

People
Events
Programs
Budgets
Prospects

SOEST

EARTH



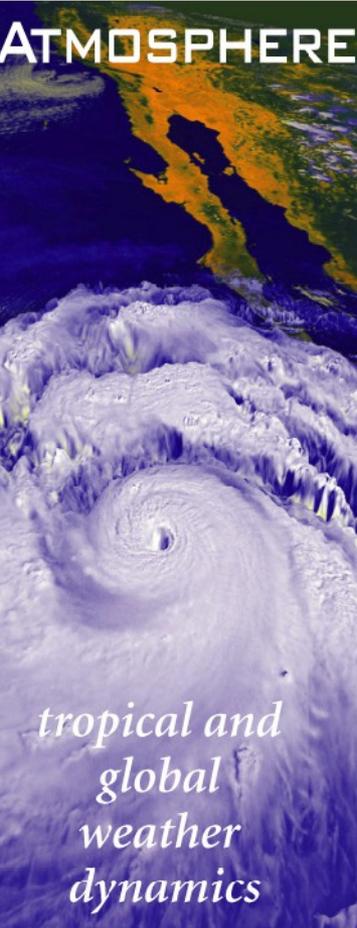
*understanding
Earth
systems*

OCEANS



*hydrosphere-
biosphere-
atmosphere
interactions*

ATMOSPHERE



*tropical and
global
weather
dynamics*

SPACE



*exploring
Earth, Moon,
Mars, and
beyond*

ENERGY



*developing
alternative
energy
resources*

SOEST Faculty Meeting 7 May 2012

SOEST Faculty Recognition

- Rob Toonen

Garrod Distinguished Graduate Mentoring



- Scott Rowland

Chancellor Meritorious Teaching

- Paul Wessel

Fellow of the American Geophysical Union



- Clinton Conrad

NSF CAREER Award

- John Wiltshire

President's Citation Award

Society of Mining, Metallurgy and Exploration



- Shang-Ping Xie

Inaugural Roger Revelle Chair at SIO



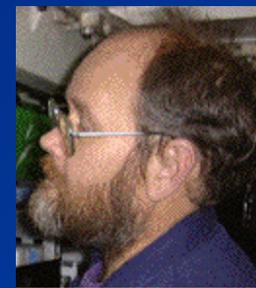
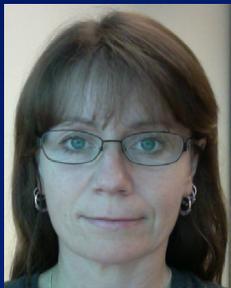
2011 Promotion & Tenure

- positive TPRC recommendations

G&G: Clinton Conrad I4 & T
HIMB: Malia Rivera T
OCE: Margaret McManus I5



HIGP: Sarah Fagents R5
James Potemra R4 & T
Mark Rognstad S5
Pavel Zinin R5



SeaGrant: Darren Lerner S4
Darren Okimoto S5
Maxine Burkett J4



17 SOEST women attended: graduate & u/grad students + 1 faculty

HAWAII'S
INTERNATIONAL
**WOMEN'S
LEADERSHIP**
CONFERENCE

*Growing our future:
Investing in Women*
September 20, 2011 Honolulu, HI



Haunane Kane is an MS student in Coastal Geology, sponsored surfer & navigator



Joy Leilei Shih is a PhD student in Biogeochemistry, activist, diver & dancer

TIME Video

How to Tag a Shark

RELATED TOPICS: Science



Christina Comfort
Graduate Student, University of Hawaii

Christina Comfort is an MS student studying deepwater sharks, OTEC environmental impacts, Tester Symposium best poster

Ugrad & Grad Commencement Reception: May 12th



Comings and Goings

New tenure track faculty

Leon Roose (HNEI)

Jennifer Small (MET)

Michael Bell (MET)

Anna Neuheimer (OCE)



JIMAR Director

Mark Merrifield



Emeritus Professors

Li-Chung Ming (HIGP)

John Mahoney (G&G)

Tom Schroeder (MET)

SOEST Young Investigators

Hilary Close (G&G) **New**

Pedro DiNezio (IPRC)

Peter Isaacson (HIGP)



Chancellor

- 20% of retiree/resignee salaries “reinvested”

Sustainability cluster hire

- Architecture (energy/water use in coastal infrastructure)
- Urban & Regional Planning (social/policy aspects of energy/water use)
- Civil & Env. Engineering (fresh, waste & salt water hydraulic eng.)
- Economics (environmental/energy/water/resource economics)
- Microbial Oce./biogeochem. (nutrient loading of OTEC & SWAC)

-Swept 15% of FY11 S carry forward = \$294K

(after we'd already spent it, as directed, during the first quarter of FY12)

Recent SOEST Gifts

- Estate of Denise B. Evans

\$1.5M for oceanographic research
2 year R.A./yr administered through HIGP

- Will of Mark & JoAnn Schindler
for climate change education & outreach

- Seaver Foundation \$100K

Foundation reef project of Brian Bowen

- Edwin W. Pauley Foundation \$80K

Pauley Summer Program in Marine Biology



An Evening of Exploration
for UHF Founders & Hoku Club Members
on R/V Kilo Moana
with tours by C-MORE & HOT staff



University of Hawai'i photo by David Beales



SOEST Video Oct 11

New videos in various stages of production:

HIGP
C-MORE

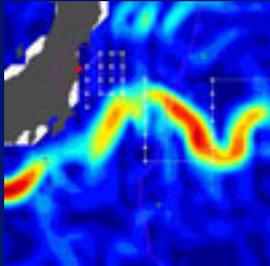
(next HIMB
& HURL ?)



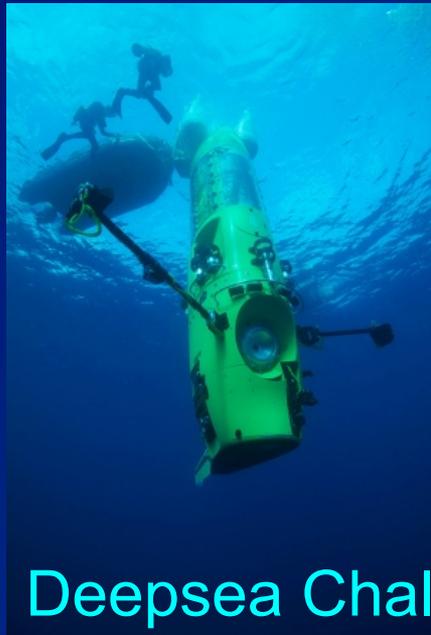
Celebrate the New Year of the
Water Dragon
and Explore new research at the
C-MORE HALE
Open House for the
UH Foundation President's Club

Wednesday, January 18, 2012





KOK: Pacific radioactivity assessment off Fukushima Ken Buesseler . . . & Henrietta Dulaiova



Patty Fryer joins James Cameron expedition to the Mariana Trench

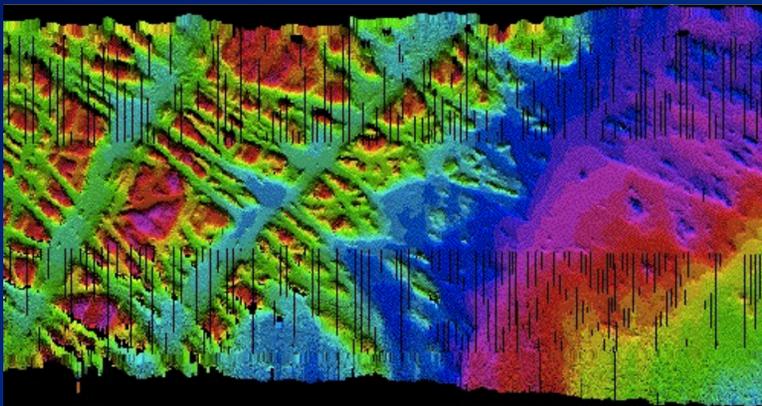


Deepsea Challenger



R/V Kilo Moana

Jan 6-7th, listing 6°-8°
returned to port with
flooded compartment.



Previously scheduled Portland
drydock in Feb-Mar included stbd
hull repair and installation of new
EM710, EM122 receive sonar array
& Bell gravimeter.

LRT
Data Base
& photo-guide

HAWAI'I UNDERSEA RESEARCH LABORATORY

NOAA's Undersea Research Center for Hawai'i and the Western Pacific

*Applying Innovative Deep-sea
Technologies Toward Research,
Service, and Stewardship
in the Pacific Region*



BoR May meeting
SOEST-CNS joint graduate degree
program in Marine Biology

Proposal submitted
G&G: MGeo professional degree

COSEE (Judy Lemus)
Carlie Wiener

UHMC move: Ships to pier 35 Boats to METC summer 2014



Environmental Assessment (TEC): Jan 2012
meets & bounds, geotech & structure, traffic

Building Improvements (Pacific Architects): Jun 2014
revise layout, cost est., design 9/12, work 1/13-5/14

Site Work (R.M.Towill): Jun 2014
grade, culvert, power, sewer,
design 1/13, work 7/13-5/14



School investments

(beyond faculty start-up packages, cost match, bridging funds & support staff):



\$2.1M 6km ROV

\$764K KM multibeam sonars

\$400K Nutrient Facility (Ruttenberg et al.)

\$71K ACO lease & insurance (Howe, Lukas)

\$56K MET facilities & equipment (Wang, Chen, SB)

\$52K X/L band sat. ground station (Businger, PMM)

\$50K Coconut Island B&G (Lakey)

\$47K G&G equipment & instrumentation (GM, RD, GI)

\$39K OCE lab & coring equipment (CM, AT, JS, EG)

\$36K pH sensors 2 PacIOOS buoys (EDC, FMK)

\$25K Hawaii-Sat I parts (Flynn)

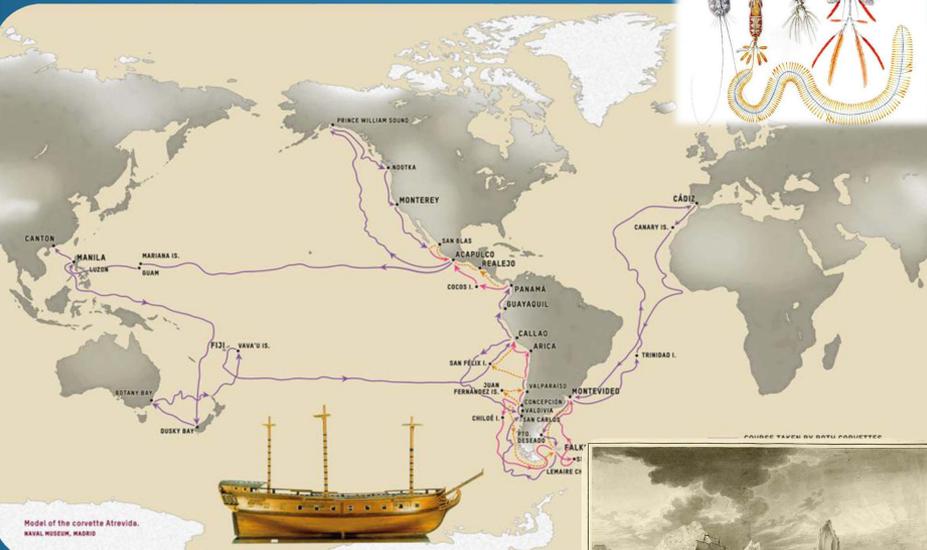
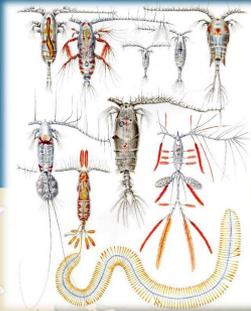
\$15K Resin histology lab (Kelley)

Old Wine in New Barrels: Science and Art on the Malaspina 2010/11

Waikiki Aquarium
Friday, May 13, 2011, 7 pm

Prof. Miguel Alcaraz
Institute of Marine Sciences
Barcelona, Spain

Come and join us for an evening of science, art and talk story! Prof. Alcaraz a member of the Malaspina Expedition will be stopping in Honolulu. Prof. Alcaraz will share his experiences with us and show us how science meets art in biological oceanography.



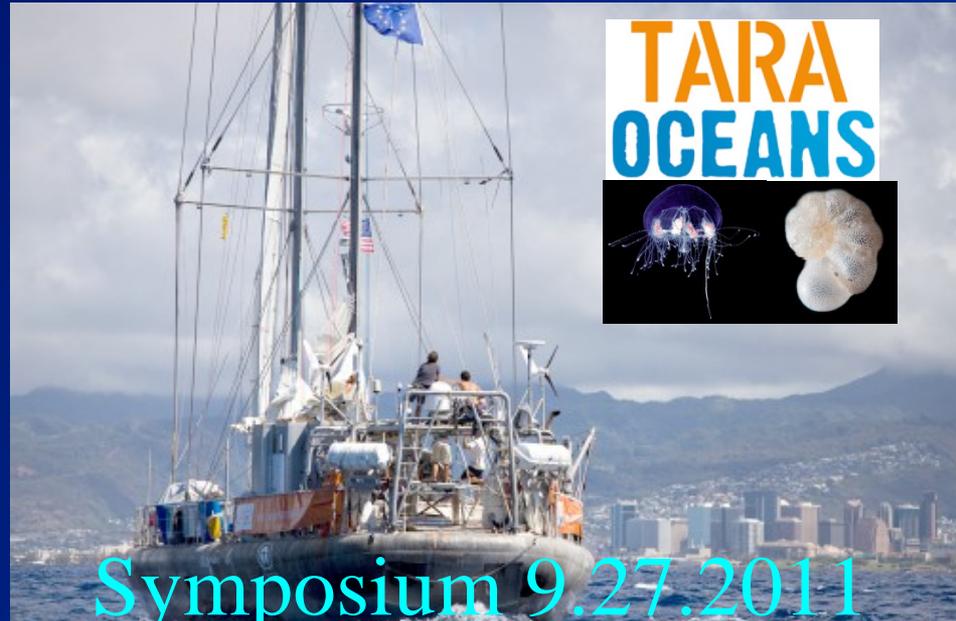
Model of the corvette Atréviga, NAVAL MUSEUM, MADRID



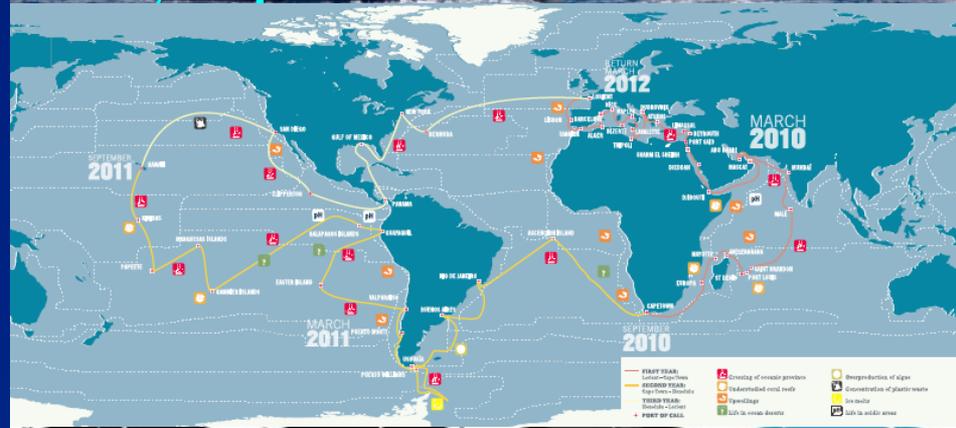
La Corbeta Príncipe real navegando en un campo de hielo en el estrecho de Magallanes el 20 de noviembre de 1791

Please RSVP on or before May 9
Call 440-9020 or email volunteer@waquarium.org

TARA OCEANS



Symposium 9.27.2011



- PRINCIPAL STATIONS
- Secondary Stations
- Agg. Sites - Stations
- TRANSIT STATIONS
- Stations in context
- PORTS OF CALL
- Sampling of mesozooplankton
- Deployment of plastic waste
- Deployment of algae
- Deployment of plastic waste
- Deployment of plastic waste
- Deployment of plastic waste



EXPEDITIONS

Preparing for PVS global voyage



OCEANS

MTS/IEEE KONA

19-22 September



www.OceanS11mtsIEEEKona.org



SOEST Open House 21-22 Oct



APEC Climate Symposium | 7-20 Oct

Public Lecture by **Rosina Bierbaum**
Dean of the School of Natural Resources

& Environment, University of Michigan



APEC 12-20 Nov

Ocean/Earth/Sky
Health/Life Sciences
Renewable Energy
Business Tourism

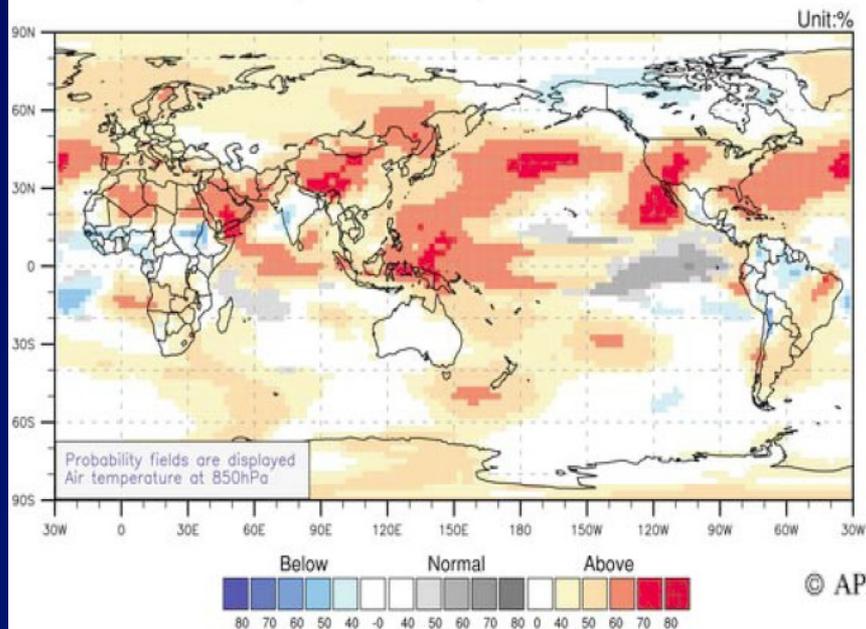
Prof. Bin Wang, Dr. Jun-Yi Lee and Dr. Baoqiang Xiang (UH) Visit APCC to APCC's Prediction Technique



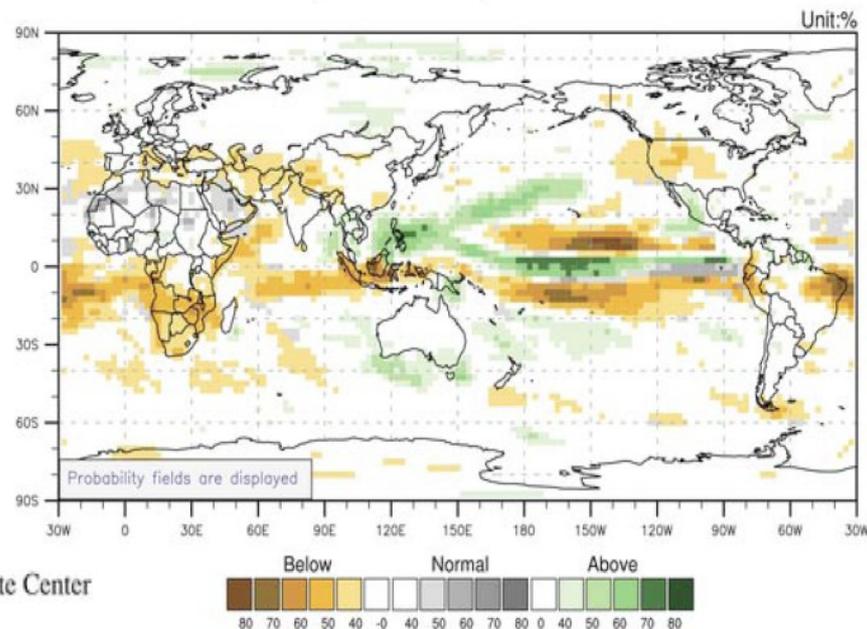
Prof. Bin Wang, Dr. June-Yi Lee, and Dr. Baoqiang Xiang of the University of Hawaii (UH) visited APCC in March 2012. During Prof. Wang's stay from 12 to 14 March, he presented the final report of an APCC international research project which was performed from May 2011 to March 2012 on the "Development of an APCC operational ISO MME system and investigation on Arctic and high-latitude influences on East Asian climate".

The report included (1) development of an ISO prediction system, (2) transfer of the UH coupled models, (3) implementation of a land initialization scheme, and (4) estimation of the impacts of associated changes in East Asian winter monsoon/cold surges on the weather/climate and socioeconomic human activities in East Asia/Korea.

Temperature for April-June 2012



Precipitation for April-June 2012

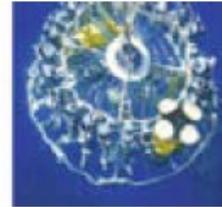




Partnership for Observation of the Global Oceans

Newsletter

Issue 7
Jan 2012

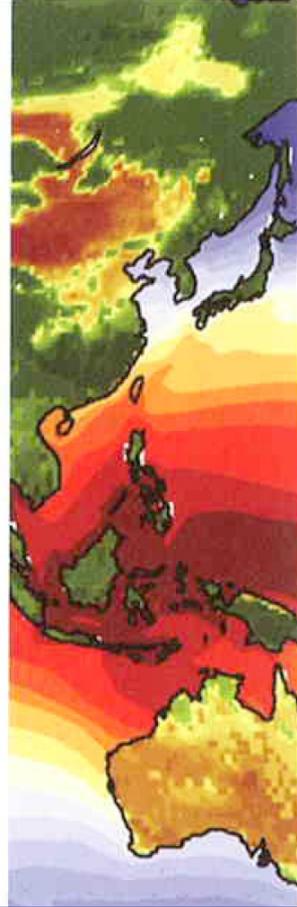
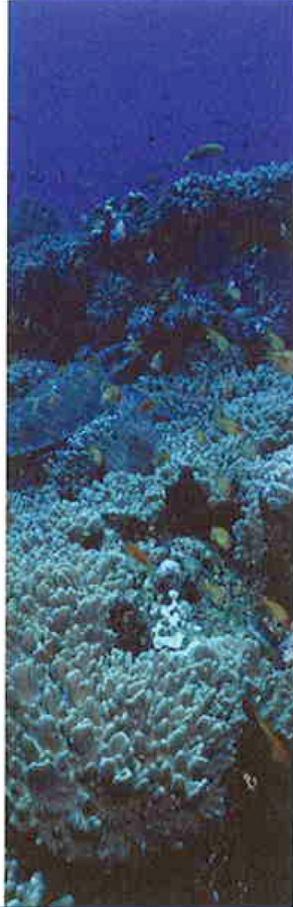


13th POGO Annual Meeting in Honolulu, Hawaii



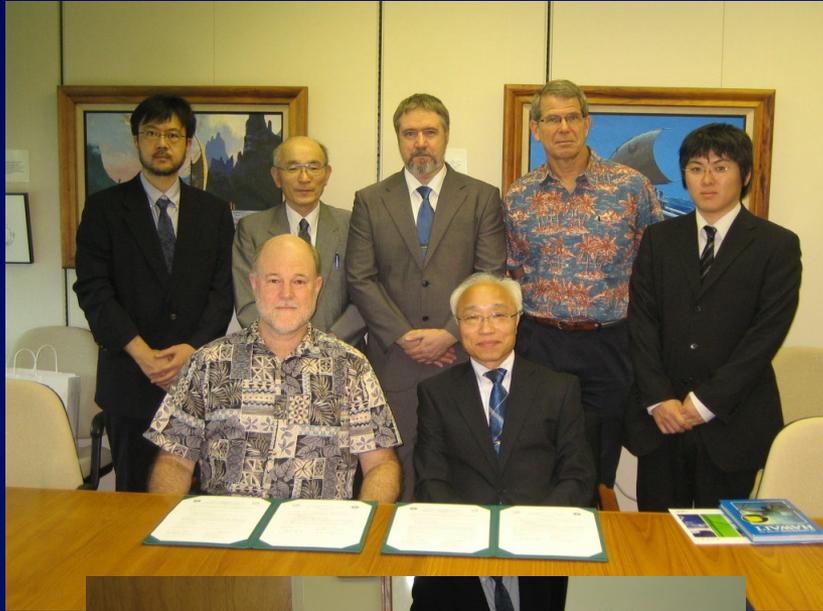
Co-operative Agreements with Japan

Atmosphere & Ocean Research Institute, U.Tokyo



Co-operative Agreements with Japan

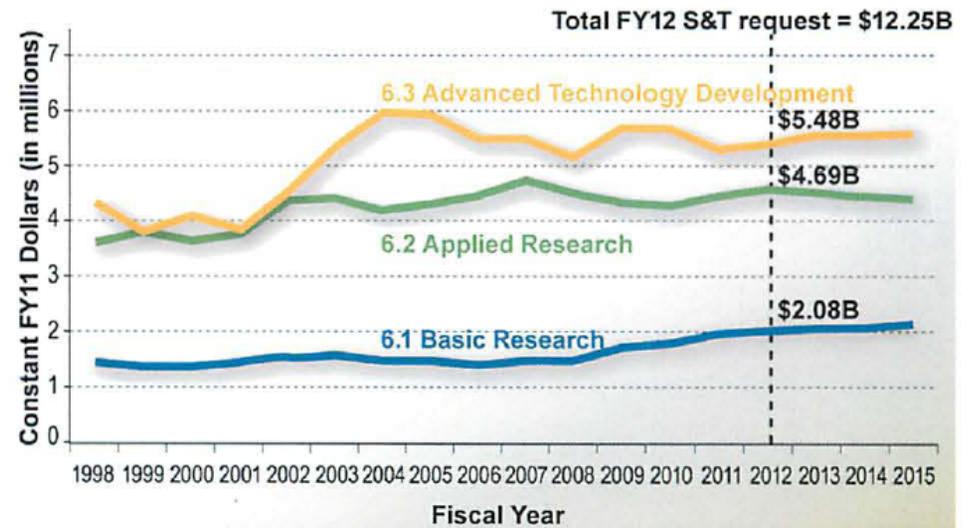
Yamagata University; JAMSTEC
3/12/12 11/14/11



IPRC at Senate Approps.

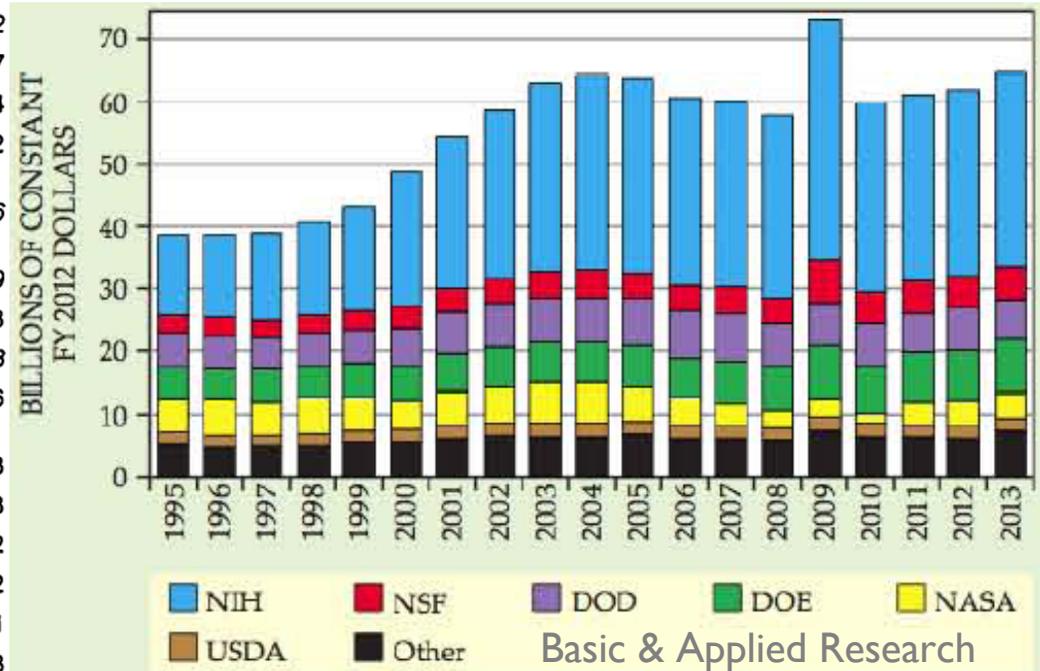
Table 1. Research in the FY 2012 budget (in millions of dollars)

	FY 2010 Actual	FY 2011 Budget	FY 2012 Request
Defense S&T - all	\$6,799		\$6,875
<i>Defense—Basic Research</i>	1,815	\$1,999	2,078
Army	420	449	437
Navy	544	626	577
Air Force	474	514	519
DARPA	194	328	329
<i>Defense Threat Reduction Agency (DTRA)</i>	40	47	48
DTRA Chem-Bio	64	49	53
Health and Human Services – all	31,259	+1	32,173
National Institutes of Health	30,047		31,041
National Aeronautics and Space Administration	1,488	+3	4,573
Energy – all	7,378	+2	9,030
Energy – Office of Science	3,908		4,142
National Science Foundation	4,963	+1	5,877
Agriculture	2,235		2,114
Commerce – all	937		1,232
National Oceanic and Atmospheric Admin	467		506
National Institute of Standards and Tech	448		649
Interior – all	692		658
U.S. Geological Survey	587		548
Transportation	727		846
Environmental Protection Agency	502		493
Veterans' Administration	1,082		938
Education	218		242
Homeland Security	361		382
Smithsonian	167		171
All Other	388		483
Total	\$59,196	+7	\$66,087



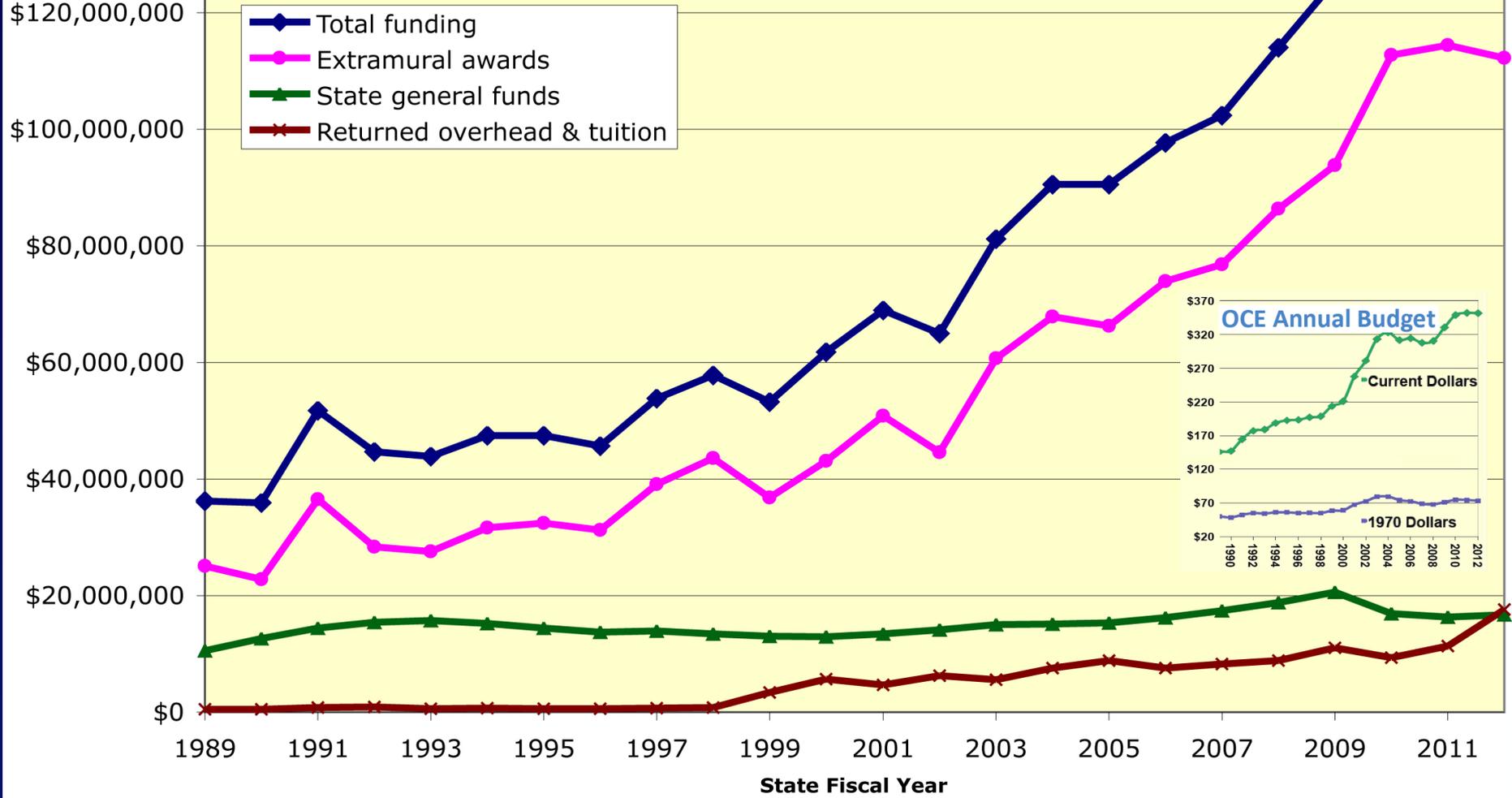
Source: Z Lemnios, 2011, *Shaping the Department's S&T Strategy*, presentation at the National Defense Industry Association Meeting, June 21, 2011.

Figure 3. DOD S&T funding by budget activity



Source: President's 2012 Budget Request

SOEST Funding Profile



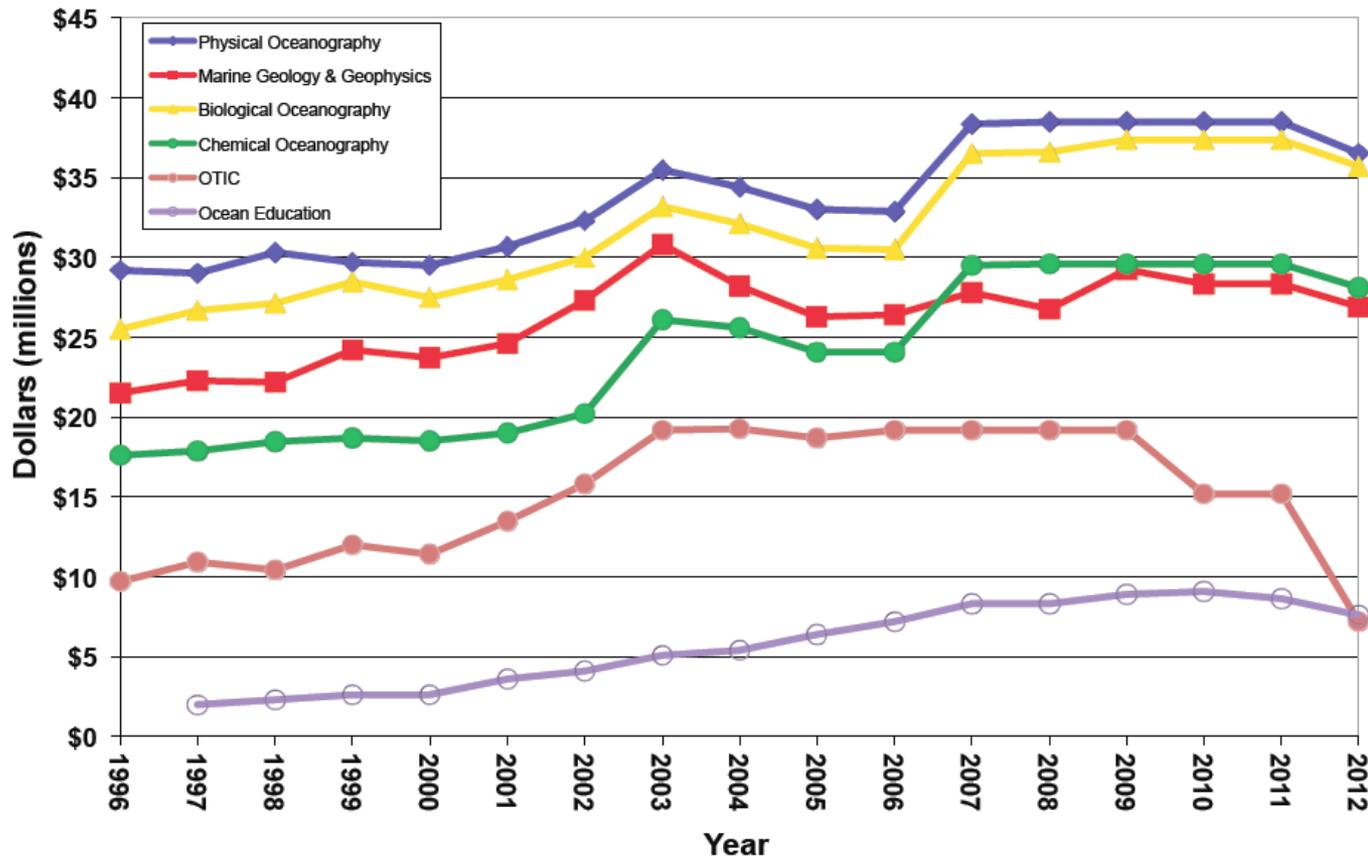
NSF Ocean Sciences

Dr. Deborah Bronk New Head of Ocean Section

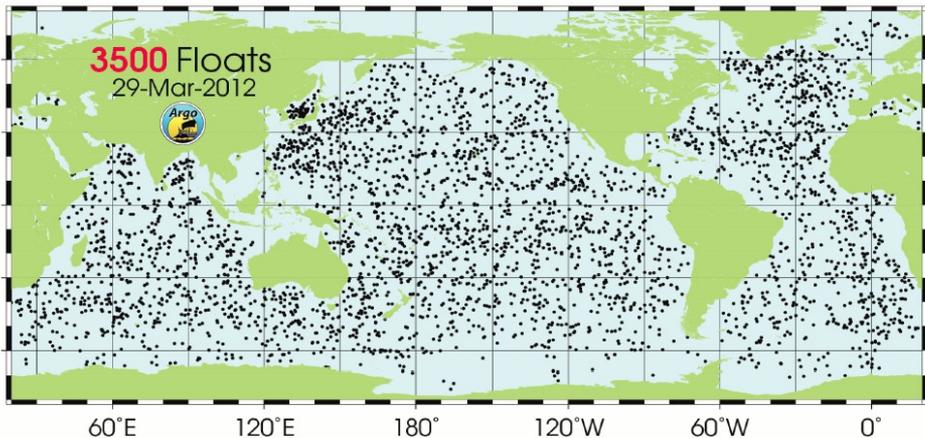
- Effective August 13, 2012
- Professor of Physical Sciences at the College of William and Mary's Virginia Institute of Marine Science
- B.S. in Marine Science and Biology, University of Miami
- Ph.D. in Marine Estuarine and Environmental Science, University of Maryland
- President, Association for the Sciences of Limnology and Oceanography



Ocean Program Budgets in Current Dollars



Cyber-Enabled Networks



Sensing

Data collection, management, and retrieval

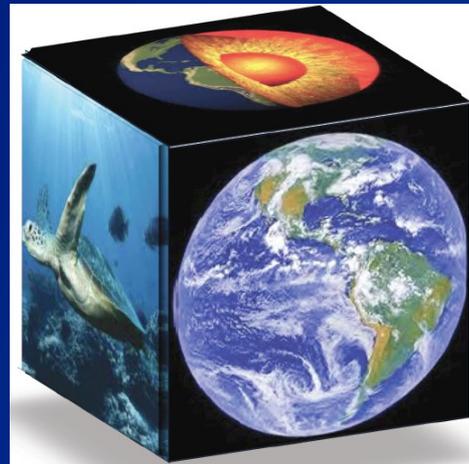
Data Analytics

Visualization

Optimization

Reasoning & Intelligent decision making

Human centered computing



Cyber-Physical Systems (CPS)

Deeply integrating computation, communication, and control into physical systems

Transportation

- Faster and safer aircraft
- Improved use of airspace
- Safer, more efficient cars

Energy and Industrial Automation

- Homes and offices that are more energy efficient and cheaper to operate
- Distributed micro-generation for the grid

Healthcare and Biomedical

- Increased use of effective in-home care
- More capable devices for diagnosis
- New internal and external prosthetics

Critical Infrastructure

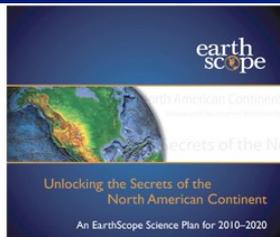
- More reliable power grid
- Highways that allow denser traffic with increased safety



Arctic Sea Ice



Oceans



EarthScope Observatory Network

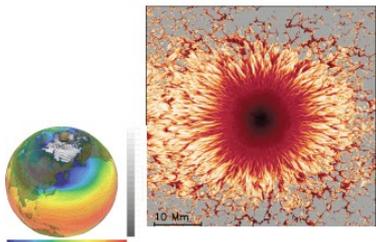
Era of Observation and Simulation



Water



Satellites



Earth System Modeling

Single-Processor Performance Plateaued (Moore's Law) Around the Year 2004

Happening now

- Architectural innovations with multi-core and many-core
- Domain-specific integrated circuits
- Energy-efficient computing and new processor architectures

Mid-term solutions

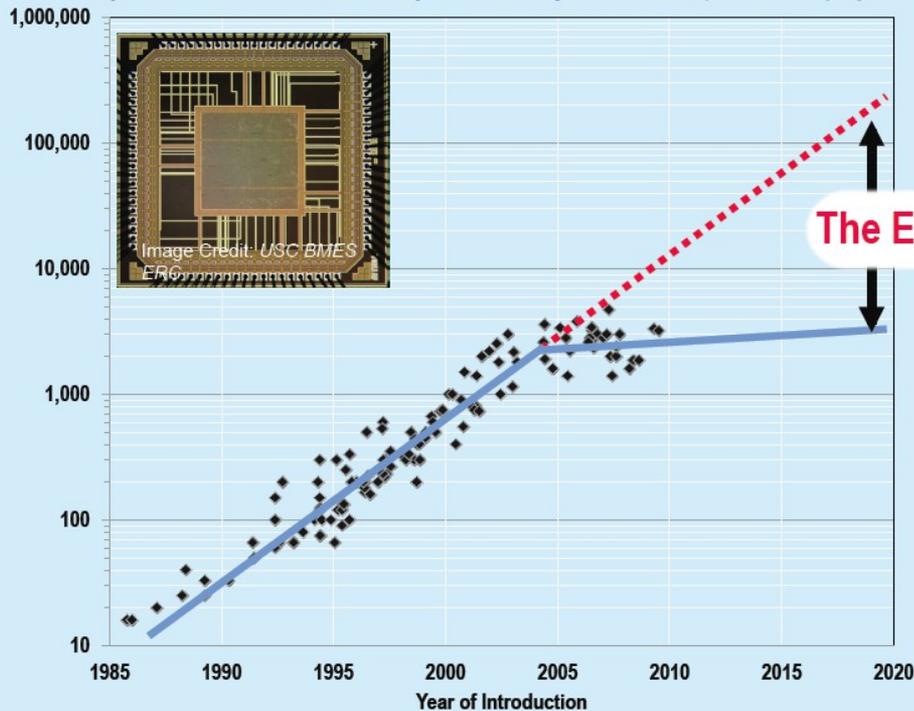
- Need to fully exploit broadly available concurrency and parallelism
- Algorithmic innovations exploiting parallelism
- Software systems leading to improved performance



Long-term solutions

- New materials (e.g., carbon nanotubes, graphene based devices)
- Non-charge transfer devices; (e.g., electron spin)
- Bio, nano, and quantum devices

Microprocessor Performance "Expectation Gap" over Time (1985-2020 projected)



Credit: Graph reprinted with permission from *The Future of Computing Performance: Game Over or Next Level?* National Academy of Sciences (2011).

Farnam Jahanian
CISE Directorate
National Science Foundation

OneNSF Activities	GEO Participation	Other NSF Participation
CIF21/EarthCube	\$12 million	\$5 million
E ² People & the Planet	\$6 million	\$8.2 million
E ² Undergraduate	\$6 million	\$12 million
INSPIRE	\$5 million	\$58 million (\$31M in OIA)
iCORPS	\$1 million	\$17.8 million
SEES Arctic	\$4 million	\$7 million
SEES Hazards	\$15 million	\$22 million

Sees portfolio (FY 10/11, 12, 13)

- Ocean Acidification (OA)
- Climate Change Education Partnership (CCEP)
- Decadal and Regional Climate Prediction using Earth System Models (EaSM)
- Dimensions of Biodiversity
- Water Sustainability and Climate (WSC)
- Research Coordination Networks – SEES track (RCN-SEES)
- Dynamics of Coupled Natural and Human Systems – SEES track (CNH-SEES)
- SEES Fellows
- Sustainability Research Networks (SRN)
- Sustainable Energy Pathways (SEP)
- SEES focus in Partnerships for International Research and Education (PIRE)
- Sustainable Chemistry, Engineering and Materials (“SusChEM”)
- Arctic regions (“ArcticSEES”)
- Hazards and Resilience (“HazardsSEES”)
- Coastal regions (“CoastalSEES”)
- Information Science and Engineering (“RISES”)

BREO:
Broadening
Research
Experiences in
Oceanography



Hawaii Space Flight Lab First Launch Funded !



HSFL - Aerojet - PMRF - Sandia NL

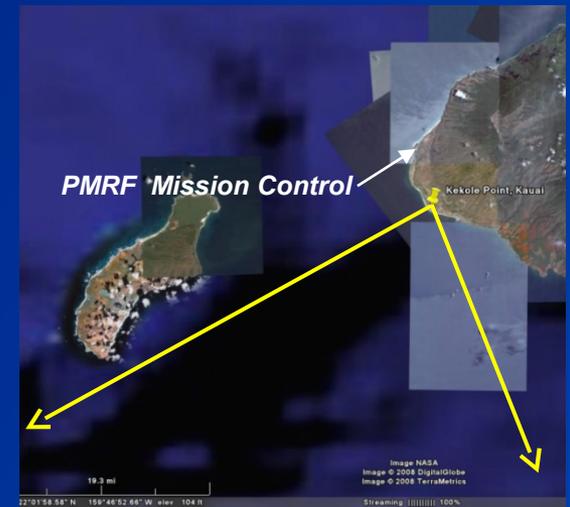
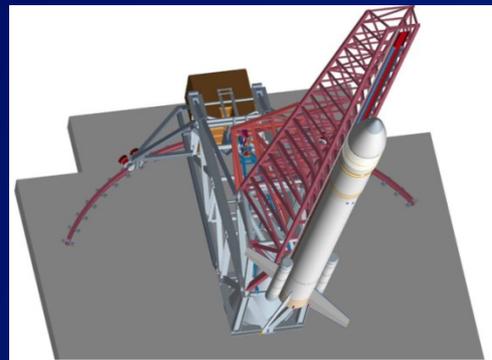
Small satellite launch, from Kauai, by fall 2013

ORS-4: sponsored by Air Force ORS

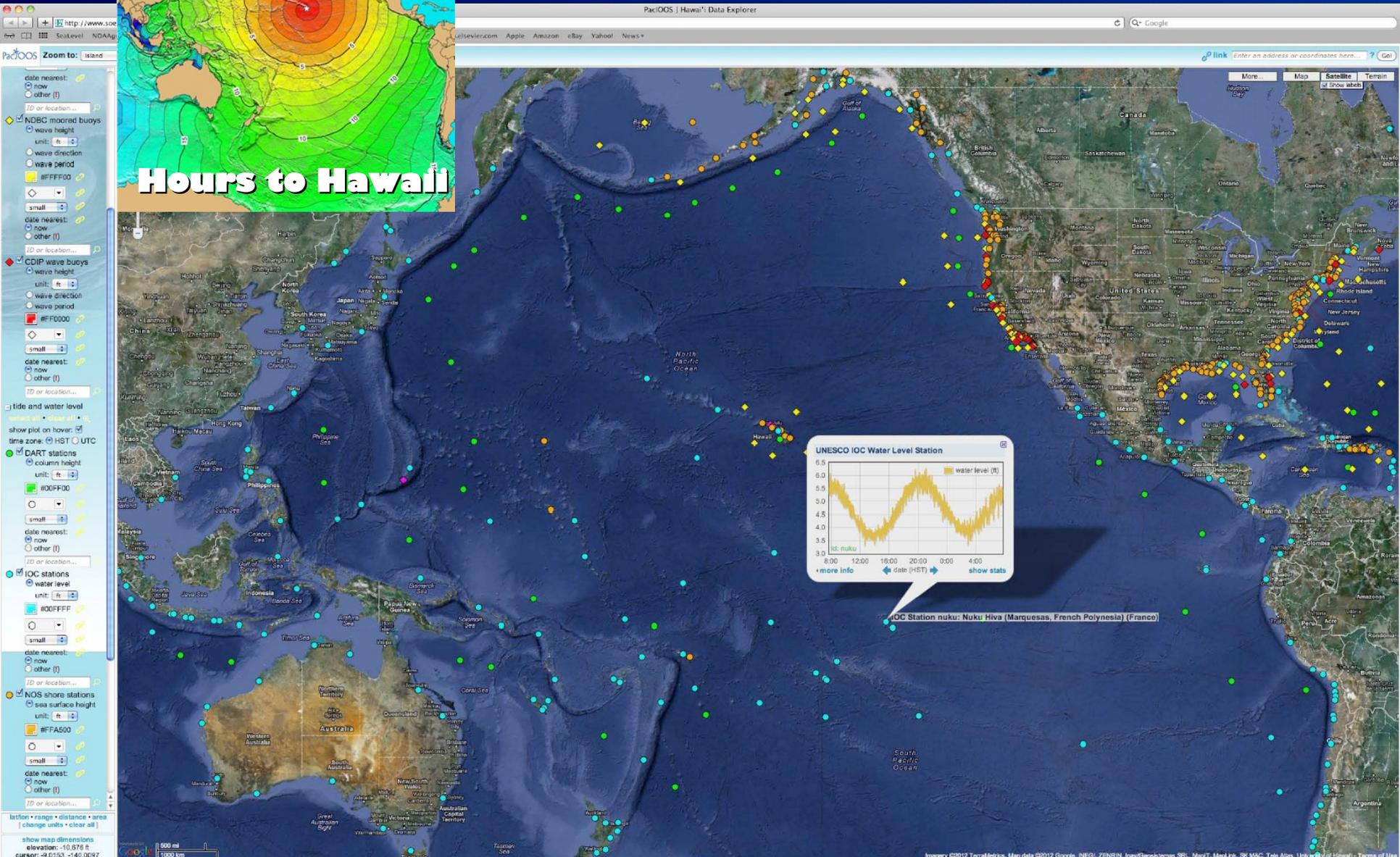
Rail-launched
3-stage solid
propellant
motor stack

180kg to 400kg
Sun-synchronous
orbit

KestrelEye
HiakaSat
CubeSat



PacIOOS waves, tides & water level



Hours to Hawaii



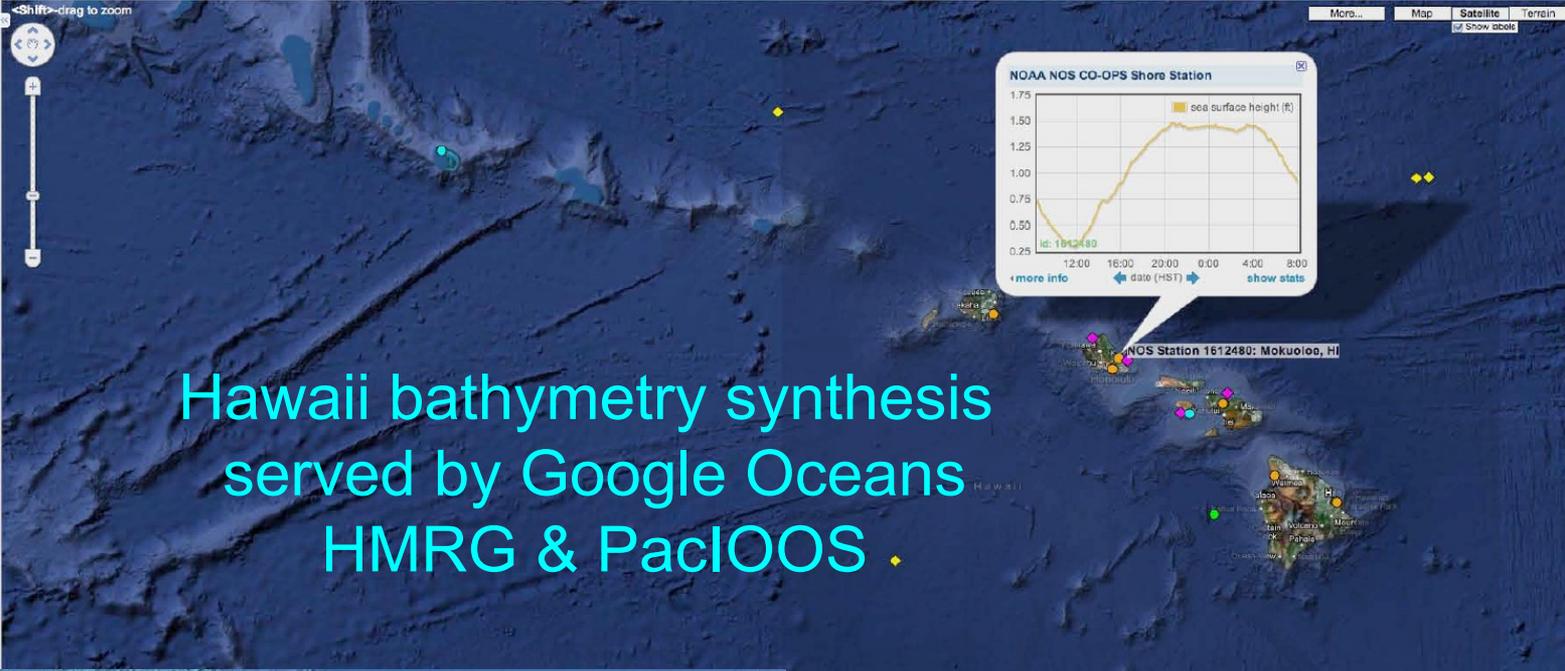
i ka nānā no a ike • by observing we learn

pacioos.org

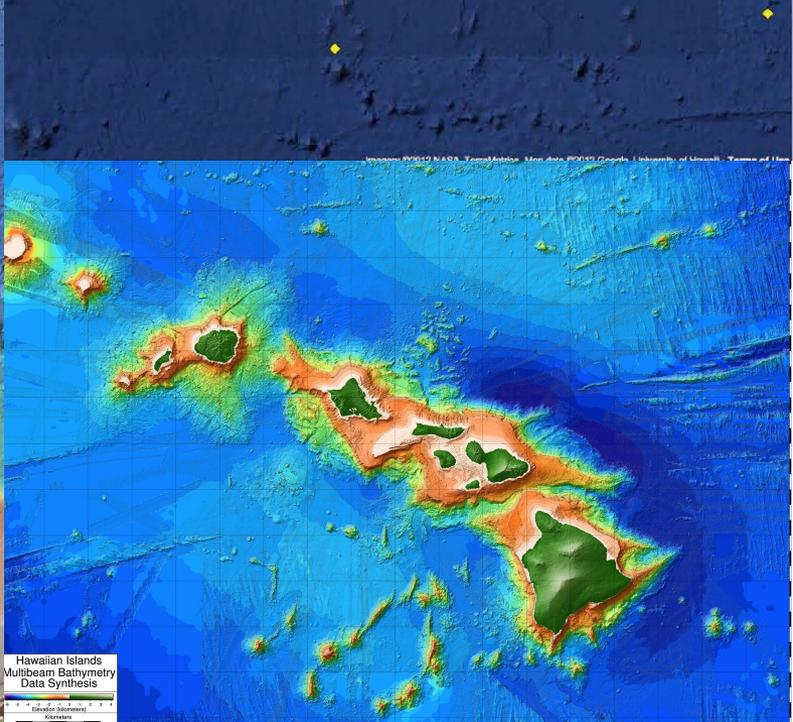
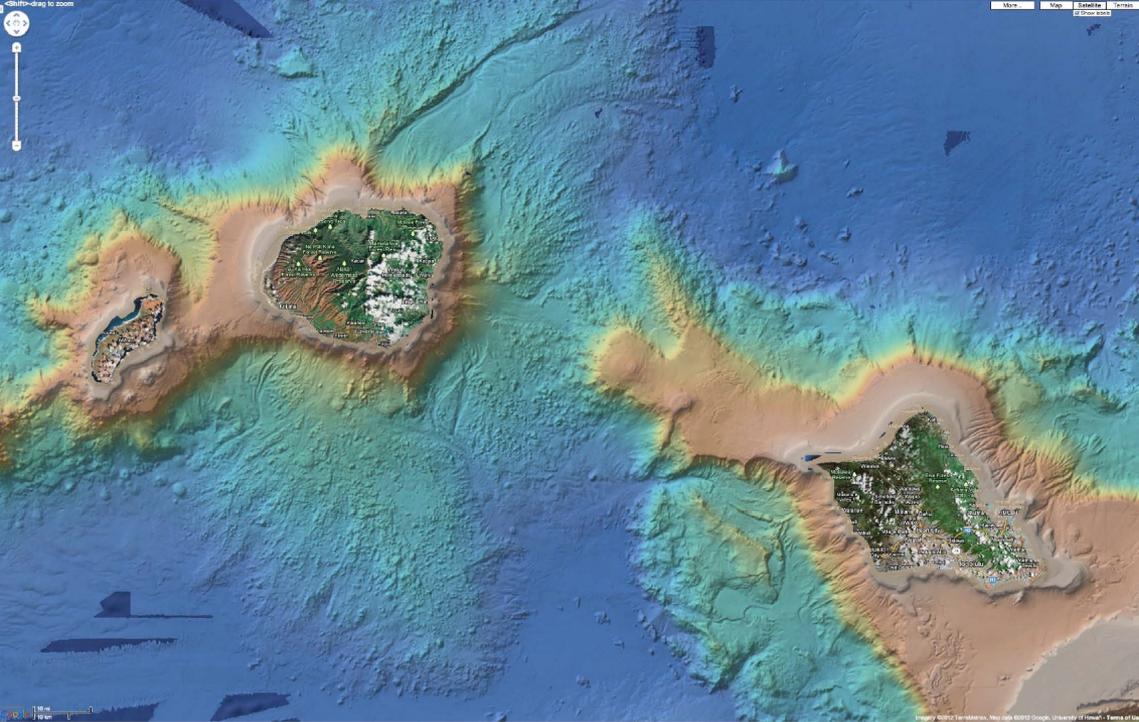
Select overlays:

- expand • collapse • clear
- doppler radar
- hazards
- nautical charts
- bathymetry (depth)
- waves
- select all • clear all • refresh
- show plot on hover
- time zone: HST UTC
- PacIOOS wave buoys
 - wave height
 - unit: ft
 - wave direction
 - wave period
 - #FF00FF
- NDBC moored buoys
 - wave height
 - unit: ft
 - wave direction
 - wave period
 - #FFFF00
- CDIP wave buoys
 - wave height

ID or location...



Hawaii bathymetry synthesis served by Google Oceans HMRG & PacIOOS





**Molly Timmers, Christopher Bird,
Derek J. Skillings,
Peter Smouse, Robert Toonen
(HIMB)**

**Crown-of-Thorns Outbreaks
in the Central Pacific
Are Regionally Derived
and Independent Events**

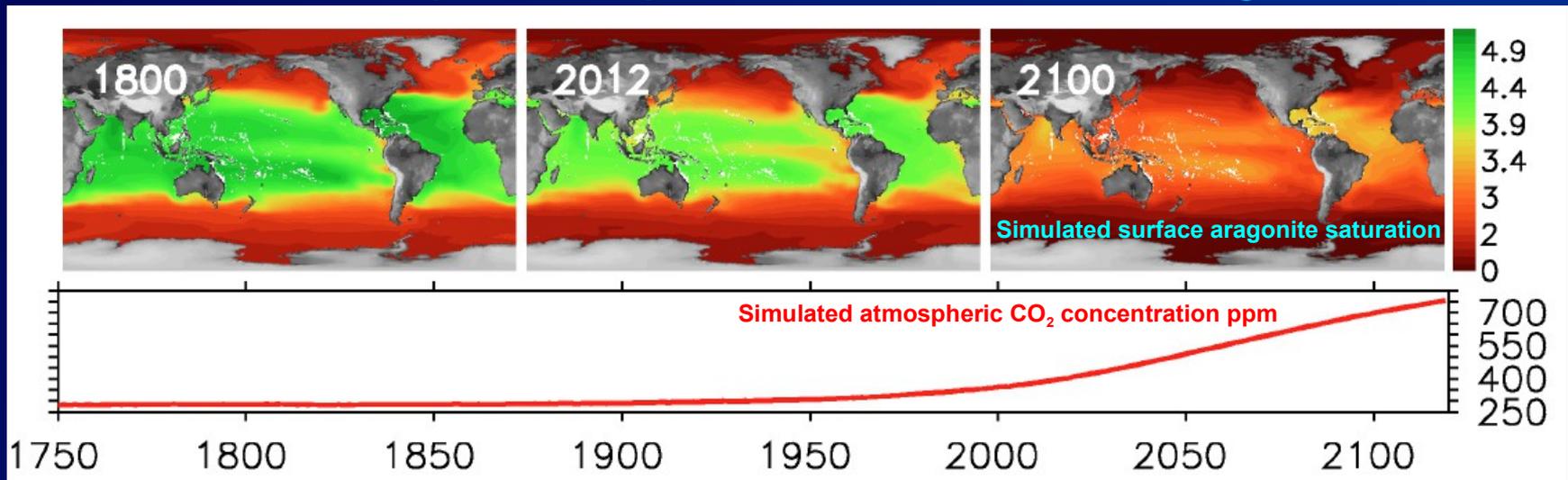
The genetic similarity between outbreak and non-outbreak crown-of-thorns sea star populations within each archipelago indicates that outbreaks are a local phenomenon

-likely fueled by nutrient inputs and favorable environmental conditions

Larvae of this species are not routinely reaching their full dispersal potential,
and are not fueling outbreaks at distant sites

Unprecedented, Man-made Trends in Ocean Acidity

T. Friedrich & A. Timmermann (IPRC); A. Abe-Ouchi & M.O. Chikamoto (JAMSTEC), et al., *Nature Climate Change*, March 2012



Modeled changes in aragonite surface saturation level from 21Ka to 2100 (using MPI, LOVECLIM, MIROC). Surface aragonite saturation levels are currently decreasing ~10-100 times faster than during the last big increase in CO₂: the Last Glacial Termination.

Coral reefs live in places where open-ocean aragonite surface saturation exceeds 3.5 units. Such conditions exist today in about 50% of the global ocean – mostly in the tropics – but could occur in less than 5% of the ocean by 2100.



PLANET
UNDER
PRESSURE
2012 MARCH 26-29
LONDON

NEW
KNOWLEDGE
TOWARDS
SOLUTIONS

State of the Planet Declaration



The continued functioning of the Earth system as it has supported the **well-being of human civilization** in recent centuries **is at risk**.

We face threats to water, food, biodiversity & other critical resources: these threats risk intensifying economic, ecological & social crises, creating the potential for a humanitarian emergency on a global scale.

In one lifetime our increasingly interconnected and interdependent economic, social, cultural and political systems have come to place **pressures on the environment** that may cause fundamental changes in the Earth system and **move us beyond safe natural boundaries**.

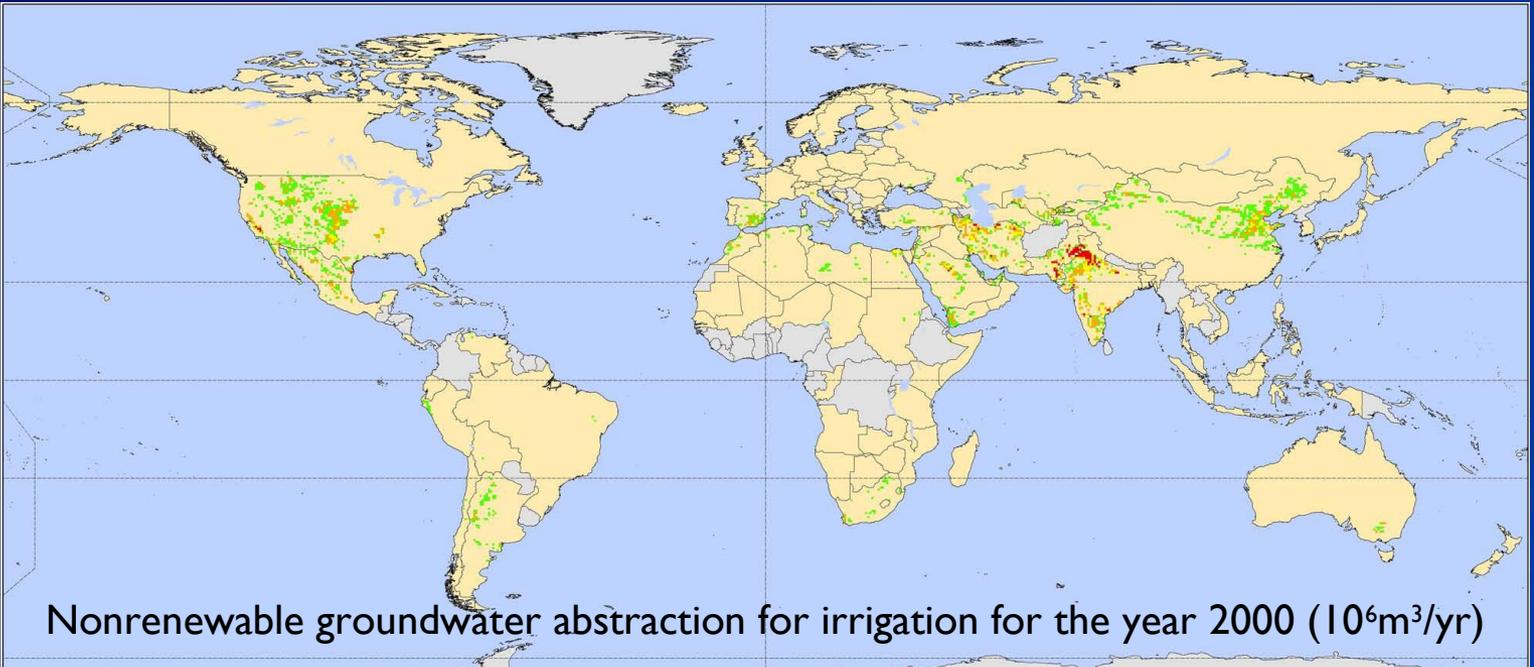
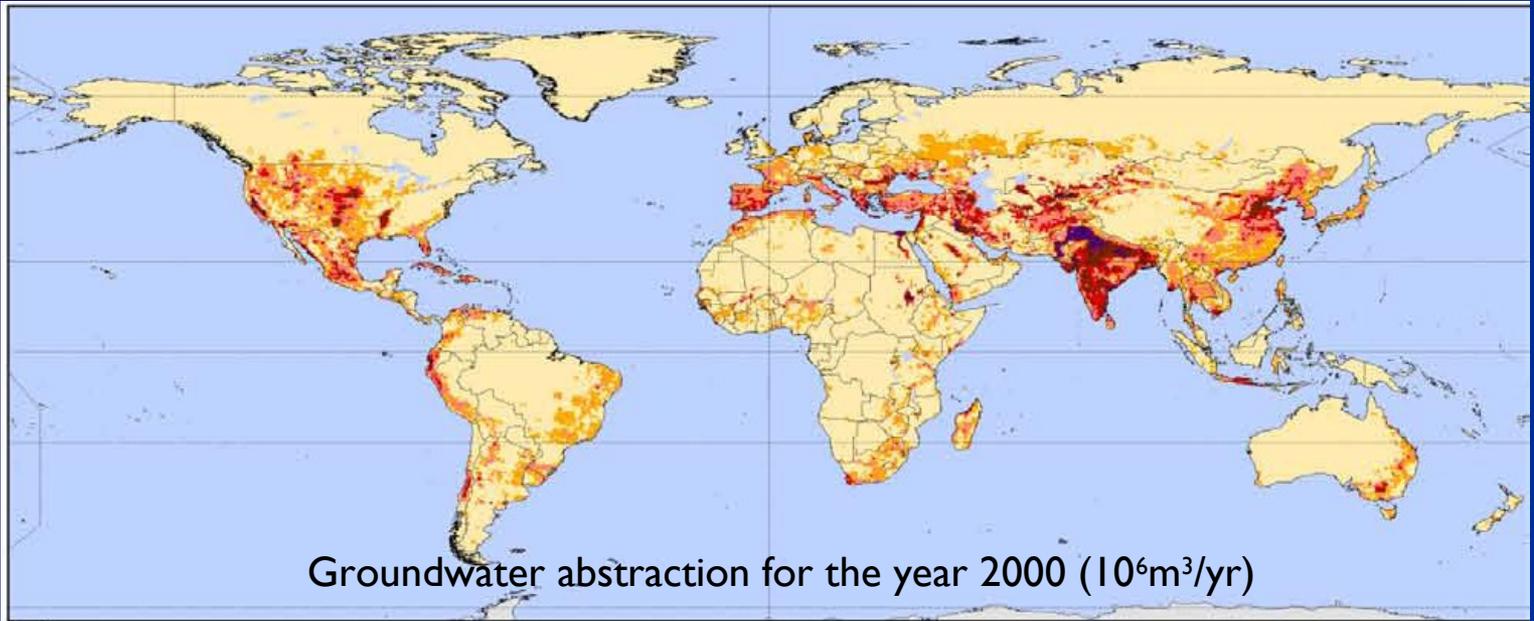
As consumption accelerates everywhere and world population rises, it is not sufficient to work towards a distant ideal of sustainable development. The defining **challenge** of our age is to safeguard Earth's natural processes to ensure the well-being of civilization.

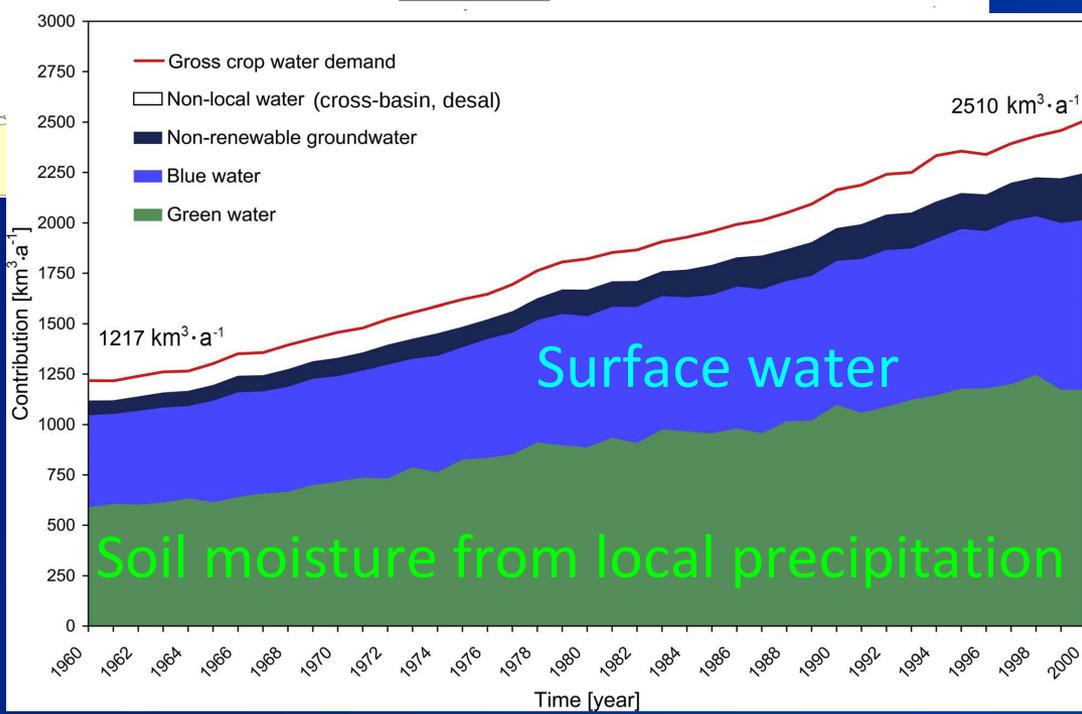
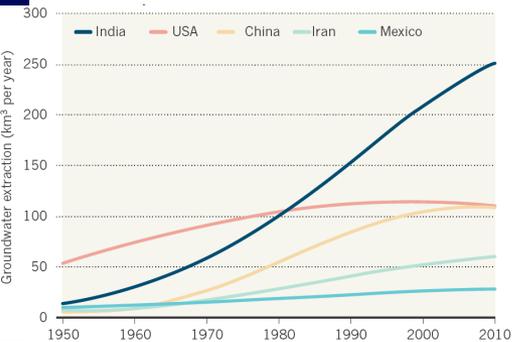
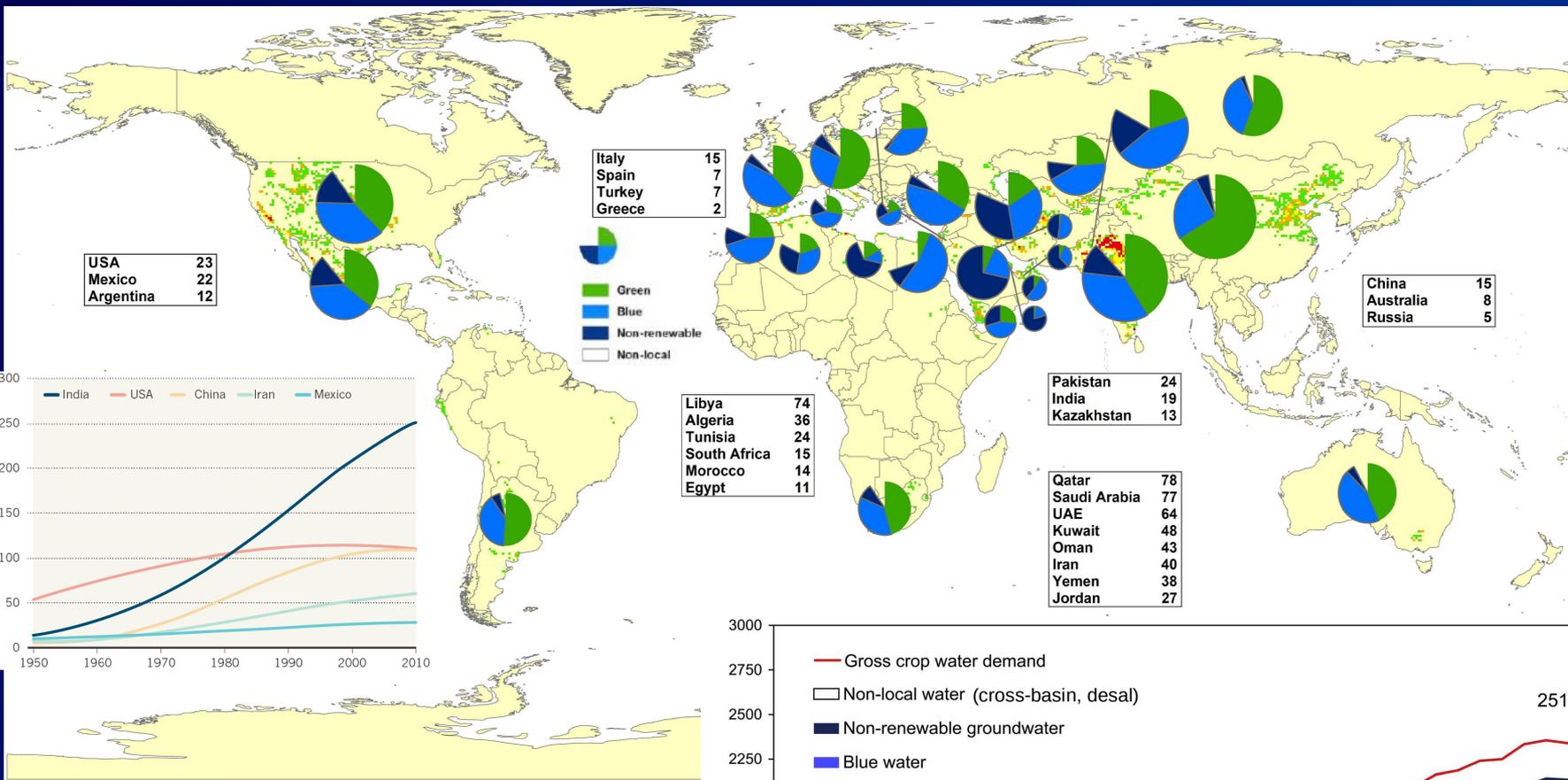
GDP is an inadequate measure of sustainable economic activity, that should be complemented with better measures of the wealth of nations, including built, financial, social, human and natural capital.

Global economic, environmental and social **sustainability will require reforms of governance, research and investment** at all scales.

Basic human needs: water, food, energy, shelter/security, sleep

Water

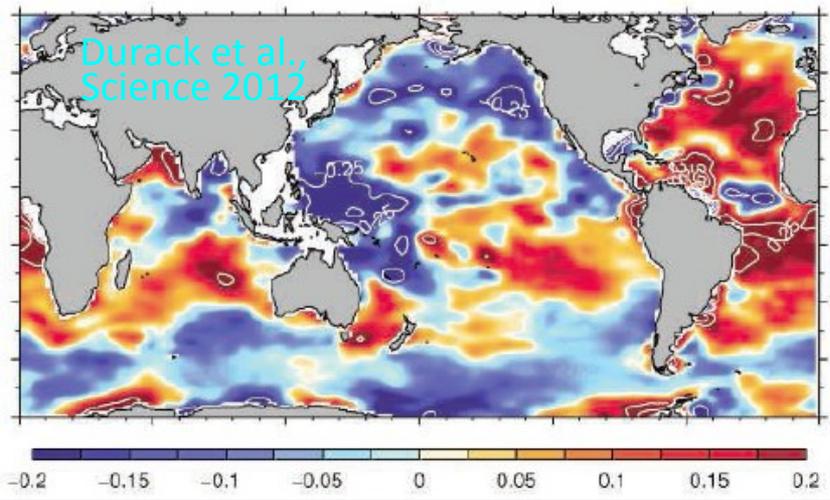




Non-renewable groundwater abstraction to irrigation tripled between 1960-2000 from 75 to 234 km³/yr (Wada et al., WRR, 2012)

Total NRG=275 of GA=734

Durack et al,
Science 2012



Mean Surface Salinity Change 1950-2000

amplified 8% for $\Delta T=0.5^{\circ}\text{C}$ (warm air holds more moisture)

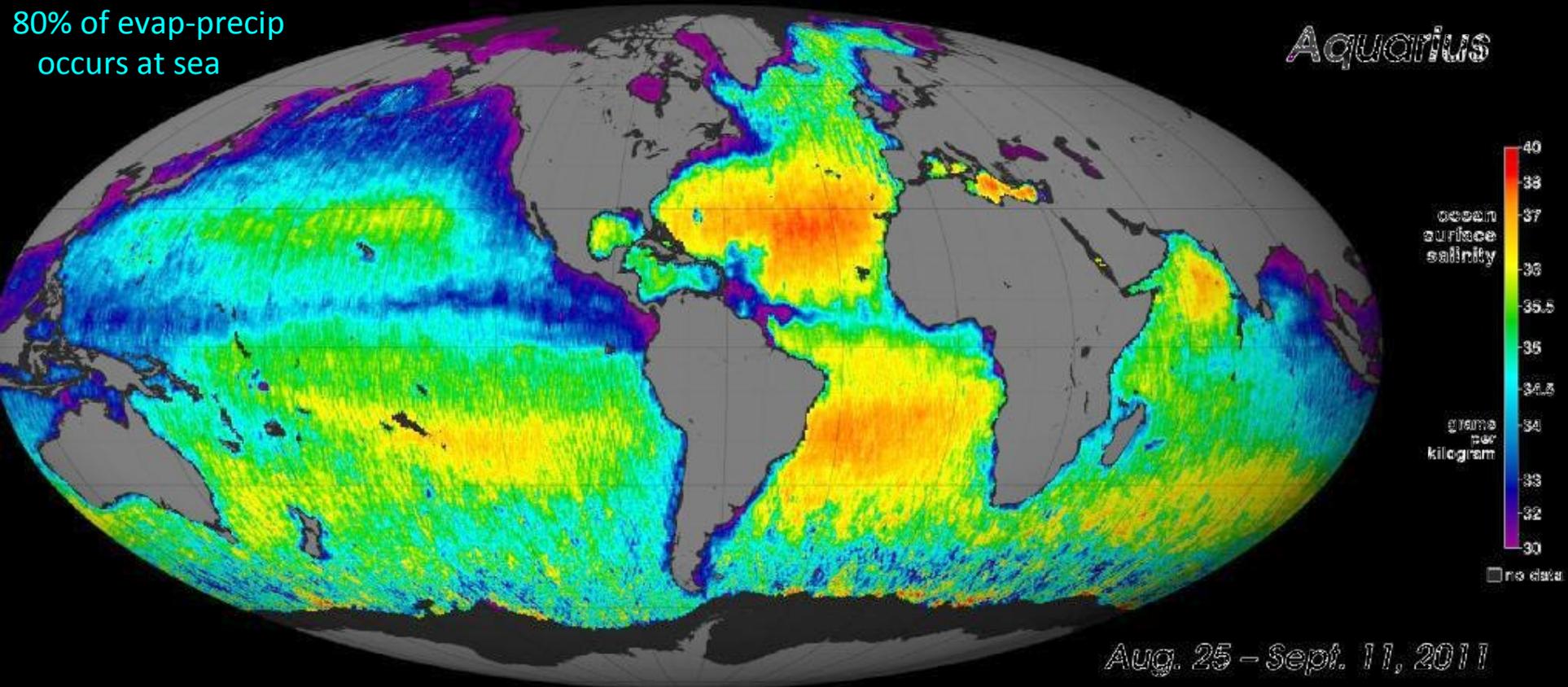
Intensified water cycle (wet, wetter; dry, dryer)

(8%/°C) enhances storms, floods & droughts

(SSS amplification increases at twice E-P amplification)

**If future GHG 2°-3°C warmer world,
global water cycle amplified 16-24%**

80% of evap-precip
occurs at sea

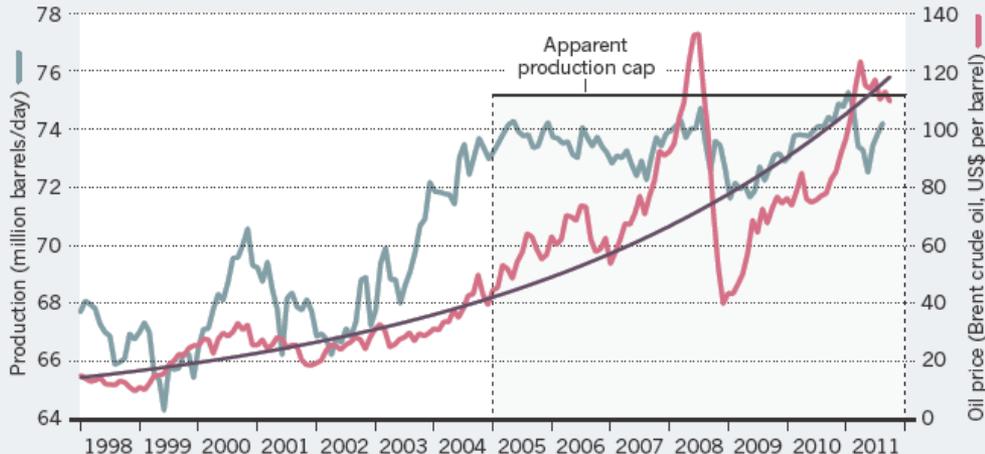




Production at oil fields globally, including at the Kern River oil field in Bakersfield, California, is declining at about 4–6% a year.

OIL PRODUCTION HITS A CEILING

Production followed demand until 2005, when it levelled off despite continued price increases. There seems to be a production 'cap' at about 75 million barrels per day.



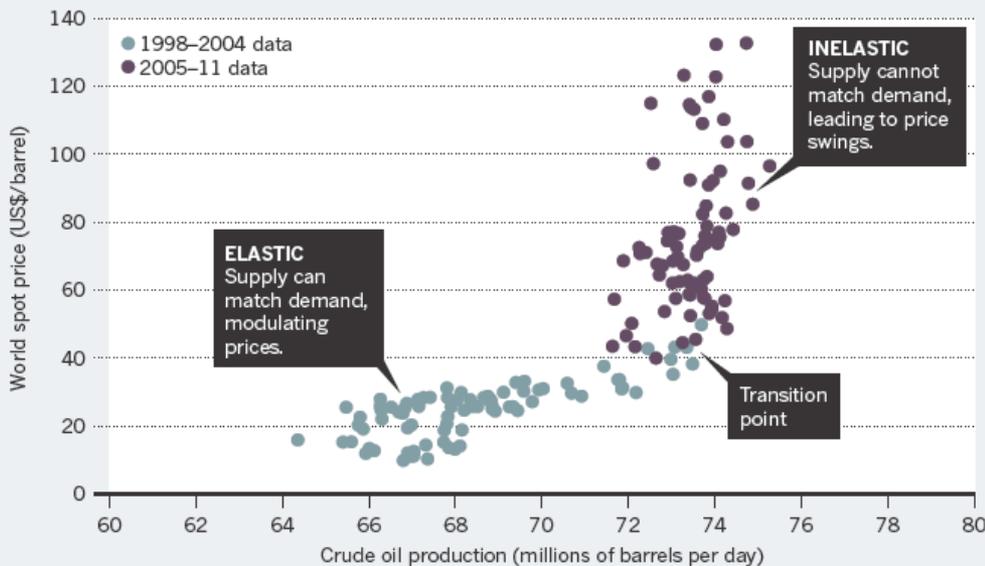
Oil's tipping point has passed

The economic pain of a flattening supply will trump the environment as a reason to curb the use of fossil fuels, say **James Murray** and **David King**.

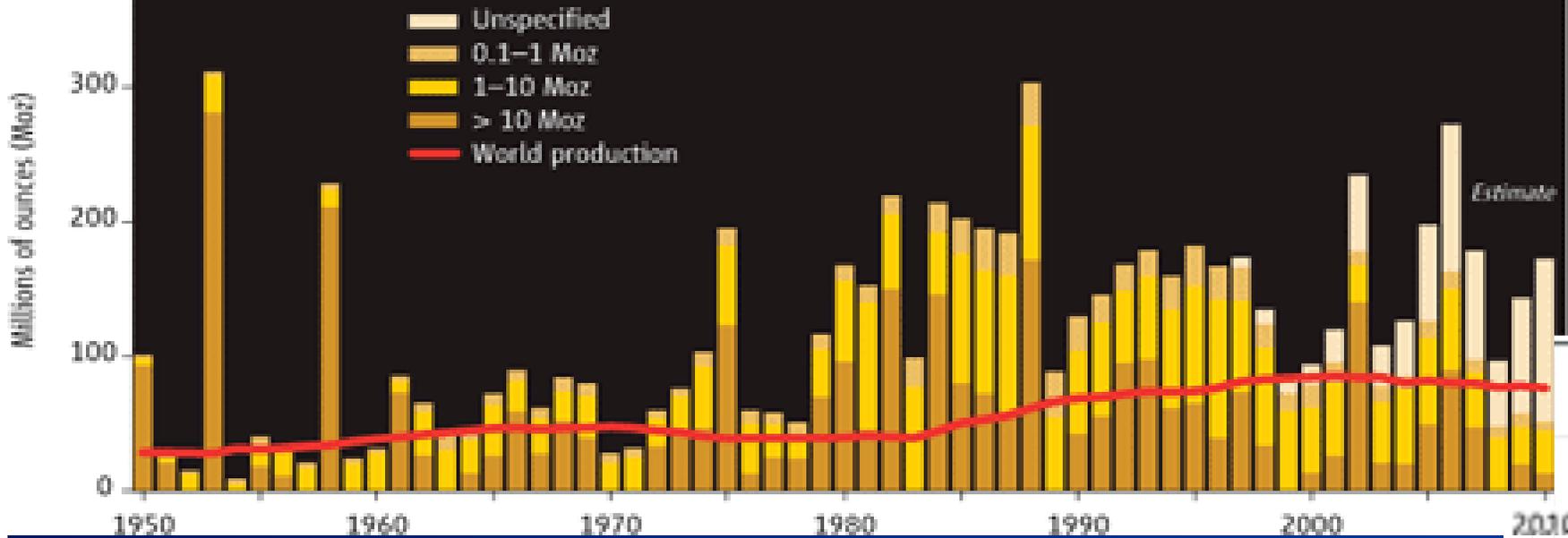
James Murray is in the School of Oceanography, University of Washington, Seattle, Washington 98195, USA. He was founding director of the University of Washington's Program on Climate Change. David King is director of the Smith School of Enterprise and the Environment, University of Oxford, Oxford OX1 2BQ, UK, and senior science adviser to the bank UBS. He served as chief scientific adviser to the UK government in 2000–07.

PHASE SHIFT

The abrupt change in oil economics can be seen in this scatter plot of production versus price.



Amount of Gold Found and Mined in the World: 1950–2010



MINERAL RESOURCES

Is the World Tottering on the Precipice of Peak Gold?

Richard A. Kerr

Science 2 March 2012



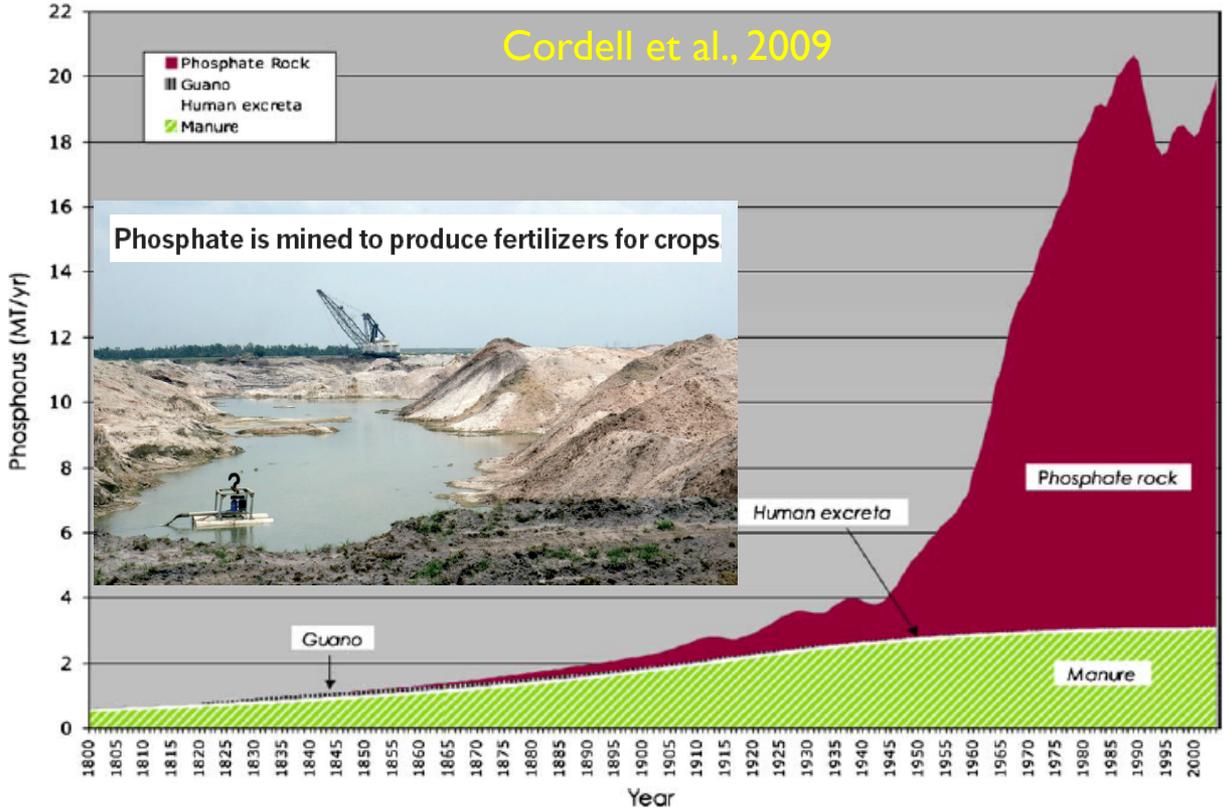
~\$35-\$40, 1950-1970

\$1000

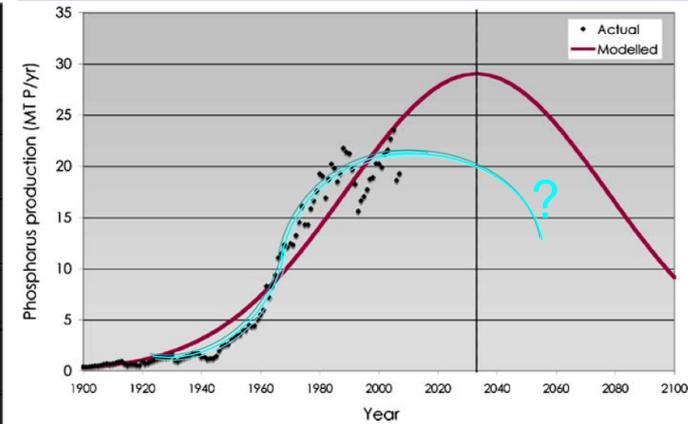
\$500

Historical global sources of phosphorus fertilizers (1800-2000)

Cordell et al., 2009



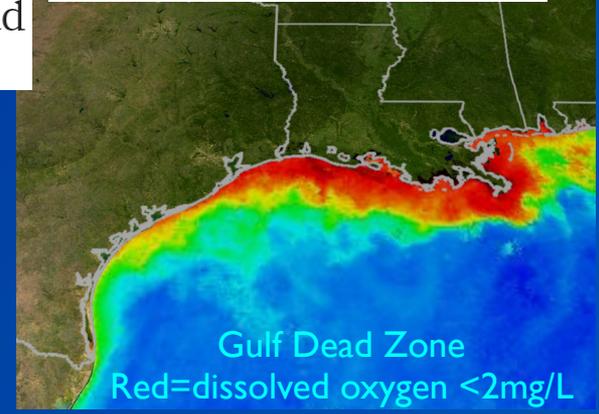
Peak Phosphorous 2015- 2037?



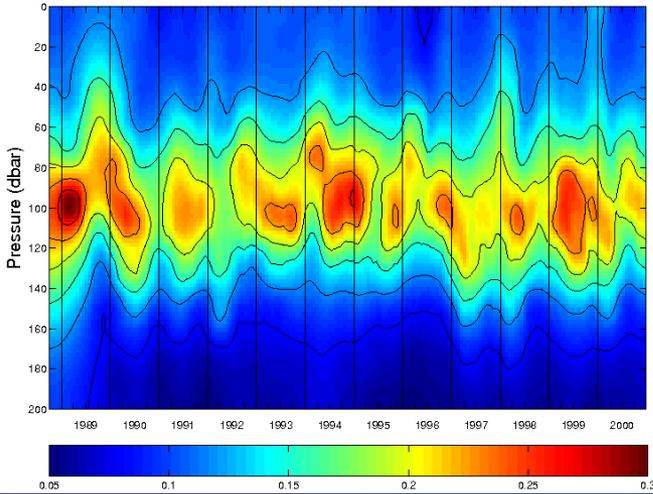
Excess phosphorus is polluting our environment while, ironically, mineable resources of this essential nutrient are limited. **James Elser** and **Elena Bennett** argue that recycling programmes are urgently needed.

Nature, 2011

Deepening Savannah Port
\$70M + \$1.2M/yr for Speece Cones
to oxygenate river during summer



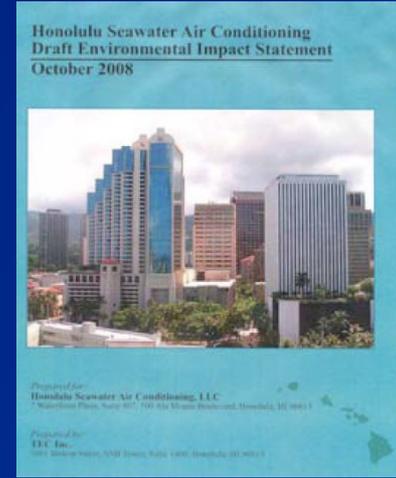
HOT 1-121 stn 1 Fluorometric Chlorophyll a ($\mu\text{g/l}$)



Station Kahe chlorophyll 1980-2000

September 16, 2011

OTEC, Seawater A/C, Currents, Nutrients & Biota



C - M O R E • E A R T H F R E E I N S T I T U T E

ENHANCED OCEAN UPWELLING:

Science, Engineering and Potential Applications

AGENDA: Tuesday 29 November 2011 • East-West Center (EWC), Asia Room
Science – Technology – Engineering - Modeling

AGENDA: Wednesday 30 November 2011 • C-MORE Hale, Moore Conference Center
A prospectus for the future

BIOGEOCHEMISTRY AND GENOMES

BAG-1

Dec. 2011

GEOMAR

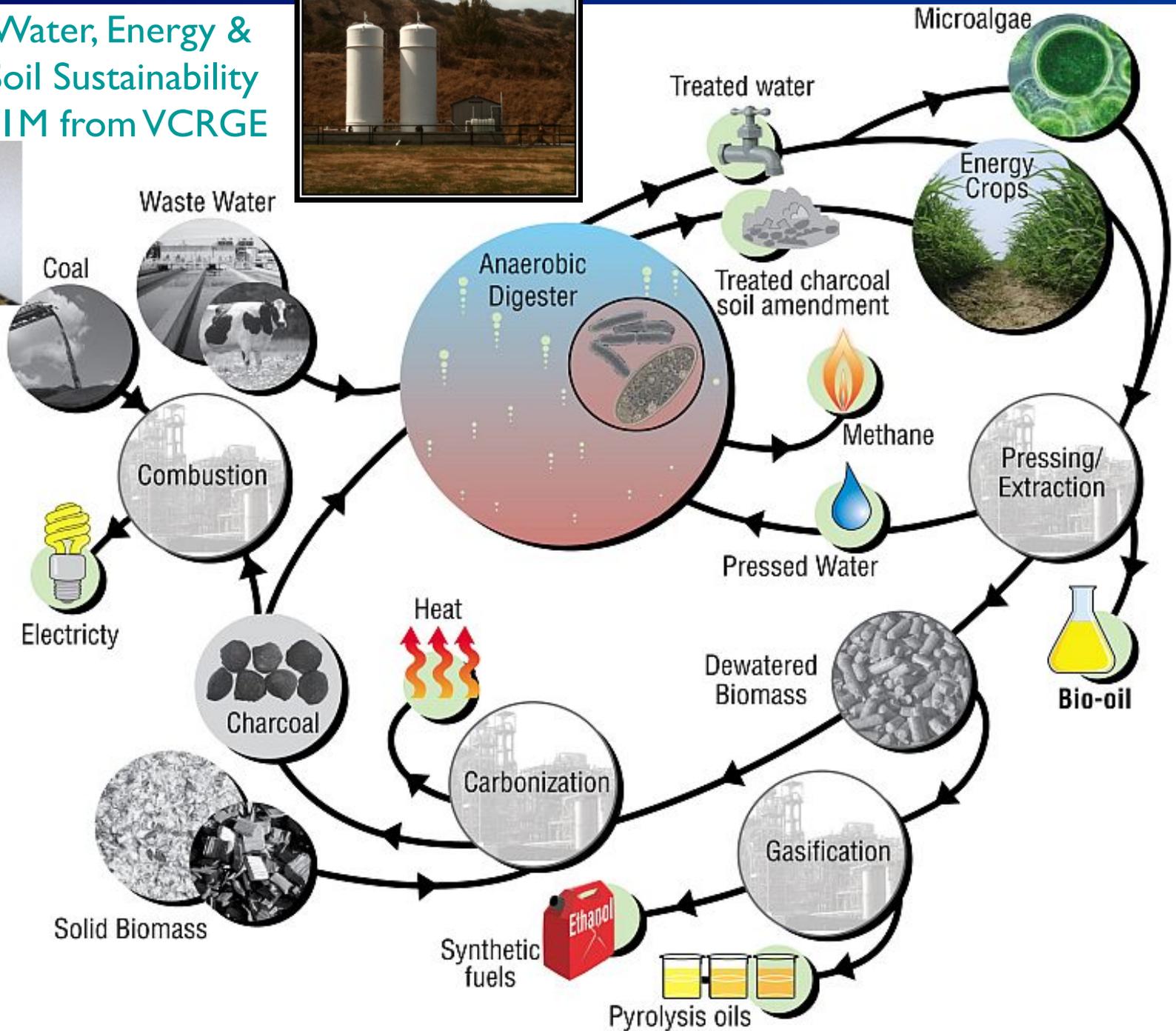
c-more



March 5-9 IPRC hosted CMIP-5,
the World Climate Research Program
coupled climate model
intercomparison project



Water, Energy & Soil Sustainability \$1M from VCRGE



HI barrel tax

\$1M c.s. towards DoE & DBEDT programmatic EIS
for undersea cable project

\$0.4M c.s. to purchase equipment for DoE project
to assess HI geothermal potential

\$0.4M c.s. towards \$13M DoE project for smart
grid-enabled PV inverters

\$0.5M c.s. for NRL project to use hydrogen production
as grid management tool

\$0.3M to support PUC efforts to develop grid scale energy
storage interconnection standards

\$0.1M for PACE projects to conduct tech/business analysis
of critical energy issues