11/21: Measuring the Carbon Isotopes<br>@INSTAAR                                    |
| 14   | Fall Break - No Class  | Fall Break - No Class   |
| 15   | 12/3: CO <sub>2</sub> Emissions                                | 12/5: Carbon-Climate Feedbacks<br><b>Final Paper Due</b>                            |
| 16   | 12/10: <b>Feedback Paper Discussions</b>                       | 12/12: <b>Feedback Paper Discussions</b>  |



# CU ATOC 5300

## Vist RAF During Upload



# ORCAS GV Chat Room



## ORCAS Field Catalog

Home Maps Reports Status Products Missions Tools & Links Data Help

#C130Q (26) #winter (23)

The Hitchhiker's Guide to Atmospheric Chemistry

**Guest:** What does the ORCAS acronym mean and what are you studying?

**Brit:** The O<sub>2</sub>/N<sub>2</sub> Ratio and CO<sub>2</sub> Airborne Southern Ocean (ORCAS) Study will advance our understanding of the physical and biological controls on air-sea exchange of O<sub>2</sub> and CO<sub>2</sub> in the Southern Ocean.

**Guest:** How do you plan on achieving this?

**Brit:** This will be achieved through an intensive airborne survey of atmospheric O<sub>2</sub>, CO<sub>2</sub>, related gases, and ocean surface properties over diverse biogeochemical regions adjacent to the southern tip of South America and the Antarctic Peninsula.

**Guest:** Wow - that sounds really intense. How will you collect all of the data needed to reach your research goals?

**Brit:** *It's really quite easy* - ORCAS will utilize the NSF/NCAR Gulfstream V (GV) aircraft with a suite of high-precision in situ and remote sensing instruments, and whole-air samplers on 14 flights over a period of 6 weeks in austral mid-summer.

The Hitchhiker's Guide to Atmospheric Chemistry  
Topic set by GlennWolfe\_GSFC on Mon Mar 09 2015 09:09:38 GMT-0600 (MDT)

Smilies | Colours | PasteBin | Minify URL

Menu

Chatting

alison  
Becky\_Bldr  
DDR\_MIA  
JorgenJensen\_NN

Idlers

groundbot\_  
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Becky\_cell  
Bill-Ads130  
C130-Cockpit  
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CoryW-VA  
DougD\_Bldr  
JoshDiGangi\_LaRC  
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PaulW\_gnd  
PVeres\_CIMS2  
reeves\_NN  
SamHall\_NN  
sbrown\_ground  
TDLIF\_C130  
TOGA\_C130

ATOOC 5300  
Students

US Schools

Chilean Schools



# ORCAS Education & Public Outreach Program



**ON-SITE ACTIVITIES**

# ORCAS Media Event & Student Visit in Punta Arenas



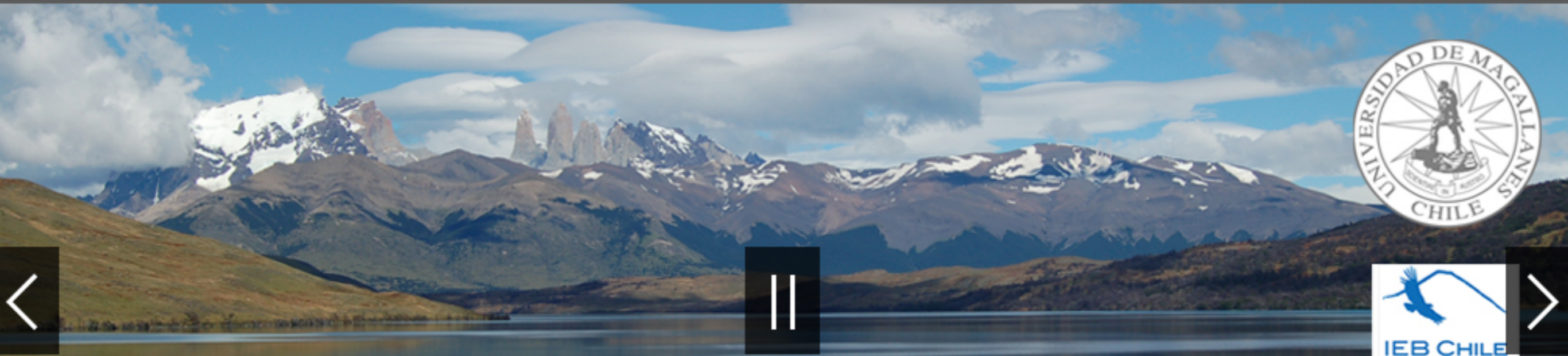
# Punta Arenas Outreach Activities



Universidad  
de Magallanes



PORTADA NUESTRA UNIVERSIDAD ▾ FACULTADES ▾ ADMISIÓN INVESTIGACIÓN ▾ POSTGRADO ▾ VINCULACIÓN CON EL MEDIO



## VIII SOUTHERN CONNECTION CONFERENCE 2016

January 18 - 23th / Punta Arenas, Chile

<http://www.umag.cl/southernconnection2016/>



# Punta Arenas Outreach Activities



Jobs and careers | News | About the IB | Contact the IB | English ▾

Benefits of the IB

**Programmes**

Become an IB school

University admission

Professional development



## The British School - Punta Arenas

Type: **PRIVATE**

Head of school: **Sra. Alejandra Barrios Harmer**

IB School since: **15 November 2006**

Country / territory: **CHILE**

Save to "My Schools"



# Punta Arenas Outreach Activities

Palmer Station  
Antarctica LTER



HOME

ABOUT

RESEARCH

DATA

EDUCATION & OUTREACH

PUBLICATIONS

Welcome to Palmer Station Antarctica LTER  
A member of the Long Term Ecological Research

K-12

Graduate Education

Undergraduate Education

Community Outreach

Multimedia

## Icebergs

Climate scientists study icebergs as they break up for clues to the processes that cause ice shelf collapse



## Latest News

### Decreasing sea ice and Minke whales



Fri, 08/15/2014

Article with Ari Friedlaender (PAL LTER) discussing the challenges of Minke whale research in the Antarctic

The Palmer Long-Term Ecological Research (LTER) study area is located to the west of the Antarctic Peninsula extending South and North of the Palmer Basin from onshore to several hundred kilometers off shore. Palmer Station is one of the three United States research stations located in Antarctica. It is on Anvers Island midway down the Antarctic Peninsula at latitude 64.7 South, longitude 64.0 West. A view from the station can be seen on the [Palmer Station webcam](#).



Any Questions?

