The Global Ocean Science Report: the Current Status of Ocean Science around the World

Dr. Luis Valdés
GOSR Coordinating editor
Instituto Español de Oceanografía

6th EMB Forum
Implementing the UN 2030 Agenda
What role for marine science? 6 December 2017, Brussels

European MARINE BOARD Advancing Seas & Ocean Science

SUSTAINABLE DEVELOPMENT GOALS

Brussels, 6th December 2017

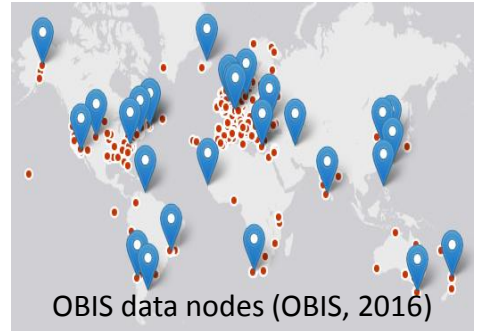
An outstanding achievement of the IOC-UNESCO

United Nations
Educational, Scientific and
Cultural Organization

Intergovernmental
Oceanographic
Commission

Motivation: Ocean science for sustainable development

- Ocean science is crucial for sustainable development
- Need to understand ocean science capacities - but many questions remain
- Global Ocean Science Report first consolidated assessment of ocean science:
  - Identifies and quantifies elements driving ocean science capacity (workforce, infrastructure, investment, data management), productivity (publications) and performance
  - Aims to strengthen international ocean science collaboration and science-policy interaction and support SDG14 (in particular 14.a)

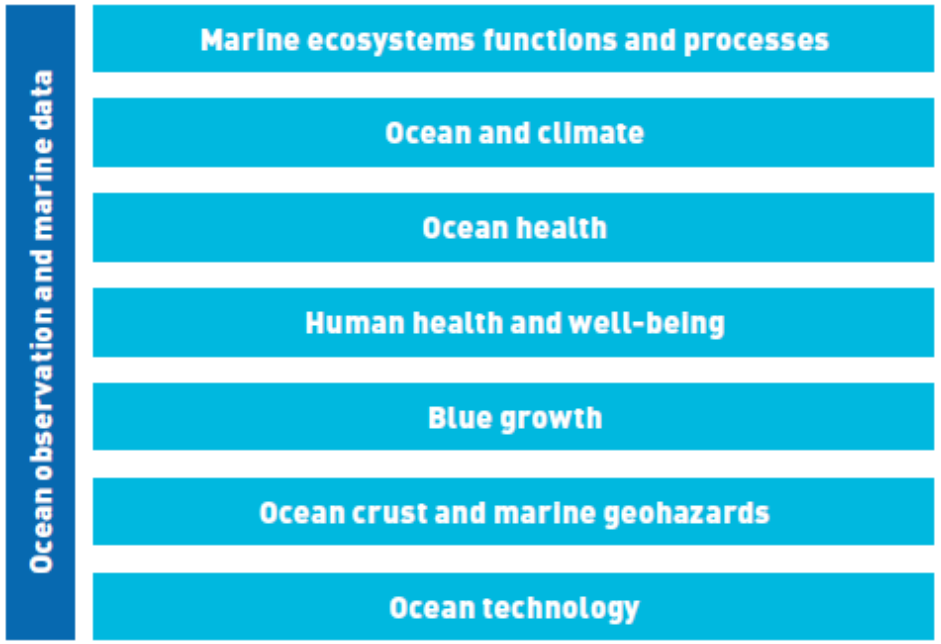

OBIS data nodes (OBIS, 2016)


RRS James Cook (NERC)


OTGA, 2016

Report structure

Ocean science categories



Chapters

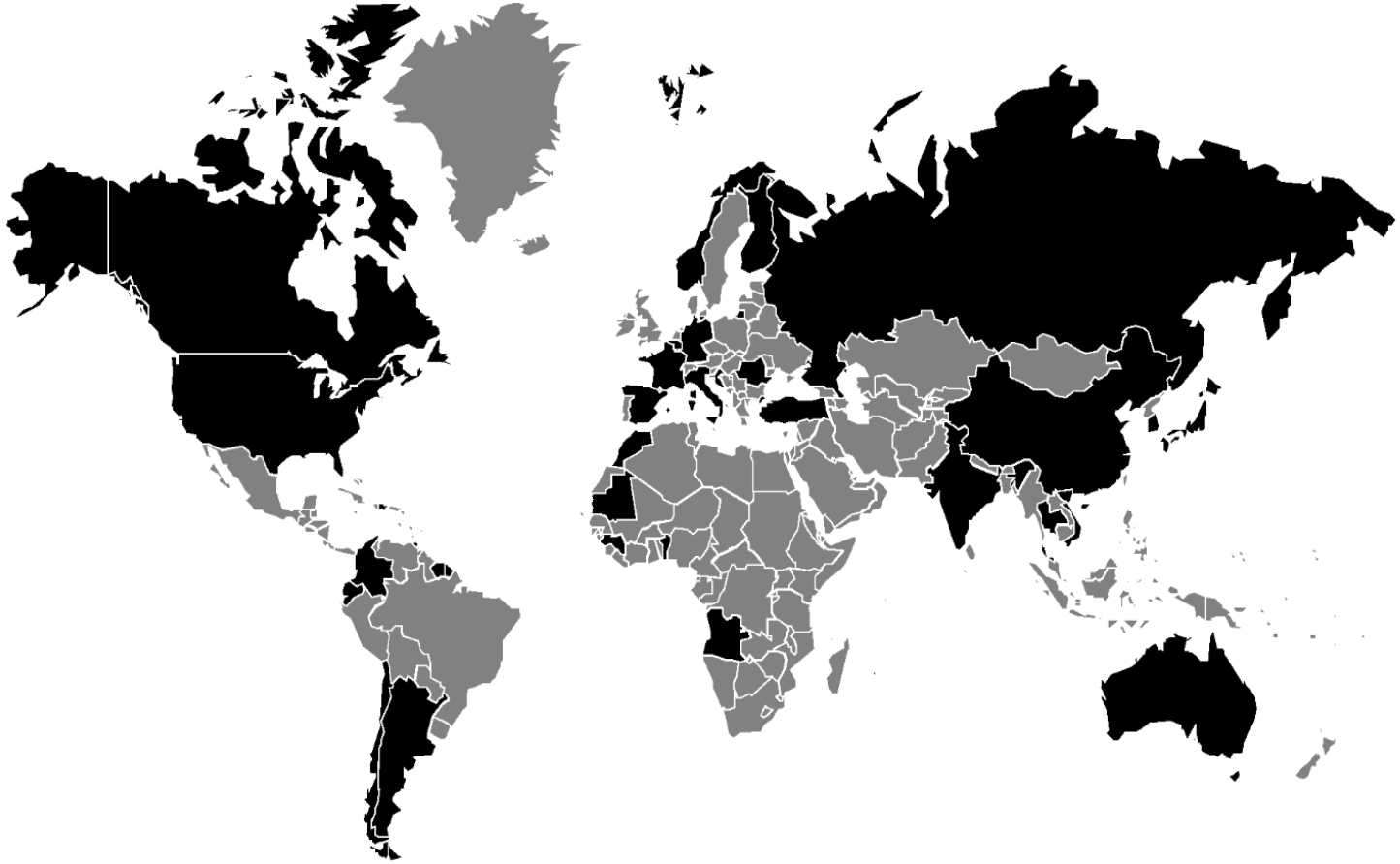
1. Introduction
2. Definitions, data collection and data analysis
3. Research capacity and infrastructure
4. Funding for ocean science
5. Research productivity and science impact
6. Oceanographic data and information exchange
7. International supporting organizations on ocean science
8. Contribution of marine science to the development of ocean and coastal policies and sustainable development

Contributions from around the world

Individual contributors:

Allan Cembella
Alexandra Chadid Santamaria
Martha Crago
Henrik Oksfeldt Enevoldsen
Hernan Garcia
Lars Horn
Kazuo Inaba
Lorna Veronica Inniss
Kirsten Isensee (Assistant Coordinating editor)
Claire Jolly
Bob Keeley
Youn-Ho Lee
Jan Mees
Seonghwan Pae
Linda Pikula
Peter Pissierssens
Lisa Raymond
Greg Reed
Susan Roberts
Martin Schaaper
Alan Simcock
Ariel H. Troisi
Luis Valdés (Coordinating Editor)

IOC Member States that responded to the GOSR questionnaire



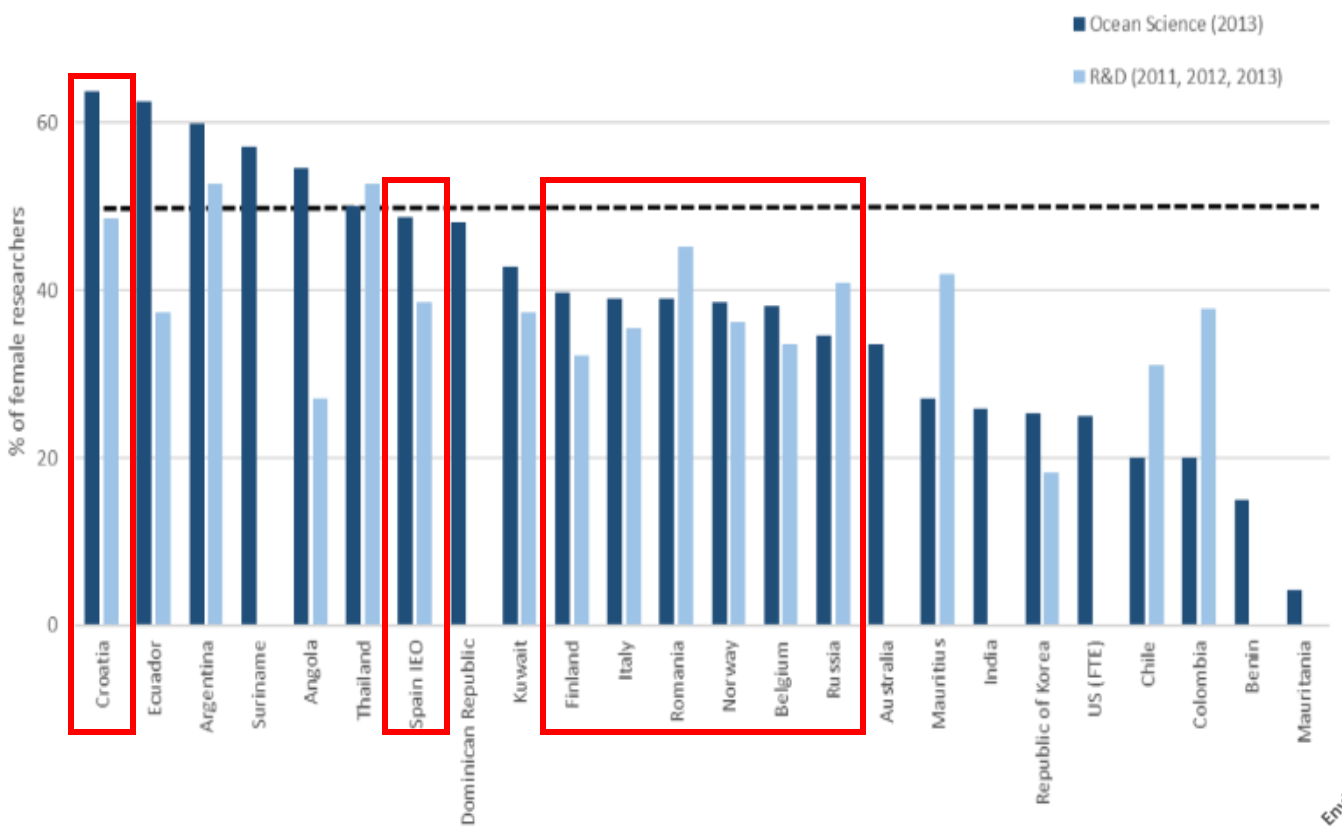
(34 States, 23% of IOC member states and
75% of ocean science publications 2010-2014)

Key findings

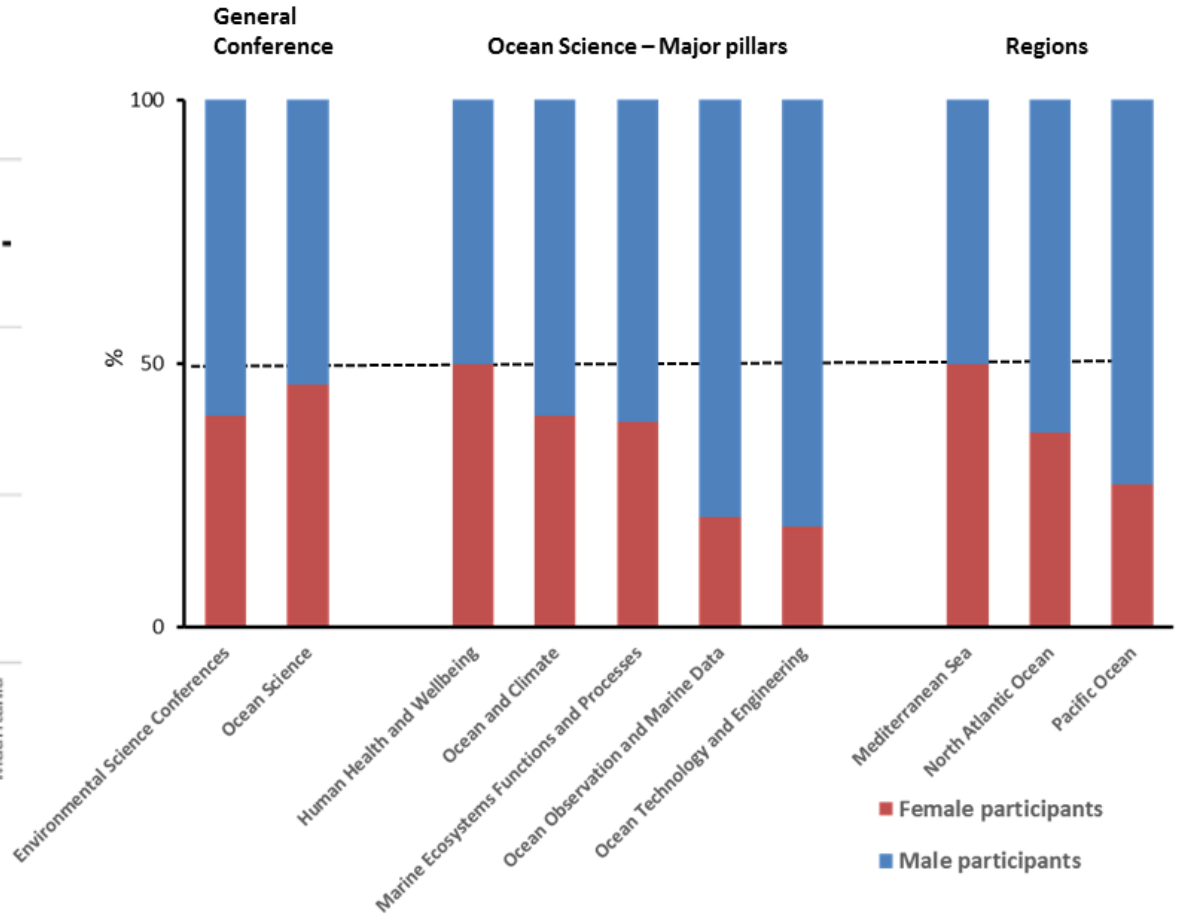
1. Global ocean science is '**big science**'
2. Ocean science is **multidisciplinary**
3. There is more equal **gender balance** in ocean science than in science overall
4. Ocean science **expenditure** is highly variable worldwide
5. Ocean science benefits from **alternative funding**
6. Ocean science **productivity** is increasing
7. International collaboration increases **citation** rates
8. Ocean **data centres** serve multiple user communities with a wide array of products
9. Many IGO and NGOs provide support to ocean science, but this also makes **ocean governance extremely complex**
10. S**cience-policy** interactions can occur through many avenues.
11. National **inventories** on ocean science capacity exist only in few countries

Gender balance

Gender balance varies between countries, regions and ocean science categories – but is more equal than in science overall



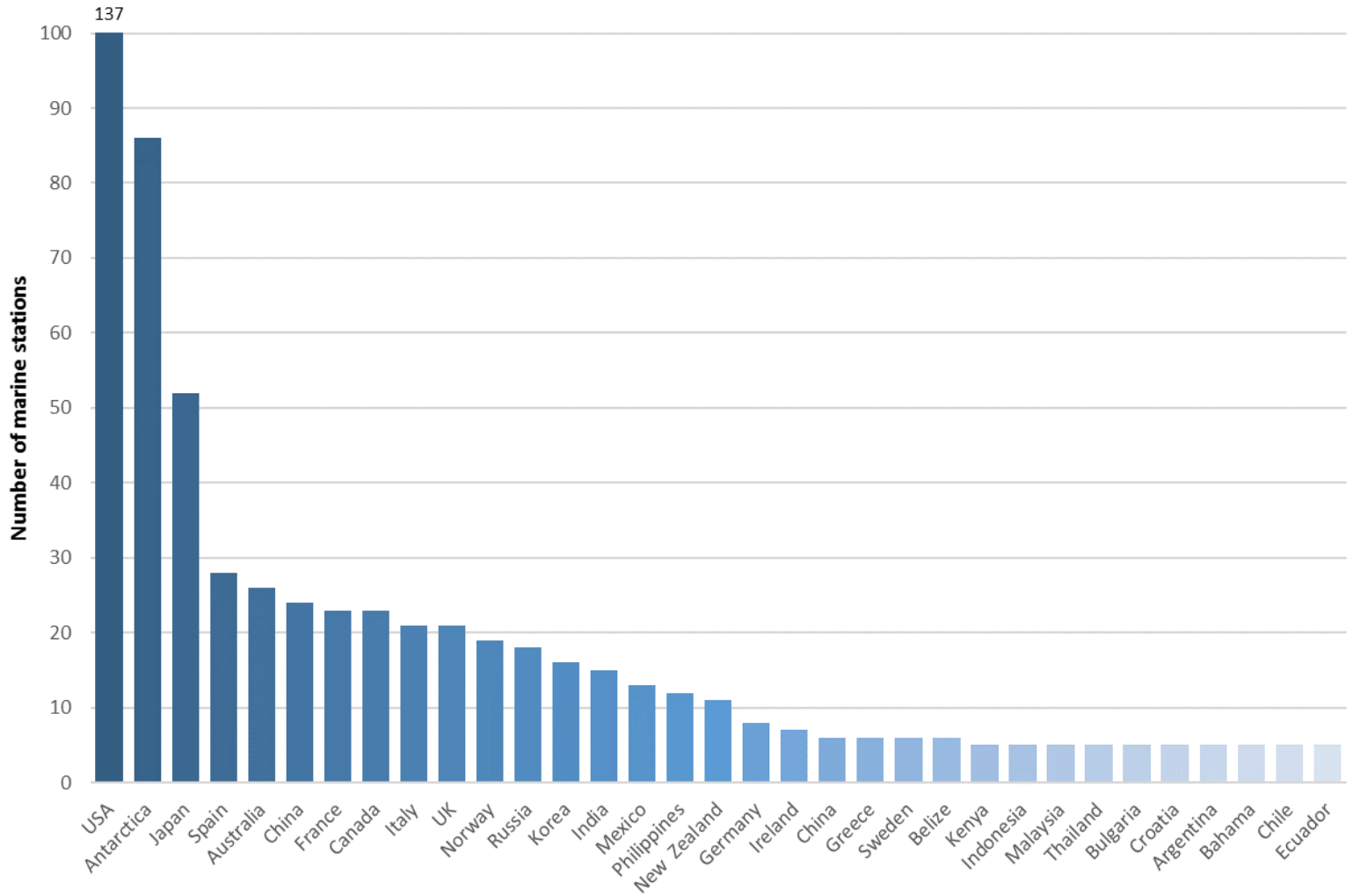
Proportion (% total) of female researchers in ocean science (headcounts; dark blue bars) and in R&D (light blue bars). Sources: GOSR questionnaire (ocean science), 2015; UIS (R&D), 2015.



Percentage of male and female participants in ocean science conferences

Marine stations

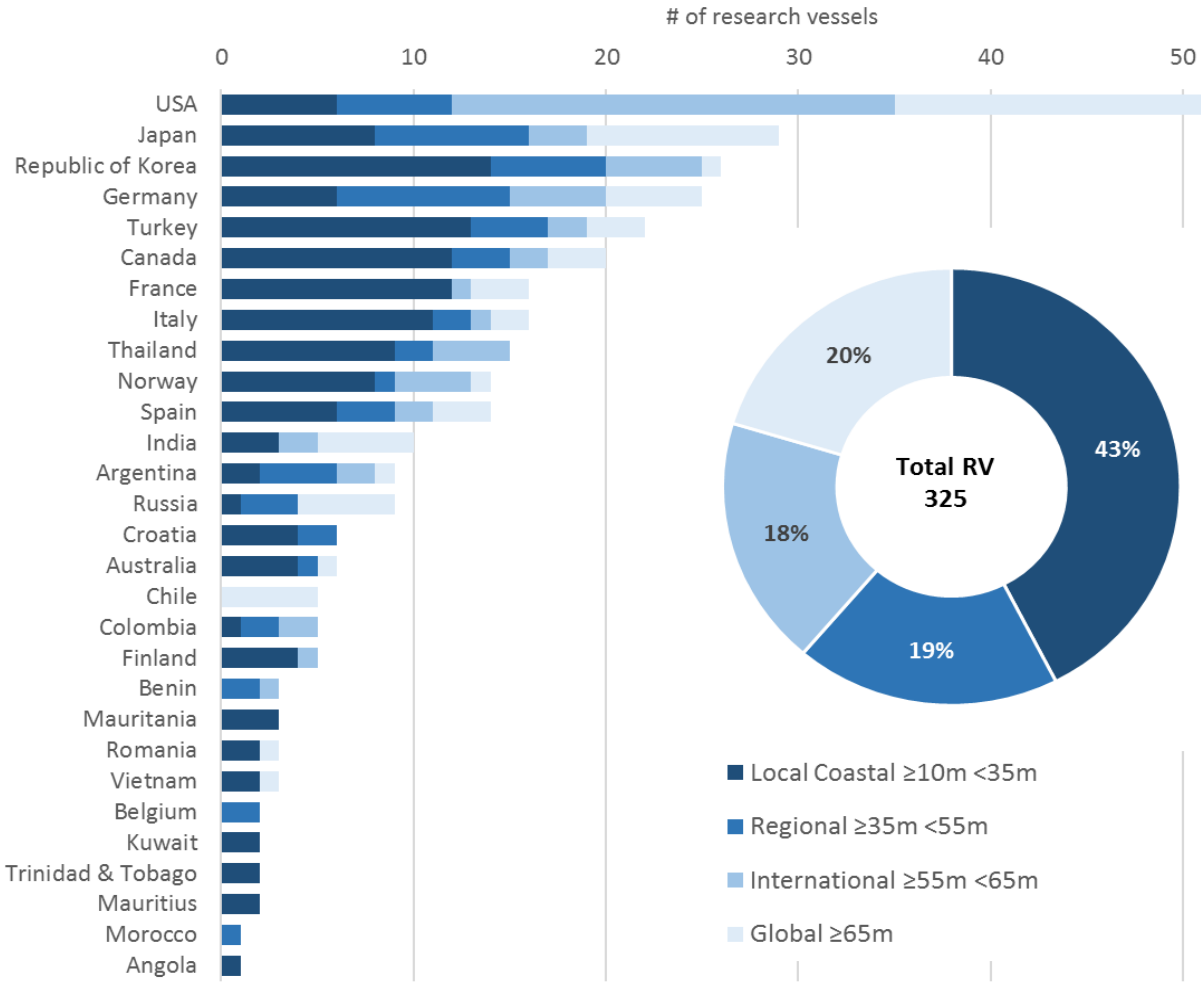
784 marine stations maintained by 98 countries

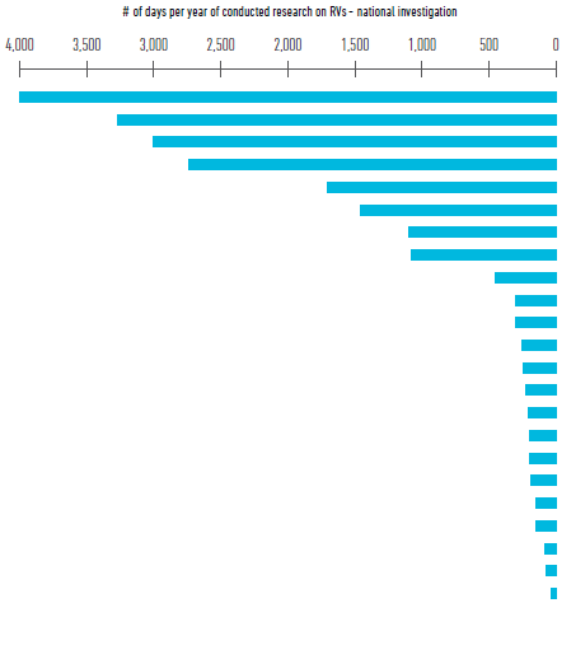


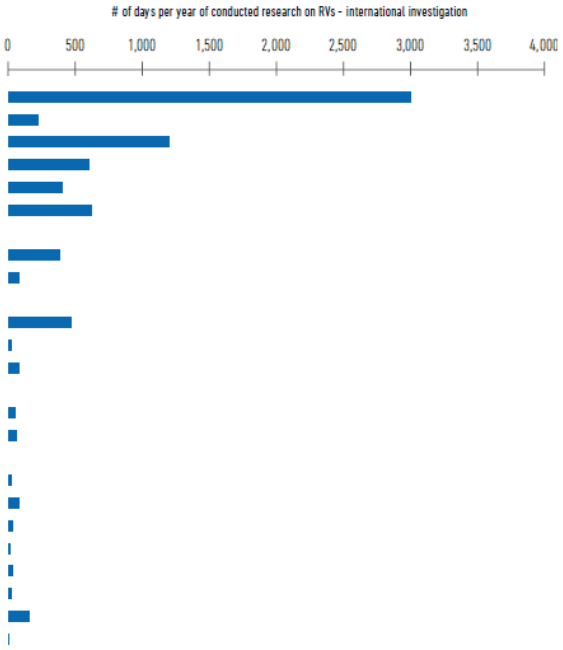
Location	Number (%)
Asia	179 (23 %)
Europe	172 (22 %)
North America	163 (21 %)
Antarctica	86 (11 %)
South/Latin America	81 (10 %)
Africa	62 (8 %)
Oceania	41 (5 %)

Research vessels

More than 320 vessels, operating at coastal, regional and global scales

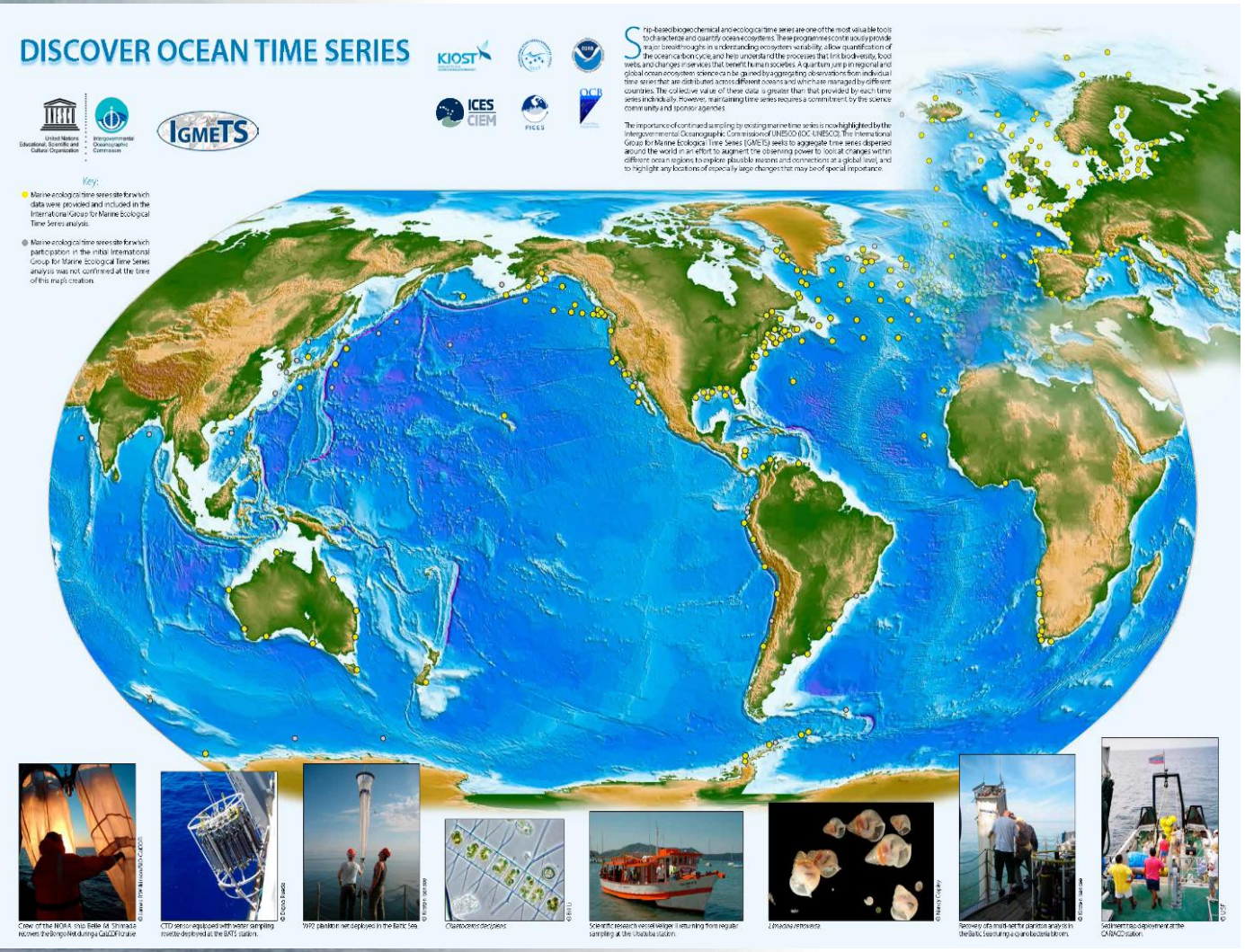




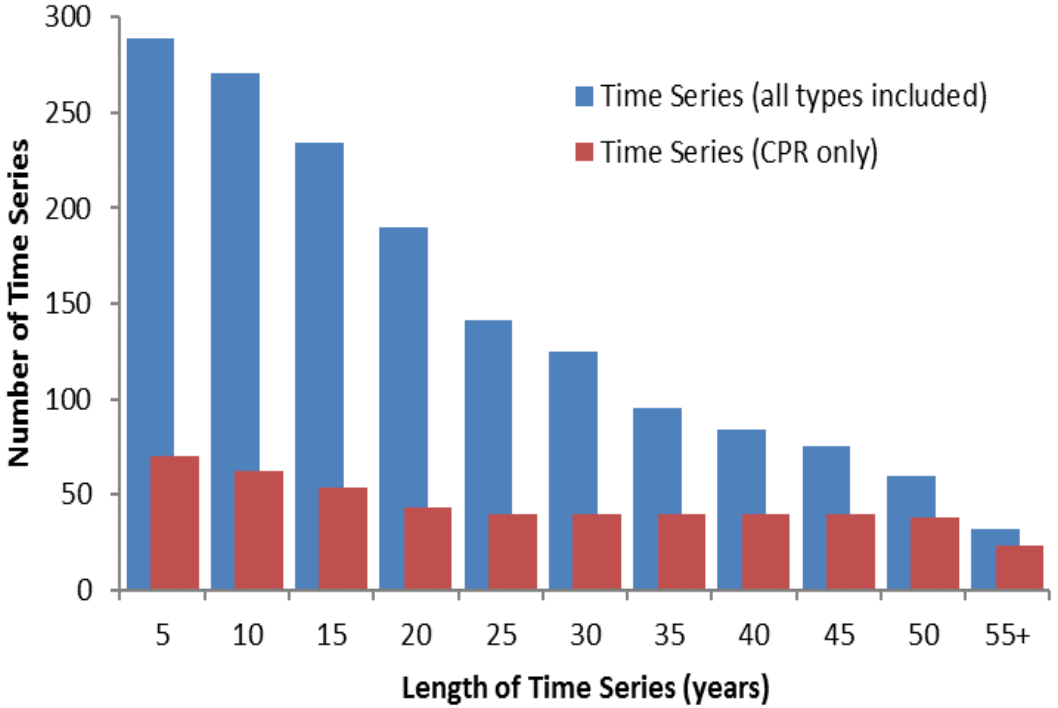


Time series

Sustained time series measurements detect changes over time and enable investigation of remote ocean locations.



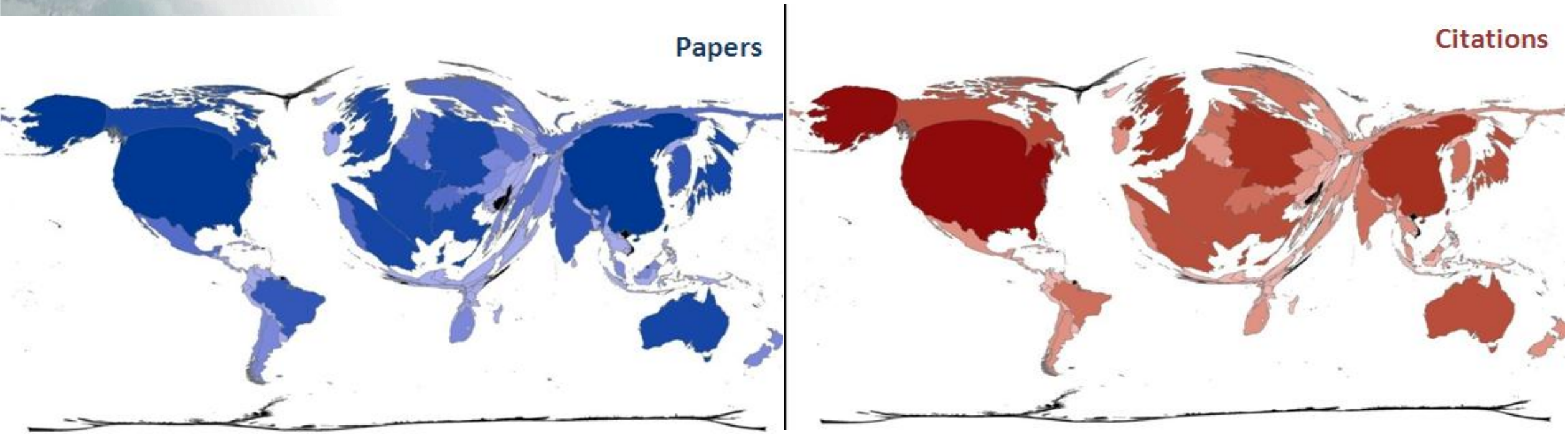
341 ship-based time series around the world



Ship-based time series (2012), including Continuous Plankton Recorder (CPR).
Source: IGMETS, 2016.

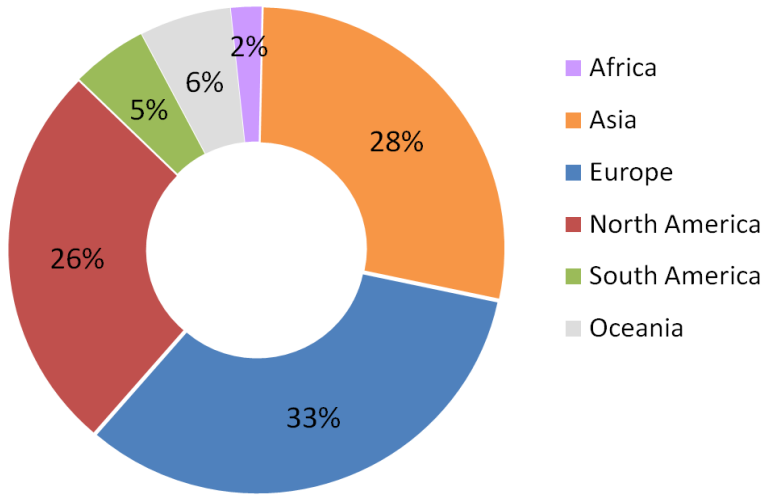
Ocean science production is increasing

More than 370,000 manuscripts in ocean sciences were published and more than 2 million articles were cited (2010-2014)

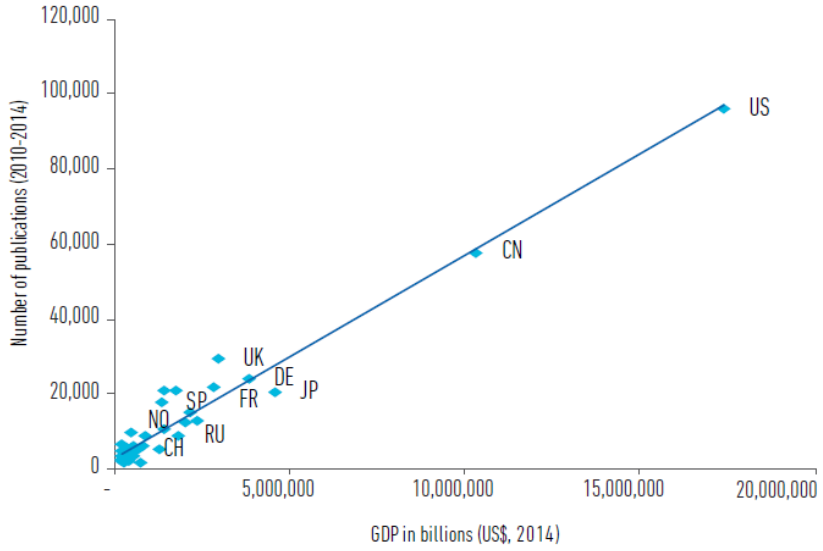


Cartogram showing publications and citations of the world. The area of each country is scaled and deformed according to the number of ocean science publications (top) or citations received (bottom). Darker colours indicate a higher number of publications (top) or citations (bottom). Source: ScienceMetrix, 2015.

Ocean science production is increasing



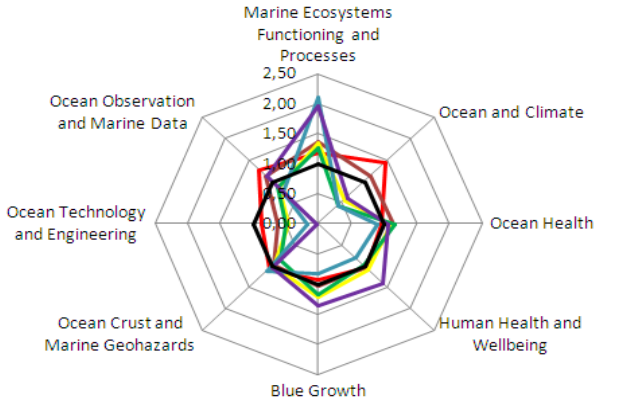
Proportion of global publication authorship by continent



2005–2009		
Country	**Rank (Δ position)**	**Paper**
USA	1	81 723
China	2 (+5)	28 325
UK	3 (-1)	23 342
Japan	4 (-1)	19 336
Germany	5 (-1)	18 048
Canada	6 (-1)	17 646
France	7 (-1)	16 685
Australia	8	14 154
Spain	9	12 009
Italy	10	11 023
Brazil	11 (+4)	8 052
India	12 (+2)	7 600
Norway	13	7 134
Russia	14 (-3)	7 047
Netherlands	15 (-3)	6 443
Rep. of Korea	16 (+2)	5 865
Sweden	17 (-1)	4 666
Portugal	18 (+6)	4 367
Turkey	19 (+4)	4 314
Denmark	20 (-3)	3 922
Mexico	21 (-1)	3 805
Belgium	22 (-1)	3 668
New Zealand	23 (-4)	3 617
Switzerland	24 (-2)	3 533
Poland	25	3 502
Greece	26 (+3)	2 948
Argentina	27 (+3)	2 569
South Africa	28	2 525
Finland	29 (-2)	2 307
Israel	30 (-4)	2 197
Chile	31 (+1)	2 125
Austria	32 (-1)	1 948
Czechia	33 (+1)	1 798
Iran	34 (+5)	1 650
Thailand	35 (+1)	1 627
Ireland	36 (-3)	1 447
Singapore	37 (-2)	1 430
Egypt	38 (-1)	1 086
Malaysia	39 (-1)	924
Saudi Arabia	40	313

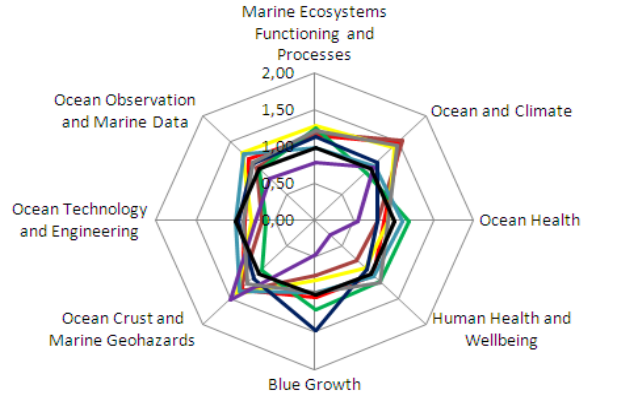
2010–2014		
Country	**Rank (Δ position)**	**Paper**
USA	1	96 088
China	2	57 848
UK	3	29 472
Germany	4 (+1)	24 227
France	5 (+2)	22 078
Canada	6	21 073
Australia	7 (+1)	20 937
Japan	8 (-4)	20 516
Spain	9	17 826
Italy	10	15 083
Brazil	11	13 211
India	12	12 631
Rep. of Korea	13 (+3)	10 688
Norway	14 (-1)	9 888
Russia	15 (-1)	8 816
Netherlands	16 (-1)	8 780
Portugal	17 (+1)	6 606
Sweden	18 (-1)	6 377
Turkey	19	6 153
Denmark	20	5 794
Switzerland	21 (+3)	5 299
Mexico	22 (-1)	5 278
Poland	23 (+2)	5 041
Belgium	24 (-2)	5 011
New Zealand	25 (-2)	4 818
Iran	26 (+8)	4 437
South Africa	27 (+1)	3 979
Argentina	28 (-1)	3 780
Chile	29 (+2)	3 577
Greece	30 (-4)	3 531
Malaysia	31 (+8)	3 315
Finland	32 (-3)	3 114
Austria	33 (-1)	2 779
Czechia	34 (-1)	2 720
Israel	35 (-5)	2 397
Thailand	36 (-1)	2 323
Singapore	37	2 307
Ireland	38 (-2)	2 272
Egypt	39 (-1)	2 063
Saudi Arabia	40	1 831

Specialization in ocean science fields



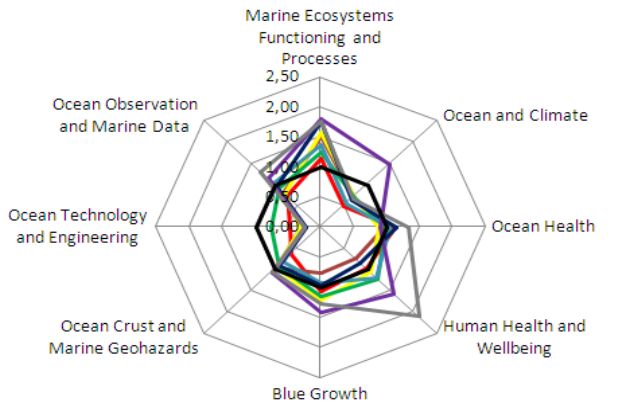
North America

- United States
- Canada
- Mexico
- Cuba
- Panama
- Costa Rica
- World



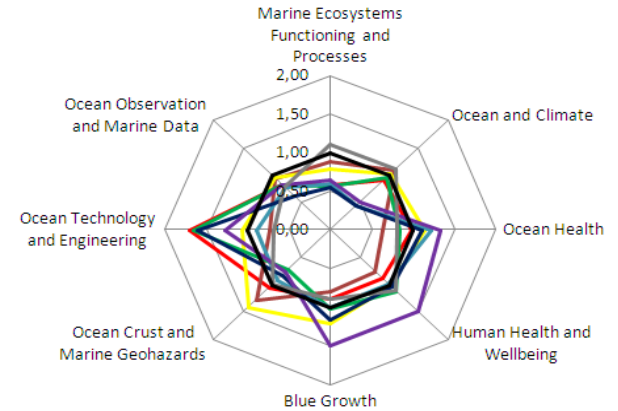
Europe

- United Kingdom
- Germany
- France
- Spain
- Italy
- Norway
- Russia
- Netherlands
- World



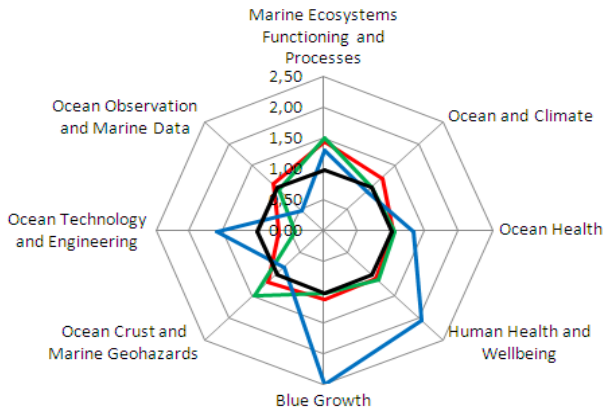
South America

- Brazil
- Argentina
- Chile
- Colombia
- Venezuela
- Uruguay
- Peru
- Ecuador
- World



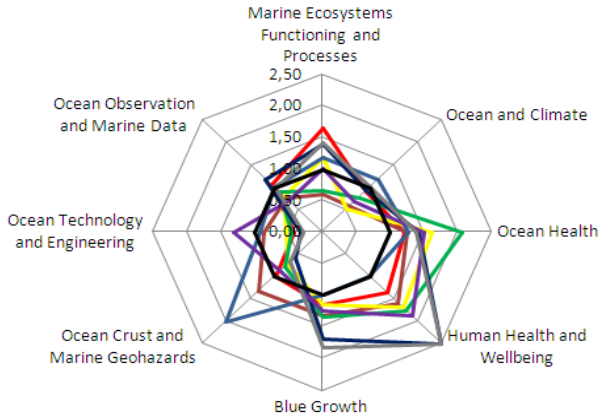
Asia

- China
- Japan
- India
- Rep. of Korea
- Turkey
- Iran
- Malaysia
- Israel
- World



Oceania

- Australia
- New Zealand
- Fiji
- World



Africa

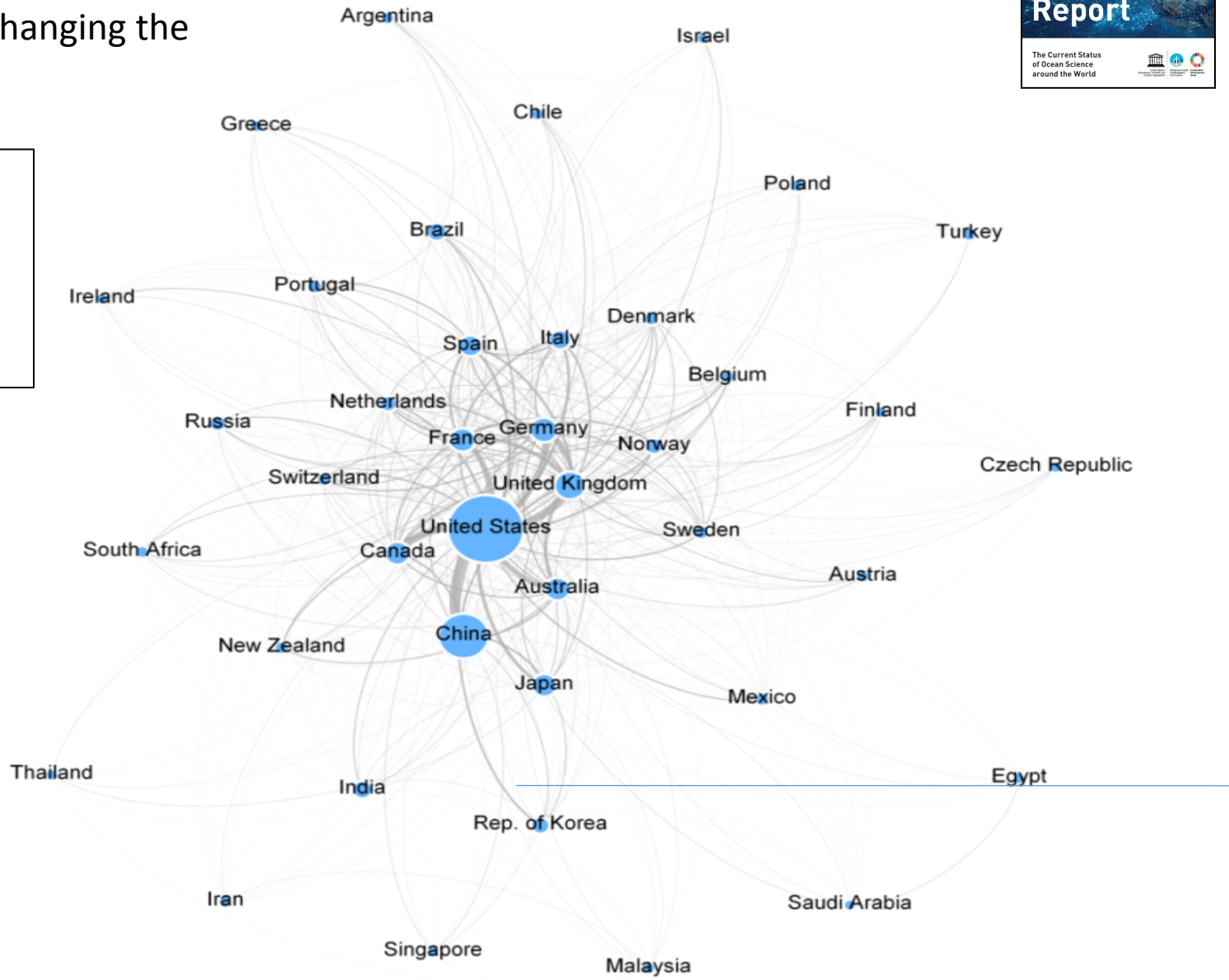
- South Africa
- Egypt
- Tunisia
- Nigeria
- Morocco
- Kenya
- Algeria
- United Rep. of Tanzania
- World

National strengths in different ocean sciences sub-fields. Spider plots show the Specialization Index (SI) compared to the world (2010-2014) for the nations accounting for at least 300 publications in the studied period

Collaboration in publications

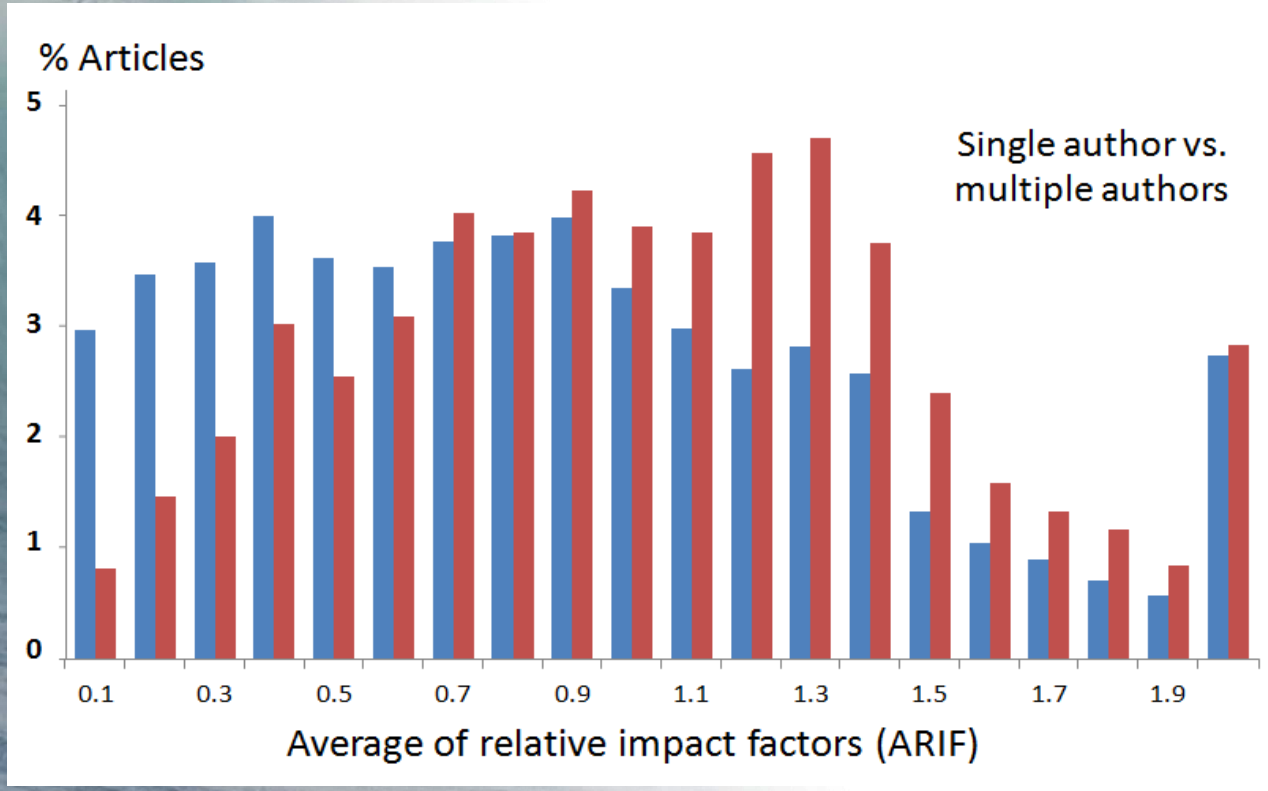
International collaboration networks are changing the global landscape of research publication

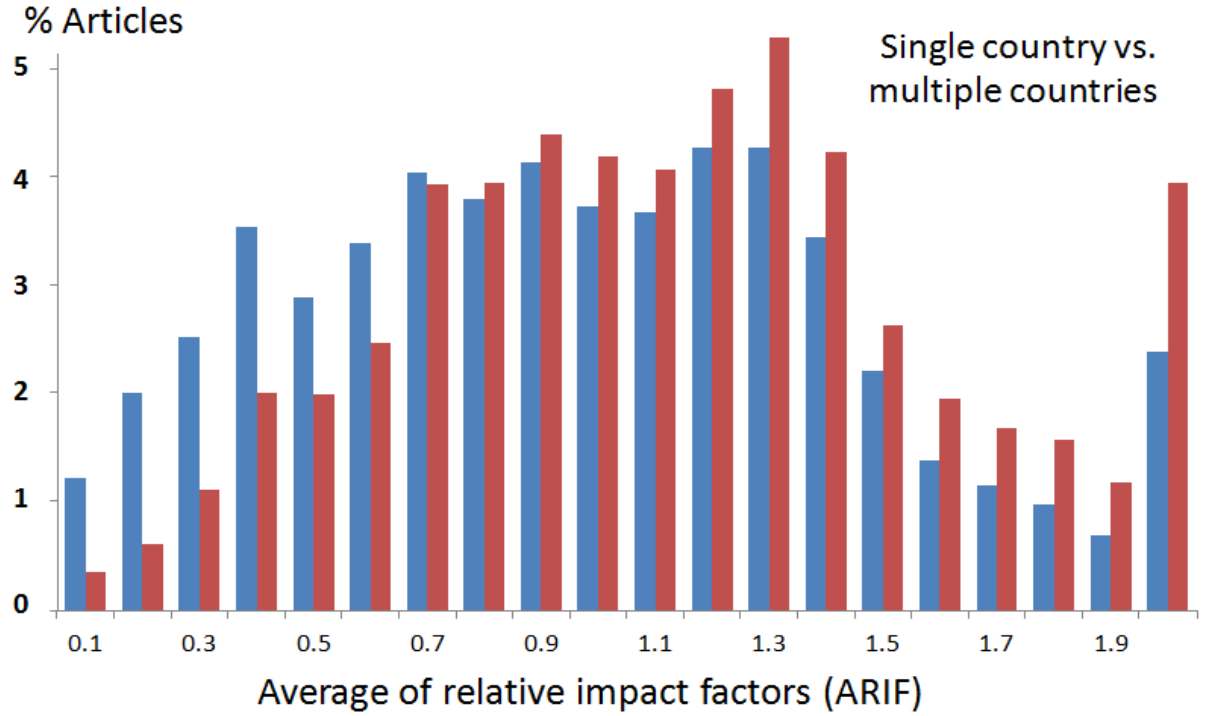
International collaboration network of selected top publishing nations and organizations in ocean science, 2010-2014. The size of the nodes is proportional to the number of publications in ocean science and the thickness of the lines is proportional to the number of collaborations (co-authored papers).



International collaboration increases science impact

Publications with multiple authors from multiple countries have higher citation rates





The expansion of international organizations supporting ocean science

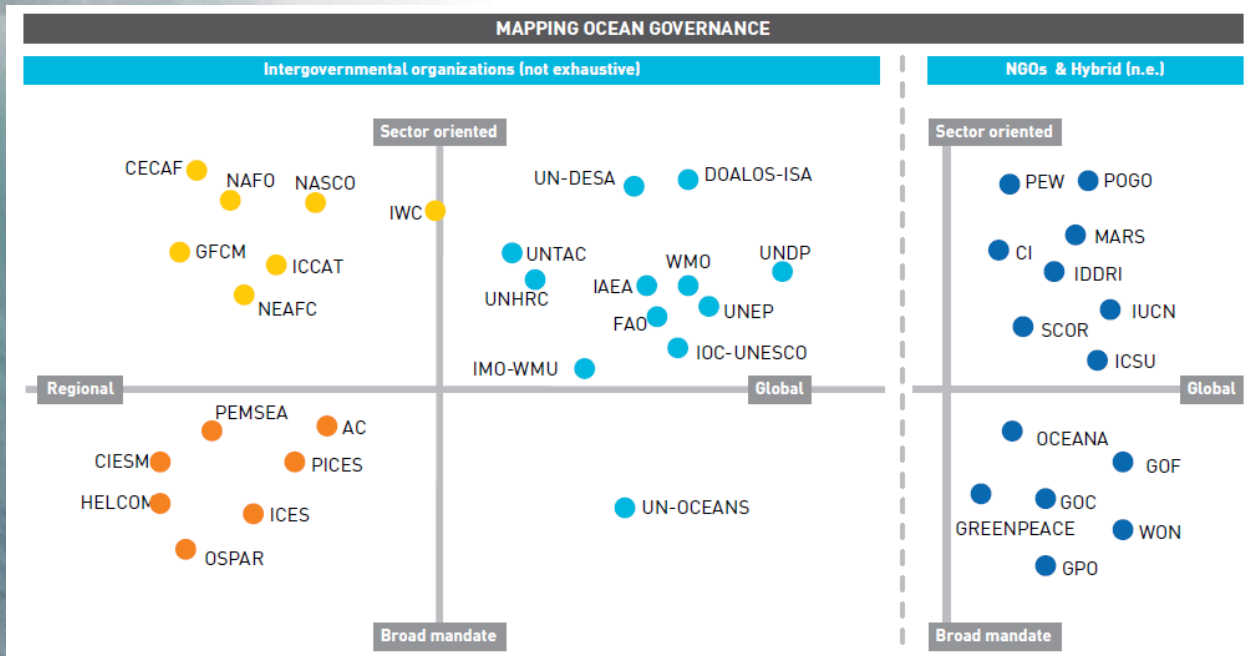


Figure 7.4. Scheme of international governmental and non-governmental lead organizations intervening in ocean management and governance clustered according to their technical mandate and the regional or global coverage (not exhaustive, see the appendix for acronyms). *Source*: adapted from Valdés (2017).

Appendix : List of 211 Orgs, being 126 IGOs, 88 NGOs, 7 Hybrid

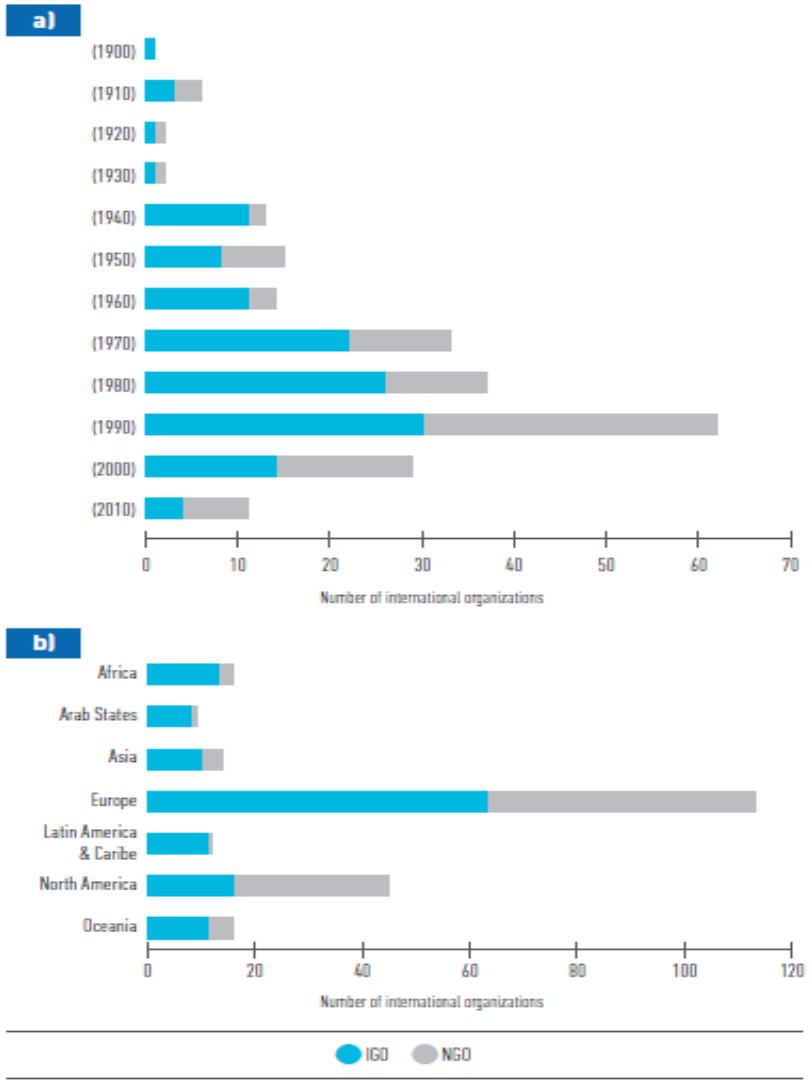
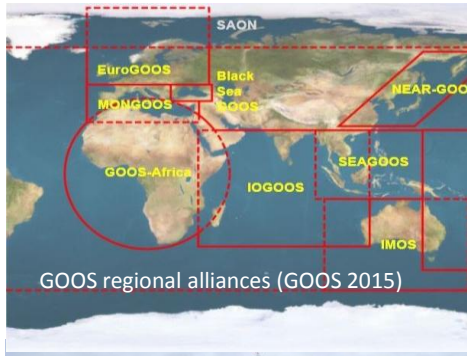


Figure 7.5. a) Number of international organizations (IGOs and NGOs) created by decade since 1900; and **b)** number of international organizations by regions.

Call for action

1. Facilitate international ocean **science cooperation**
2. Support global, regional and national **data centres** for effective and efficient management and exchange of ocean data and promote open access
3. Explore and encourage alternative **funding models**
4. Enable ocean **science-policy** interactions through diverse avenues
5. Align national **reporting mechanisms** on ocean science capacity, productivity and performance



GOOS regional alliances (GOOS 2015)

An outstanding achievement of the IOC-UNESCO

The Global Ocean Science Report is a tool for international cooperation and collaboration to increase ocean science, boost global research capacity and transfer technology

Thank you very much for your attention

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