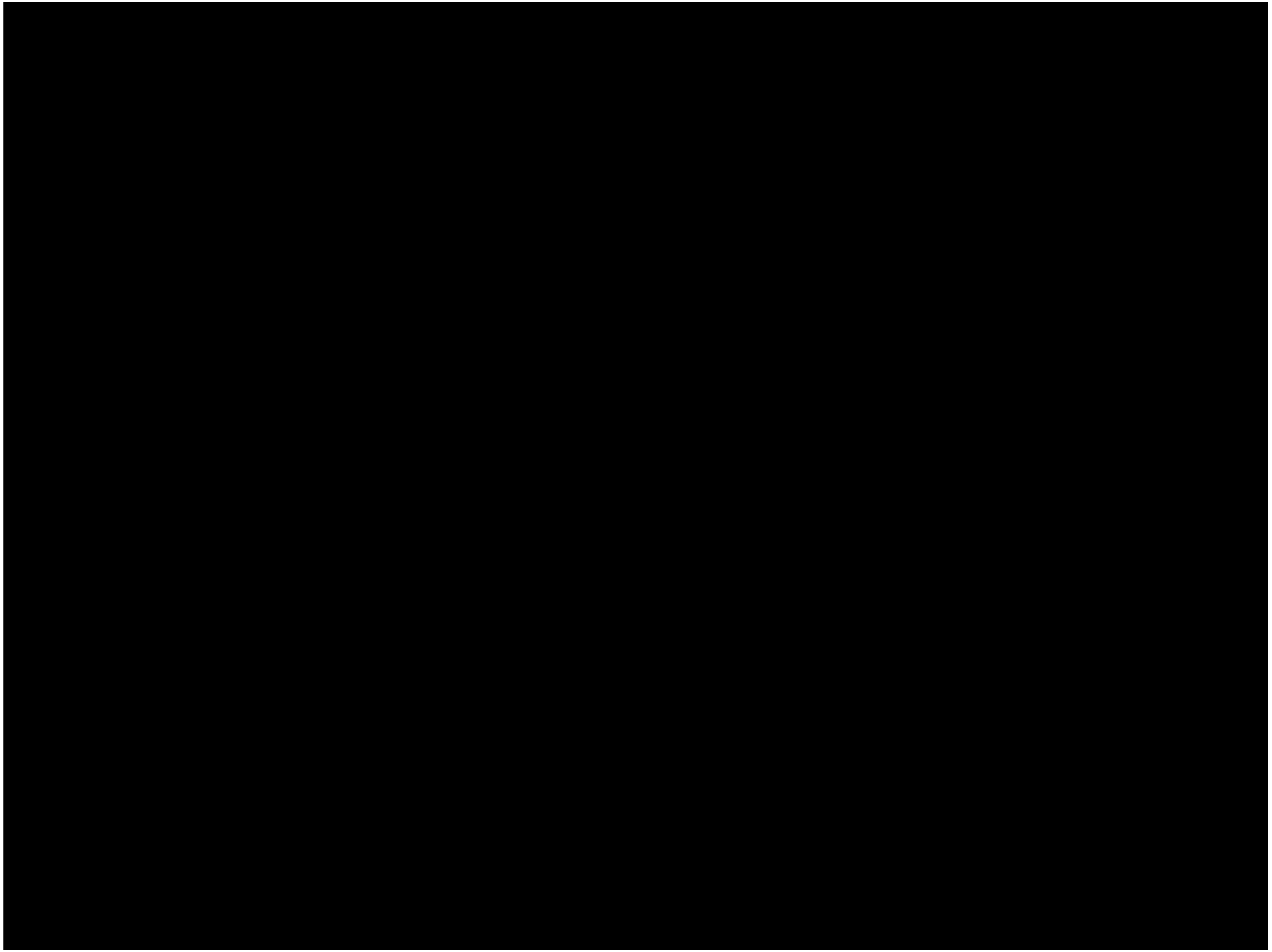
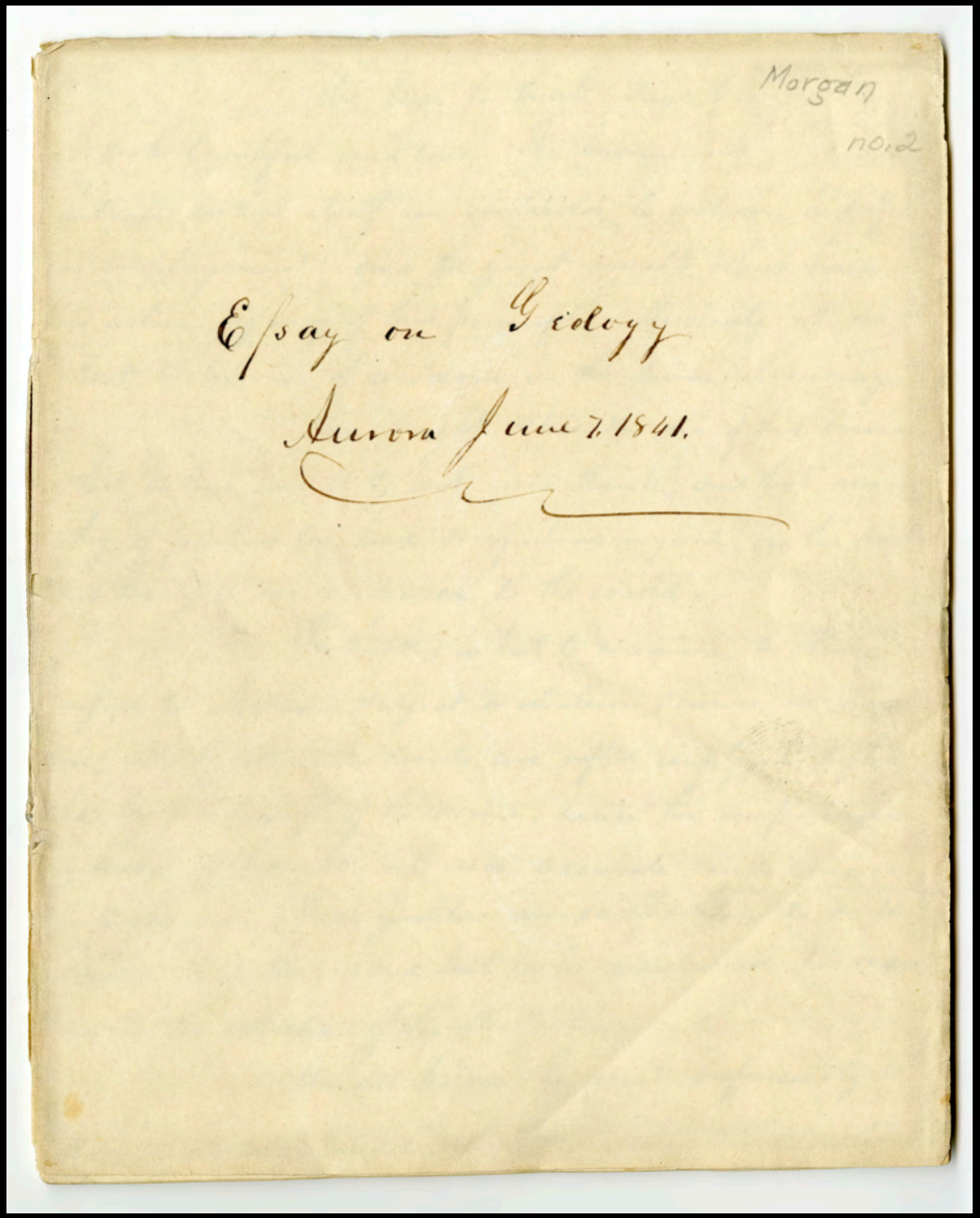
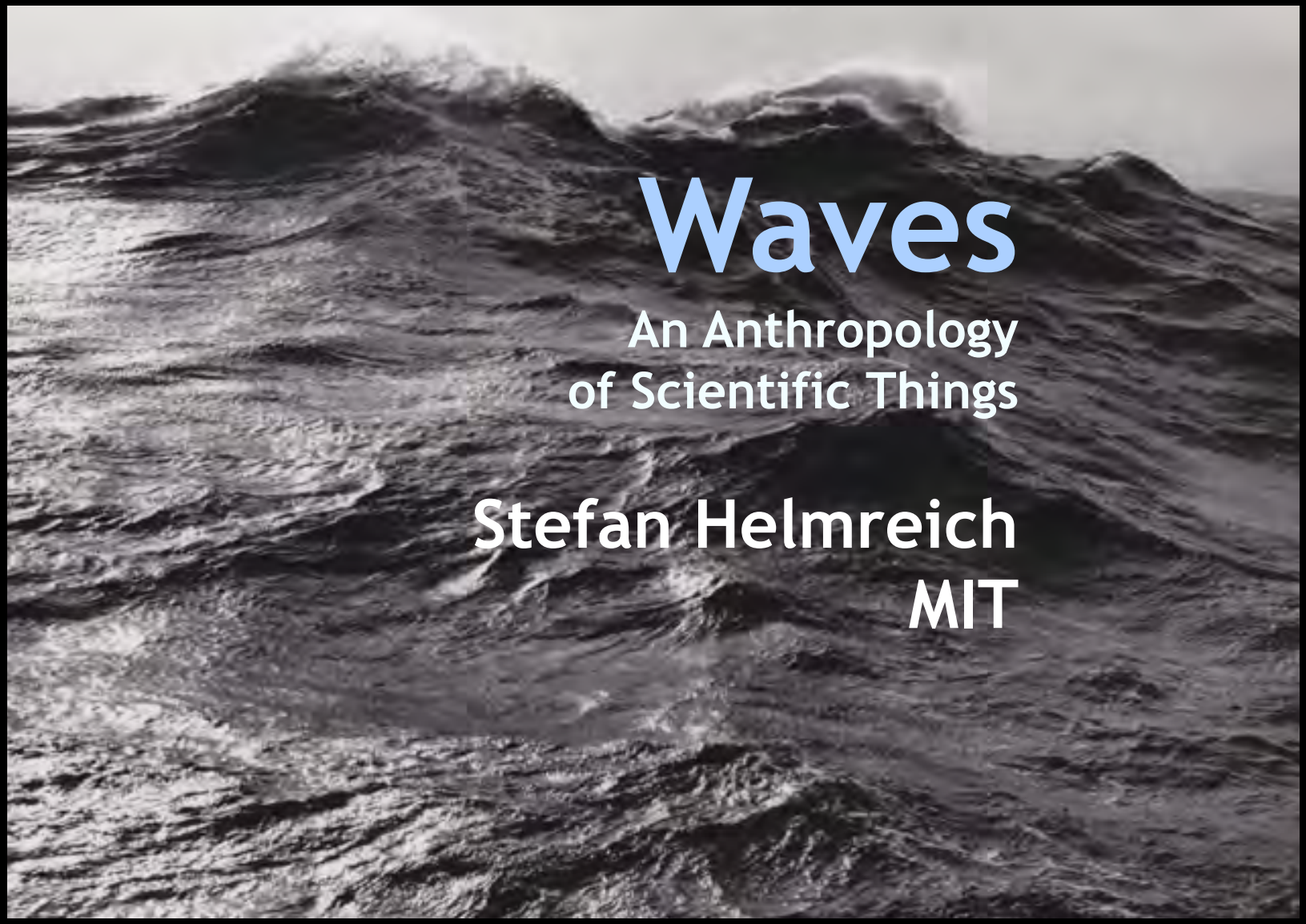


SLIDE 1



SLIDE 2



The Texture of a Great Wave
Willard Newell Bascom, photo, 1971

Biosphere: Microorganisms
Alexis Rockman, 18” x 24”, oil on wood panel, 1993


KOZ Waves
Effect of symmetry defect on the edge resonance in elastic plate
KOZ Waves
Kiwi-Oz Waves Conference
The first international Australasian conference on wave science
17—19 February, 2014
Venue: Newcastle City Hall
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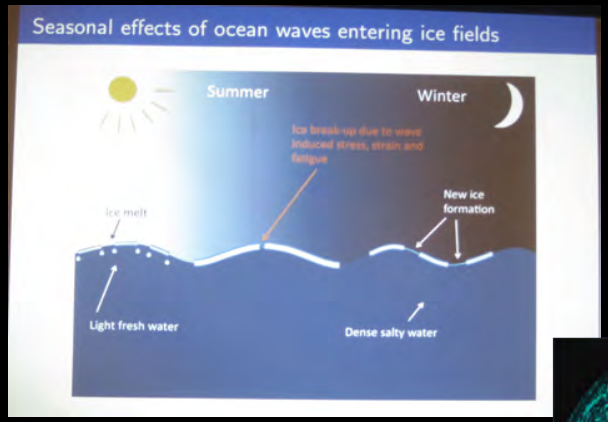

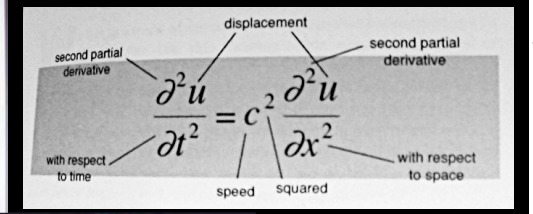

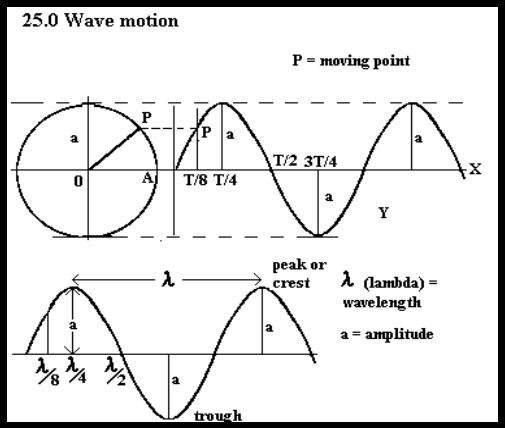

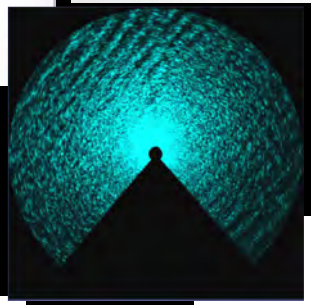

KOZ Waves
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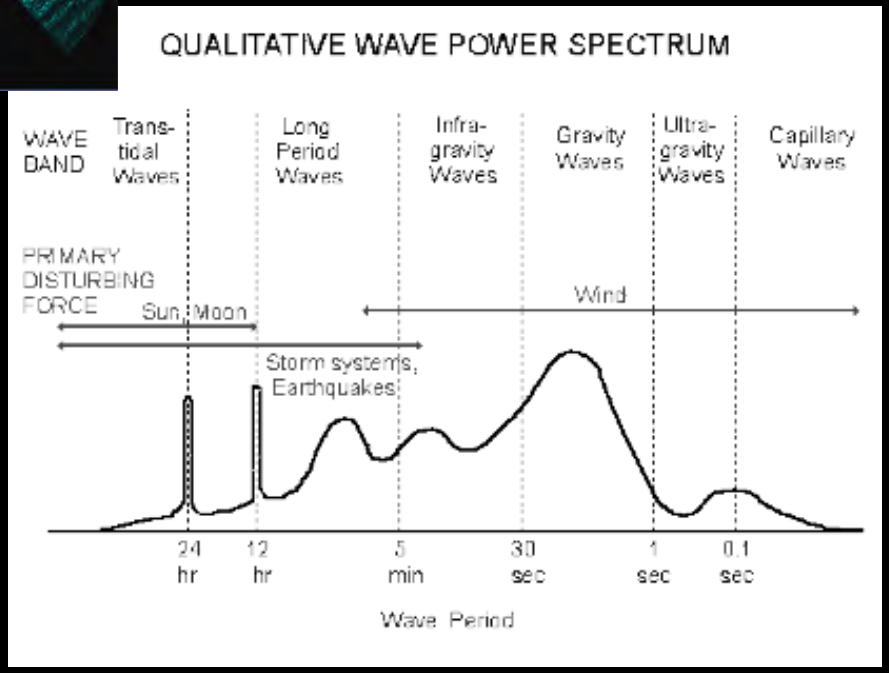

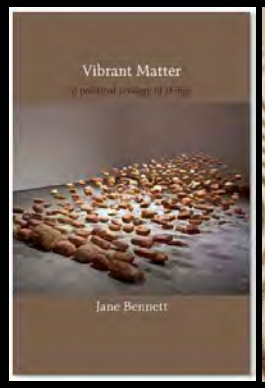

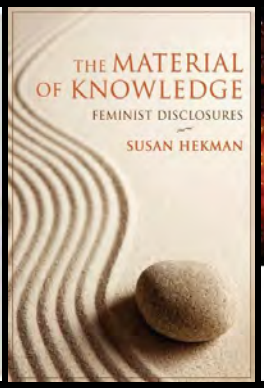

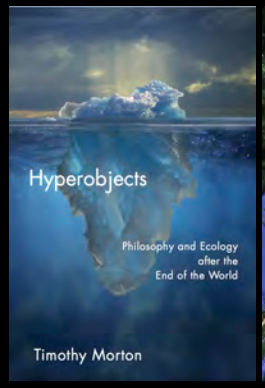

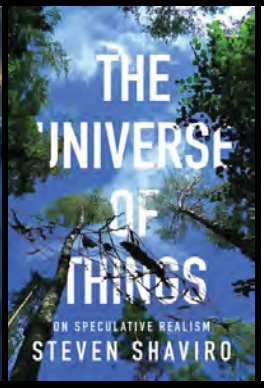

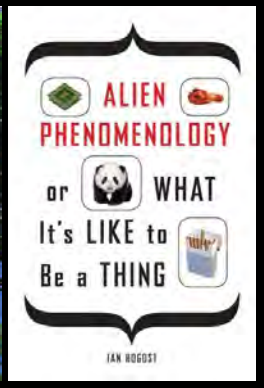

2013-14 Rice Seminar:

"Materialism and New Materialism across the Disciplines"

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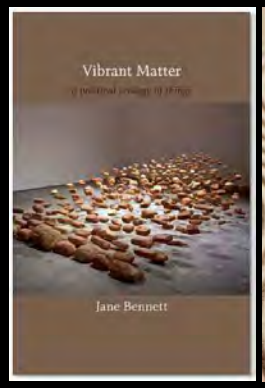
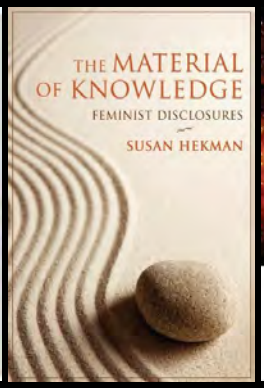
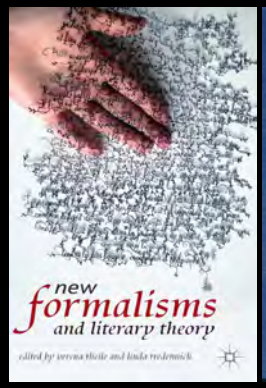
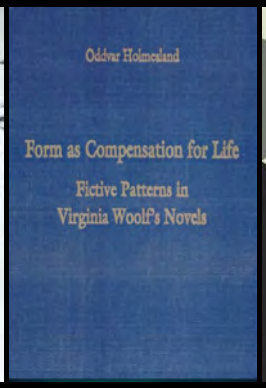

Vibrant Matter
Jane Bennett

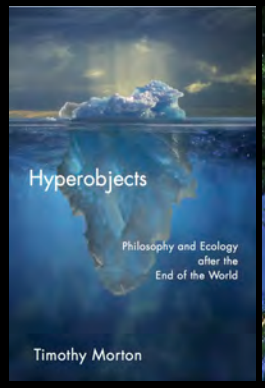

THE MATERIAL OF KNOWLEDGE
FEMINIST DISCLOSURES
SUSAN HEKMAN

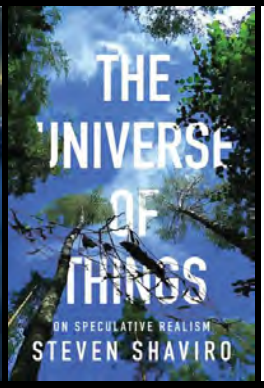

New Materialisms
Ontology, Agency, and Politics
DIANA COOLE AND SAMANTHA FROST

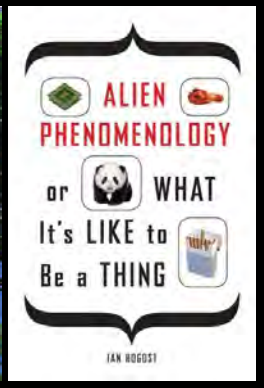

new formalisms
and literary theory

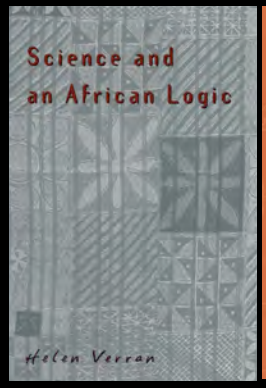

Oldvar Holmeland
Form as Compensation for Life
Fictive Patterns in Virginia Woolf's Novels

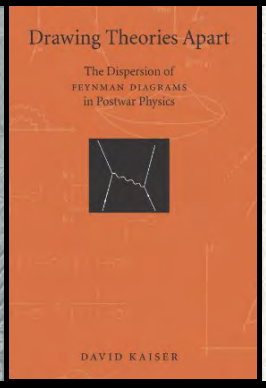

Against Affective Formalism
MATISSE, BERGSON, MODERNISM

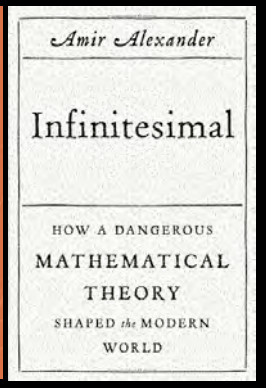

Hyperobjects
Philosophy and Ecology after the End of the World
Timothy Morton


THE UNIVERSE OF THINGS
ON SPECULATIVE REALISM
STEVEN SHAVIRO


ALIEN PHENOMENOLOGY
or WHAT It's LIKE to Be a THING
IAN BOGOST


Science and an African Logic
Helen Verran


Drawing Theories Apart
The Dispersion of FEYNMAN DIAGRAMS in Postwar Physics
DAVID KAISER


Amir Alexander
Infinitesimal
HOW A DANGEROUS MATHEMATICAL THEORY SHAPED the MODERN WORLD


2013-14 Rice Seminar:
"Materialism and New Materialism across the Disciplines"
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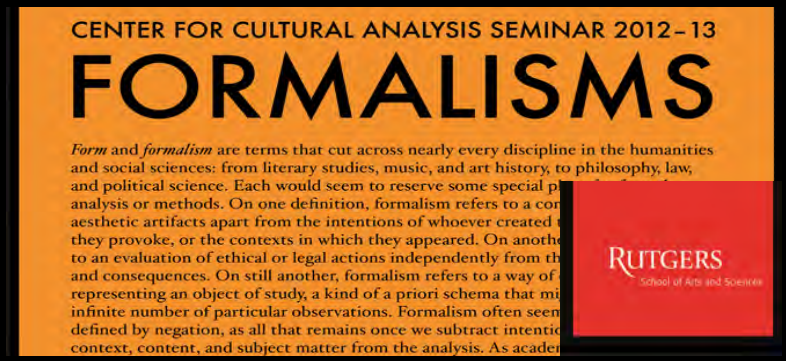
CENTER FOR CULTURAL ANALYSIS SEMINAR 2012-13
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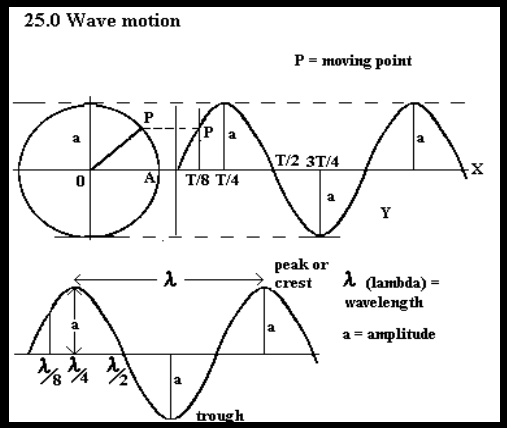
Form and formalism are terms that cut across nearly every discipline in the humanities and social sciences: from literary studies, music, and art history, to philosophy, law, and political science.
RUTGERS
School of Arts and Sciences


25.0 Wave motion
P = moving point
a
P
0
A
P
a
T/8 T/4
T/2 3T/4
a
X
a
Y
λ
peak or crest
λ (lambda) = wavelength
a = amplitude
a
a
λ/8 λ/4 λ/2
a
trough

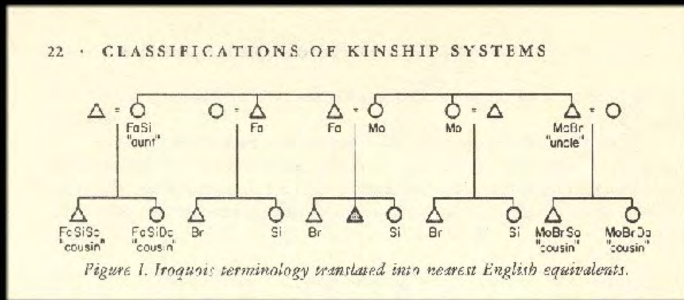
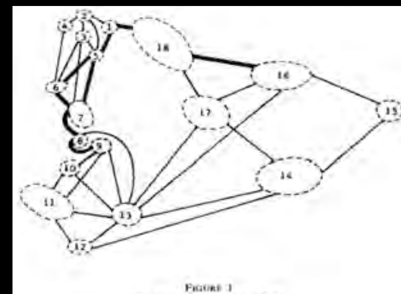
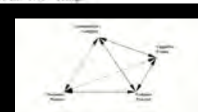
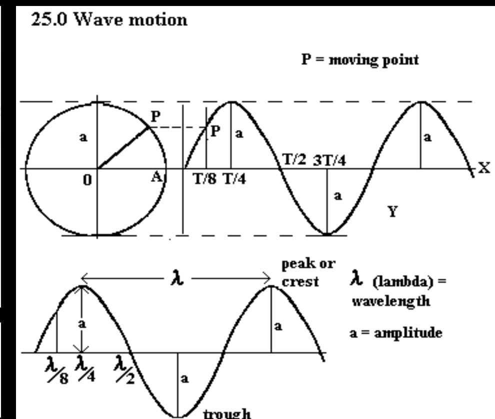
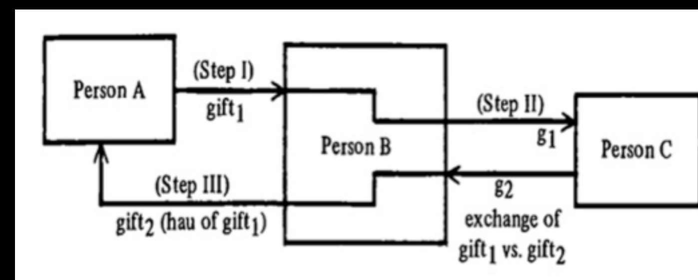


Figure 1. Iroquois terminology translated into nearest English equivalents.


The graph G of the Kula Ring







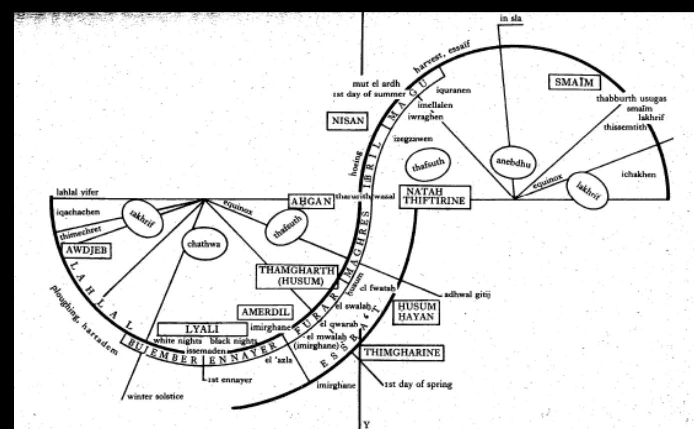


Fig. 2. The abstract "calendar"

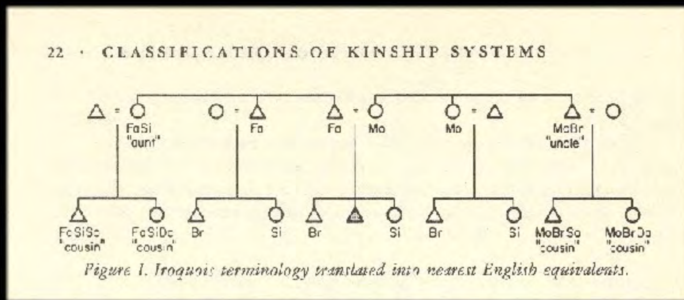


Figure 1. Iroquois terminology translated into nearest English equivalents.

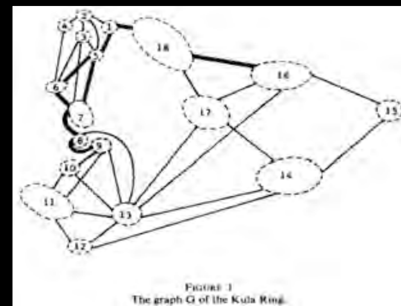
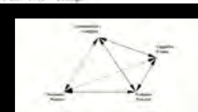
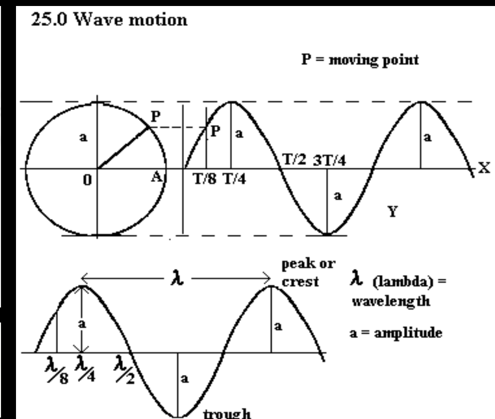
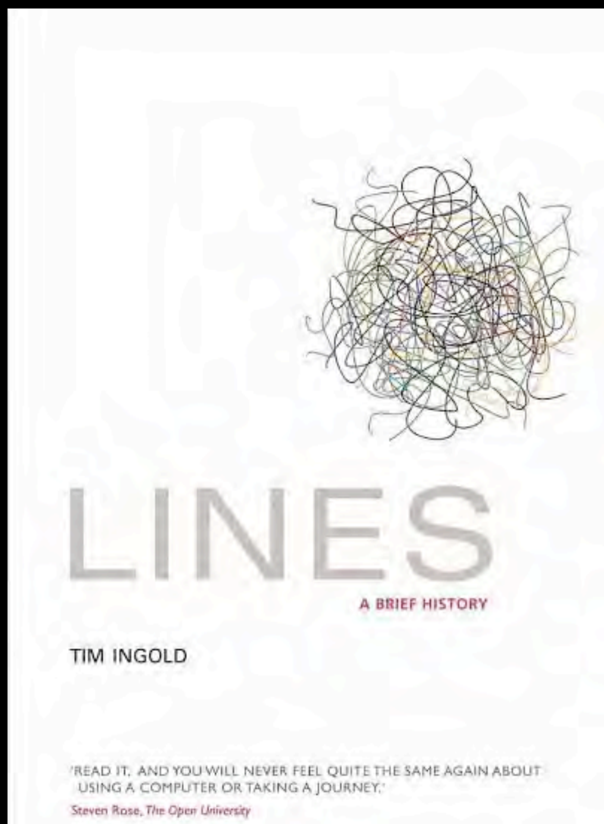
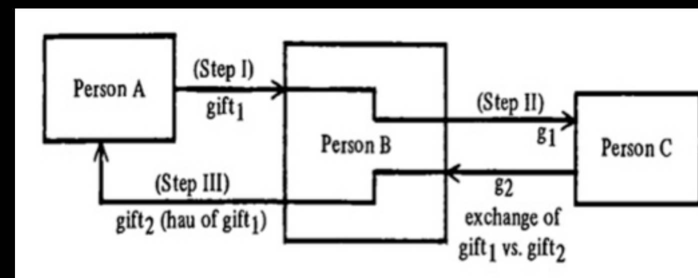


FIGURE 1
The graph G of the Kula Ring









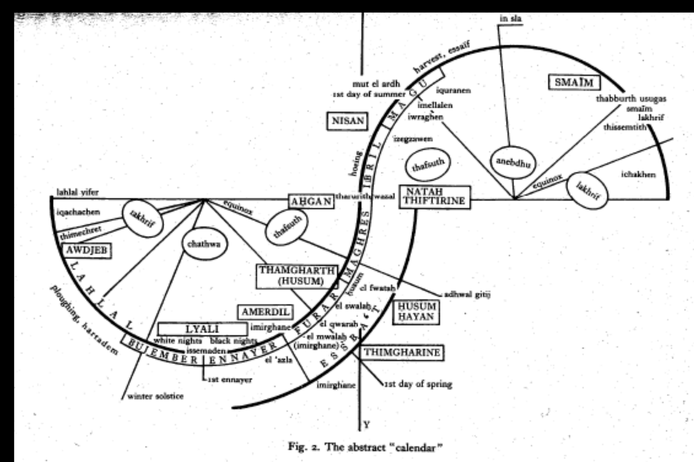
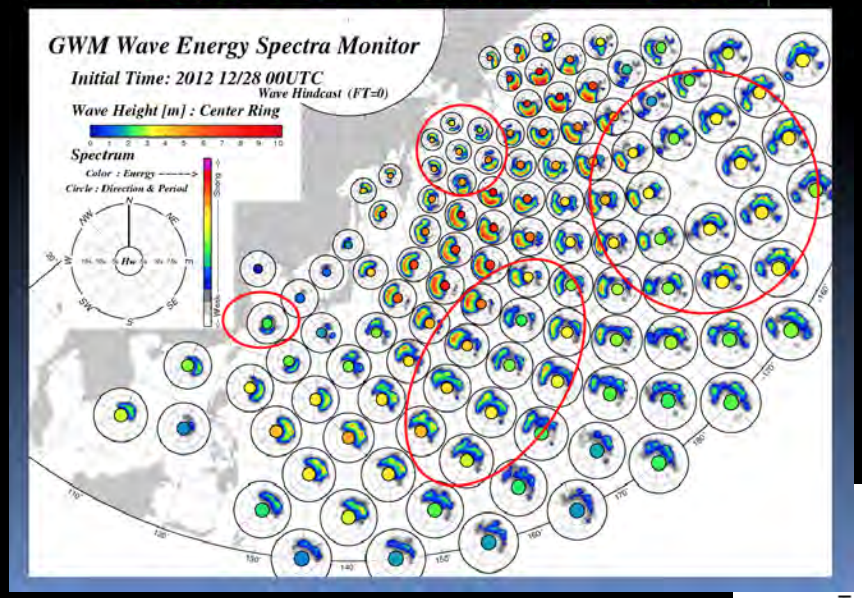
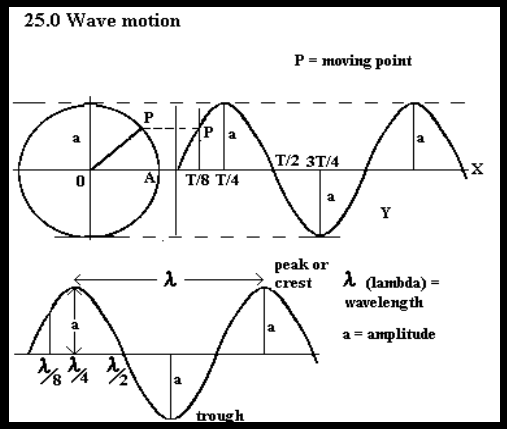


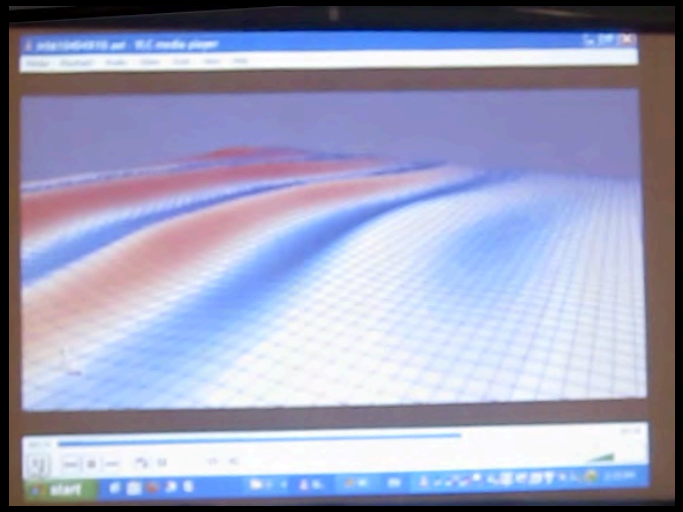
Fig. 2. The abstract "calendar"

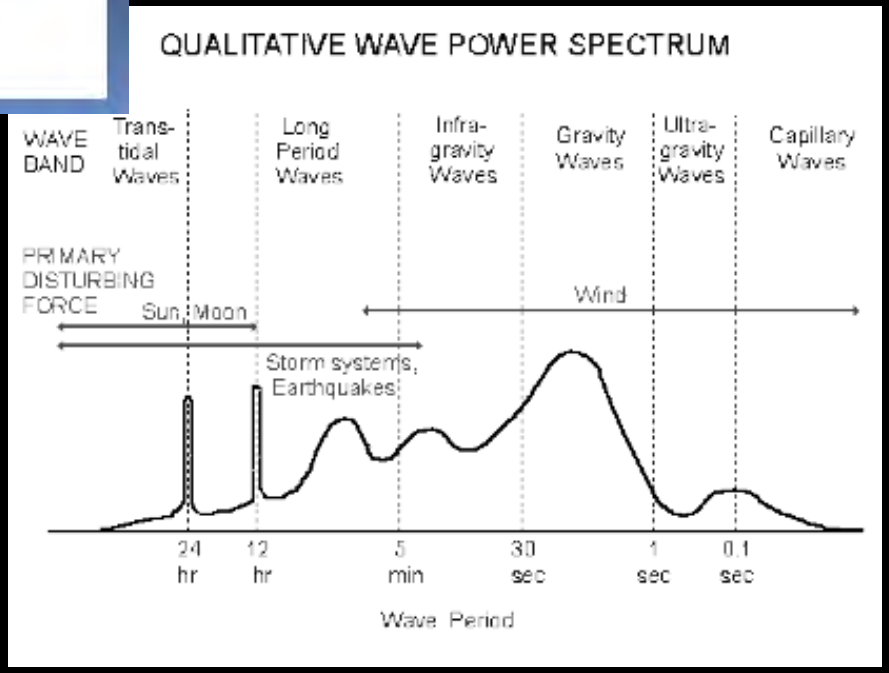
SLIDE 11

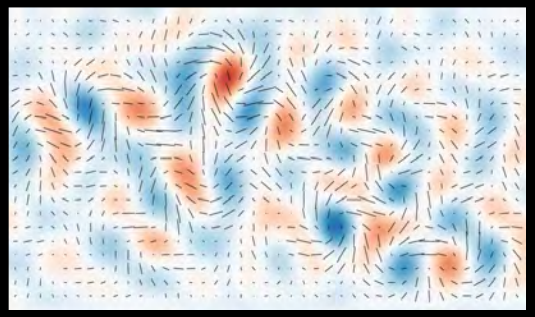
全球波浪モデルの波浪スペクトル

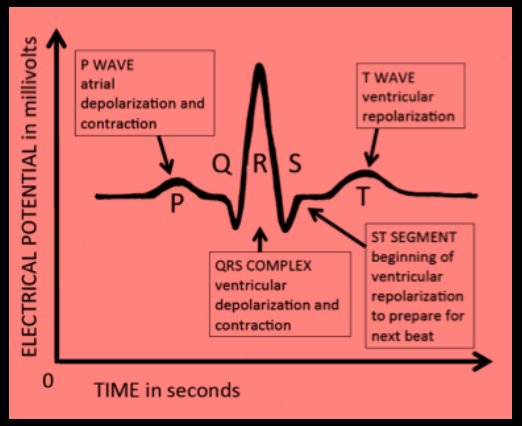


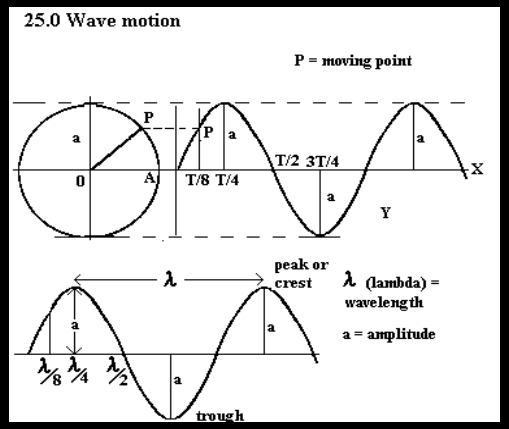


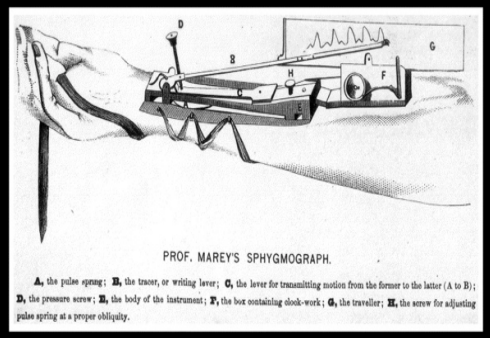


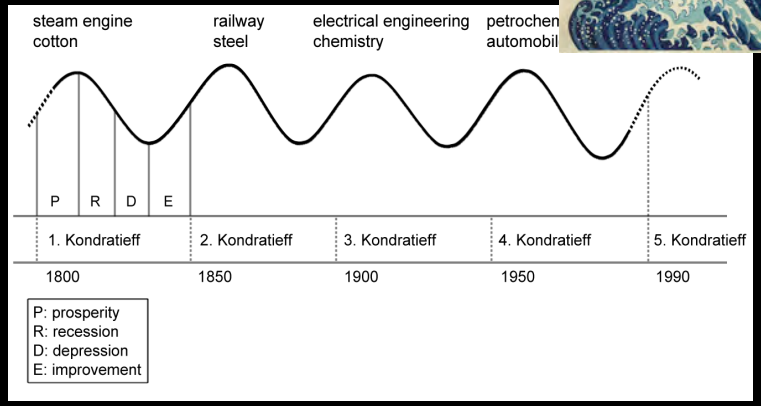


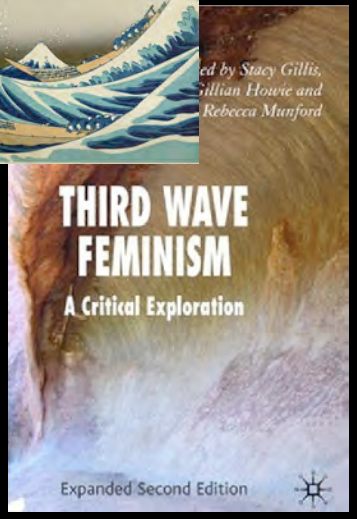


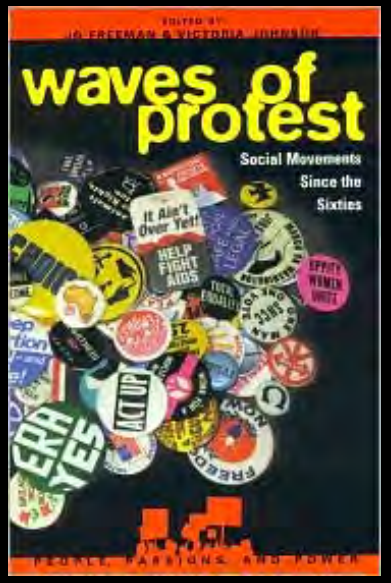

ELECTRICAL POTENTIAL in millivolts
P WAVE
atrial
depolarization and
contraction
Q R S
T WAVE
ventricular
repolarization
P
T
QRS COMPLEX
ventricular
depolarization and
contraction
ST SEGMENT
beginning of
ventricular
repolarization
to prepare for
next beat
0
TIME in seconds


25.0 Wave motion
P = moving point
a
P
P
a
T/2 3T/4
a
0
A
T/8 T/4
X
Y
a
λ
peak or
crest
λ (lambda) =
wavelength
a = amplitude
a
a
λ/8 λ/4 λ/2
a
trough


PROF. MAREY'S SPHYGMOGRAPH.
A, the pulse spring; B, the tracer, or writing lever; C, the lever for transmitting motion from the former to the latter (A to B); D, the pressure screw; E, the body of the instrument; F, the box containing clock-work; G, the traveller; H, the screw for adjusting pulse spring at a proper obliquity.


steam engine
cotton
railway
steel
electrical engineering
chemistry
petrochen
automobil
P
R
D
E
1. Kondratieff
2. Kondratieff
3. Kondratieff
4. Kondratieff
5. Kondratieff
1800
1850
1900
1950
1990
P: prosperity
R: recession
D: depression
E: improvement


ed by Stacy Gillis,
illian Howie and
Rebecca Munford
THIRD WAVE
FEMINISM
A Critical Exploration
Expanded Second Edition


waves of
protest
Social Movements
Since the
Sixties
It Ain't
Over Yet!
HELP
FIGHT
AIDS
ACT UP
ERA
YES
PEOPLE, PASSIONS, AND POWER


THE
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AND
HIS WORKS.
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1868.
RULE
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MODERNITY
TIMOTHY MITCHELL
WILD
PROFUSION
Celia Lowe
Dolly
mixtures
THE REMAKING OF GENEALOGY
SARAH FRANKLIN
DONNA J. HARAWAY WHEN SPECIES MEET
ALIEN OCEAN
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STEFAN HELMREICH
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SOCIABLE LIFE
EVOLUTION AFTER SCIENCE STUDIES
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AN ETHNOGRAPHY OF ENDANGERMENT IN HONG KONG
TIM CHOY
Social Text
106
Interspecies
PIGEON TROUBLE
Bestiary
Biopolitics
in a
Deindustrialized
America
Hoon Song
Matsutake Worlds Live
One mushroom, one world: many cultures, many ecologies.
Matsutake are aromatic wild mushrooms picked in forests across the northern hemisphere. Japanese value these mushrooms above all others because of their fresh and enticing smell, a sign of the autumn season.
マツタケ・ワールド ライブ
生氣蓬勃的松茸世界
SCIENCE
as
CULTURE
WILD DOG
DREAMING
LOVE AND EXTINCTION
MINERALS,
COLLECTING,
AND VALUE ACROSS THE
US-MEXICO BORDER
ELIZABETH EMMA FERRY
HOW FORESTS THINK
Eduardo Kohn
The
MULTISPECIES
SALON
EBEN KIRKSEY, EDITOR


KOZ Waves
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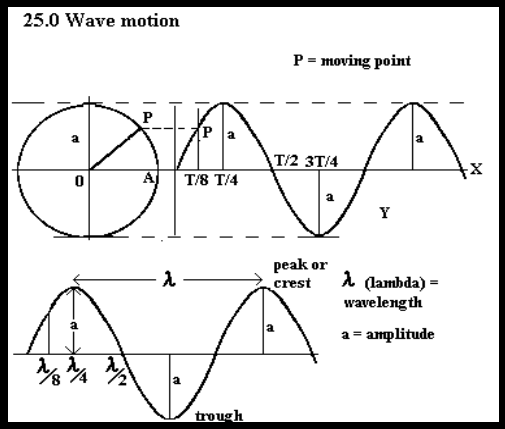
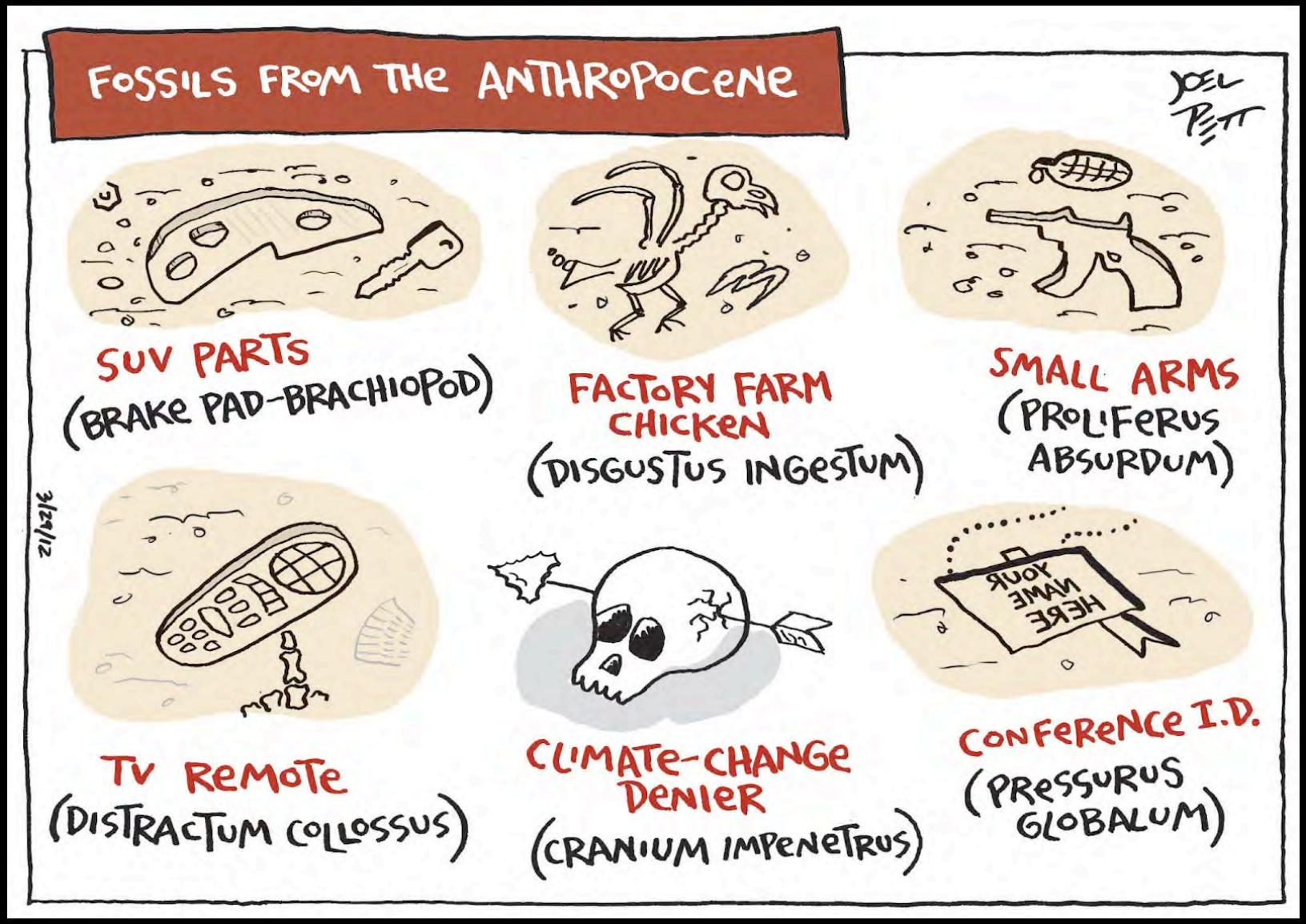
Gustave Doré, 1870 engraving of scene from *The Rime of the Ancient Mariner*

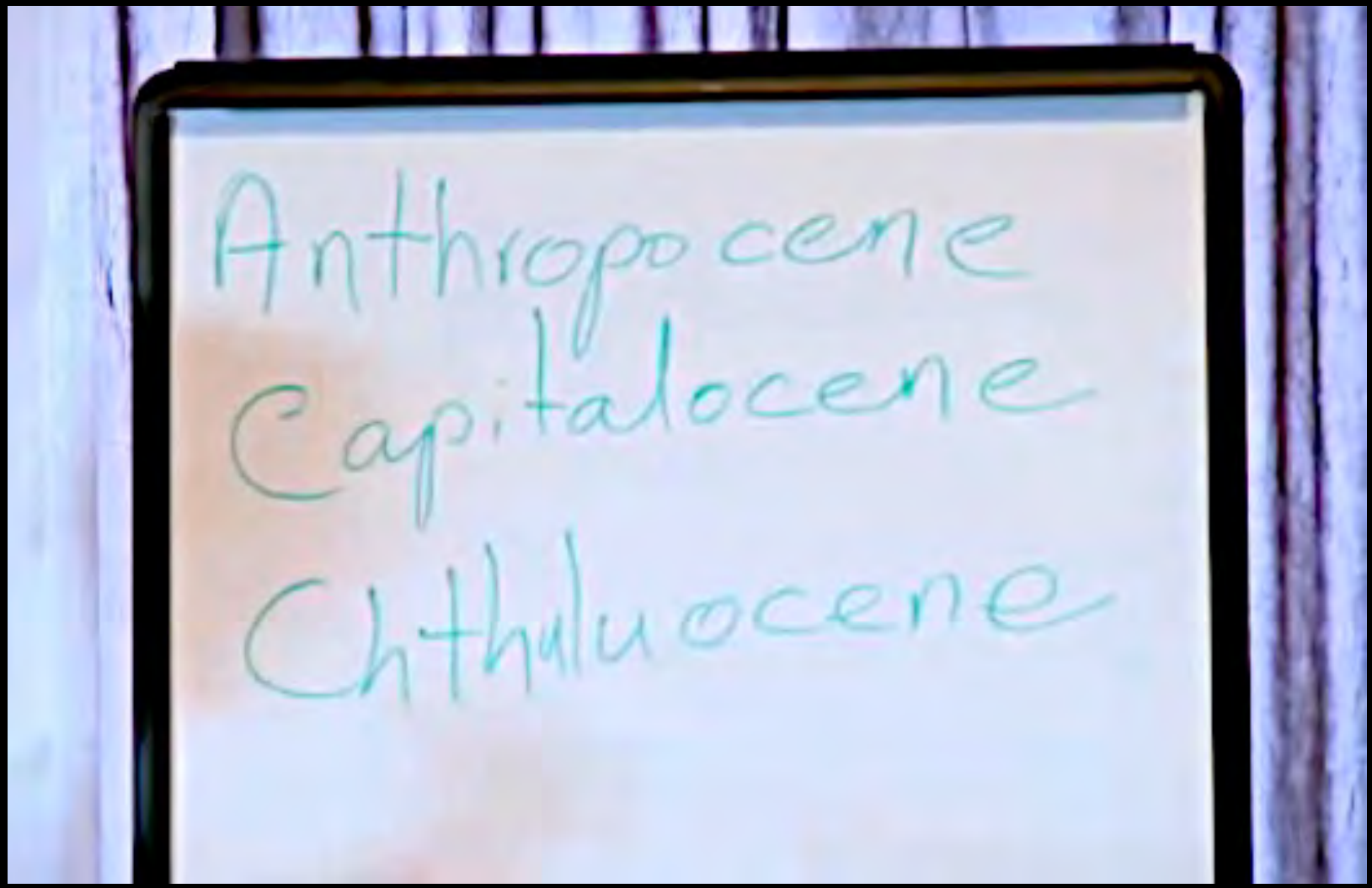
The Honourable East India Company's Iron War Steamer, the ship Nemesis. London: Colnaghi & Puckle, October 26, 1841. Engraved by R. G. Reeve after a painting by H. J. Leathern

Photo from StokeReport | Surf Reports for Ocean Beach, Linda Mar and the San Francisco Bay Area



Wave schematic, uq.edu.au


FOSSILS FROM THE ANTHROPOCENE
JOEL PETT
SUV PARTS
(BRAKE PAD-BRACHIOPOD)
FACTORY FARM CHICKEN
(DISGUSTUS INGESTUM)
SMALL ARMS
(PROLIFERUS ABSURDUM)
TV REMOTE
(DISTRACTUM COLLOSSUS)
CLIMATE-CHANGE DENIER
(CRANIUM IMPENETRUS)
CONFERENCE I.D.
(PRESSURUS GLOBALUM)
YOUR NAME HERE
2/12/16

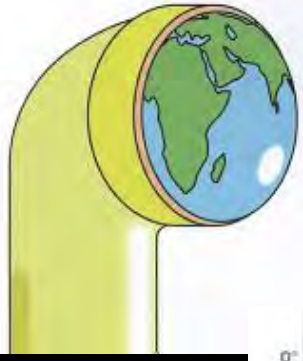


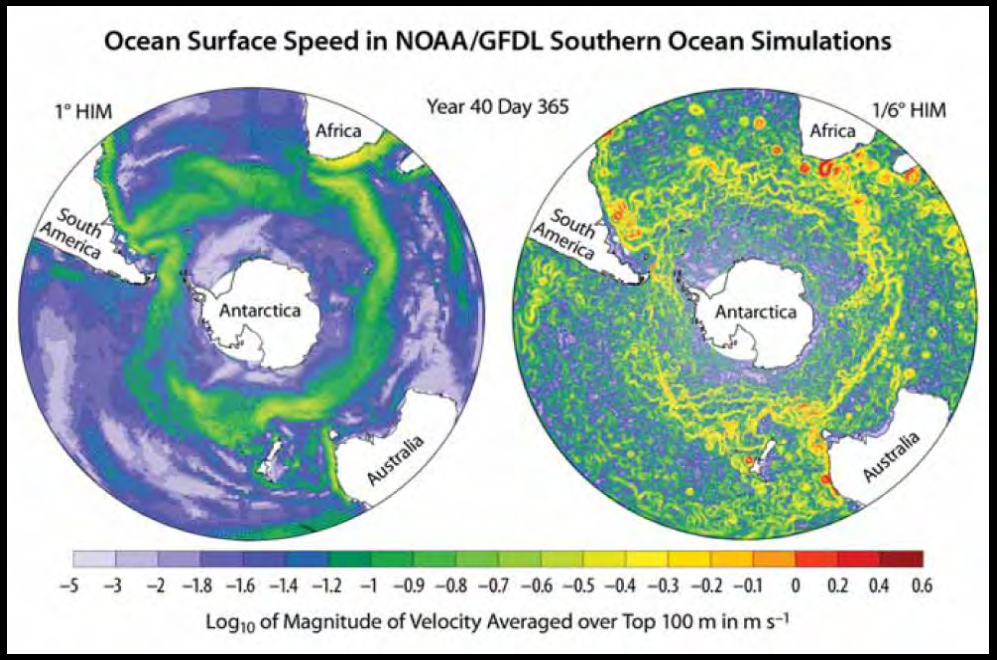
from Donna Haraway. 2014. “SF: String Figures, Multispecies Muddles, Staying with the Trouble,” Keynote Lecture, *Knowings and Knots: Methodologies and Ecologies in Research-Creation*, University of Alberta, Canada, March 24.

Theory From The South

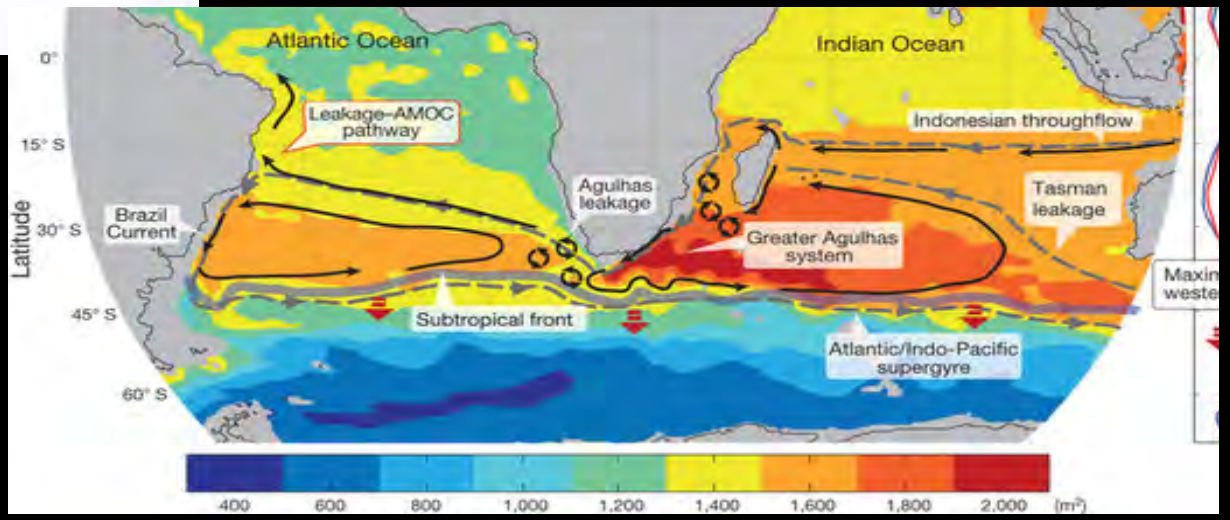
Or, How Euro-America Is Evolving Toward Africa

Jean Comaroff &
John L. Comaroff





www.gfdl.noaa.gov/ocean_mesoscale_eddies



www.nature.com/nature/journal/v472/n7344/full/nature09983.html?WT.ec_id=NATURE-20110428


KOZ Waves
Effect of symmetry defect on the edge resonance in elastic plate
KOZ Waves
Kiwi-Oz Waves Conference
The first international Australasian conference on wave science
17—19 February, 2014
Venue: Newcastle City Hall
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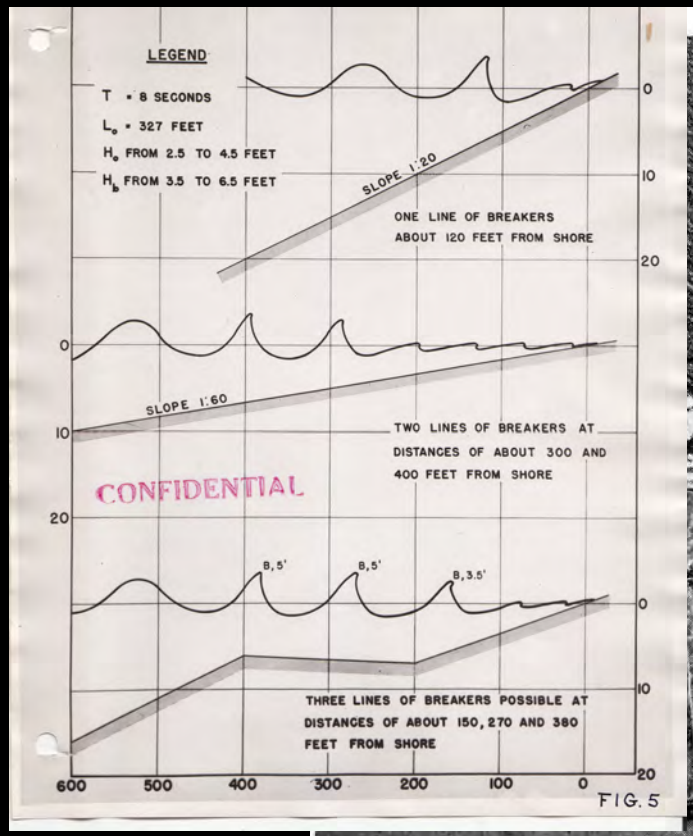
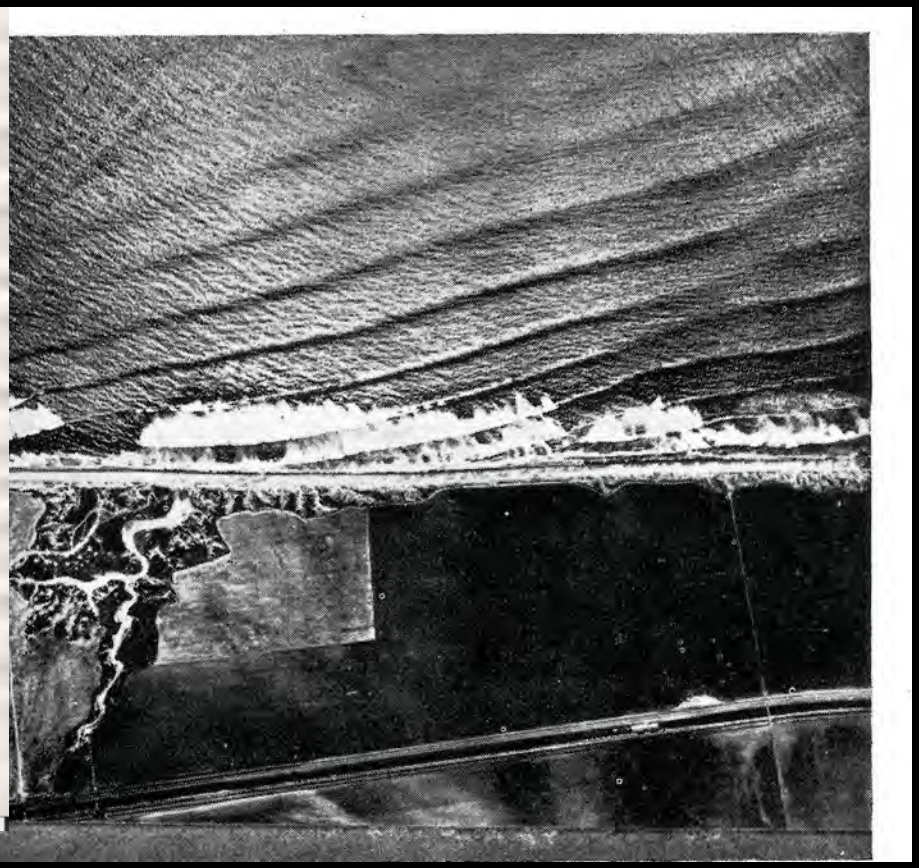
H.M.S. *Agamemnon* Completing First Atlantic Cable, near Ireland, August 1858, 1898 engraving after original painting by Henry Clifford

Wave measurements, 1940s, Willard Newell Bascom Papers, 1945-2000, Collection 2008-21, BOX 3, Scripps Institution of Oceanography Archives





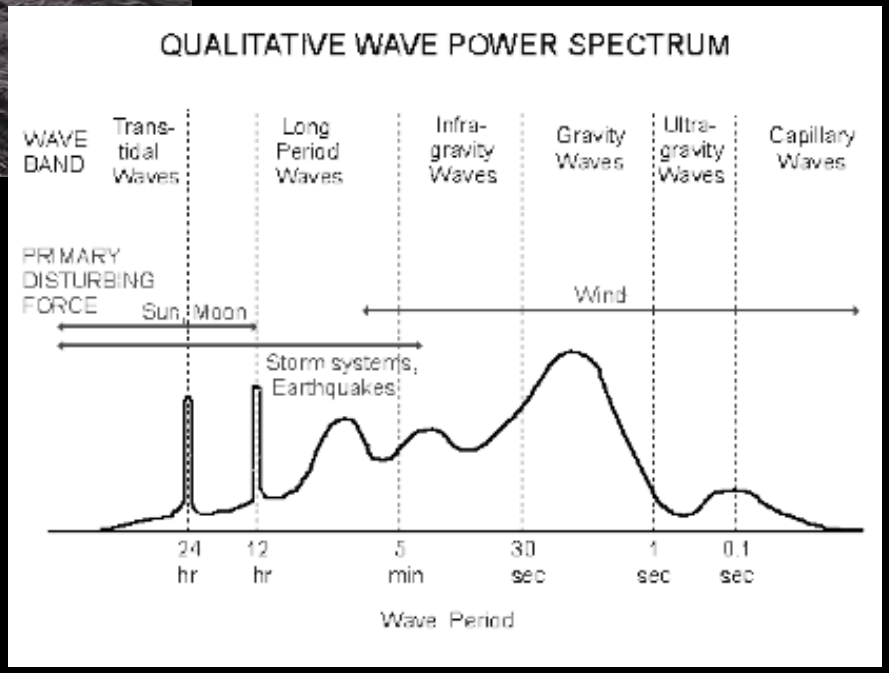
Left: “Effect of Bottom Slope on Breaker Characteristics as Observed along the Scripps Institution Pier,” Walter Heinrich Munk Papers, 1944-2002, Collection 87-035, BOX 23, Scripps Institution of Oceanography Archives (note wartime confidentiality label)

Right: World War II-era aerial photo by John Issacs, www.coastalwatch.com/surfing/6916/where-the-swell-begins-from-the-surfers-journal

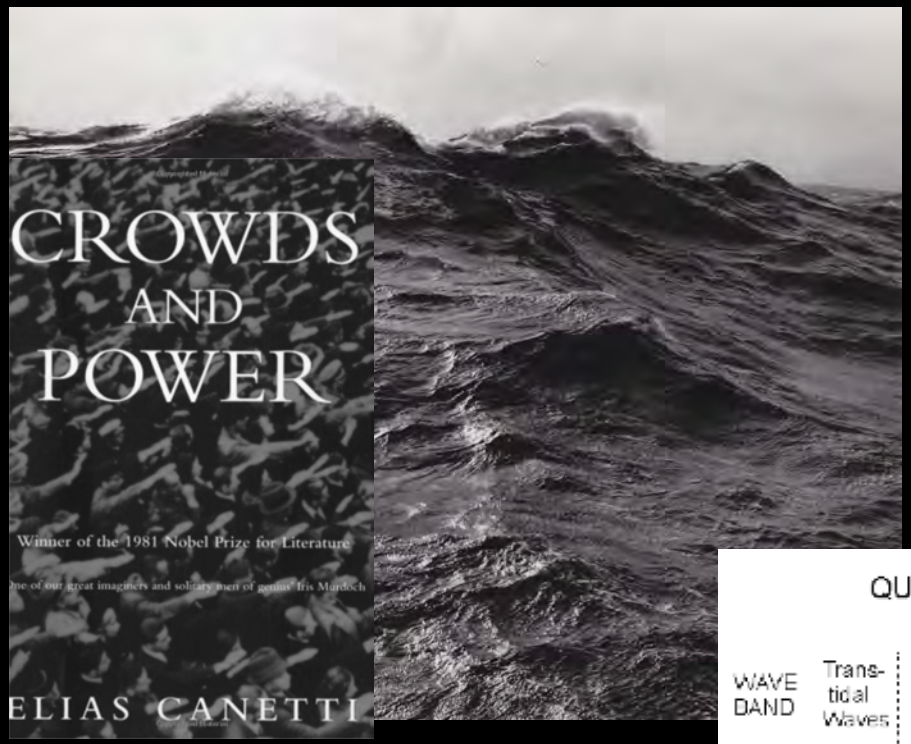
First Atomic bomb test at Bikini Lagoon, 1 July 1946, Willard Newell Bascom Papers, 1945-2000, Collection 2008-21, BOX 3, Scripps Institution of Oceanography Archives

“The Gulf of Mexico offshore oil and gas industry was born off the coast of Louisiana in the 1940's, and from there the people, companies, and technologies spread across the globe.” *Bureau of Ocean Energy Management, Regulation and Enforcement*, www.eoearth.org/view/article/164883/

The Texture of a Great Wave, ~ 1971
Willard Newell Bascom Papers, 1945-2000, Collection 2008-21, BOX 3, Scripps Institution of Oceanography Archives

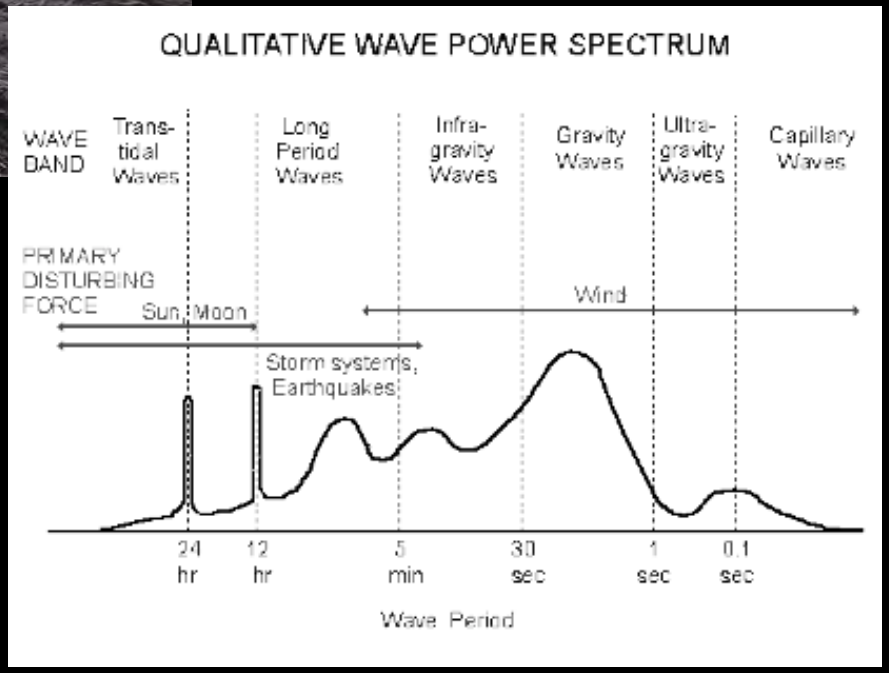


Qualitative wave power spectrum, adapted from Blair Kinsman. 1965. *Wind Waves: Their Generation and Propagation on the Ocean Surface*. Englewood Cliffs, NJ: Prentice-Hall, p 23
tidesandcurrents.noaa.gov/levelhow.html



The Texture of a Great Wave, ~ 1971
Willard Newell Bascom Papers, 1945-2000, Collection 2008-21, BOX 3, Scripps Institution of Oceanography Archives

Elias Canetti. 1962. *Crowds and Power.* London: Gollancz.



Qualitative wave power spectrum, adapted from Blair Kinsman. 1965. *Wind Waves: Their Generation and Propagation on the Ocean Surface*. Englewood Cliffs, NJ: Prentice-Hall, p 23
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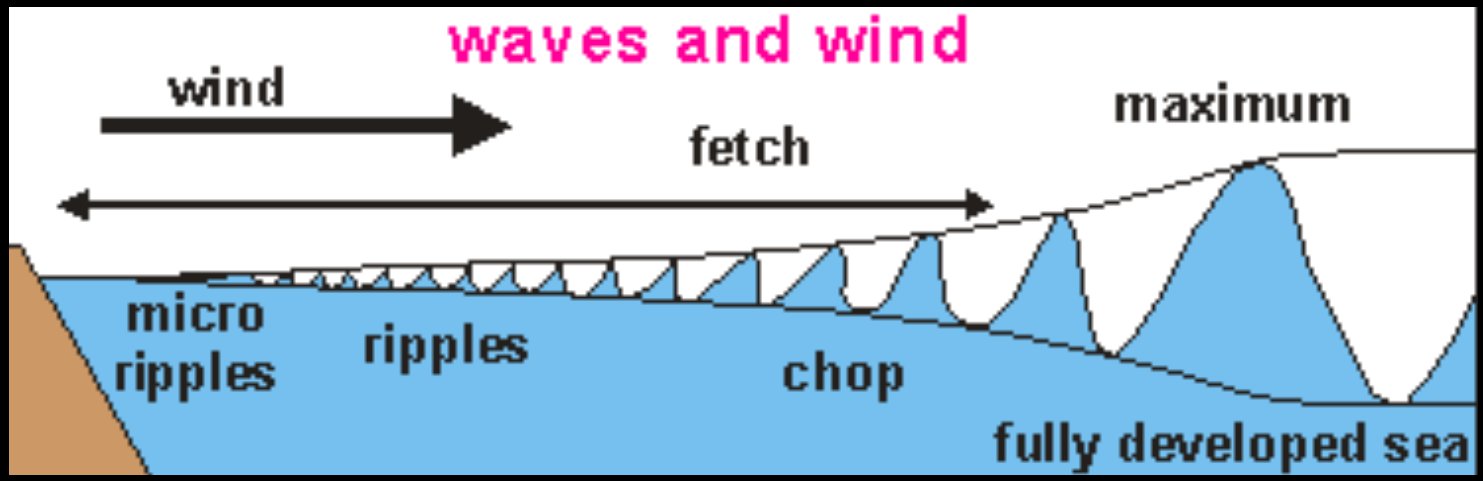
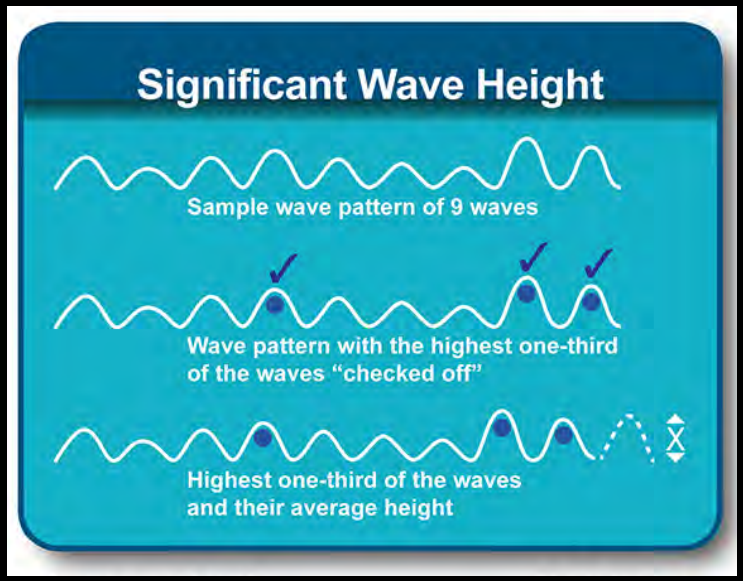
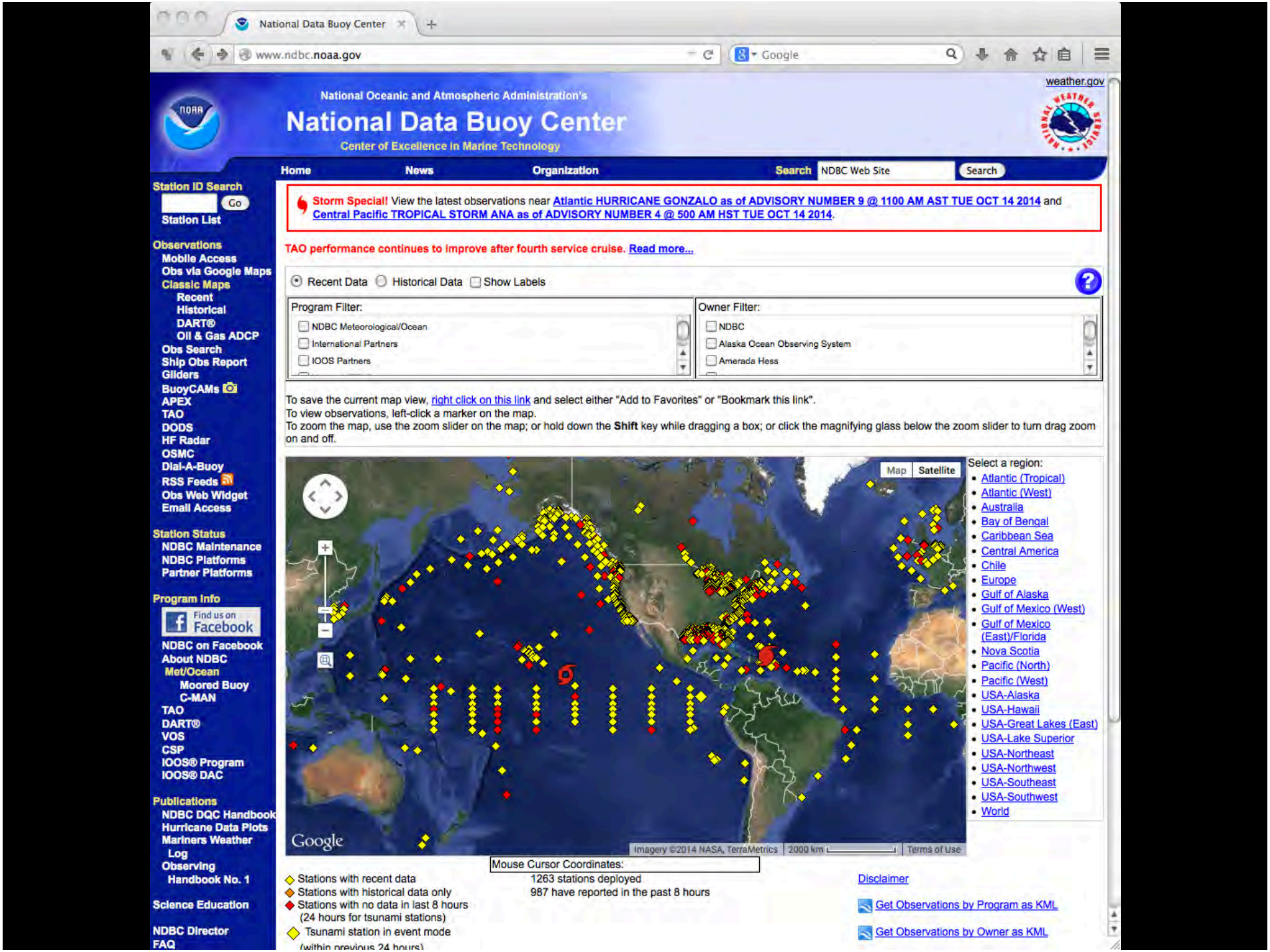


www.seafriends.org.nz/oceano/waves.htm



ec.gc.ca/meteo-weather/default.asp?lang=En&n=279AC7ED-1&offset=3&toc=show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Nova Scotia
Pacific (North)
Pacific (West)
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USA-Hawaii
USA-Great Lakes (East)
USA-Lake Superior
USA-Northeast
USA-Northwest
USA-Southeast
USA-Southwest
World
Mouse Cursor Coordinates:
Stations with recent data
Stations with historical data only
Stations with no data in last 8 hours (24 hours for tsunami stations)
Tsunami station in event mode (within previous 24 hours)
1263 stations deployed
987 have reported in the past 8 hours
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Get Observations by Program as KML
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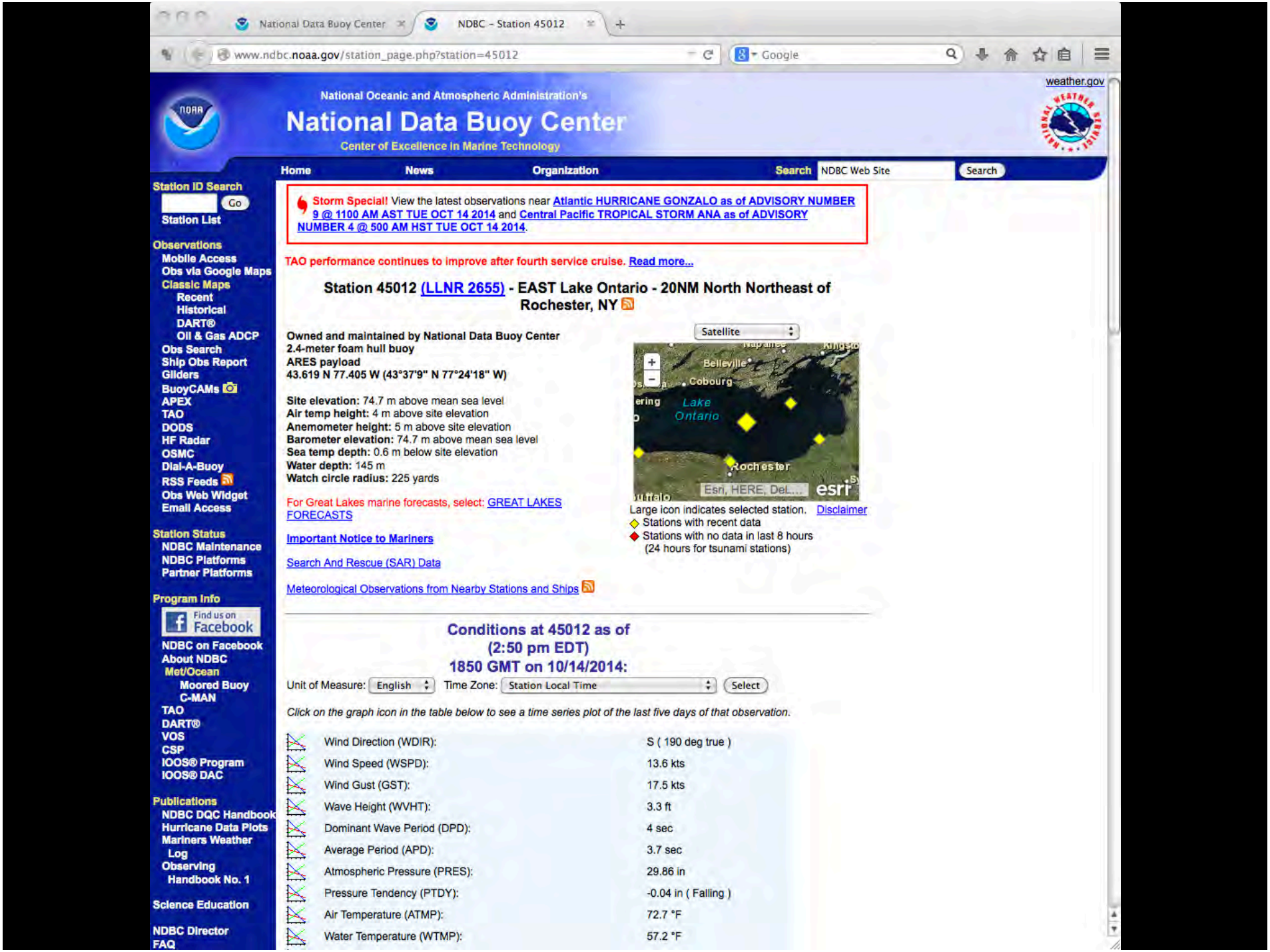
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NDBC - Station 45012
www.ndbc.noaa.gov/station_page.php?station=45012
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TAO performance continues to improve after fourth service cruise. Read more...
Station 45012 (LLNR 2655) - EAST Lake Ontario - 20NM North Northeast of Rochester, NY
Owned and maintained by National Data Buoy Center
2.4-meter foam hull buoy
ARES payload
43.619 N 77.405 W (43°37'9" N 77°24'18" W)
Site elevation: 74.7 m above mean sea level
Air temp height: 4 m above site elevation
Anemometer height: 5 m above site elevation
Barometer elevation: 74.7 m above mean sea level
Sea temp depth: 0.6 m below site elevation
Water depth: 145 m
Watch circle radius: 225 yards
For Great Lakes marine forecasts, select: GREAT LAKES FORECASTS
Important Notice to Mariners
Search And Rescue (SAR) Data
Meteorological Observations from Nearby Stations and Ships
Satellite
Belleville
Cobourg
Lake Ontario
Rochester
Esri, HERE, DeL...
esri
Large icon indicates selected station. Disclaimer
Stations with recent data
Stations with no data in last 8 hours (24 hours for tsunami stations)
Conditions at 45012 as of (2:50 pm EDT) 1850 GMT on 10/14/2014:
Unit of Measure: English
Time Zone: Station Local Time
Select
Click on the graph icon in the table below to see a time series plot of the last five days of that observation.
Wind Direction (WDIR): S (190 deg true)
Wind Speed (WSPD): 13.6 kts
Wind Gust (GST): 17.5 kts
Wave Height (WVHT): 3.3 ft
Dominant Wave Period (DPD): 4 sec
Average Period (APD): 3.7 sec
Atmospheric Pressure (PRES): 29.86 in
Pressure Tendency (PTDY): -0.04 in (Falling)
Air Temperature (ATMP): 72.7 °F
Water Temperature (WTMP): 57.2 °F

National Data Buoy Center | NDBC - Station 46054

www.ndbc.noaa.gov/station_page.php?station=46054

National Oceanic and Atmospheric Administration's

National Data Buoy Center

Center of Excellence in Marine Technology

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Storm Special! View the latest observations near Atlantic HURRICANE GONZALO as of ADVISORY NUMBER 9 @ 1100 AM AST TUE OCT 14 2014 and Central Pacific TROPICAL STORM ANA as of ADVISORY NUMBER 4 @ 500 AM HST TUE OCT 14 2014.

TAO performance continues to improve after fourth service cruise. Read more...

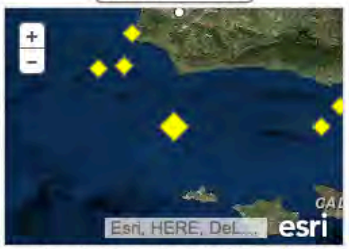
Station 46054 (LLNR 198) - WEST SANTA BARBARA 38 NM West of Santa Barbara, CA

Owned and maintained by National Data Buoy Center
3-meter discus buoy
ARES payload
34.265 N 120.477 W (34°15'53" N 120°28'37" W)

Site elevation: sea level
Air temp height: 4 m above site elevation
Anemometer height: 5 m above site elevation
Barometer elevation: sea level
Sea temp depth: 0.6 m below site elevation
Water depth: 382.3 m
Watch circle radius: 813 yards

NOTICE: In addition to the present 3 meter hull for station 46054, the old 10 meter hull (10D12) is still located at position 34.273N, 120.462W (34°16'22"N 120°27'42"W)

Satellite



Large icon indicates selected station. Disclaimer
◇ Stations with recent data
◆ Stations with no data in last 8 hours (24 hours for tsunami stations)

Latest NWS Marine Forecast

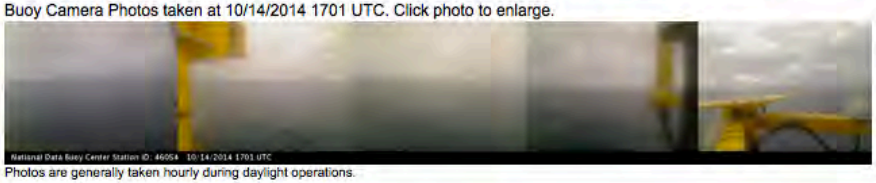
Important Notice to Mariners

Search And Rescue (SAR) Data

Meteorological Observations from Nearby Stations and Ships

Regional HF Radar Surface Current Observations

Buoy Camera Photos taken at 10/14/2014 1701 UTC. Click photo to enlarge.



Photos are generally taken hourly during daylight operations.

Conditions at 46054 as of (11:50 am PDT) 1850 GMT on 10/14/2014:

National Data Buoy Center | NDBC/44013

www.ndbc.noaa.gov/mobile/station.php?station=44013

wavewatch

NDBC/44013

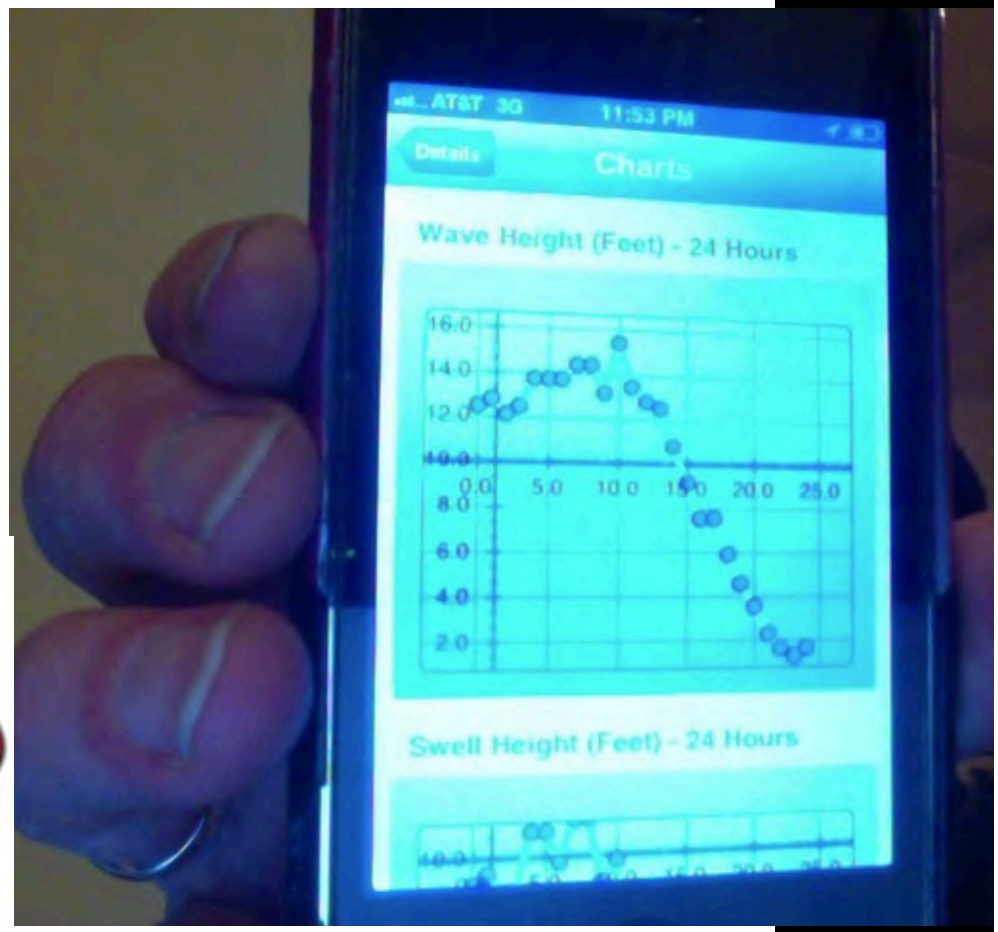
BOSTON 16 NM East of Boston, MA
42.346N 70.651W

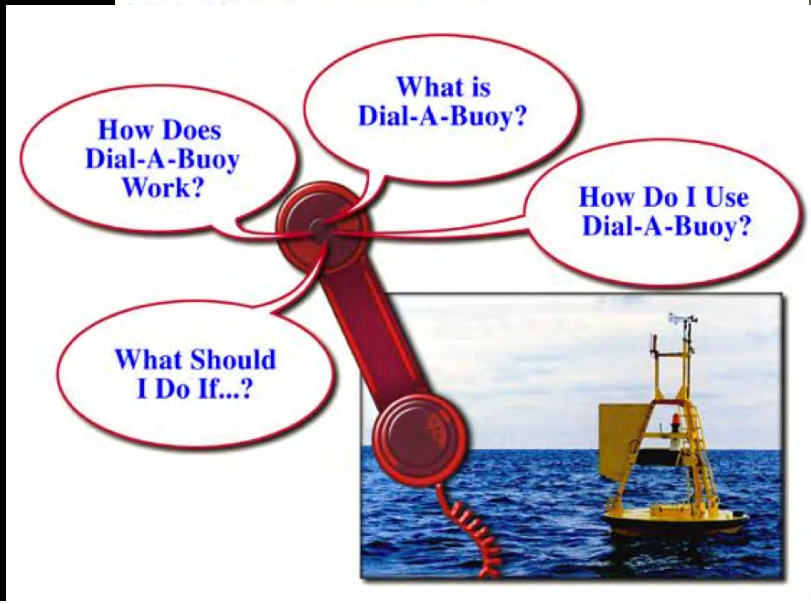
Weather Conditions

2:50 pm EDT 14-Oct-2014
Wind: SSW (200°), 14 kts (25 kph)
Gust: 16 kts (29 kph)
Seas: 1.6 ft (0.5 m)
Peak Period: 11 sec
Pressure: 30.19 inHg (1022.3 mb) falling
Air Temp: 67 °F (20 °C)
Water Temp: 59 °F (15 °C)
Dew Point: 64 °F (18 °C)

Wave Summary

3:00 pm EDT 14-Oct-2014
Swell: 1.0 ft (0.3 m)
Period: 10.8 sec
Direction: ESE
Wind Wave: 1.3 ft (0.4 m)
Period: 3.4 sec
Direction: ESE





National Data Buoy Center | NDBC - Station 41009 | Environmental Modeling C...

polar.ncep.noaa.gov/waves/index2.shtml

wavewatch

www.nws.noaa.gov

National Weather Service

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Local forecast by "City, St" or Zip Code

City, St | Go

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- Experimental
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MMAB Operational Wave Models

Home | Product Viewer | Product Table | Product Descriptions | Model Description | Model Data Access

The operational ocean wave predictions of NOAA/NWS/NCEP use the wave model WAVEWATCH III® using operational NCEP products as input.

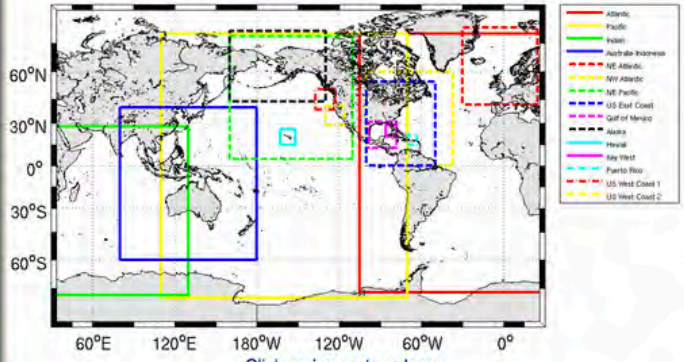
Detailed description of the WAVEWATCH III® model and source code distribution.

The model is run four times a day: 00Z, 06Z, 12Z, and 18Z. Each run starts with 9-, 6- and 3-hour hindcasts and produces forecasts of every 3 hours from the initial time out to 180 hours (84 hours for the Great Lakes).

The wave model suite consists of global and regional nested grids. As background information, a list of selected references and a chronological list of model changes are available. Finally, validation data are available for the multi-scale model.

Global | Hurricane Waves | Great Lakes (NAM winds) | Great Lakes (NDFD winds) | Global Ensemble

WAVEWATCH III Regional Views



Click on image to enlarge

Forecast Zones

Click to open the Product Viewer for the selected zone (latest model run)

Full Basin	Regional	Local
Atlantic Ocean	NE Atlantic	Gulf of Mexico


13th International Workshop on Wave Hindcasting and Forecasting
& 4th Coastal Hazards Symposium
Registration
OCTOBER 27 – NOVEMBER 1, 2013
Environment Canada
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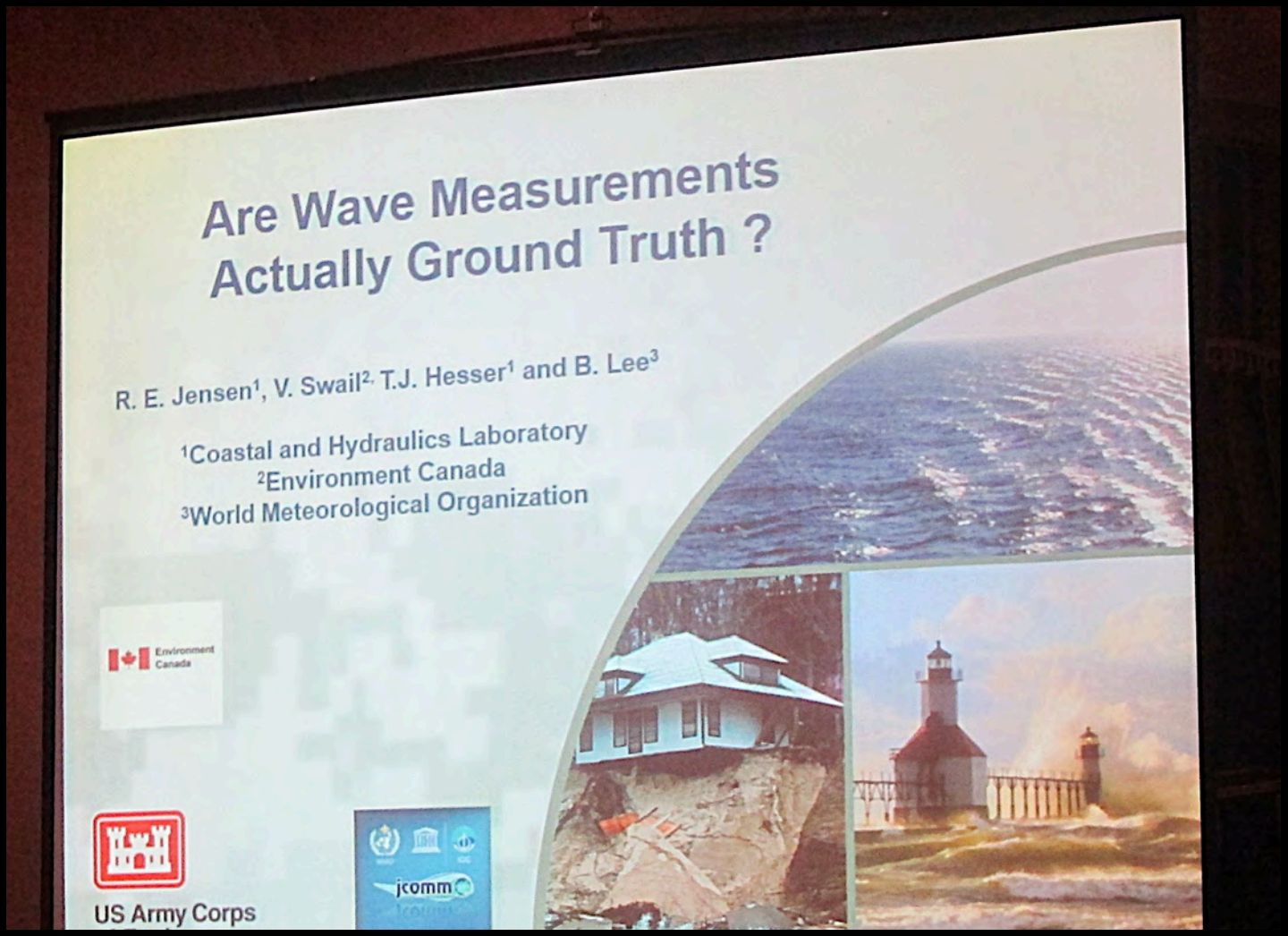
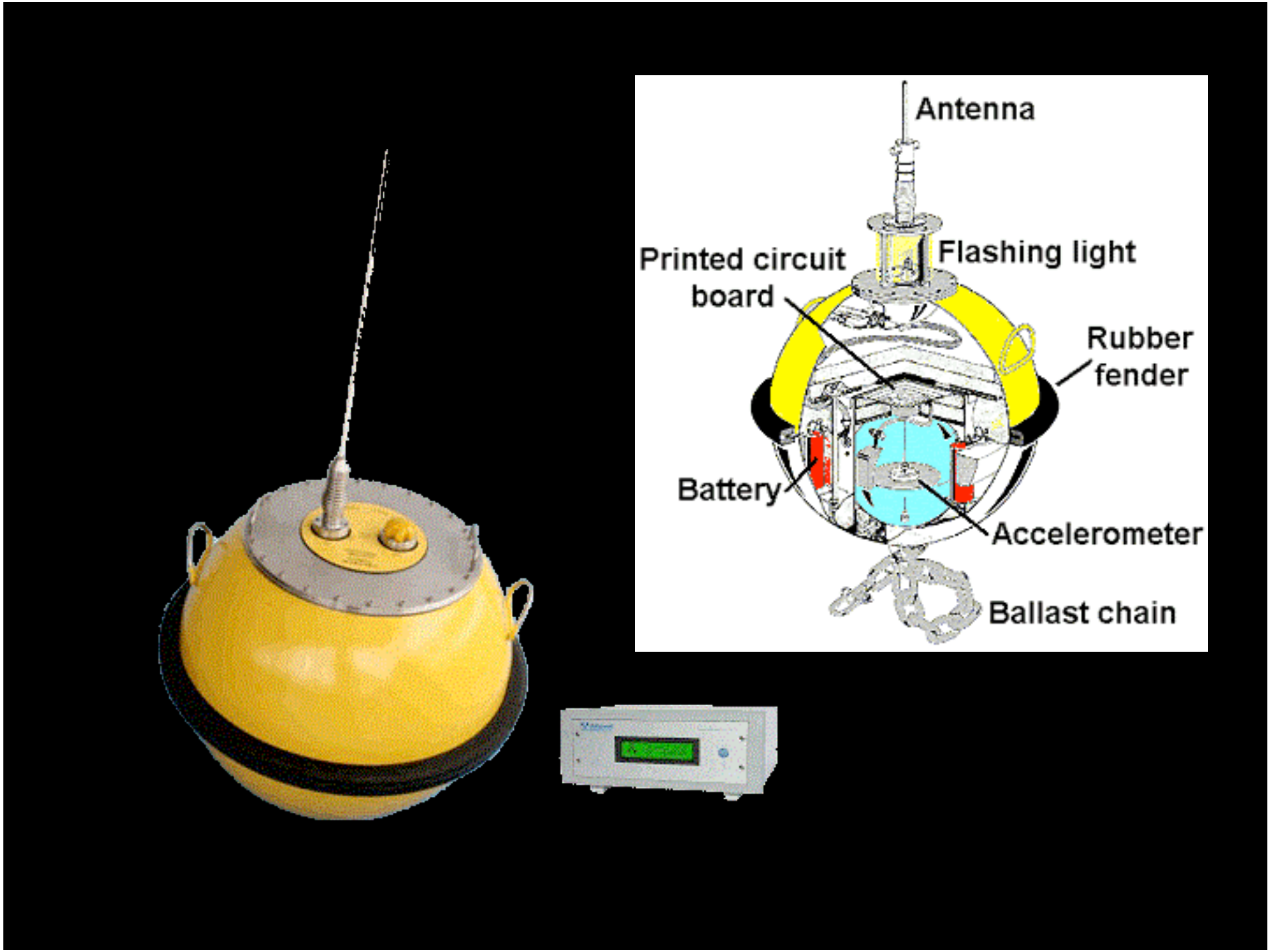


from R.E. Jensen et al. 2013. “Are Wave Measurements Actually Ground Truth?” Forecasting Dangerous Sea States, Banff, Alberta, Canada, October 27-November 1.

from R.E. Jensen et al. 2013. “Are Wave Measurements Actually Ground Truth?” Forecasting Dangerous Sea States, Banff, Alberta, Canada, October 27-November 1.


Antenna
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Flashing light
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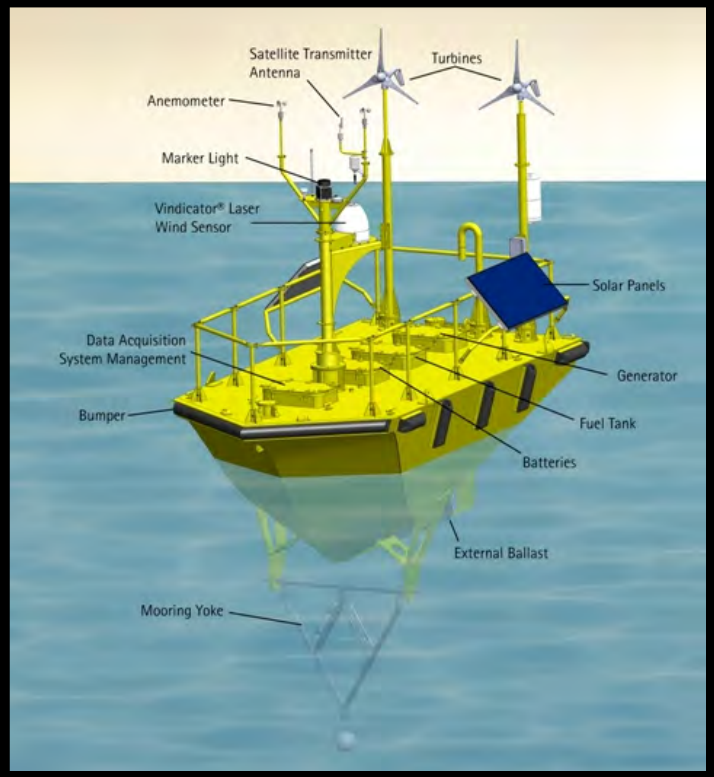
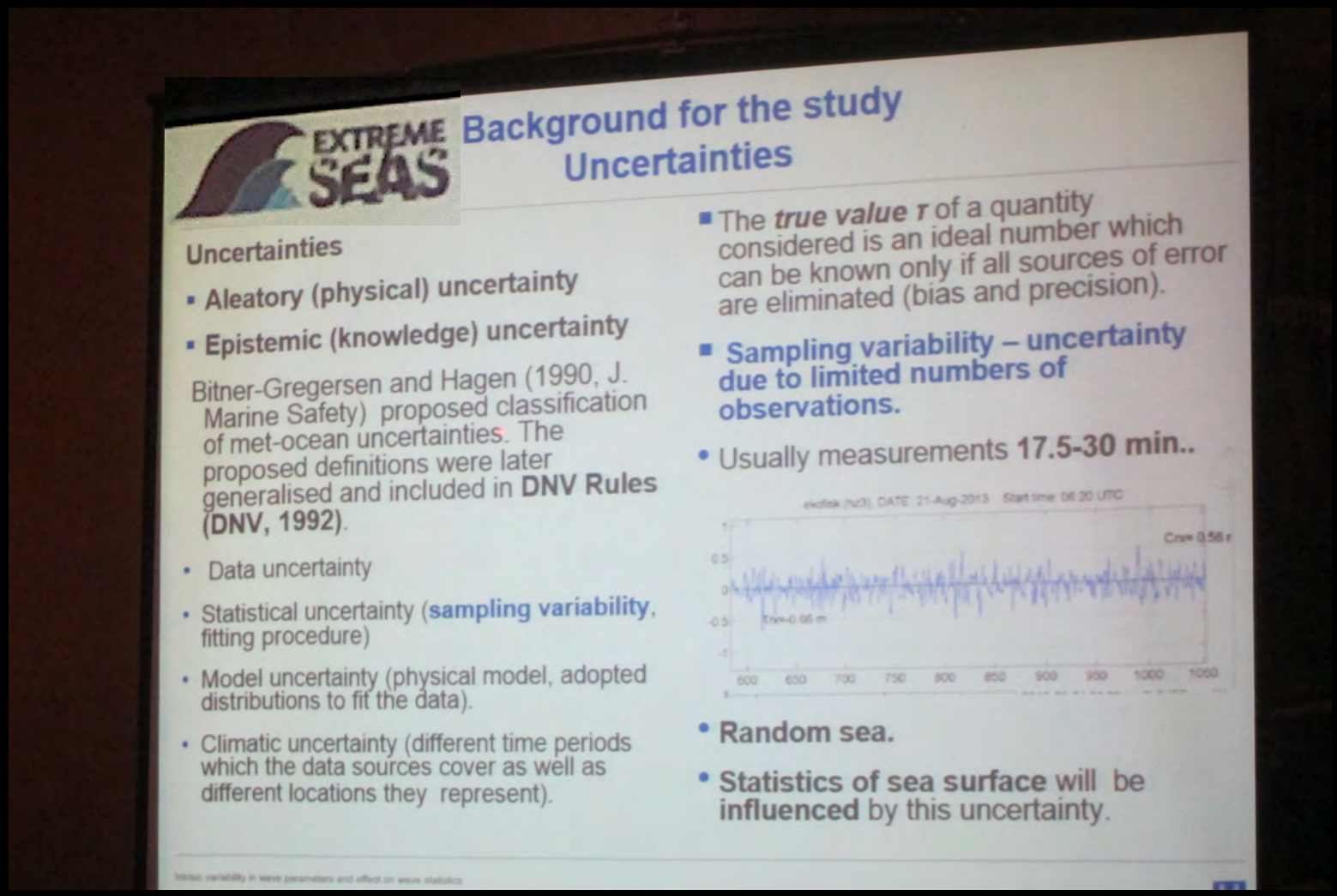
Battery
Accelerometer
Ballast chain



NOMAD buoy, by AXYS

SAAB/Rosemount WaveRadar, widely used by oil industry "This was photographed in tranquil seas off the coast of Borneo," *from* Kevin Ewans et al. 2013. "What Does a Wave Radar Actually Measure?" Forecasting Dangerous Sea States, Banff, Alberta, Canada, October 27-November 1.



from Elzbieta Bitner-Gregersen et al. 2013. “Intrinsic Variability in Wave Parameters and Effect on Wave Statistics,” Forecasting Dangerous Sea States, Banff, Alberta, Canada, October 27-November 1.

from Alexander Babanin et al. 2014. “Third Generation Wave Models Based on Observational Physics,” KOZWaves: Kiwi-Oz Waves Conference: First International Australasian Conference on Wave Science, Newcastle, Australia, February 17-19.

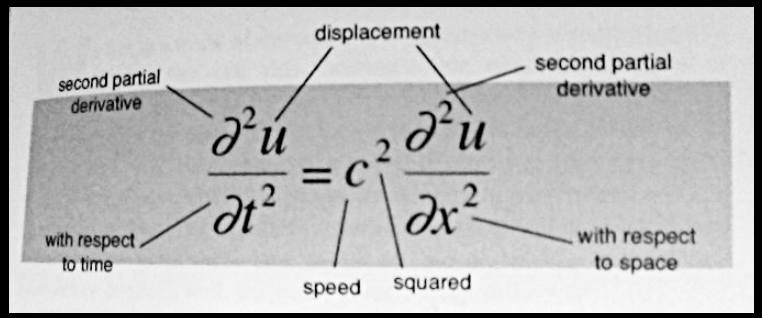
Radiative Transfer Equation is used in spectral models for wave forecast

$$\frac{dE(k,f,\theta,x,t)}{dt} = S_{tot} = S_{in} + S_{ds} + S_{nl} + S_{bf}$$

- Describes temporal and spatial evolution of the wave energy spectrum E(k,f,θ,t,x)

S_{tot} – all physical processes which affect the energy transfer
S_{in} – energy input from the wind
S_{ds} – dissipation due to wave breaking
S_{nl} – nonlinear interaction between spectral components
S_{bf} – dissipation due to interaction with the bottom

the wave equation



National Data Buoy Center | NDBC - Station 41009 | Environmental Modeling C...

polar.ncep.noaa.gov/waves/index2.shtml

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The operational ocean wave predictions of NOAA/NWS/NCEP use the wave model WAVEWATCH III® using operational NCEP products as input.

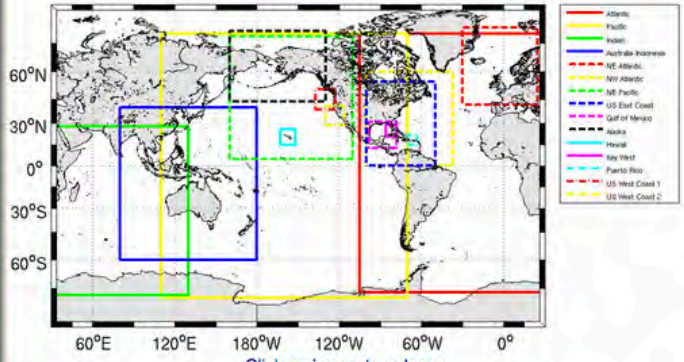
Detailed description of the WAVEWATCH III® model and source code distribution.

The model is run four times a day: 00Z, 06Z, 12Z, and 18Z. Each run starts with 9-, 6- and 3-hour hindcasts and produces forecasts of every 3 hours from the initial time out to 180 hours (84 hours for the Great Lakes).

The wave model suite consists of global and regional nested grids. As background information, a list of selected references and a chronological list of model changes are available. Finally, validation data are available for the multi-scale model.

Global | Hurricane Waves | Great Lakes (NAM winds) | Great Lakes (NDFD winds) | Global Ensemble

WAVEWATCH III Regional Views



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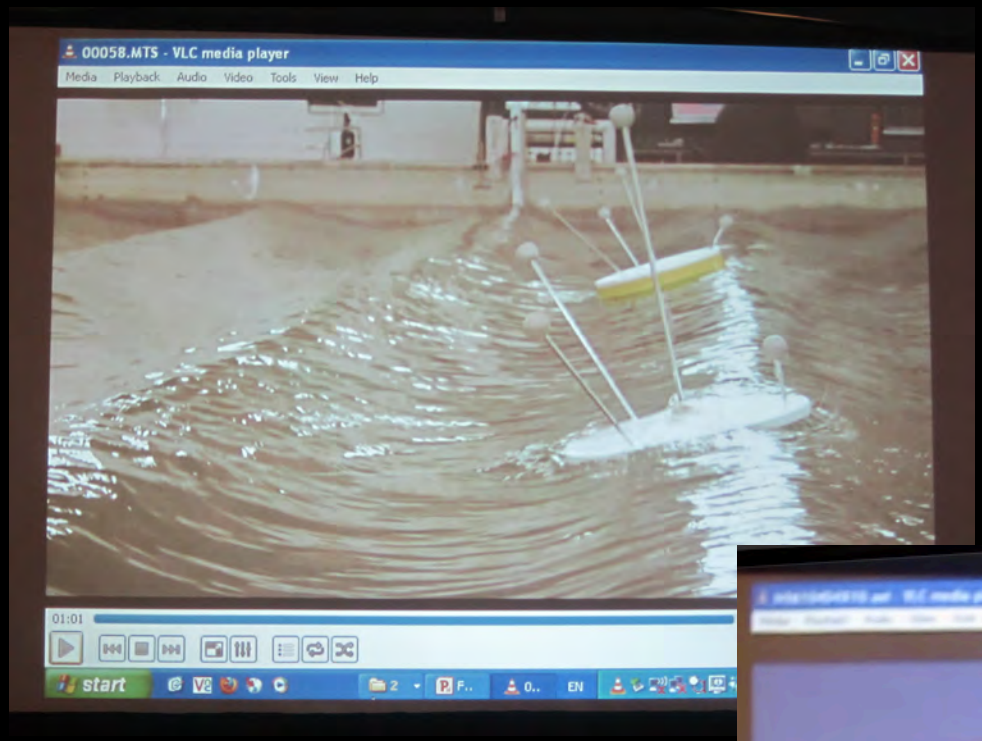
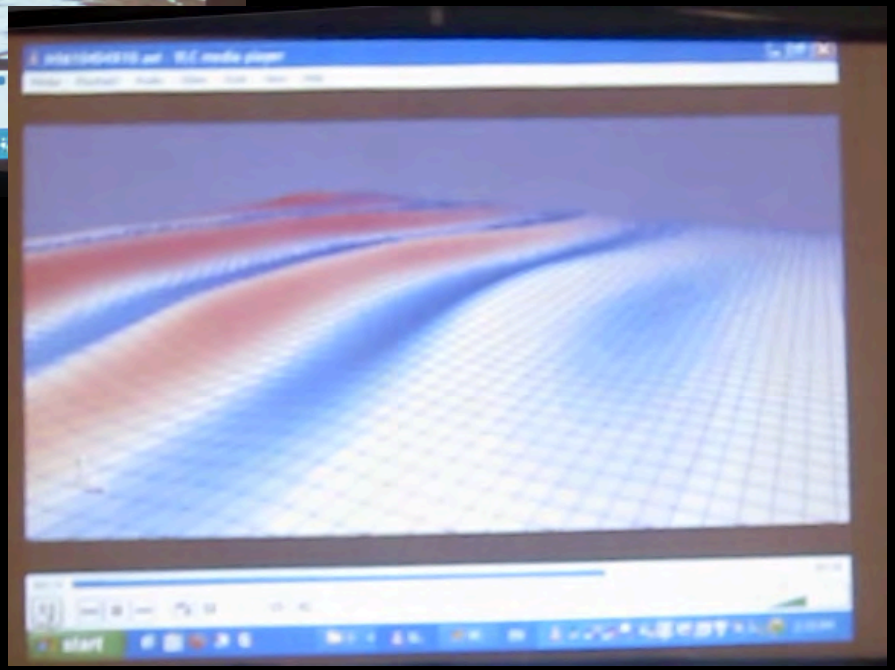
Forecast Zones

Click to open the Product Viewer for the selected zone (latest model run)

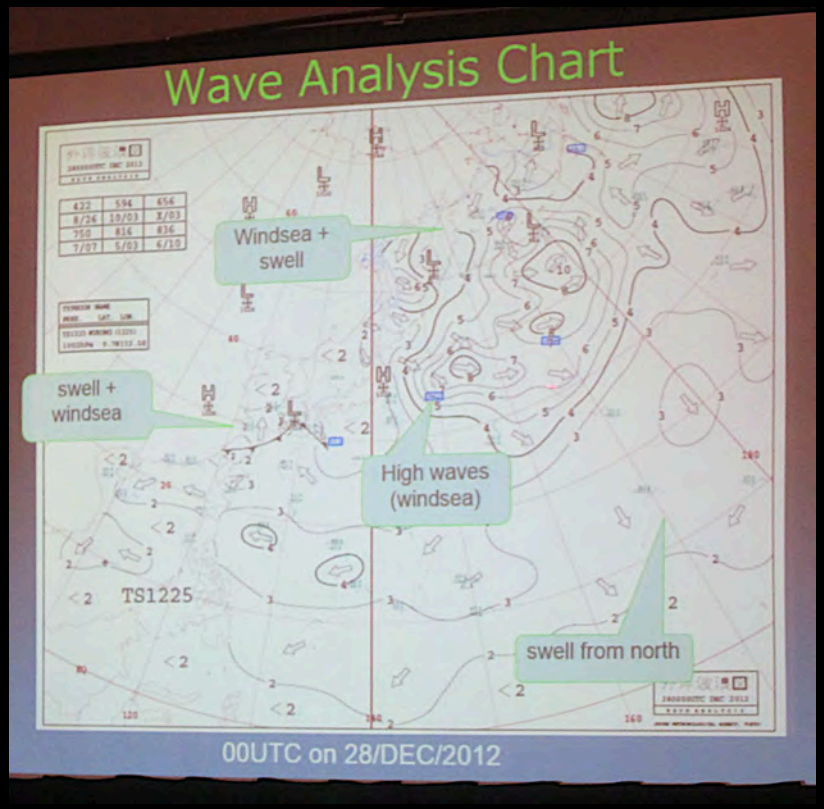
Full Basin	Regional	Local
Atlantic Ocean	NE Atlantic	Gulf of Mexico

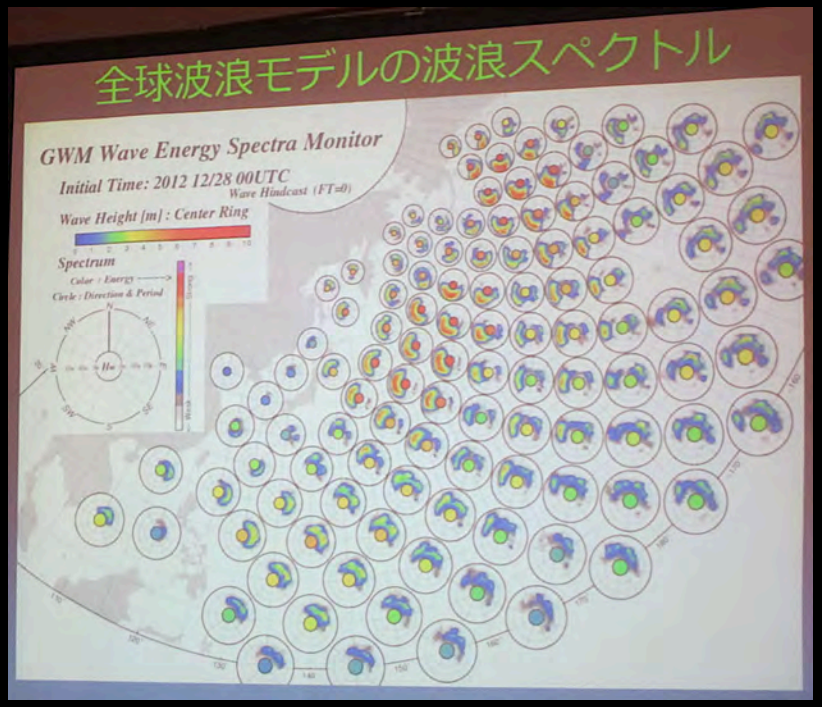


from Benjamin French et al. 2014. “Motions of a Scale Model Ice Floe in Regular Waves,” KOZWaves: Kiwi-Oz Waves Conference: First International Australasian Conference on Wave Science, Newcastle, Australia, February 17-19.

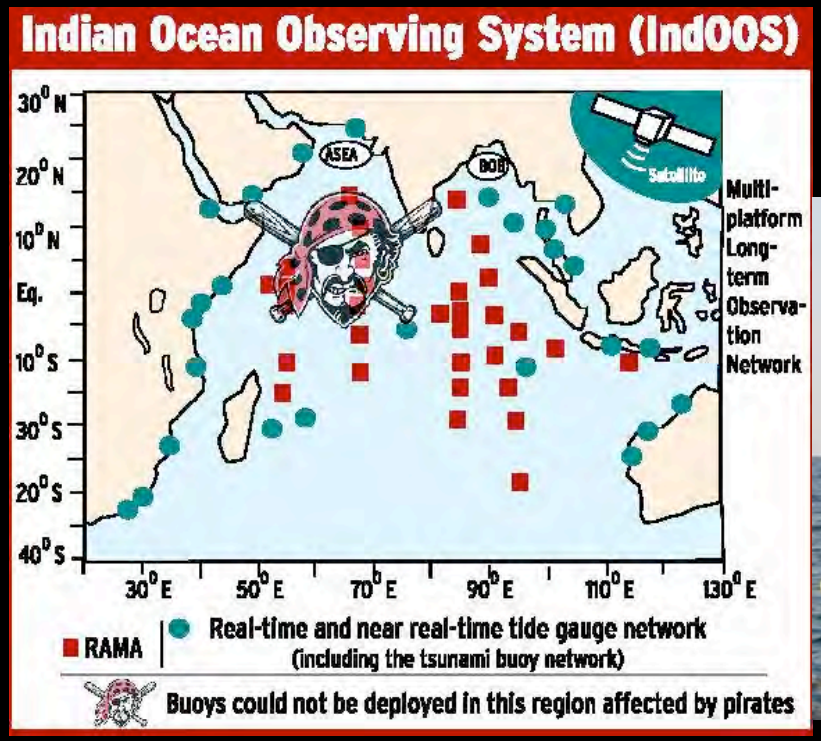


from Fabien Montiel. 2014. “Propagation of a Directional Wave Spectrum through Random Arrays of Scatterers,” KOZWaves: Kiwi-Oz Waves Conference: First International Australasian Conference on Wave Science, Newcastle, Australia, February 17-19.





from Nadao Kohno. 2013. "An Approach for Tough Navigation Sea Information," Forecasting Dangerous Sea States, Banff, Alberta, Canada, October 27-November 1.



"theft of sensors and solar panel from a Weather /Ocean buoy,"

www.vos.noaa.gov/MWL/apr_10/vandalism.shtml

“An IBM supercomputer at the National Weather Service runs numerical weather models that create guidance for weather forecasters. This supercomputer can make more than 450 billion calculations per second,” photo, NOAA, on www.e-education.psu.edu/worldofweather/node/2029

from Frank Melger. 2013. “Dangerous Hardly Visible Seas from an Installation Contractor Perspective,” Forecasting Dangerous Sea States, Banff, Alberta, Canada, October 27-November 1.

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St Jude's Storm shutdown: Eurostar and Monday morning train services cancelled across south as coast is lashed by 25ft waves

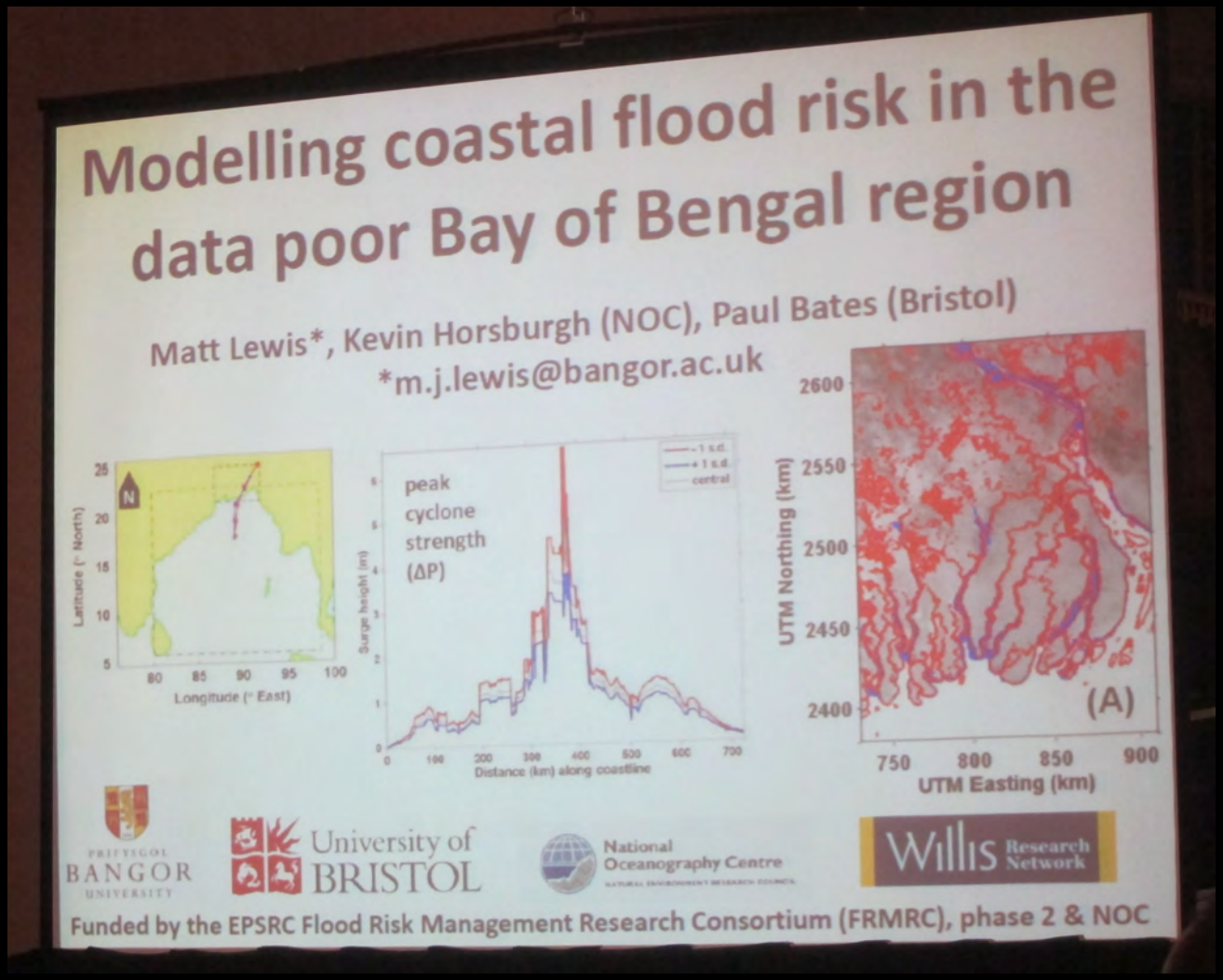
- Amendments and cancellations on First Capital Connect, Southeastern, Greater Anglia and Stansted Express
- Also disruption on East Coast, c2c, First Great Western, Southern, Gatwick Express and South West Trains
- Ferries from Poole and Weymouth to Guernsey & Jersey cancelled and hovercrafts to Isle of Wight suspended
- About 60 flights cancelled at London Heathrow Airport tomorrow but none yet at Gatwick, Stansted and Luton
- Forecasters warn houses face damage, trees falling and power cuts in biggest storm to hit Britain in a decade
- Wales and South West England will be hit first early tomorrow morning with winds of up to 90mph expected
- Boy, 14, believed to have drowned today after swimming with friends in waves off Newhaven in East Sussex
- Canoeist dies after being pulled from swollen River Tees near Barnard Castle, County Durham, after capsizing

By MARK DUELL, TARA BRADY and JONATHAN PETRE

PUBLISHED: 21:26 GMT, 26 October 2013 | **UPDATED:** 09:23 GMT, 28 October 2013

"A kite surfer enjoys the stormy seas at Fistral Beach, in Newquay, Cornwall, yesterday ahead of the storm,"
www.dailymail.co.uk

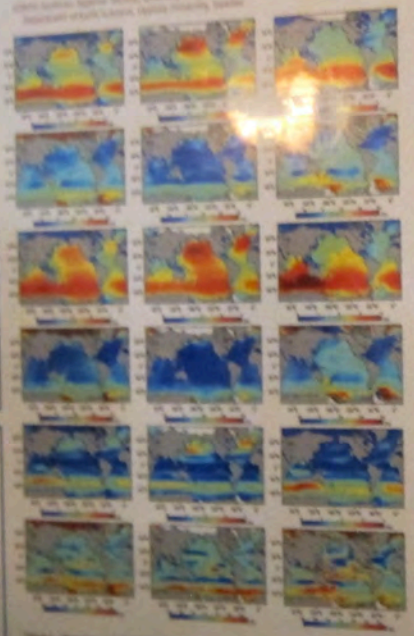
"Waves: A search was launched for a 14-year-old boy who was swept out to sea while swimming near the shore in Newhaven, East Sussex,"
www.dailymail.co.uk



from Matt Lewis et al. 2013. "Modelling Coastal Flood Risk in the Data Poor Bay of Bengal Region," Forecasting Dangerous Sea States, Banff, Alberta, Canada, October 27-November 1.

Impact of climate change on the future global wind sea and swell climates

Alvaro Semedo*
Andreas Sterl
Ralf Weisse



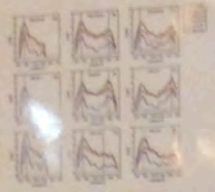


Figure 2 – Meridional cross sections of the zonally averaged annual, DJF, and JJA H_s (m), H_{ss}^{*}(m), and H_{ss}^{*} (m) fields, for present (dashed lines) and future (full line), separated for each ocean basin. The vertical full (dashed) line represents the latitudinal position of the future (present) North and South Hemispheres climatological mean maxima.

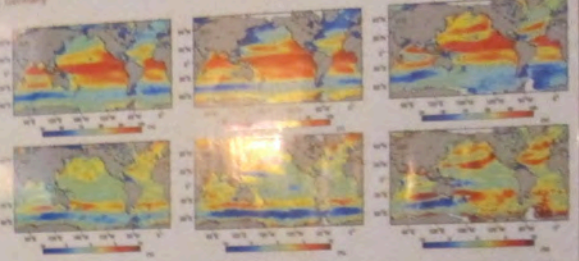


Figure 3 – Annual (column a), DJF (column b), JJA (column c) global distributions of swell energy weight (WS; dimensionless), and correspondent projected changes (line and 2).

3. Results

Figure 1 shows the present annual, December-July (DJF), and June-August (JJA) means of H_s, H_{ss}^{*}, and H_{ss}^{**}, and the correspondent projected changes in percentage (FC21 minus PC20 normalized by PC20). Projected light increases in the annual mean H_{ss}^{*} in the southern hemisphere (SH) and along the equator are expected. Higher increases are projected for the southern ocean (SO) storm belt. Some decrease is expected to occur in the Northern Hemisphere (NH). The expected changes in the annual mean H_{ss}^{**} show a dipole (decrease/increase) in the SO, and some increases along the SH Trade Winds.

Decreases in the annual H_{ss}^{**} are projected for the NA.

Projected changes in the DJF mean H_{ss}^{**} shows a general decrease (more in the North Pacific – NP). The projected changes for the SH in the DJF mean H_{ss}^{**} are coherent with the pole-ward shift. Some decrease is expected in most areas of the NH. Changes in the JJA mean H_{ss}^{**} show an increase in the SH, propagating north-ward, mainly in the PO. Some decrease is expected in the NA. Increases in the JJA mean H_{ss}^{**} are more expected in the SH; some decreases are projected to occur in the NH.

The cross sections of the zonally averaged annual and seasonal mean H_s, H_{ss}^{*}, and H_{ss}^{**} fields in each ocean basin are shown in Figure 2.

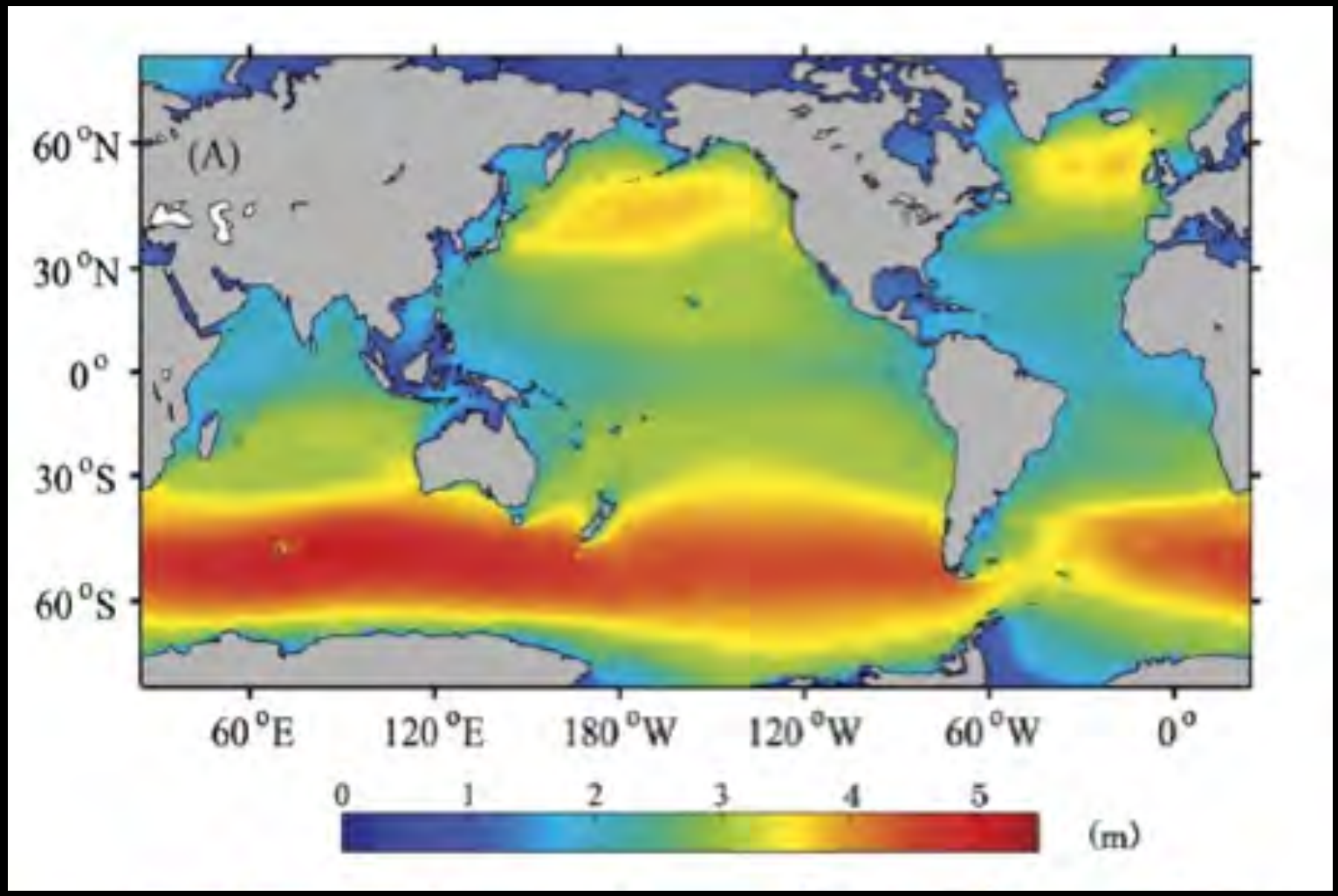
Figure 3 displays the annual, DJF and JJA global spatial distribution of the swell energy proportion to the total wave energy ($W_s = E_s/E$) and the correspondent future projected changes in percentage. Some increase in the swell weight, outside the SO storm belt, is expected to occur, mostly in JJA.

4. Conclusions

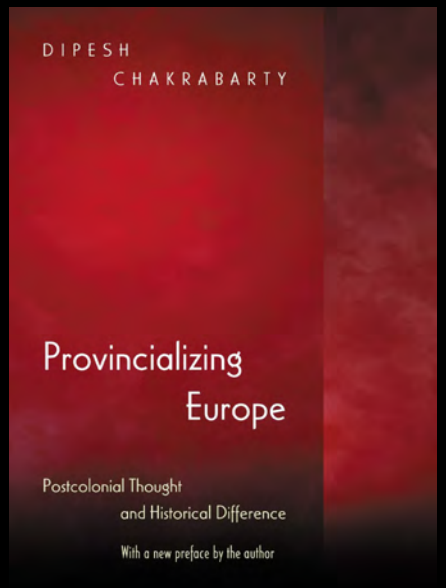
- There is an impact of climate change on the wind sea and swell climates in the end of the 21st century;
- This impact is more pronounced on the Southern Hemisphere, and is related to the pole-ward shift of the storm tracks, and consequently of the climatological wave heights maxima;
- The propagated effect of this pole-ward is spread to the Global Ocean as changes in the swell pattern, mostly in the Pacific Ocean during the Austral winter; and
- The swell spectral energy weight is also projected to change, also predominantly in the Pacific Ocean in JJA, due to the larger propagating area, but also along the Trade Winds track.

Acknowledgments: FCT grants SHARE project, RECI/GEO-MET/0380/2012

SLIDE 49



Projected annual mean changes in *significant wave height* for the years 2069-2100 — Fig 7a *from* Alvaro Semedo et al. 2013. "Projection of Global Wave Climate Change toward the End of the Twenty-First Century," *Journal of Climate* 26(21): 8269-8288.



History 1: normative, secular,
Enlightenment history, as told by the West

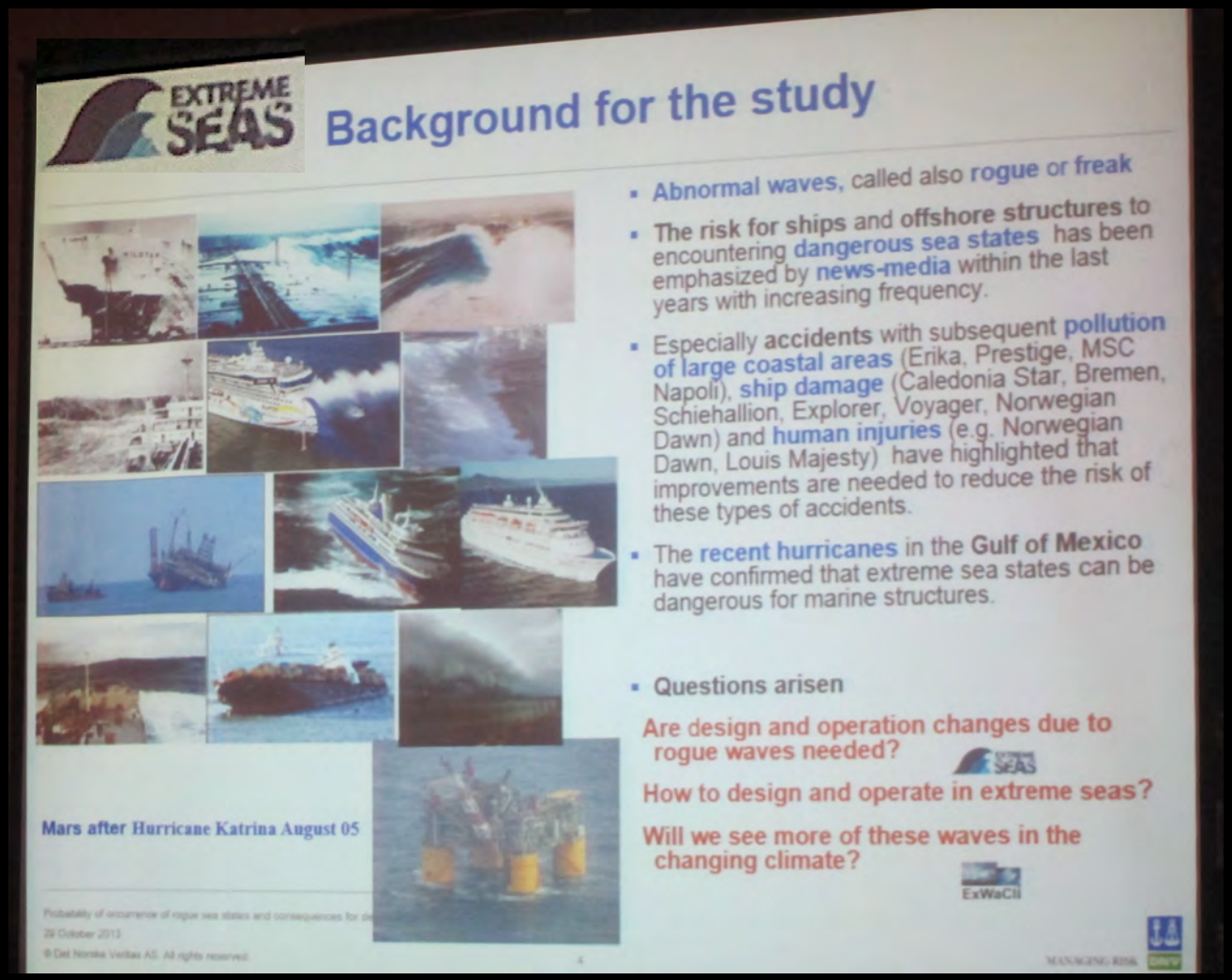
History 2: subaltern, postcolonial,
sometimes supernatural accounts

— Dipesh Chakrabarty. 2000.
Provincializing Europe: Postcolonial Thought and Historical Difference.
Princeton NJ: Princeton University Press.

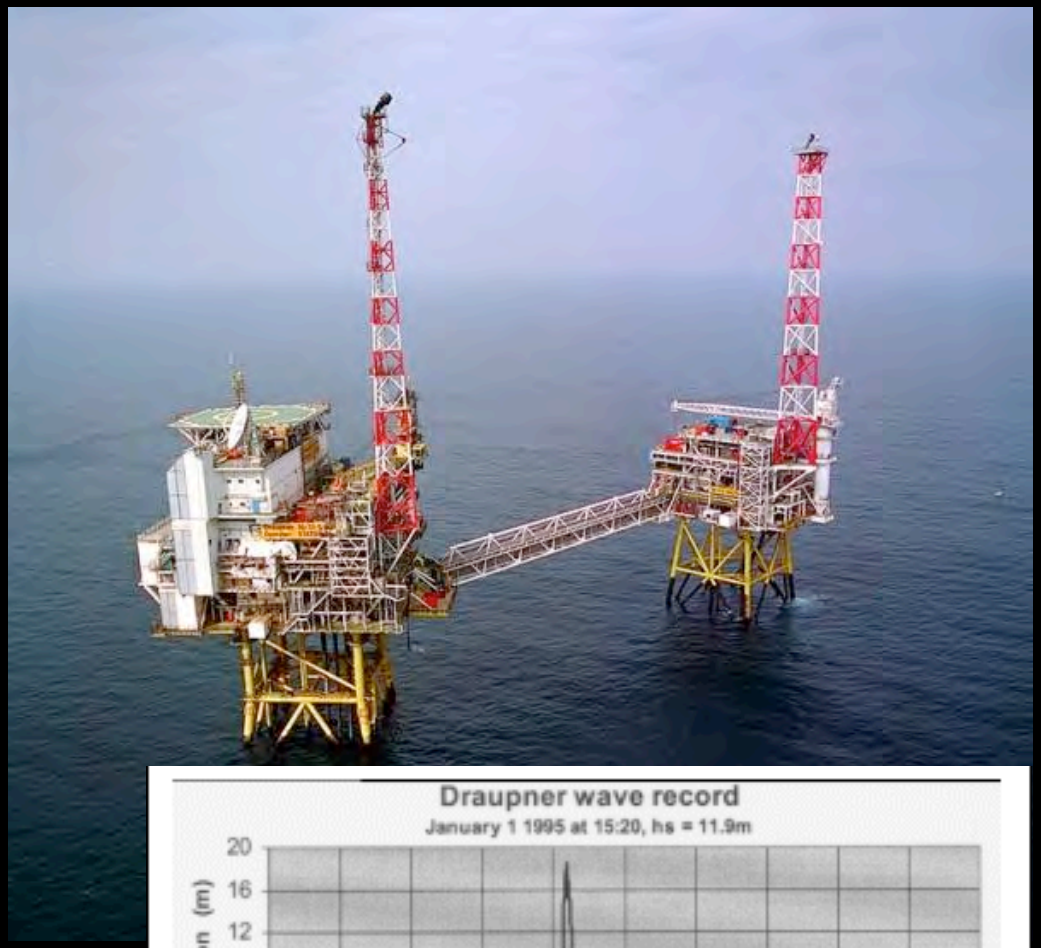
History 3: naturalhistorical

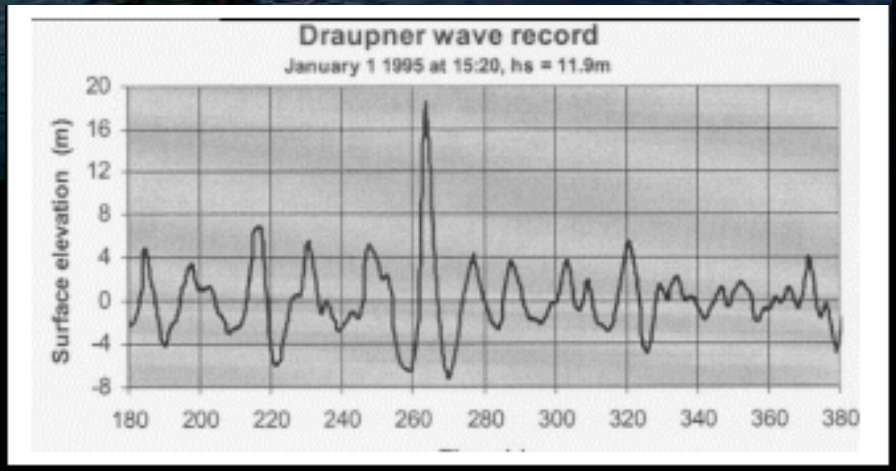
History 4°C: historiography — but also future-fashioning — demanded by the Anthropocene

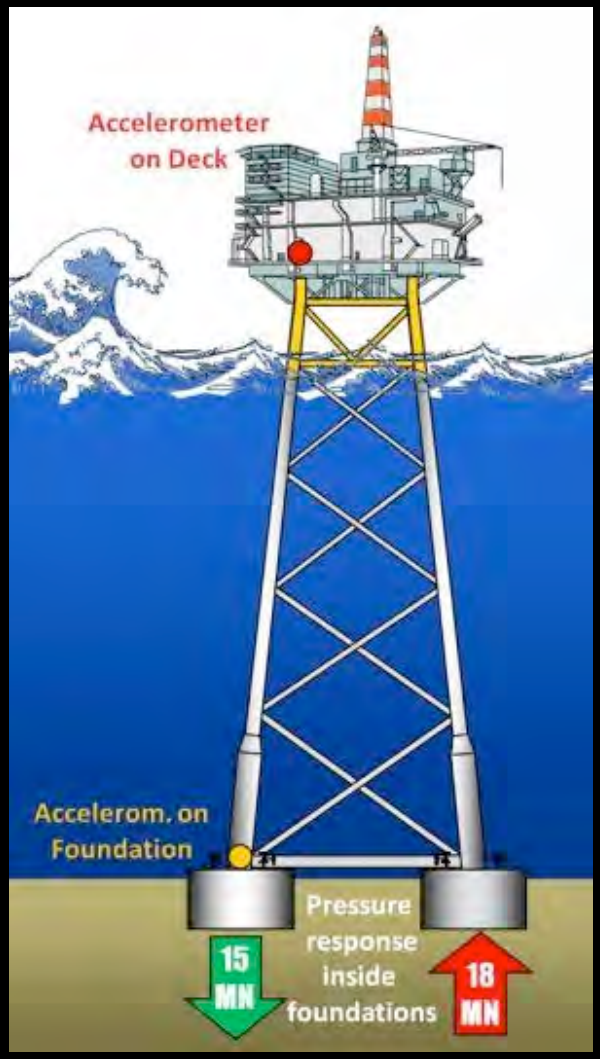
— Ian Baucom. 2014.
"Postcolonial Method and Anthropocene Time,"
Center for 21st Century
Studies, University of Wisconsin,
Milwaukee, February 7

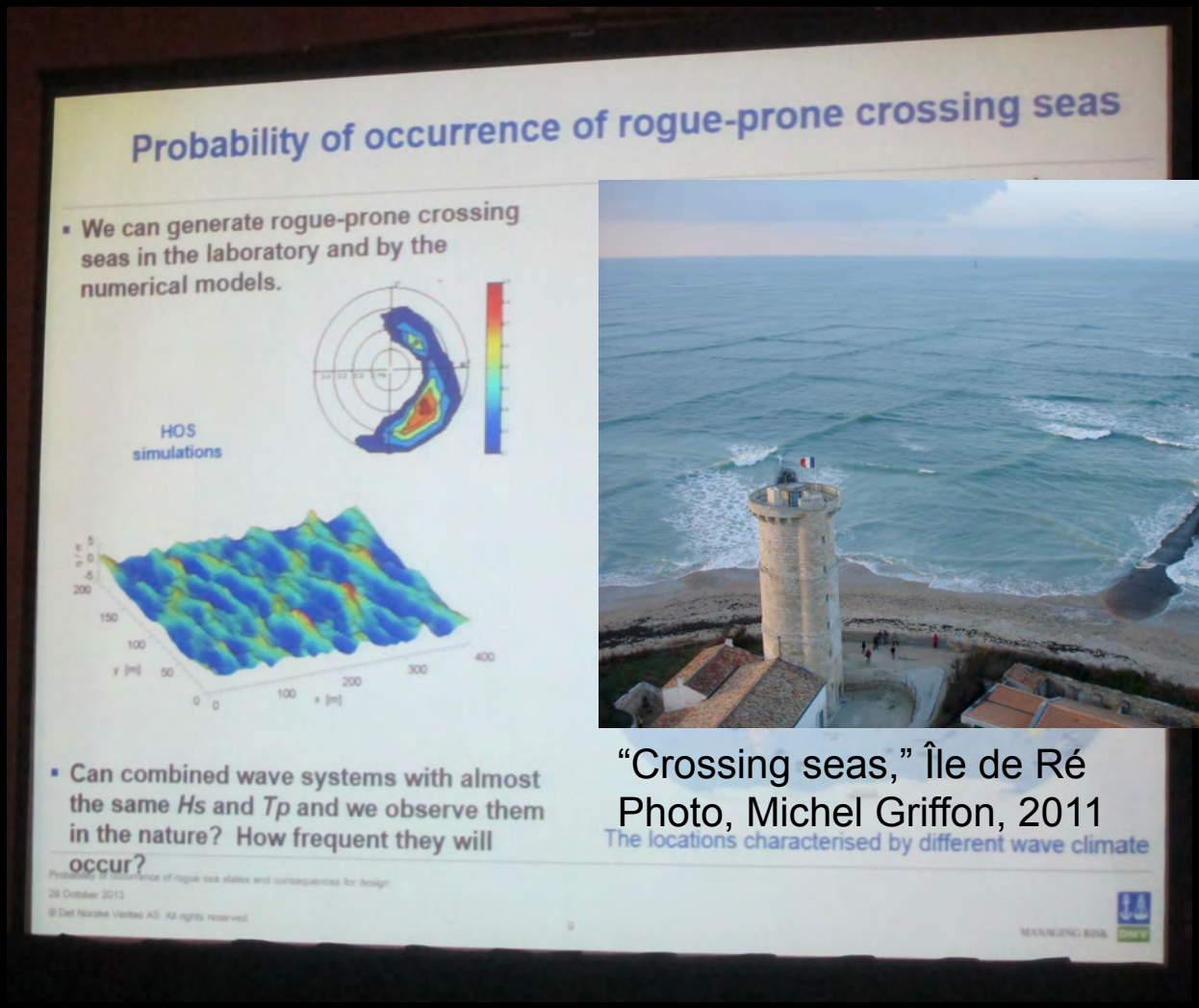


from Elzbieta Bitner-Gregersen et al. 2013. “Probability of Occurrence of Rogue Sea States and Consequences for Design,” Forecasting Dangerous Sea States, Banff, Alberta, Canada, October 27-November 1.




Draupner wave record
January 1 1995 at 15:20, hs = 11.9m
Surface elevation (m)
20
16
12
8
4
0
-4
-8
180
200
220
240
260
280
300
320
340
360
380


Accelerometer on Deck
Accelerom. on Foundation
Pressure response inside foundations
15 MN
18 MN

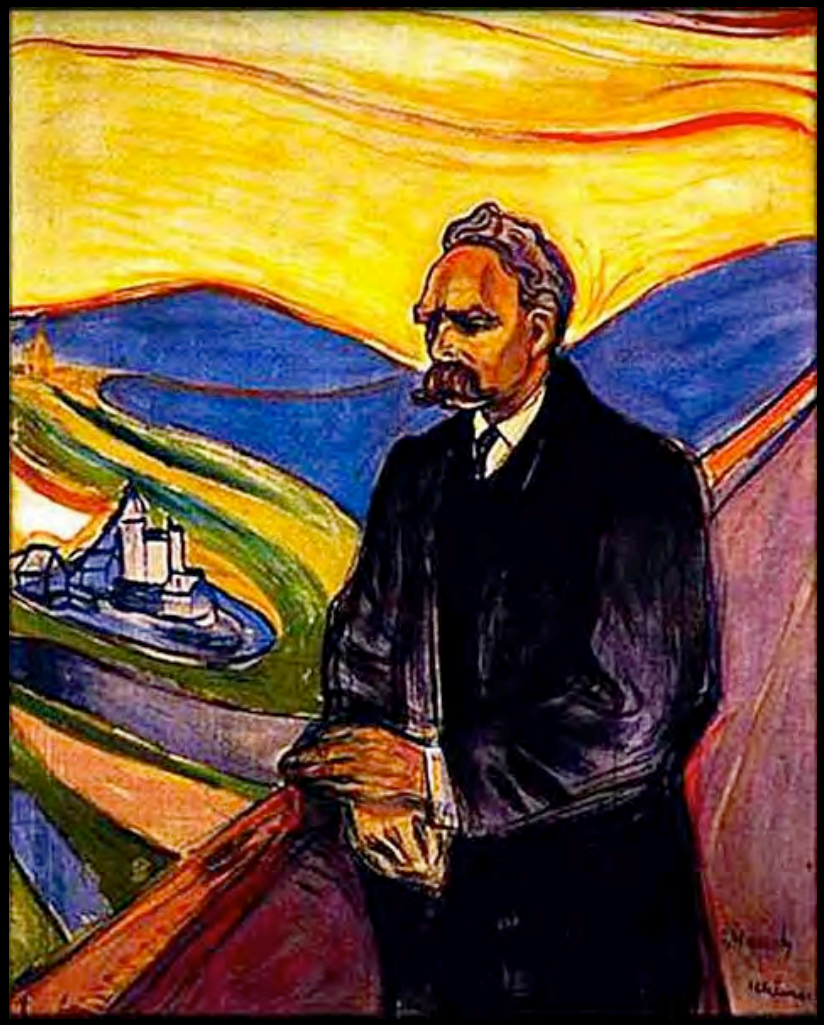


"Crossing seas," Île de Ré
Photo, Michel Griffon, 2011

from Elzbieta Bitner-Gregersen et al. 2013. "Probability of Occurrence of Rogue Sea States and Consequences for Design," Forecasting Dangerous Sea States, Banff, Alberta, Canada, October 27-November 1.

Image from The Hexaemeron, Homily IV, St. Basil the Great (AD 329-379)

when the sea meets the land, it “withdraws out of respect, *bowing its waves*, as if to worship the Lord who has appointed its limits.”



Nietzsche, by Edvard Munch, oil on canvas, 1906

"How greedily this wave approaches, as if it were after something! How it crawls with terrifying haste into the inmost nooks of this labyrinthine cliff! But already another wave is approaching, still more greedily and savagely than the first, and its soul, too, seems to be full of secrets and the lust to dig up treasures" — Nietzsche. 1882. *The Gay Science*.


"Mi vida con la ola"
de Octavio Paz
Dirección: Hirán Sánchez
Teatro Xbalamqué
2 y 9 de julio 20:00 hrs
$100 y $50.00 Est. e Insen
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"The chief engineer of the Stolt Surf took photographs as the tanker met a rogue wave in 1977. The deck, nearly 75 feet above sea level, was submerged," William Broad. 2006. "Rogue Giants at Sea," *New York Times*, July 11 www.nytimes.com/2006/07/11/science/11wave.html?pagewanted=all


KOZWaves
Effect of symmetry defect on the edge resonance in elastic plate
KOZWaves
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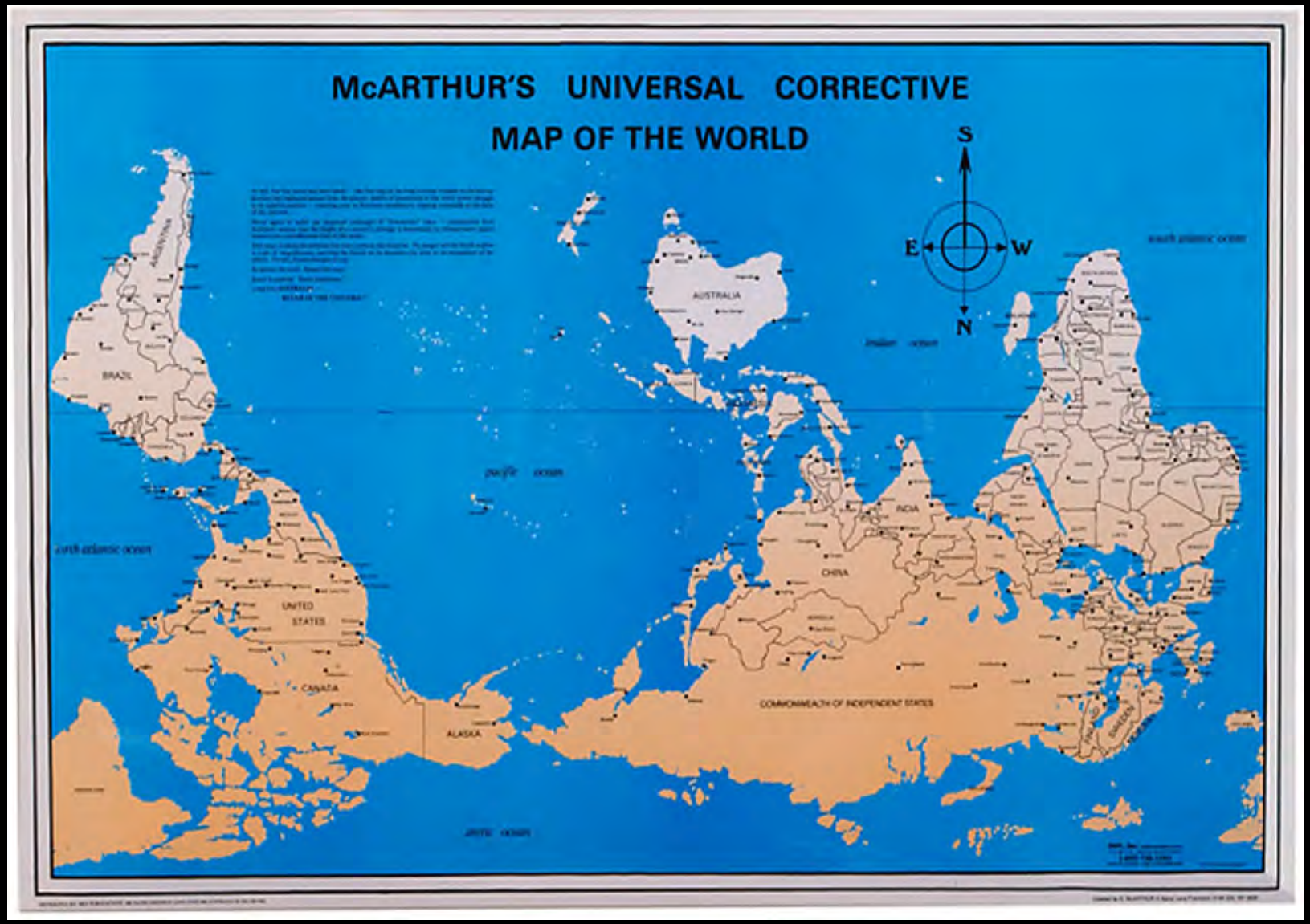
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CHINA
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CANADA
ALASKA
COMMONWEALTH OF INDEPENDENT STATES

SLIDE 60

nature climate change

LETTERS

PUBLISHED ONLINE: 23 FEBRUARY 2014 | DOI: 10.1038/NCLIMATE2118

A global perspective on CMIP5 climate model biases

Chunzai Wang[1*], Liping Zhang [1,2], Sang-Ki Lee[1,2], Lixin Wu[3] and Carlos R. Mechoso[4]

The Intergovernmental Panel on Climate Change's Fifth Assessment Report largely depends on simulations, predictions and projections by climate models[1]. Most models, however, have deficiencies and biases that raise large uncertainties in their products. Over the past several decades, a tremendous effort has been made to improve model performance in the simulation of special regions and aspects of the climate system[2–4]. Here we show that biases or errors in special regions can be linked with others at far away locations. We find in 22 climate models that regional sea surface temperature (SST) biases are commonly linked with the Atlantic meridional overturning circulation (AMOC), which is characterized by the northward flow in the upper ocean and returning southward flow in the deep ocean. A simulated weak AMOC is associated with cold biases in the entire Northern Hemisphere with an atmospheric pattern that resembles the Northern Hemisphere annular mode. The AMOC weakening is also associated with a strengthening of Antarctic Bottom Water formation and warm SST biases in the Southern Ocean. It is also shown that cold biases in the tropical North Atlantic and West African/Indian monsoon regions during the warm season in the Northern Hemisphere have interhemispheric links with warm SST biases in the tropical southeastern Pacific and Atlantic, respectively. The results suggest that improving the simulation of regional processes may not suffice for overall better model performance, as the effects of remote biases may override them.

The United Nations Intergovernmental Panel on Climate Change's Fifth Assessment Report updates the knowledge and understanding of the scientific, technical and socio-economic aspects of climate change. The report relies heavily on the products of climate models. These, however, have serious systematic errors that challenge the reliability of climate predictions. Hence, climate model bias identification and reduction are topics of great importance. One major reason for such biases is the misrepresentations of physical processes, which can be amplified by feedbacks among climate components especially in the tropics. Much effort, therefore, is dedicated to the better representation of physical processes in coordination with intense process studies[5]. This paper focuses on the SST simulations by 22 participants in the Coupled Model Intercomparison Project phase 5 (CMIP5; Supplementary Information). We target the global connections among regional SST biases. The existence of such connections means that efforts to improve model performance cannot be narrowly focused on particular regions.

SSTs simulated by CMIP5 models generally show too low values in the Northern Hemisphere and too high values in the Southern Hemisphere. Annual-mean SST error (that is, mean SST bias for the period from 1900 to 2005) magnitudes can be several degrees Celsius (Fig. 1a). SSTs are clearly too high in the tropical southeastern Pacific and Atlantic and too low in the equatorial and tropical southwestern Pacific. In general, these biases have patterns that are largely independent of season, but amplitudes can vary with season (Supplementary Fig. 1). For example, the warm SST bias in the Southern Ocean is present throughout the year but is much stronger during the austral summer and autumn. It is noted that the SST biases in these models are quite stable during the 1900–2005 period and the models do not show a significant SST bias trend.

The misrepresentation of local processes and/or ocean–atmosphere interactions has caused some of the biases. The too warm SSTs in the tropical southeastern Pacific and Atlantic, for example, have been linked to excessive heat flux into the ocean under insufficient coverage by stratocumulus clouds[6,7] combined with insufficient cooling by ocean transients from the upwelling regions along the eastern coasts[8]. The cold SST bias in the equatorial and tropical southwestern Pacific has been associated with an excessive westward extension of the cold tongue from the eastern equatorial Pacific in association with difficulties in the representation of surface winds and ocean mixing processes[6,9]. A recent study has argued that model biases even far away from the tropics can be linked to those in the tropics[10]. According to the study, cloud errors over the Southern Ocean may be responsible for the generation of a spurious intertropical convergence zone south of the Equator in most CMIP5 models.

We start by investigating the relationships in the global domain between biases in simulated SST and in other features of atmosphere and ocean circulations. For this we take the mean AMOC as reference. The AMOC, which is characterized by warmer and saltier water flowing northward in the upper Atlantic Ocean and by cooler and fresher water flowing southward in the deep ocean[11,12], is crucial to the northward heat transport by the ocean circulation[13–16]. As the first step in our analysis, we perform an inter-model singular value decomposition (SVD) analysis of the SST biases and AMOC streamfunction. The spatial pattern of the first SVD mode of the SST biases in Fig. 1b closely resembles the mean model biases in Fig. 1a. The corresponding AMOC mode is weakened, as indicated by the negative values of the AMOC streamfunction in the upper 3,000 m (Fig. 1c). The time series of the first SVD coefficients are highly and positively correlated (correlation coefficient 0.70). Global SST biases, therefore, strengthen as the AMOC circulation weakens.

We next turn to the SST biases in the North Atlantic and Pacific oceans. It has been shown that a weakening of the AMOC is accompanied by a cooling of the North Atlantic Ocean, whereas a

[1]NOAA Atlantic Oceanographic and Meteorological Laboratory, Miami, Florida 33149, USA, [2]Cooperative Institute for Marine and Atmospheric Studies, University of Miami, Miami, Florida 33149, USA, [3]Physical Oceanography Laboratory/Qingdao Collaborative Innovation Center for Marine Science and Technology, Ocean University of China, Qingdao 266100, China, [4]University of California, Los Angeles, California 90095, USA.
*e-mail: Chunzai.Wang@noaa.gov; ocean.climate.ping@gmail.com

SLIDE 61

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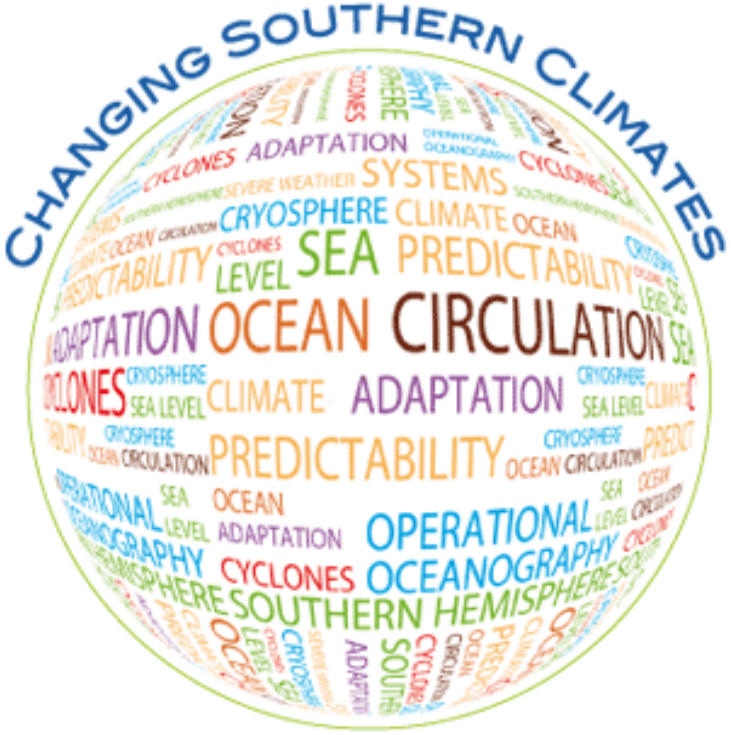

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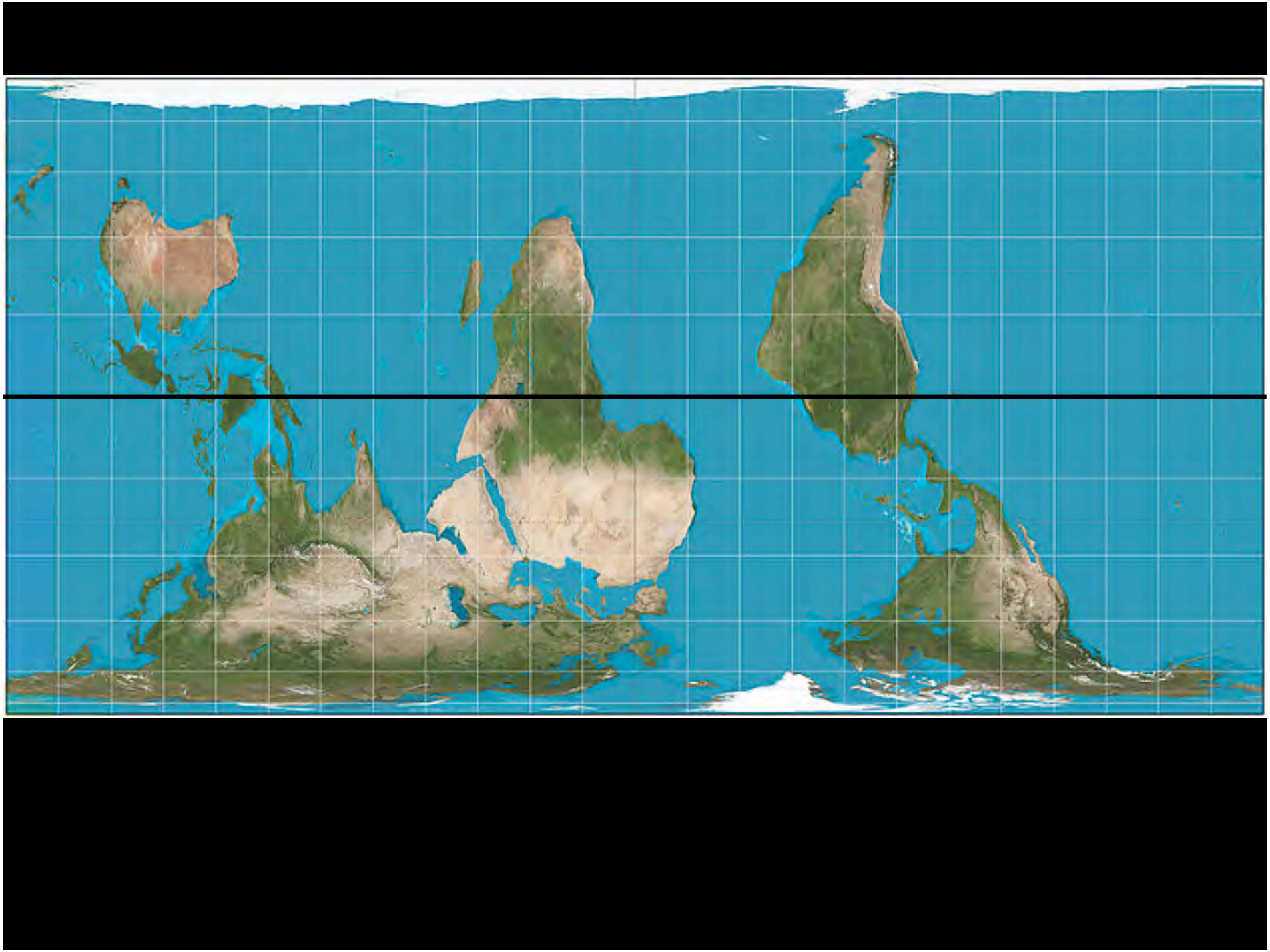
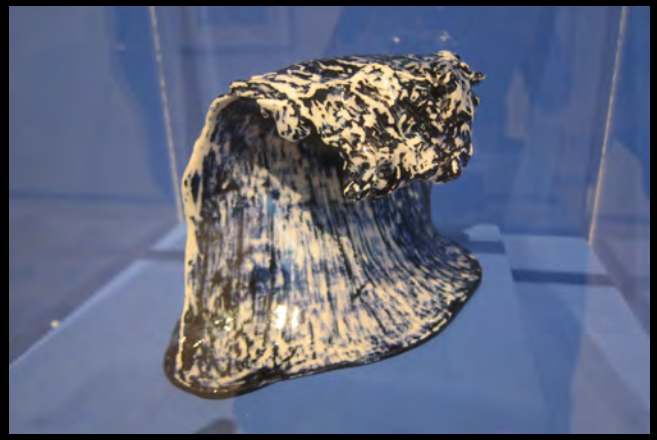
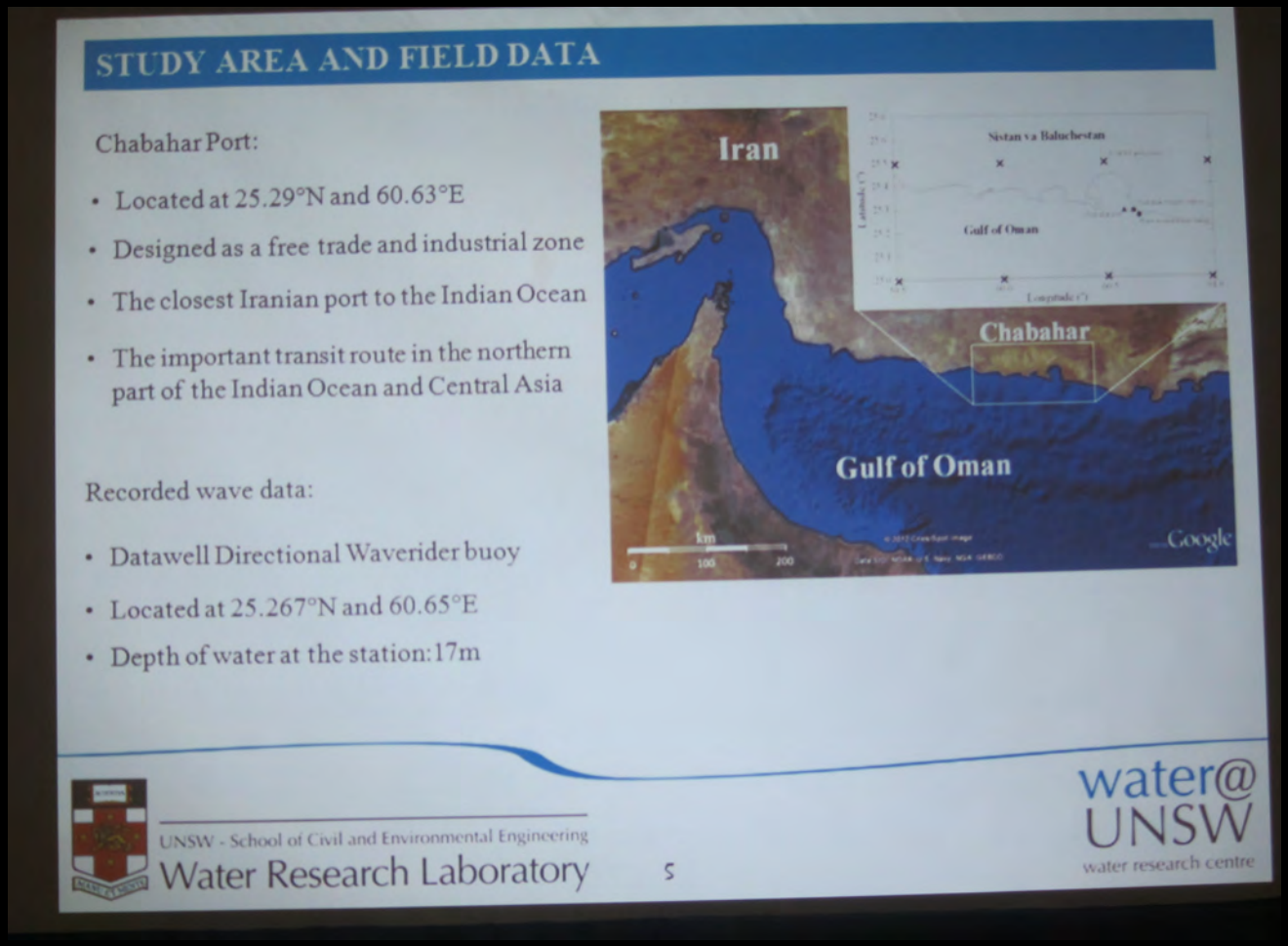


Brett Whiteley,
Waves on the Harbour
screenprint, 1974

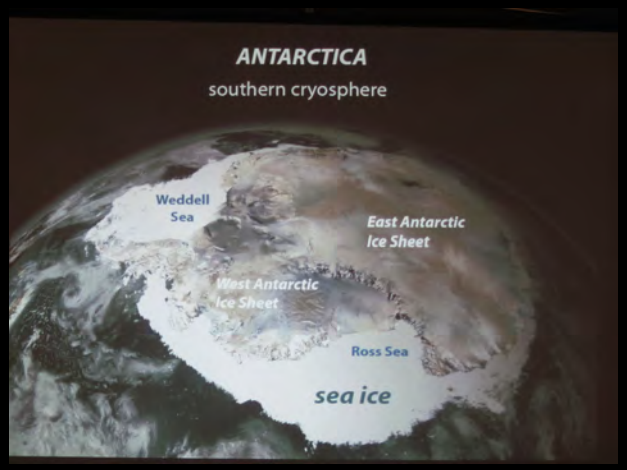
Brett Whiteley, *Wategoes Beach II,* watercolor gouache, collage on white wove paper, 1989

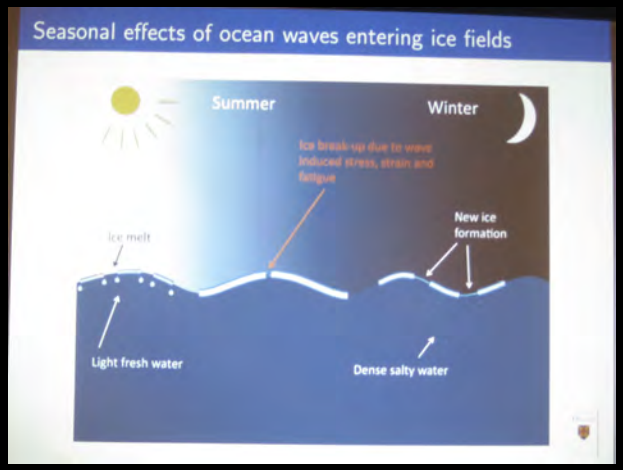


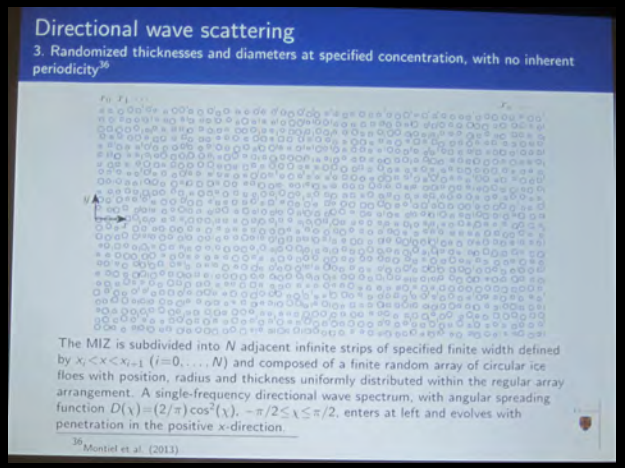
Gerry Wedd, *Small wave*, ceramic, 2009



from Arvin Saket. 2014. “Evaluation of ECMWF Wind Data for Wave Hindcast in Chabahar Zone,” KOZWaves: Kiwi-Oz Waves Conference: First International Australasian Conference on Wave Science, Newcastle, Australia, February 17-19.







from Kenneth Golden. 2014. “Homogenization for Sea Ice,” and Vernon Squire, “Why Ocean Waves Propagating in Ice-Covered Seas Have Suddenly Become Fashionable,” KOZWaves: Kiwi-Oz Waves Conference: First International Australasian Conference on Wave Science, Newcastle, Australia, February 17-19.

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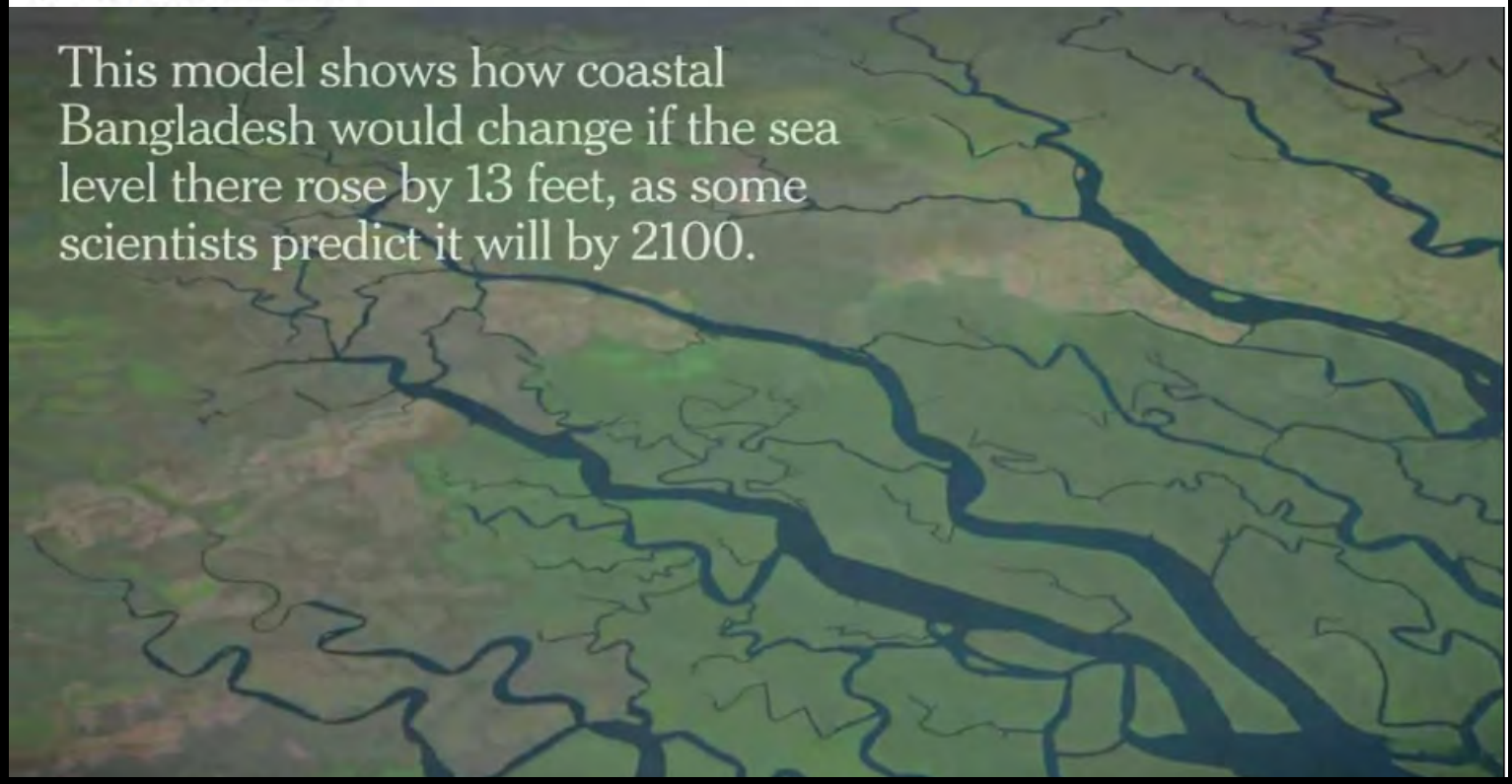
ASIA PACIFIC 515 COMMENTS

Borrowed Time on Disappearing Land

Facing Rising Seas, Bangladesh Confronts the Consequences of Climate Change

By GARDINER HARRIS MARCH 28, 2014



Djarrwark ga Dhalwaŋu

Artist: Gawirriṉ Gumana
Place: Baraltja
Painting title: Djarrwark ga Dhaḷwaŋu
Size: 153 x 83 cm
Moiety: Yirritja
Clan: Dhaḷwaŋu

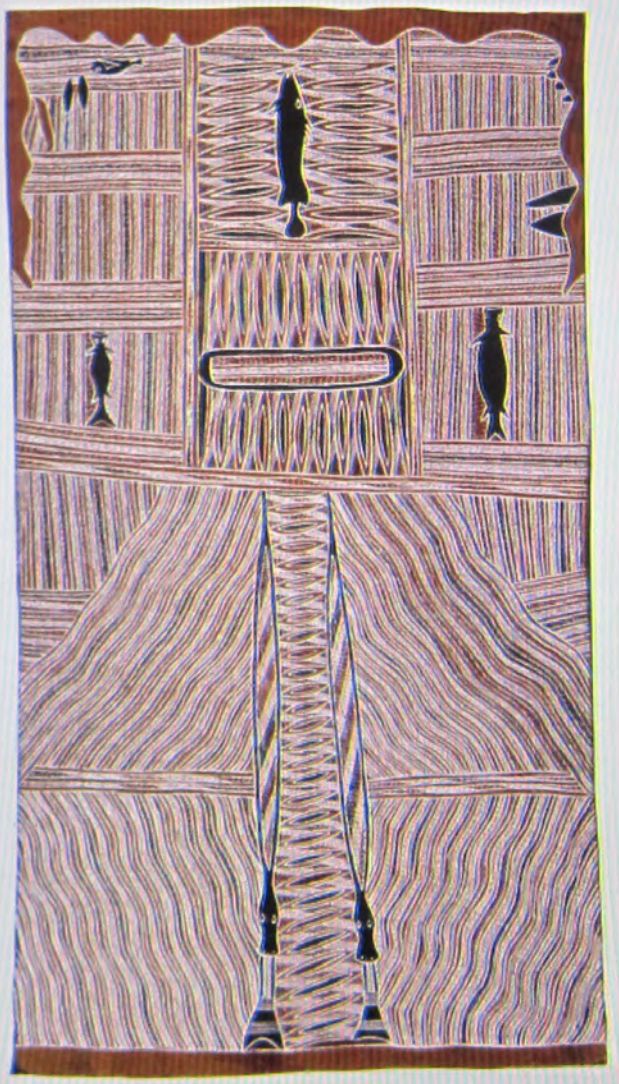
Gawirriṉ's painting maps the Yolŋu sea country of his clan and related clans. Use the buttons to highlight areas of sea country according to the moiety of the clans.

Dhuwa waters

Yirritja waters

show hot spots

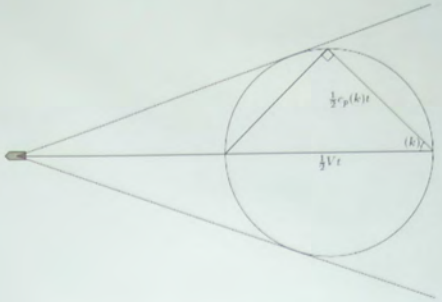
close maps



Kelvin ship waves

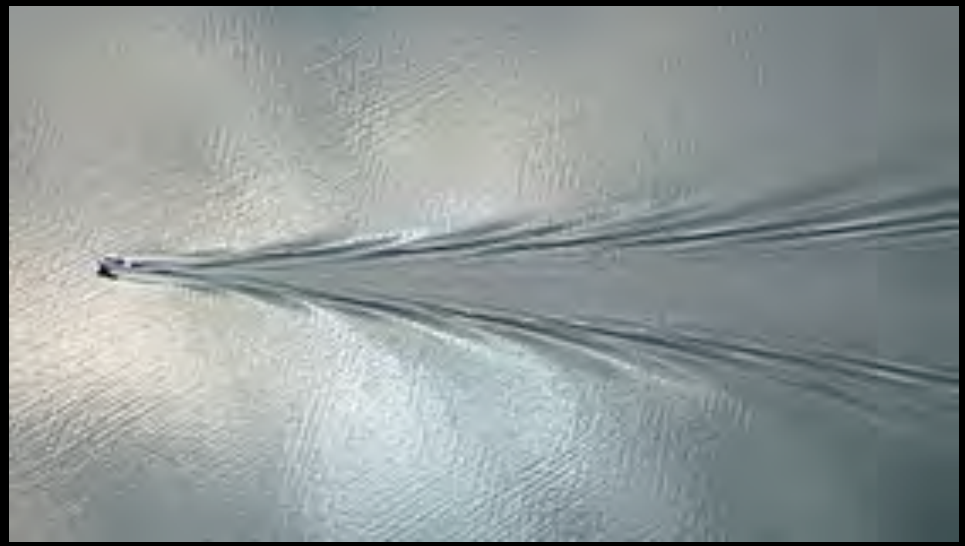
Linear case

- Dispersion relation gives $c_p = 2c_g = \sqrt{\frac{g}{k}}$

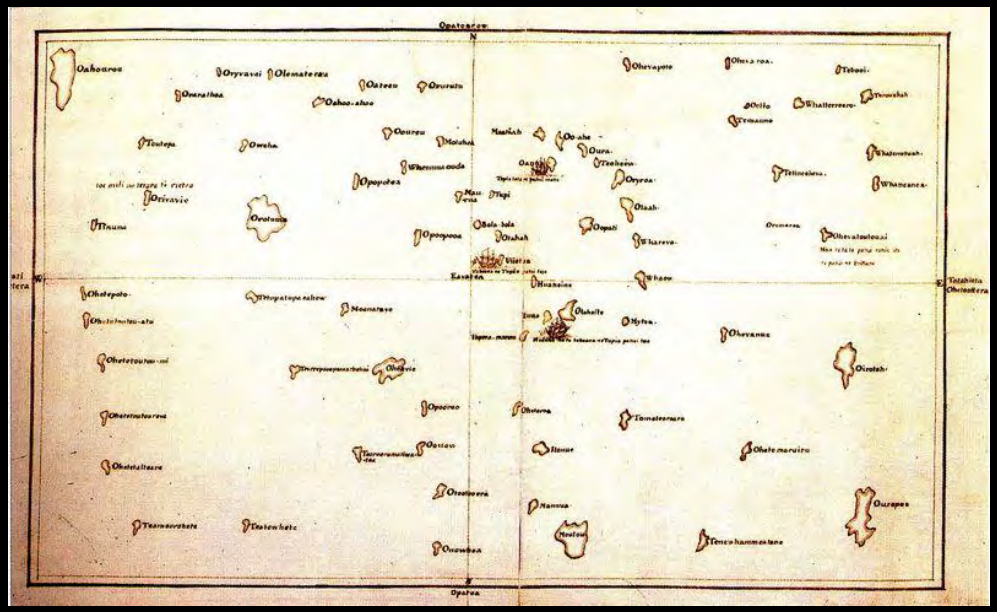


- Kelvin Angle $= \tan^{-1}\left(\frac{1}{\sqrt{8}}\right) \approx 19.47°$ (independent of speed)

J. Billingham and A. C. King. Wave motion *Cambridge university press*, 2000

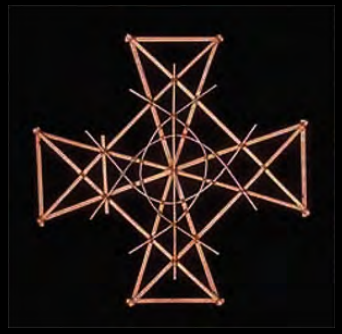


from Ravina Pethiyagoda et al. 2014. “Linear and Nonlinear Kelvin Ship Waves,” KOZWaves: Kiwi-Oz Waves Conference: First International Australasian Conference on Wave Science, Newcastle, Australia, February 17-19.

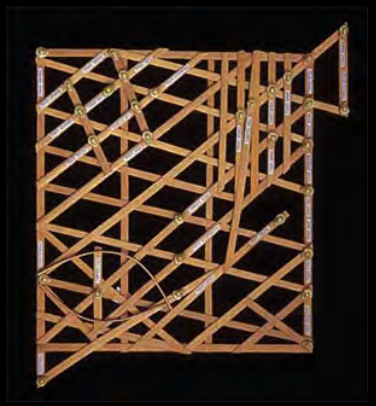


Polynesian navigator Tupaia's map of the Pacific, rendered on board Captain James Cook's *Endeavour*, 1769. This map uses current and winds to mark distance.

Micronesian wave navigation charts from Marshall Islands:



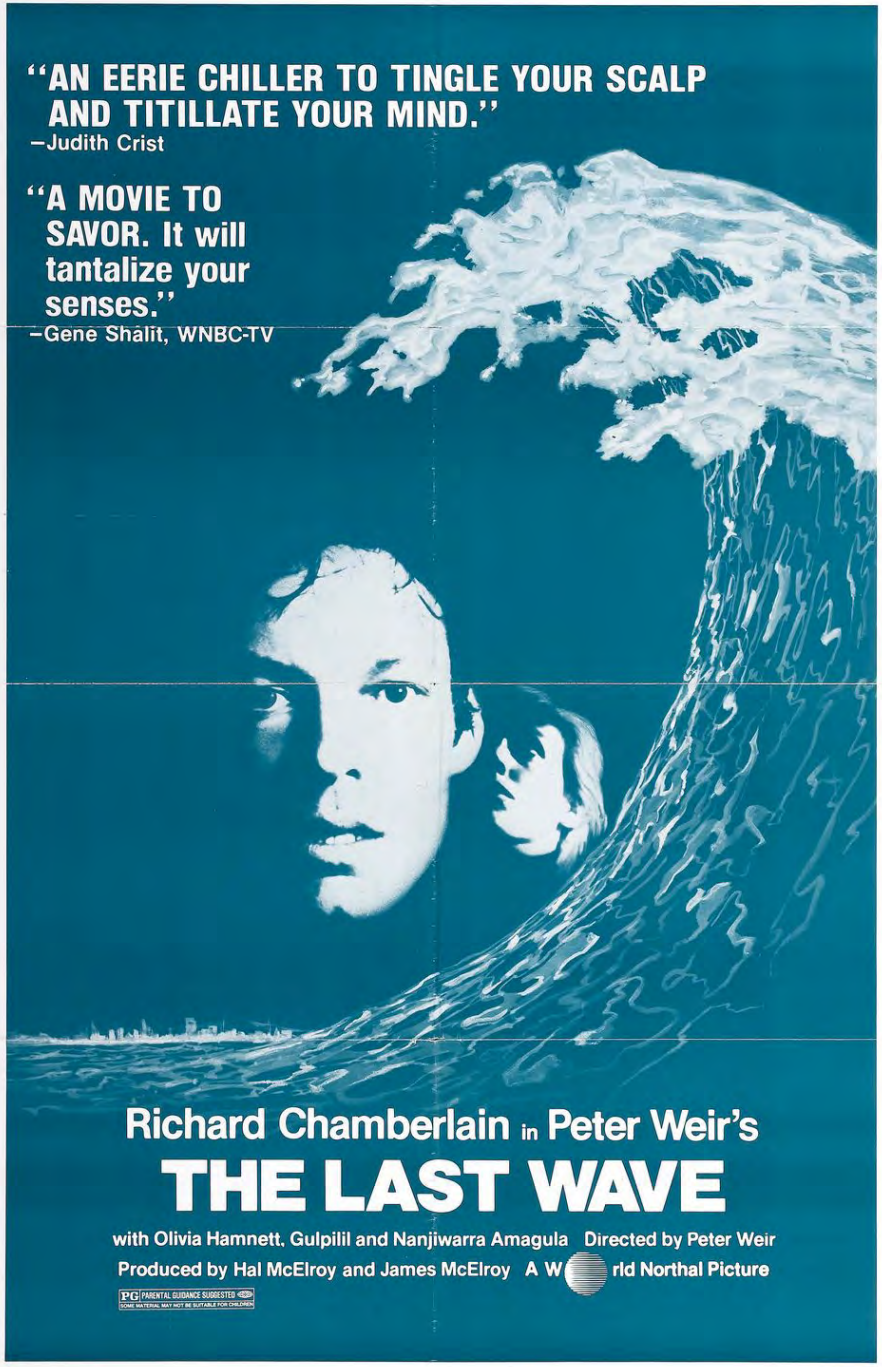
REBBELIB: "general wave navigational chart mapping an entire chain, showing relationships between islands and major ocean swells."



MEDO: "covers a few Islands; useful for specific voyages."

MATTANG: "shows wave patterns around single island"

via thenonist.com/index.php/thenonist/permalink/stick_charts/, from various sources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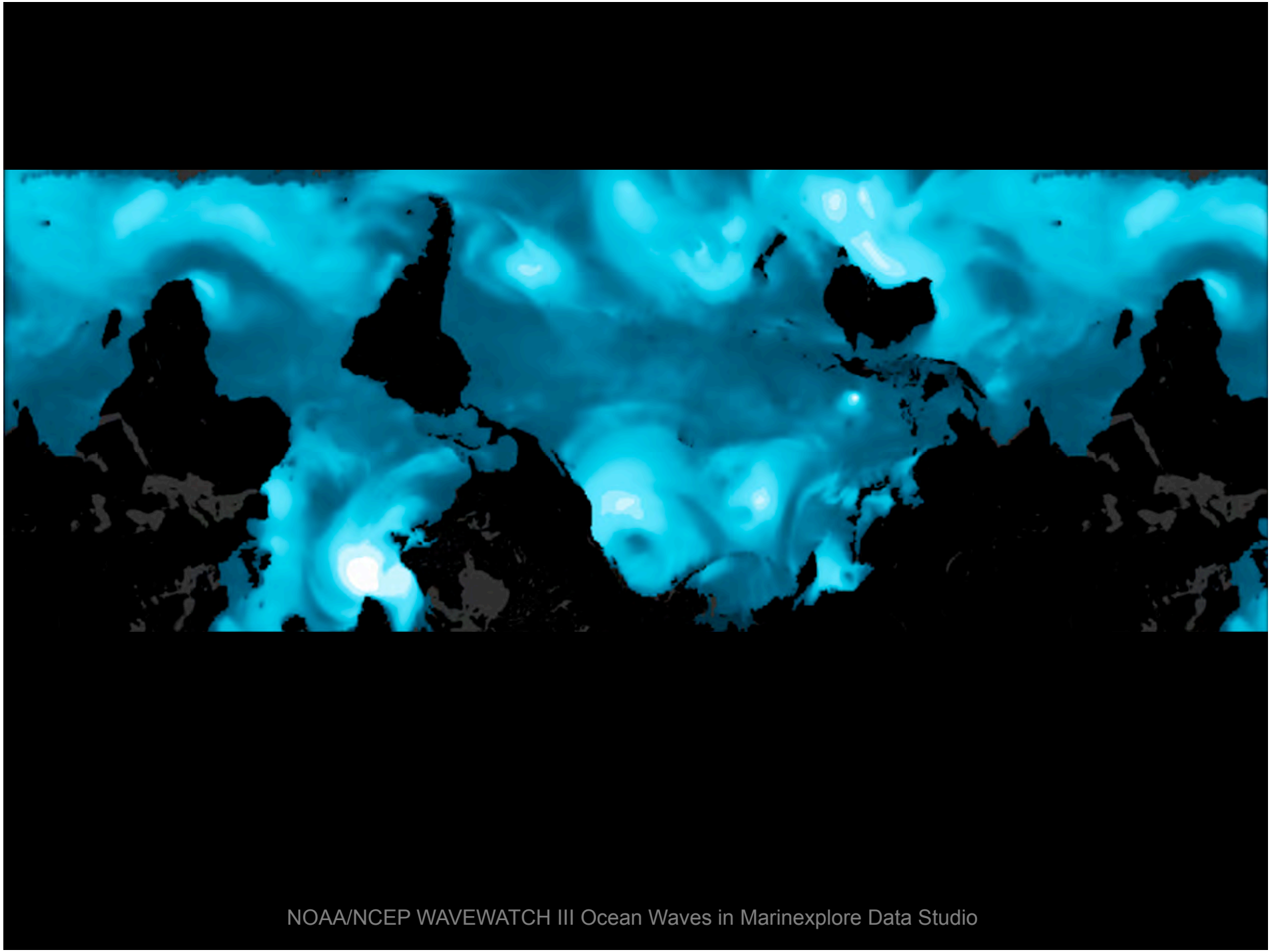
–Judith Crist
"A MOVIE TO SAVOR. It will tantalize your senses."
–Gene Shalit, WNBC-TV
Richard Chamberlain in Peter Weir's
THE LAST WAVE
with Olivia Hamnett, Gulpilil and Nanjiwarra Amagula Directed by Peter Weir
Produced by Hal McElroy and James McElroy A World Northal Picture
PG PARENTAL GUIDANCE SUGGESTED
SOME MATERIAL MAY NOT BE SUITABLE FOR CHILDREN



NOAA/NCEP WAVEWATCH III Ocean Waves in Marinexplore Data Studio