Research Infrastructures for the Ocean and Atmosphere*

Doug Wallace;
Scientific Director
Marine Environmental Observation
Prediction and Response Network

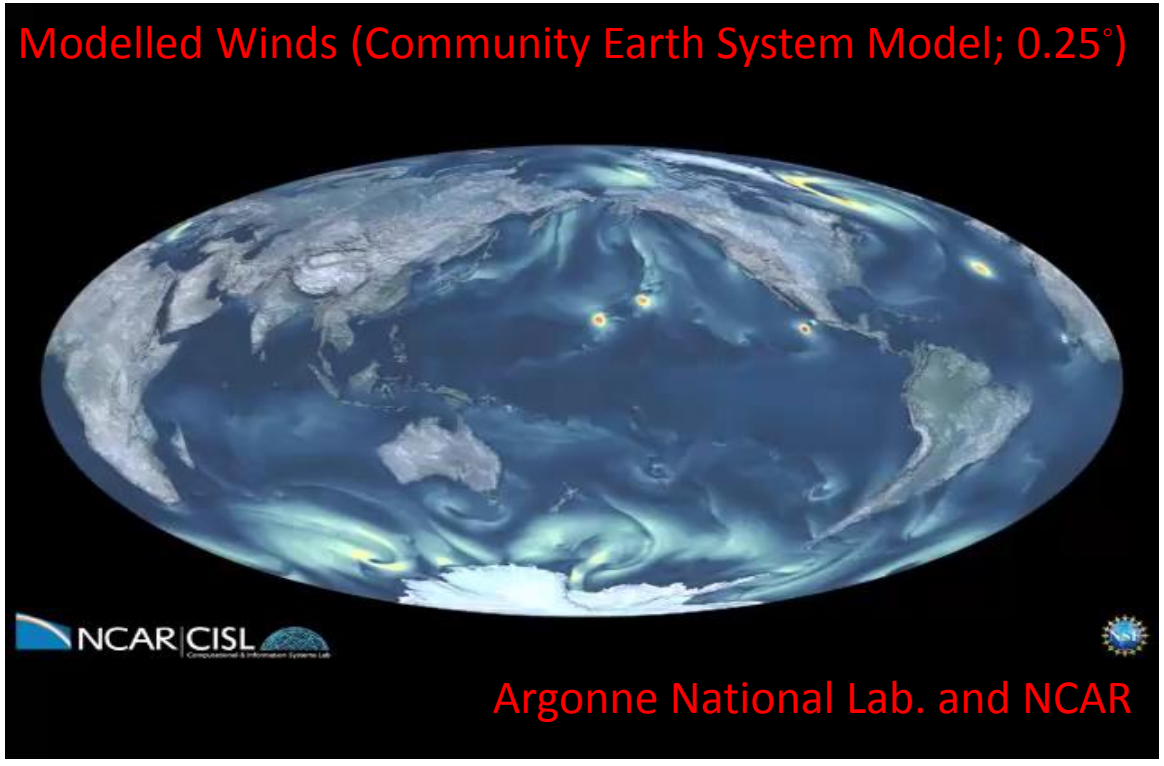
MEOPAR

* Largely from the researcher's perspective

Premise for Session 1C: "With the exception of a few very large scale research facilities, almost all research infrastructures are essentially national."

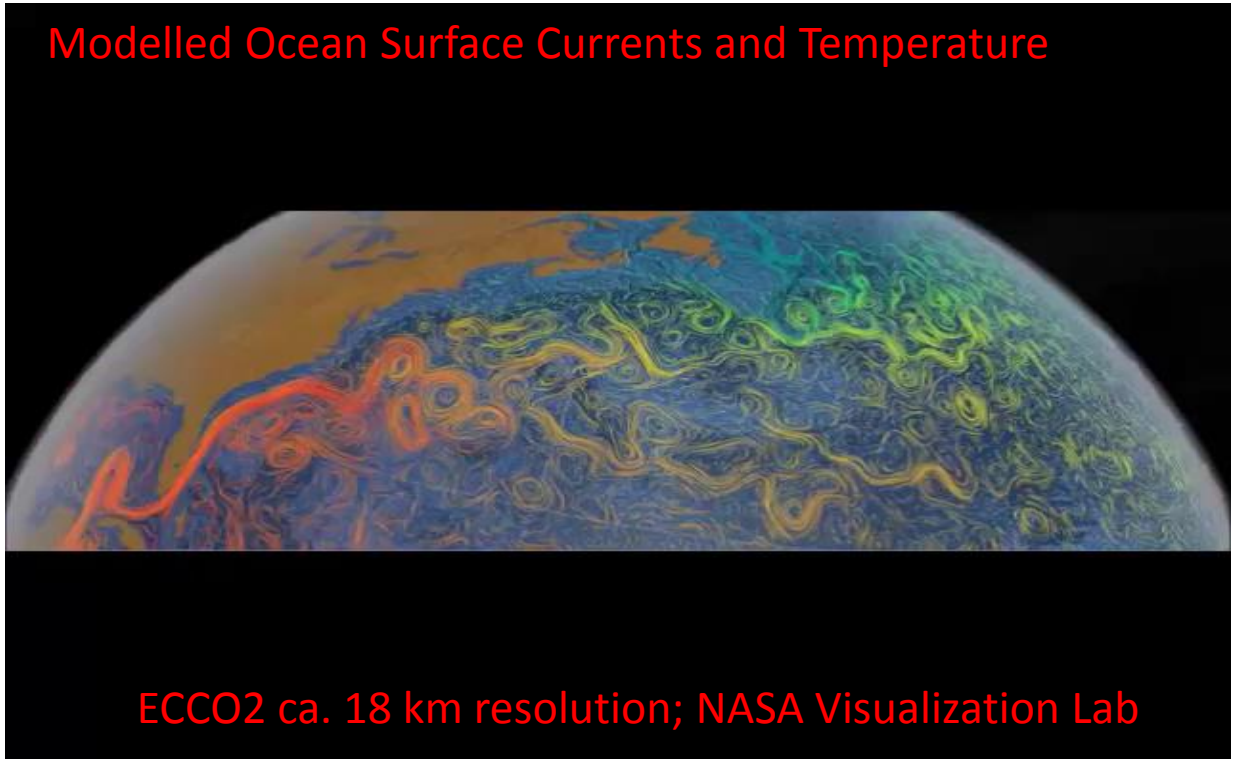
In the case of ocean and atmospheric research:
why is this?

Modelled Winds (Community Earth System Model; 0.25°)



Argonne National Lab. and NCAR

Modelled Ocean Surface Currents and Temperature



ECCO2 ca. 18 km resolution; NASA Visualization Lab

Research into the behaviour of the shared ocean and atmospheric environment makes a compelling case for international research infrastructures.

International law envisions mechanisms for research infrastructure sharing/ transfer and use.

UN Convention on the Law of the Sea (UNCLOS) calls explicitly for:
"international cooperation . . . through existing bilateral, regional or multilateral programmes, and also through expanded and new programmes in order to facilitate marine scientific research, the transfer of marine technology, particularly in new fields, and appropriate international funding for ocean research and development."

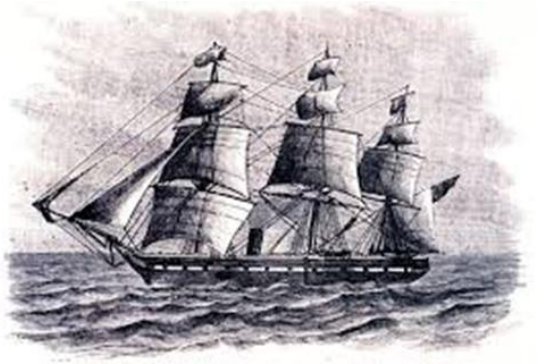
United Nations Educational, Scientific and Cultural Organization

Intergovernmental Oceanographic Commission

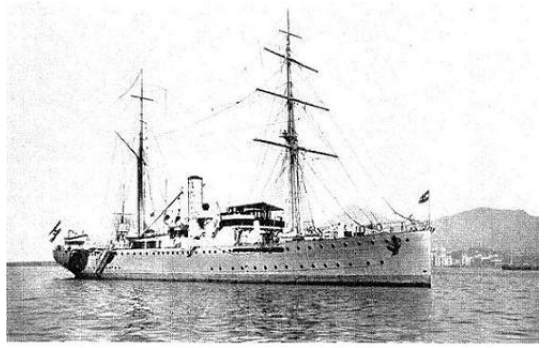
WORLD METEOROLOGICAL ORGANIZATION

IGOS Integrated Global Observing Strategy

Yet, most ocean and atmosphere research infrastructures remain “national”.
Including research vessels designed for working in “areas beyond national jurisdiction”.



Challenger: 1872-1876



Meteor: 1925-1927

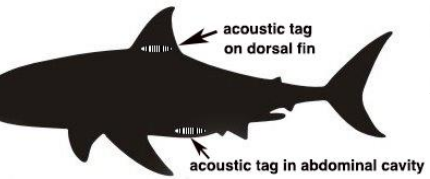
Motivations then:
Scientific exploration/ cataloguing/ etc.
Naval interests, ASW, etc.
“Flying the flag”; colonialism
Direct support for natl. economies/ industries
More recent motivations:
Safety/ operational forecasting
Climate change/ mitigation assessment
Biodiversity/ ecosystem management
Pollution on global scales

Premise:
National, centralized infrastructures are poorly suited for modern large-scale ocean and atmosphere research.

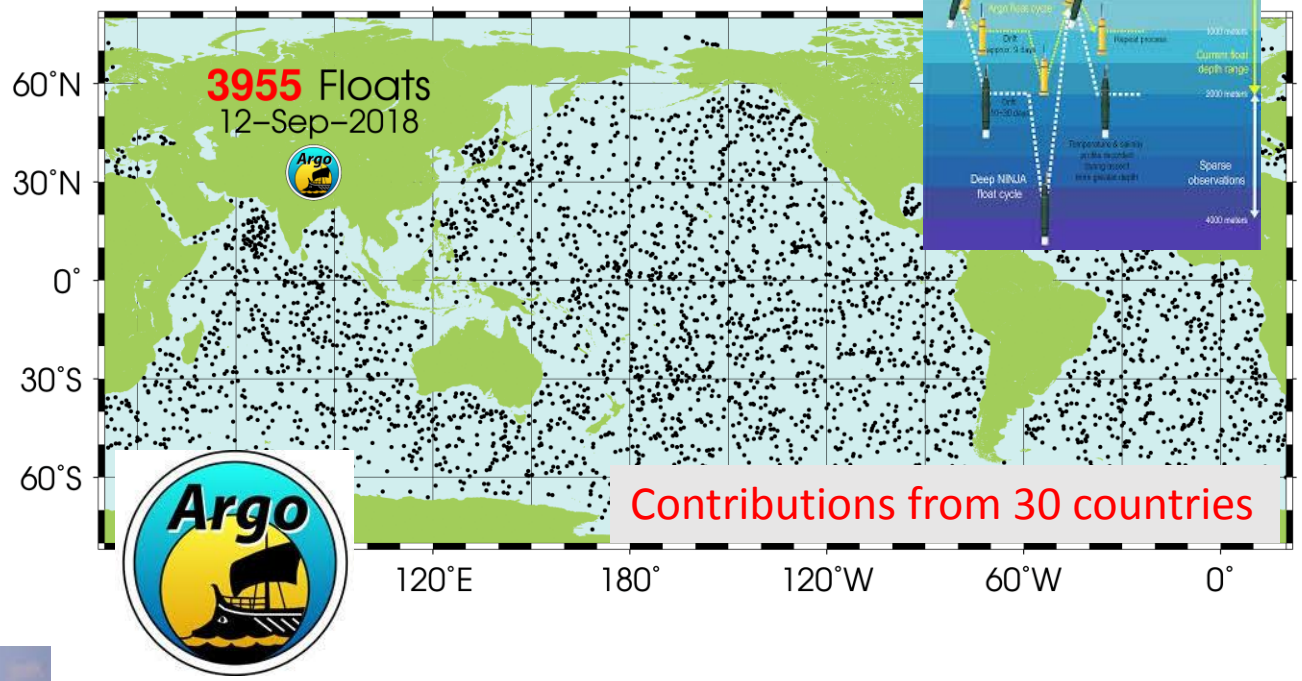
Consequently, the research infrastructure situation is changing:

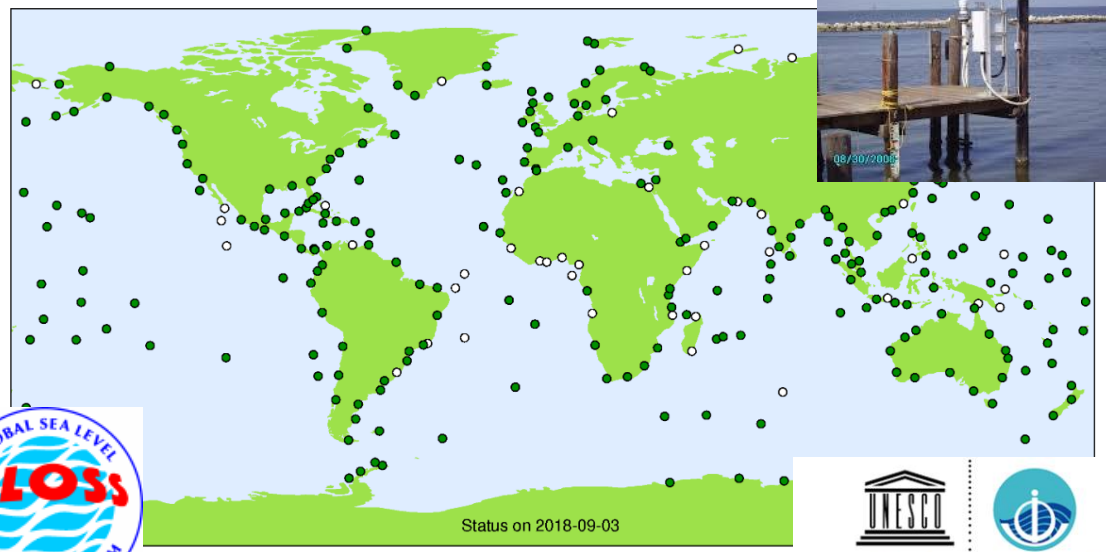
- Growing number of multilateral, shared infrastructures
- Tendency towards widely-distributed systems
- Global coverage; continuous operation

OCEAN TRACKING NETWORK



INNOVATION.CA
CANADA FOUNDATION FOR INNOVATION | FONDATION CANADIENNE POUR L'INNOVATION

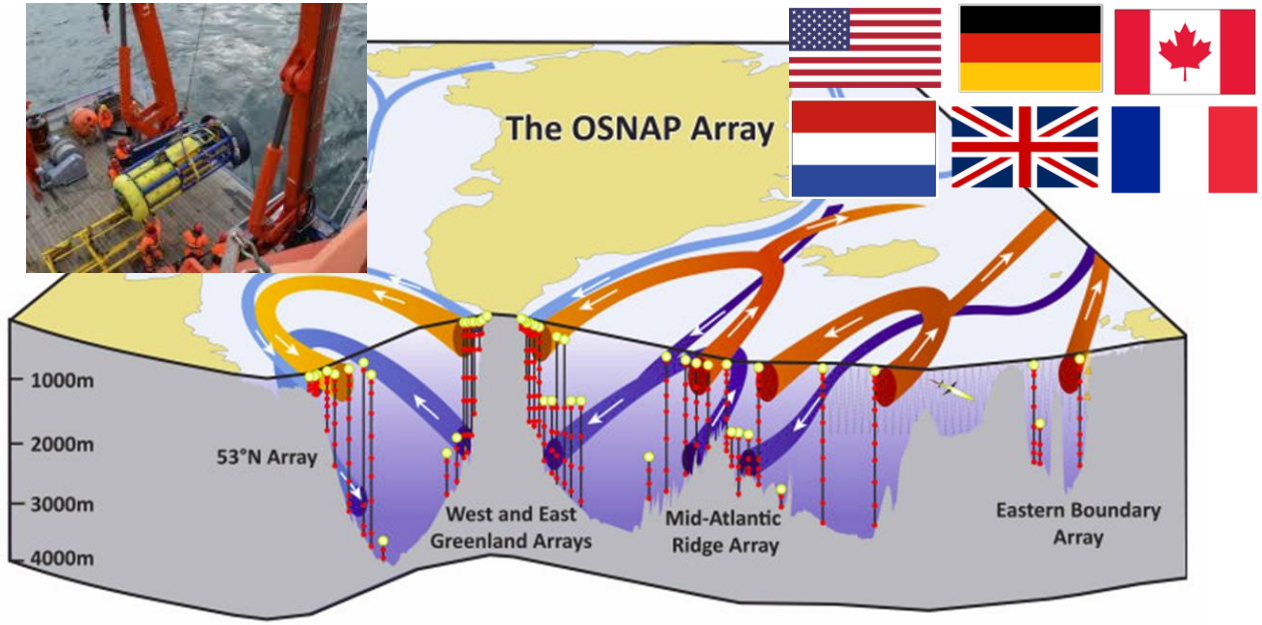




GLOSS GLOBAL SEA LEVEL OBSERVING SYSTEM

UNESCO United Nations Educational, Scientific and Cultural Organization

Intergovernmental Oceanographic Commission



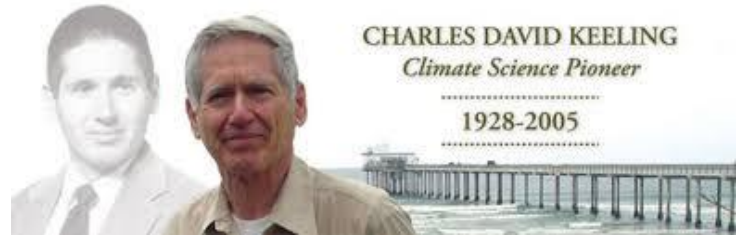
Issues to consider:

- Most current examples are single-discipline (= missed opportunities)
- Funding mechanisms are complex, ad-hoc and variable
- (Severe) barriers to international funding are counter-productive
- Need to **work with** developing countries and indigenous peoples
- Planning process is too cumbersome and slow.

Opportunities:

Science diplomacy:
“The culture of science can break down national barriers and help make the world a better place. This requires shared infrastructures.”
(very loosely paraphrased from Prof. Yuri Balega, yesterday)

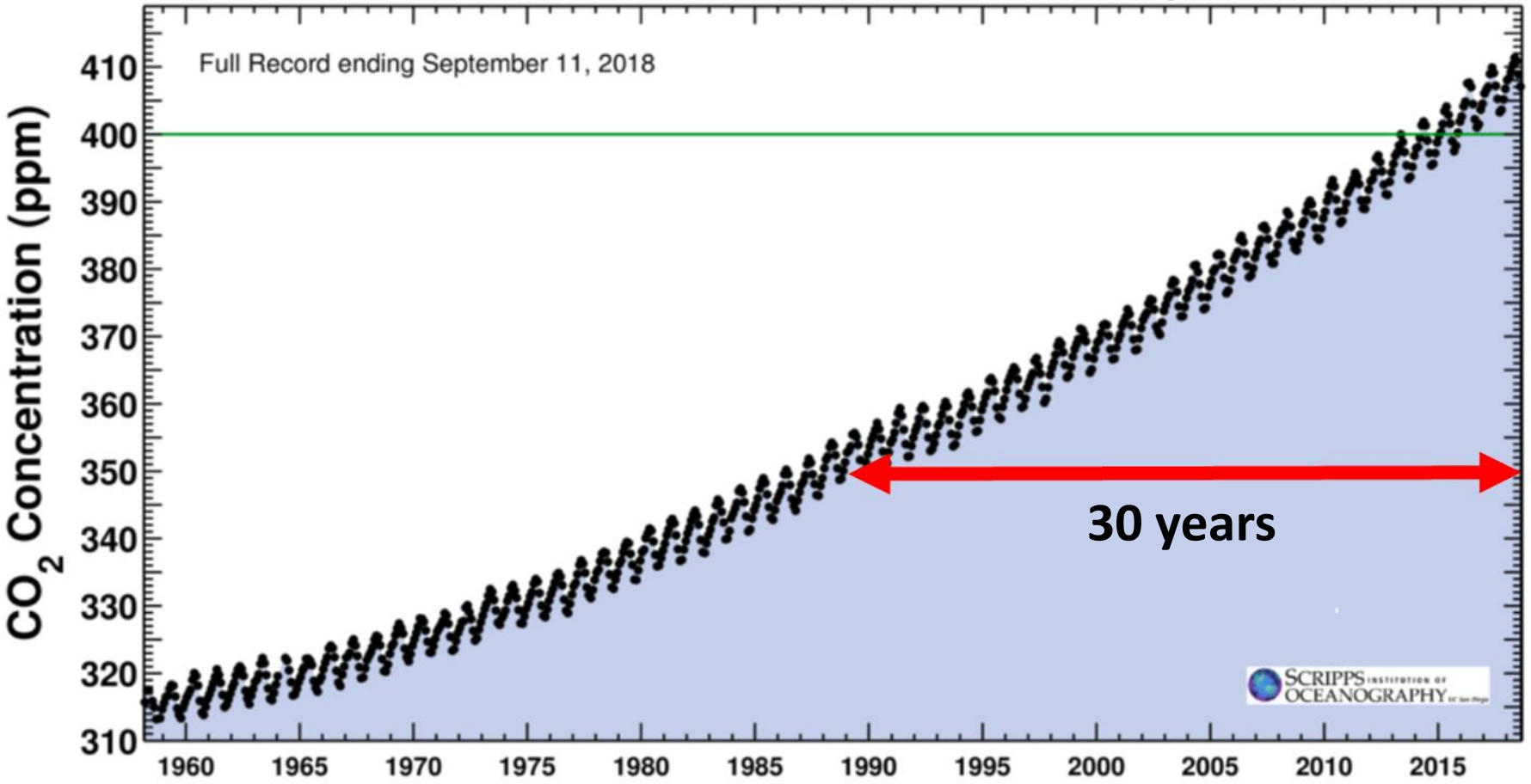
Current time horizons for infrastructure planning are too long!!!



Latest CO_2 reading
September 11, 2018

404.69 ppm

Carbon dioxide concentration at Mauna Loa Observatory



Research institutions are often key to planning, operation **and the use** of large, complex infrastructures ("national labs").

Are our research institution structures up to the task? Up-to-date?

Do we need multinational or transnational research institutions that can:

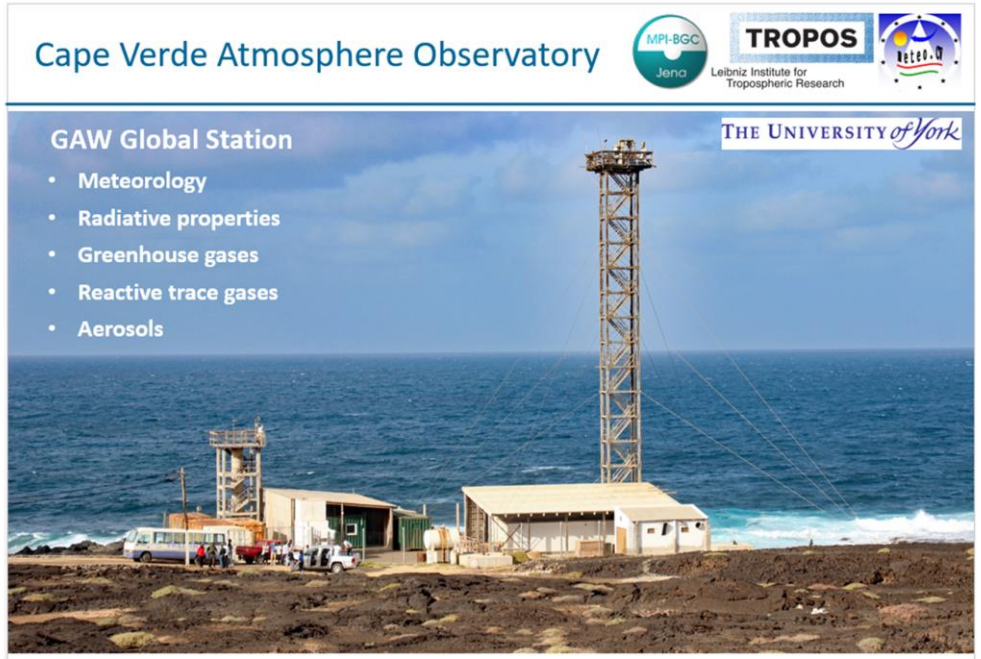
- React to global imperatives (more rapidly and strategically than inter-governmental organizations)?
- Lead the institutional push and heavy-lifting for development and operation of major, international infrastructures

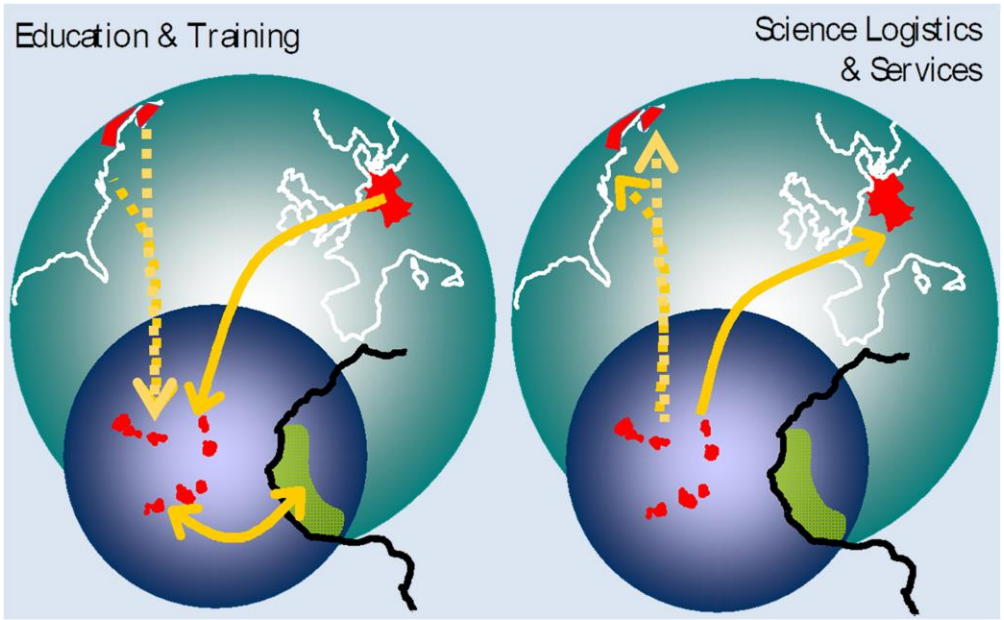
A transnational corporation…..does not identify itself with one national home. While traditional multinational corporations are national companies with foreign subsidiaries, transnational corporations spread out their operations in many countries to sustain high levels of local responsiveness. (Wikepedia)

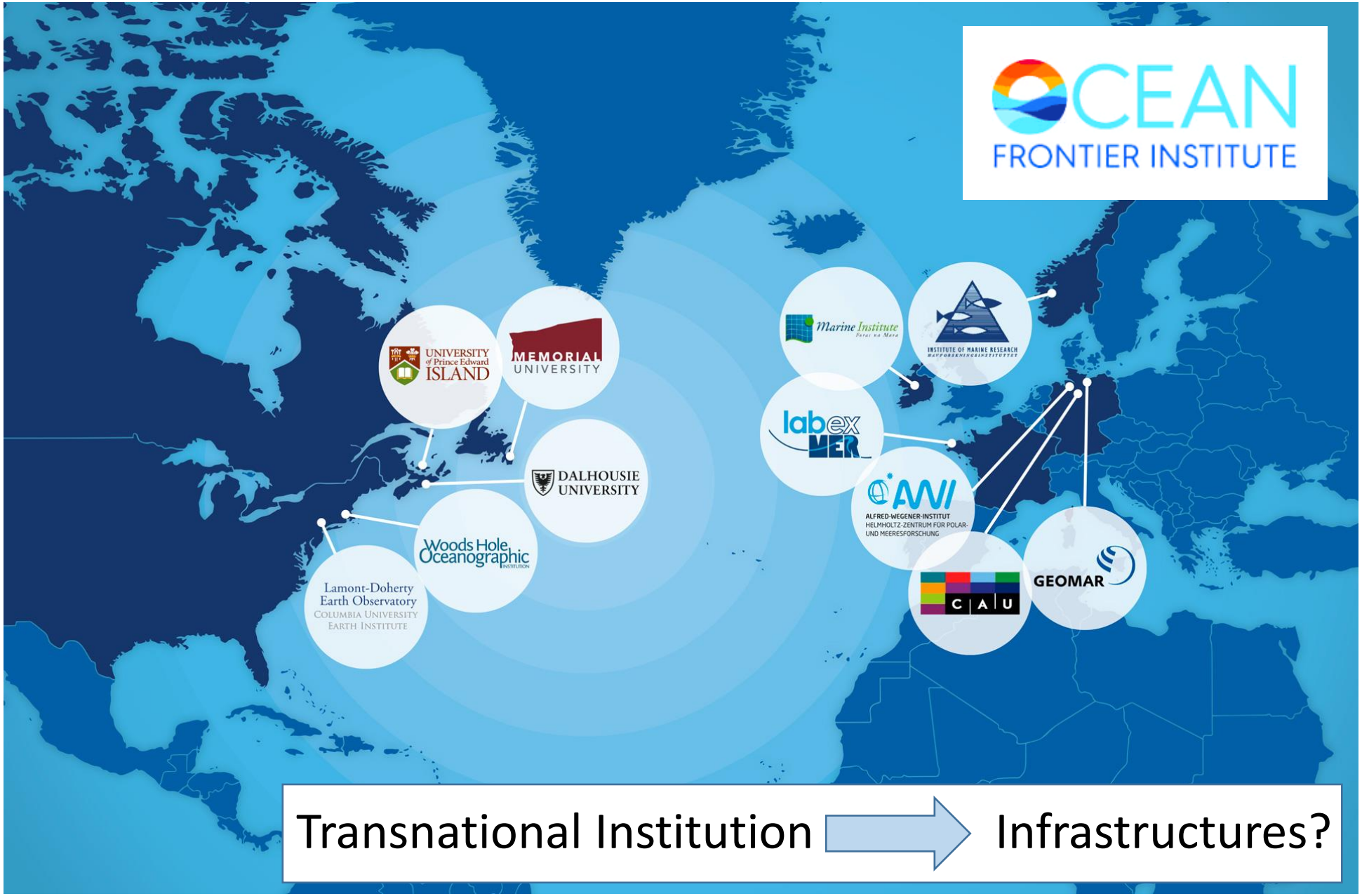
Two multi-disciplinary “proto-structure” examples.

Cabo Verde

Infrastructure → Transnational institution?



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DALHOUSIE UNIVERSITY
Woods Hole Oceanographic Institution
Lamont-Doherty Earth Observatory
Columbia University Earth Institute
Marine Institute
INSTITUTE OF MARINE RESEARCH
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ALFRED-WEGENER-INSTITUT
HELMHOLTZ-ZENTRUM FÜR POLAR- UND MEERESFORSCHUNG
C A U
GEOMAR
Transnational Institution
Infrastructures?

summary

- Distributed, international infrastructures are the way of the future
- They were envisioned by the Law of the Sea in 1982
- Existing intl. structures are, generally, underfunded and sometimes cumbersome
- Most “real” support for infrastructure remains national or single discipline

- Good examples exist but templates need to be systemized, compared (beyond Europe) and made available across disciplines.
- Need for new structures (including transnational research institutes)
- Can be a powerful vehicle for science diplomacy