A large, jagged iceberg floats in the ocean. The iceberg is white on top and has a deep blue color on its sides and base. The water is a dark blue-grey color. The sky is overcast with grey clouds. The text is overlaid on the image in a bold, black font with a white outline.

**In the Footsteps of  
Roger Revelle:  
Seagoing  
Oceanography for  
Middle School  
Science**

IFRR commemorates the late Roger Revelle, former director of SIO, founder of UC San Diego, one of the first to grasp the link between CO<sub>2</sub> emissions and greenhouse warming, and a leading 20th century statesman of science.



**In The Footsteps of Roger Revelle**



# *IFRR GOALS*

- teach students physical science via seagoing oceanography (e.g. CLIVAR, Geotraces, HADES)
- provide professional development in seagoing physical science for SMMS teachers
- create systemic change for science teaching and learning at SMMS; prototype for district/national dissemination
- demonstrate the effectiveness of seagoing oceanography as a method to teach mandated physical science standards
- <http://footsteps.ucsd.edu>

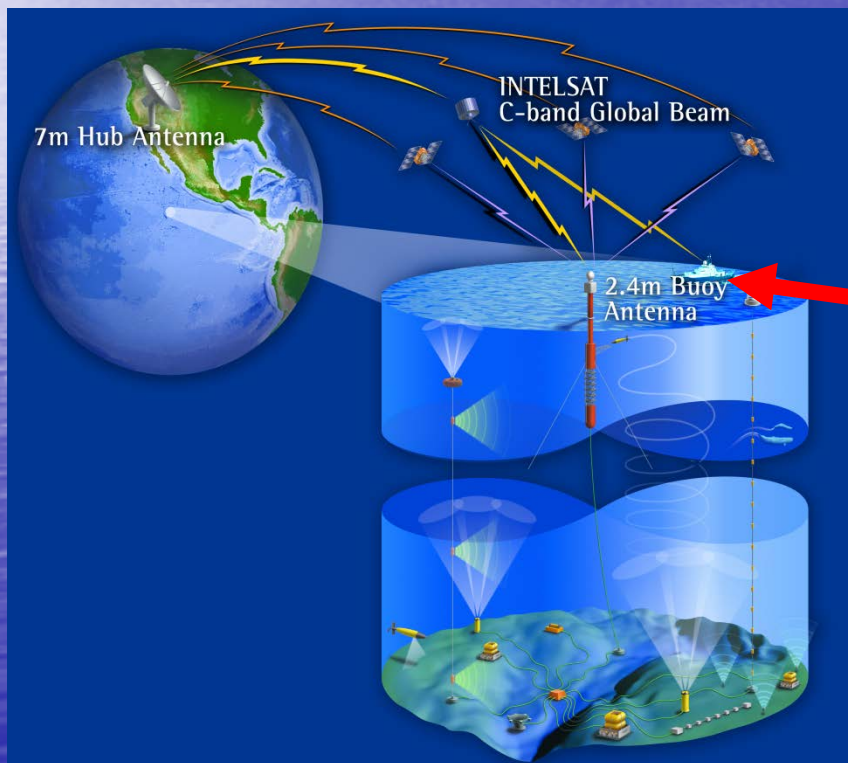
# How we did it:

- extensive precruise teacher/chief scientist consultation and coordination to ensure mutually agreeable integration of the educational effort into the cruise plan
- well-planned coordination of curricular and cruise subject matter and timelines
- internet connectivity of the ship via satellite for student-teacher interaction

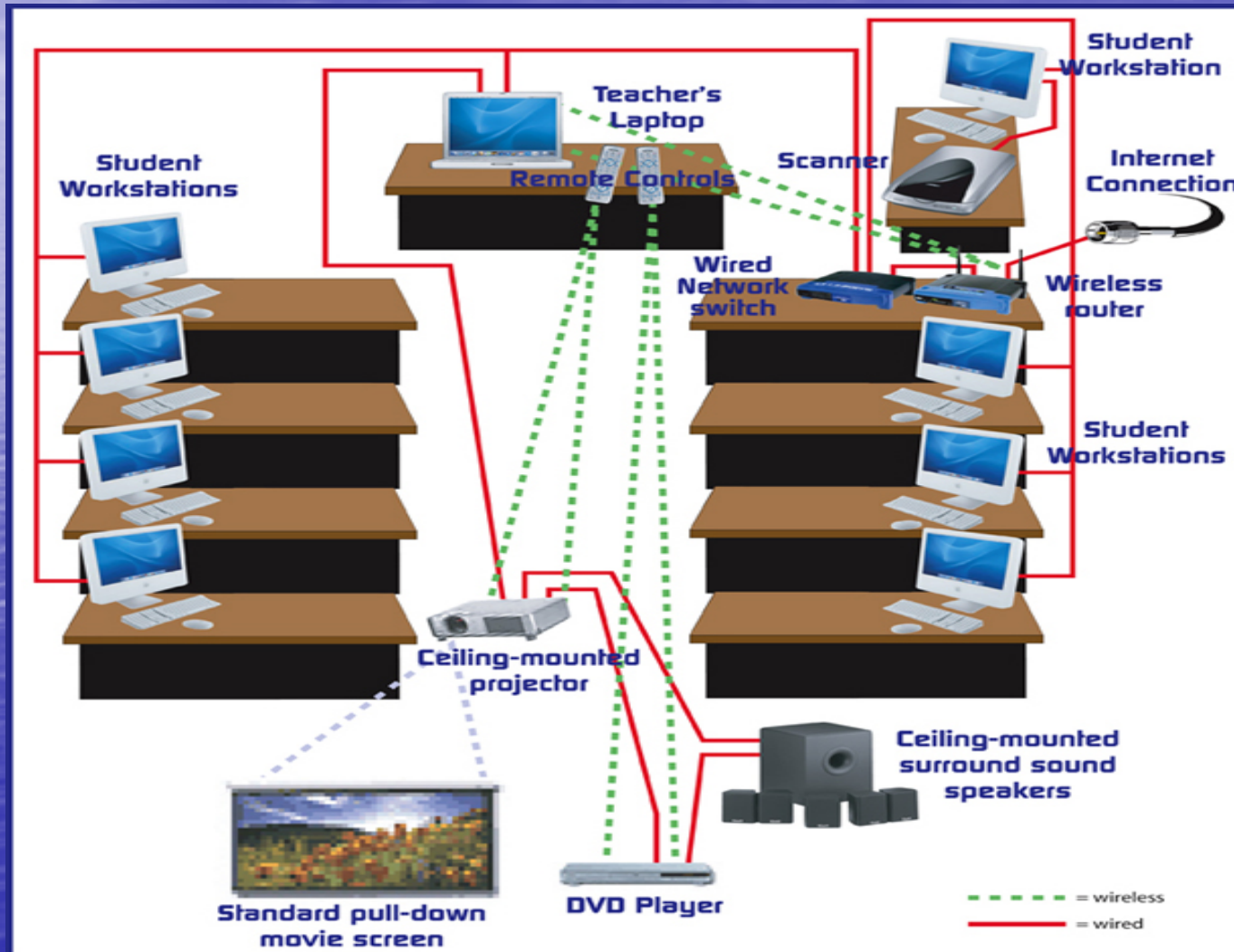


# Technical Enabler – HiSeasNet

HiSeasNet (<http://hiseasnet.ucsd.edu/>) enables affordable satellite-linked communications between shore and research platforms at sea, including ships. The system was implemented first on R/V *Roger Revelle*.



# Technology in the Classroom





# *Educational Ingredients*

- Live videoconferences/ interviews of scientists, crew and technicians on ship - science topics, also career insights (background, education, etc.)
- Daily teacher personal and science logs entries
- Lessons transmitted from sea
- Email exchanges with students
- Data/images from ship to classroom
- Trials of student-designed instruments
- Precruise tours of ship
- Postcruise field trips/day cruises on local R/V, including instrument trials and basic data/sample acquisition
- Creating/building up a website with items above

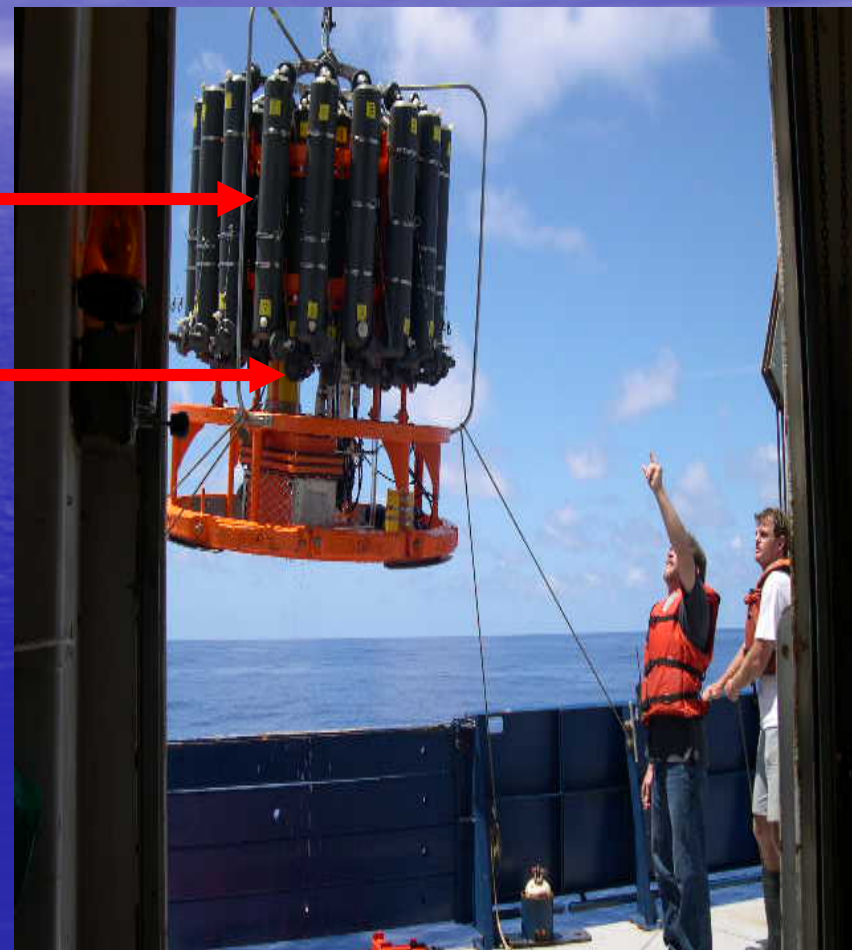
# What science students learned from some of the cruises:





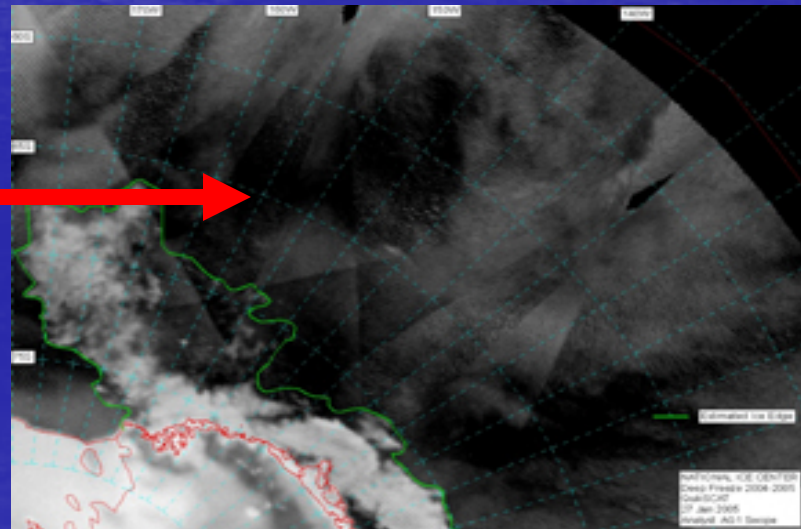
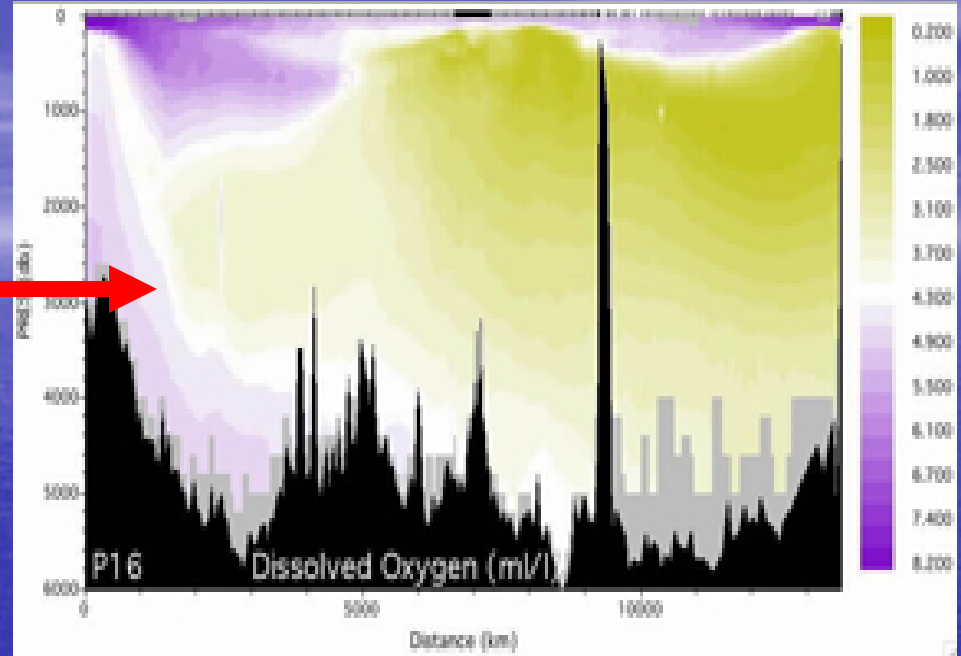
# CTD sampling along 150'W....only 110 to go!

- Sample bottles
- Instruments
- The key instrument at each station is the CTD (Conductivity, Temperature, Depth), lowered by winch from the ship on a cable with electrical conductors.



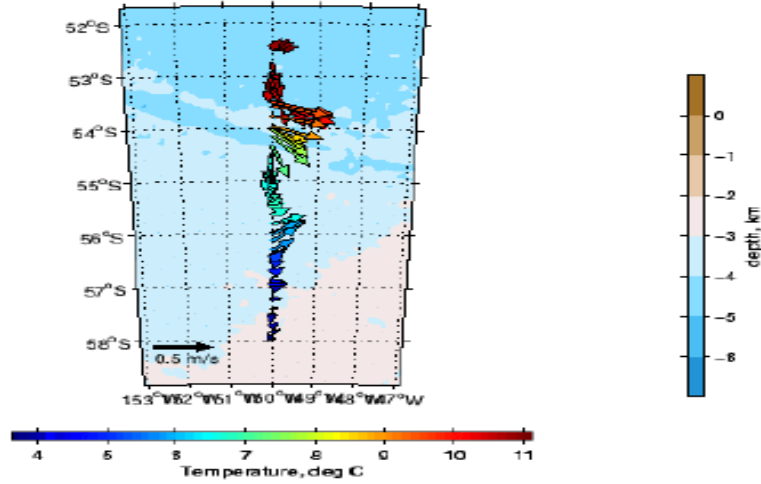
# Data from the cruise to the classroom

- Dissolved O<sub>2</sub>
- From water samples
- Satellite picture of Antarctic ice shelf



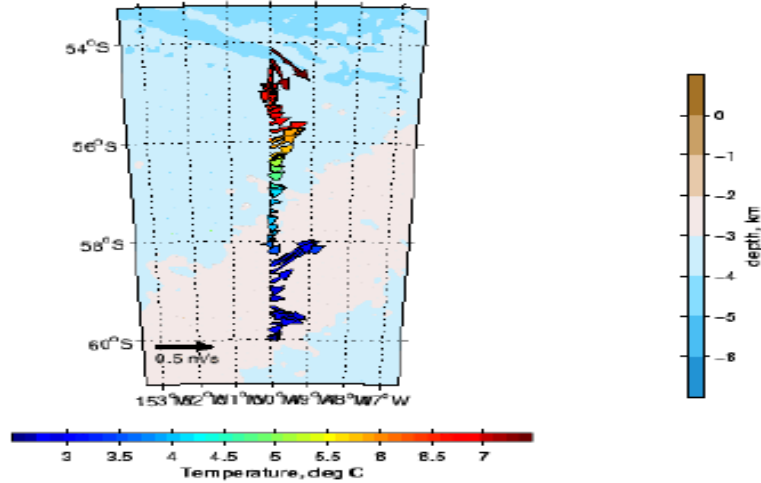


P16Sa nb150 (2005/01/31 23:21:40 to 2005/02/03 23:18:12 UTC), 63–100m



2005/02/03 23:52:49 preliminary ADCP processing, UTM, Hawaii

P16Sa nb150 (2005/02/01 23:21:20 to 2005/02/04 23:18:22 UTC), 63–100m



2005/02/04 23:53:49 preliminary ADCP processing, UTM, Hawaii

- ADCP data from the Revelle

As we cross the Furious Fifties we see our first icebergs...



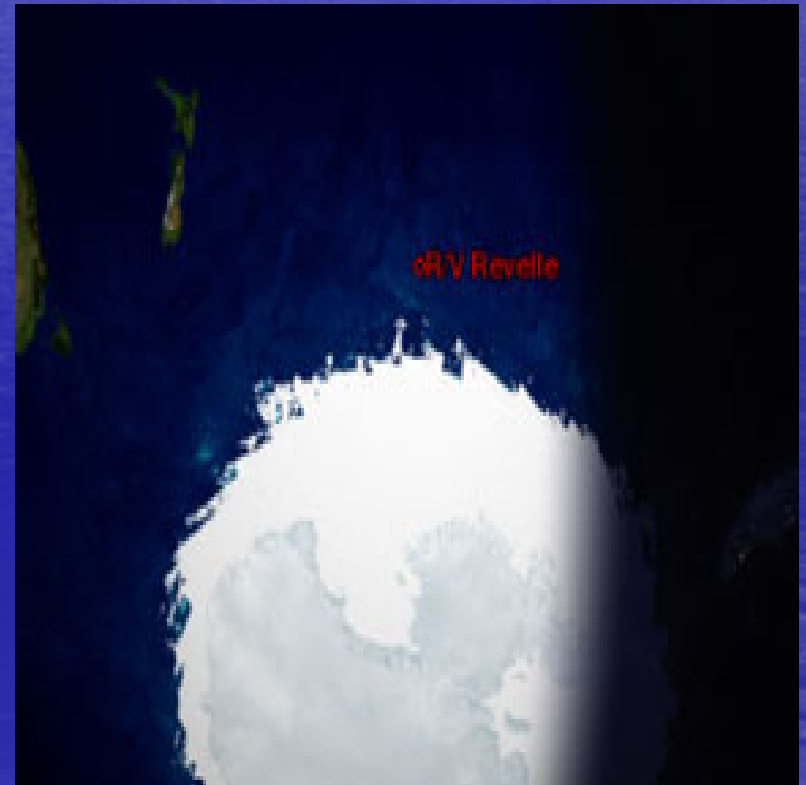


# Big Waves from the bridge.....



# The excitement of being taught from the other side of the world

- Yes..we did see penguins .....





# *The Antarctic Crossing into the frozen realm of King Neptune*



# One of the student experiments.....

- Real physics....shrunk heads.....





# Looking at the ships lab....



- My desk and the main lab, CO<sub>2</sub> analysis, Helium analysis, Chlorophyll analysis.



# At sea...it is the little things that count.....



- Sundays are the best days.....the Chief Engineer BBQ's!

# Dr. Chris Measures talks to a class from 70' South



# Dr. Katie Phillips talks to students off the coast of the Big Island of Hawaii





*Dr. Bruce Appelgate led tours and answered science questions...*



There were small attempts to stow away.....but we told them they had to go to college first....



# 241 students per year from San Marcos Middle School went on oceanographic cruises for a day with the Ocean Institute





# They explored the biological and physical ocean off Dana Pt., CA



From mud grabs to water chemistry....



# They discovered the ocean as a laboratory





# We took Scientists with us..

- Dr. Chris Massell joined us for a day at sea





Discovering "life at sea" ....nah , they aren't seasick..just absolutely fascinated!!!!!!



We wrote journals and watched the ship from our classroom:

# After seeing ROVS..students make their own version.....

- Dr. Knox introduces students to ATV



We shared our field trips, journals and tours on our website:

<http://footsteps.ucsd.edu>



# What We Did:

- In real time IFRR has brought current research in physical oceanography to students at San Marcos Middle School (SMMS) from the research vessel (R/V) Roger Revelle, R/V Melville of the Scripps Institution of Oceanography (SIO) and other ships in the UNOLS Fleet.
- SMMS is a Title I school in an economically disadvantaged area; enrichment activities and motivations of students at this critical age toward science are scarce.

# In the Footsteps of Roger Revelle and Sally Ride



- The future: We are adding the late Dr. Sally Ride to our project in honor of the new SIO vessel, the R/V Sally Ride. Dr. Ride was a distinguished physics teacher at UCSD and a renowned explorer and advocate of science education.





Did we make a difference?



Future Oceanographers.....maybe.  
Futures citizens who see the importance  
of science.....absolutely!!!





Thank you to the Office of Naval  
Research, SIO, scientists, crews, and  
technicians of the research vessels for  
the opportunity to see real science and  
experience being an oceanographer.  
Mrs. Brice's Scientists in Training  
2004-2015

