



ICOS

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INTEGRATED
CARBON
OBSERVATION
SYSTEM



ENHANCED OCEAN OBSERVATIONS OF OCEAN CARBON UPTAKE FROM RESEARCH VESSELS - CAN YOU HELP

Richard Sanders, ICOS Ocean Thematic Centre, Bergen Norway



GEORGE

Next generation multiplatform
ocean observing technologies
for research infrastructures



TRICUSO
SOUTHERN OCEAN CARBON OBSERVATION

JPI
OCEANS

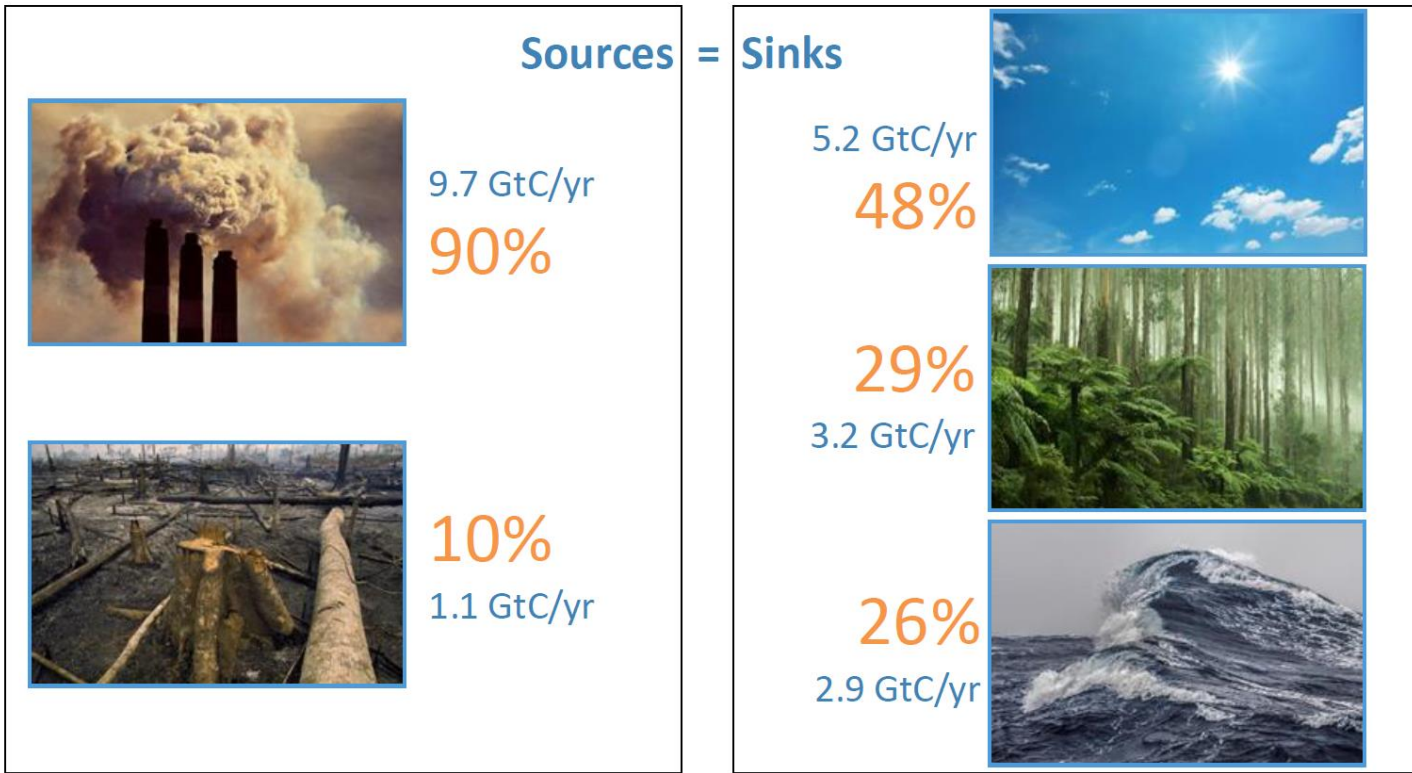
Q New
About Joint Actions

Ocean Carbon Capacities



amrit
Advance Marine Research
Infrastructures Together

Fate of anthropogenic CO₂ emissions (2014–2023)

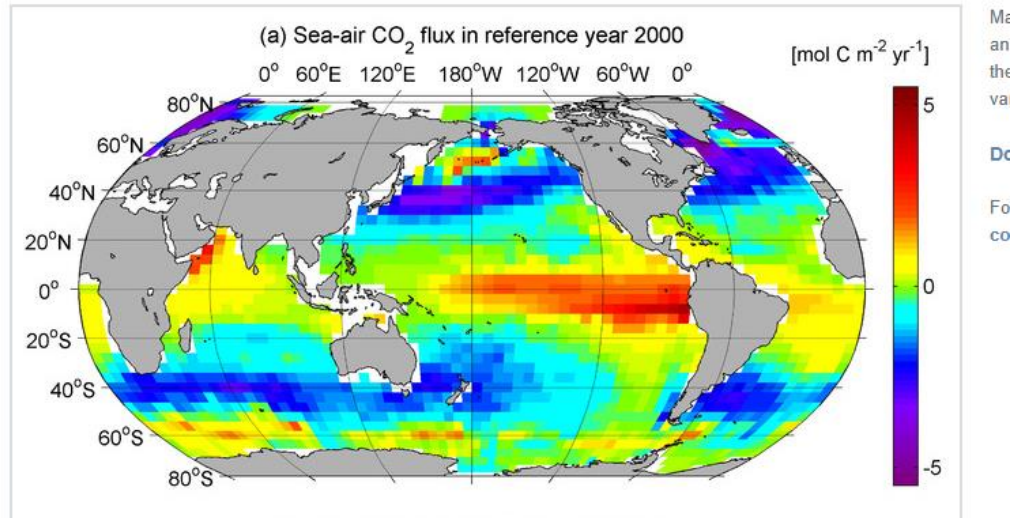


Budget Imbalance: 4%
(the difference between estimated sources & sinks) -0.4 GtC/yr

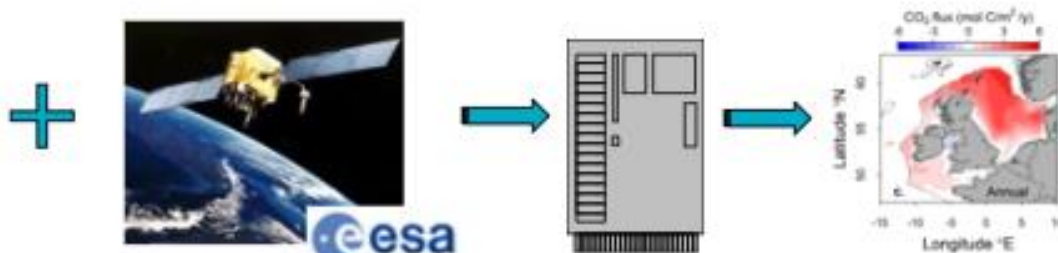
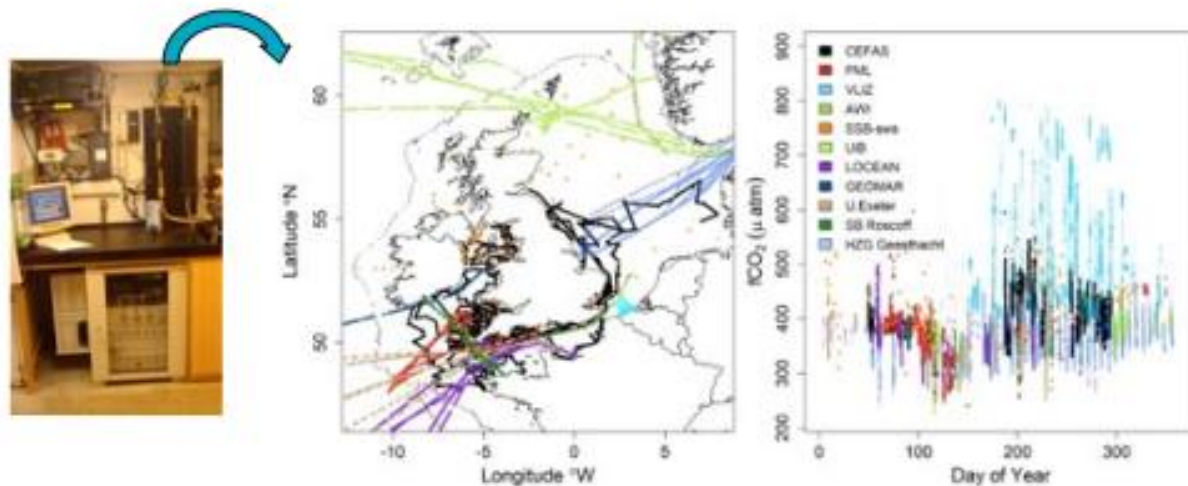
- Some areas sources and others sinks
- Net uptake is difference between two much larger terms
- Need a lot of data to measure this



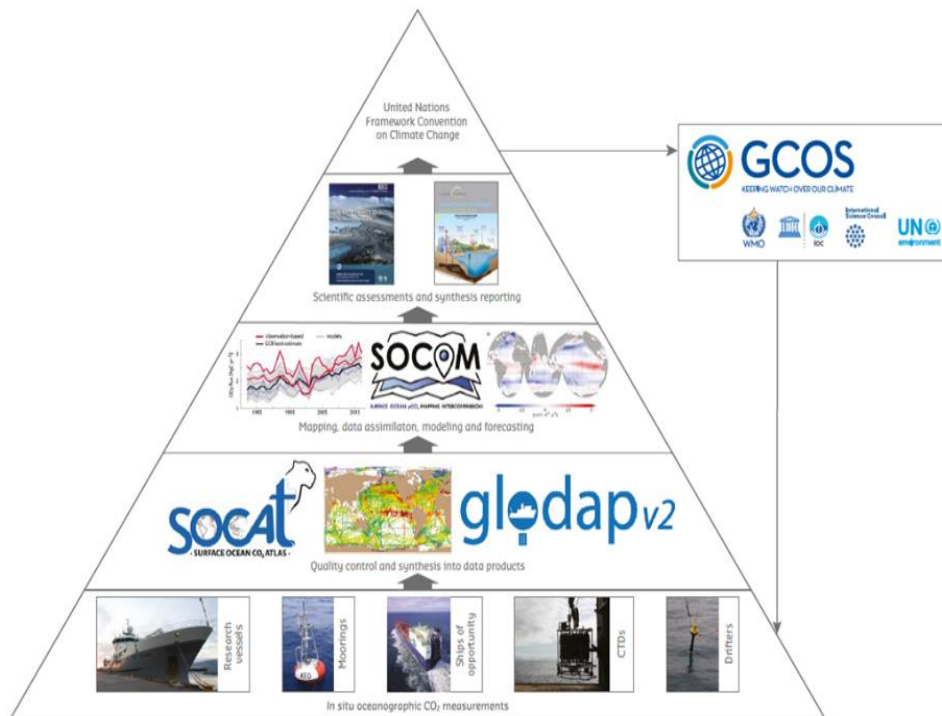
CO₂ Flux Map



Require system to monitor ocean C uptake and report it to decision makers in support of climate negotiations

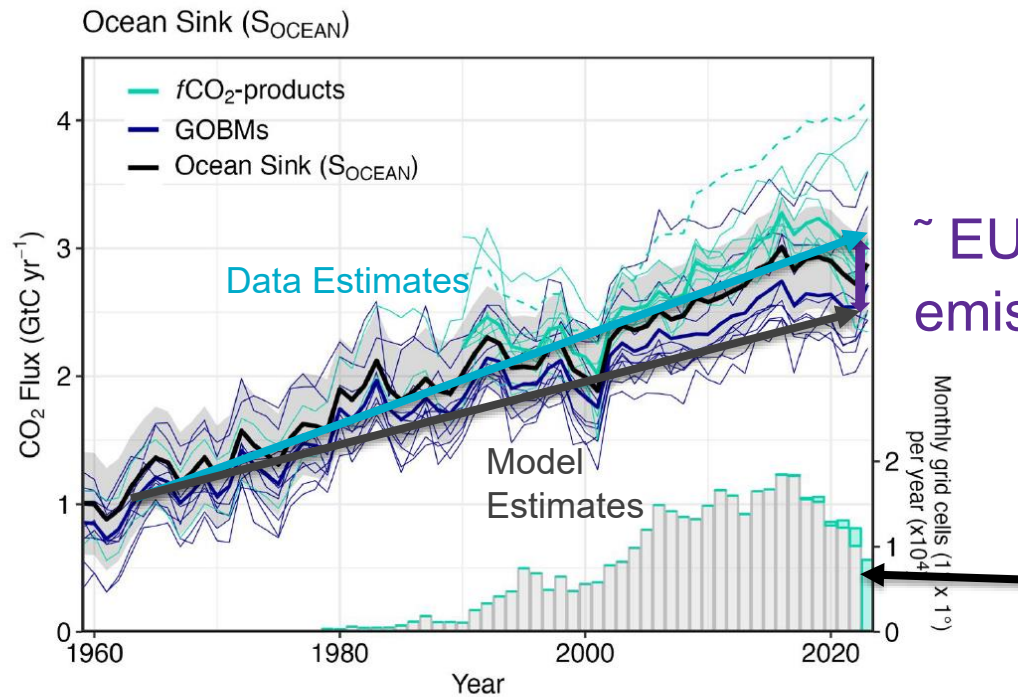


The Ocean C Value Chain



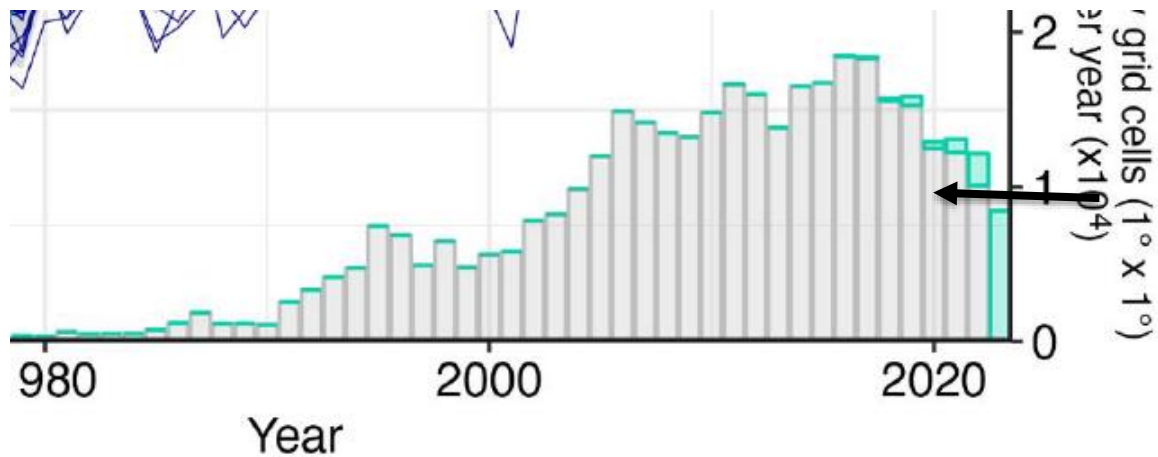
- The Ocean Carbon Value Chain (From Guidi et al., (2020) Big Data in Marine Science. Alexander, B., Heymans, J. J., Muñiz Piniella, A., Kellett, P., Coopman, J. [Eds.] Future Science Brief 6 of the European Marine Board, Ostend, Belgium. ISSN: 2593-5232. ISBN: 9789492043931. DOI: 10.5281/zenodo.375579).

The challenge



Source: [SOCATv2023](#); [Bakker et al 2016](#); [Friedlingstein et al 2024](#); [Global Carbon Project 2024](#)

The challenge

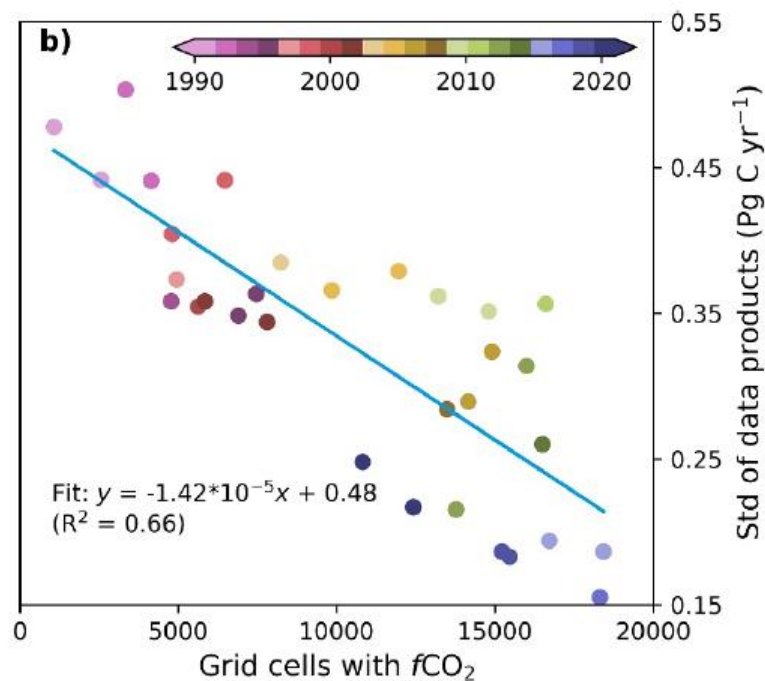


Amount of data,
50% reduction in last 5
years, now at 20 year
low.

[al 2016](#); [Friedlingstein et al 2024](#); [Global Carbon Project 2024](#)

Quality of advice linked to data quality,

- Number of grid cells with data inversely related to precision of uptake estimates
- More Data = Better advice
- Currently data has declined by ca. 50% in last 5 years
- We are coming blind to the factors driving the rate of climate change just when we need to see clearly



- The discounted net economic benefit of a putative 20-year scientific research program to narrow the range of uncertainty around the amount of carbon sequestered in the ocean is on the order of \$0.5 trillion (USD)
- 0.025 Trillion dollars per year is 25 000 million dollars per year
- Value is in cost avoidance: by knowing the likely future trajectory of climate better we can more precisely target our investments
- For reference the total cost to implement the WMO Global greenhouse gas watch is estimated at 250 million dollars per year.



The value of scientific research on the ocean's biological carbon pump

Di Jin ^{a,*}, Porter Hoagland ^a, Ken O. Buesseler ^b

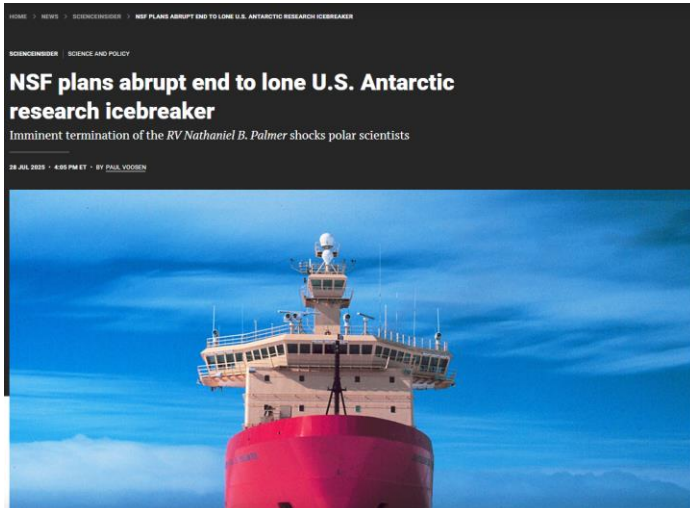
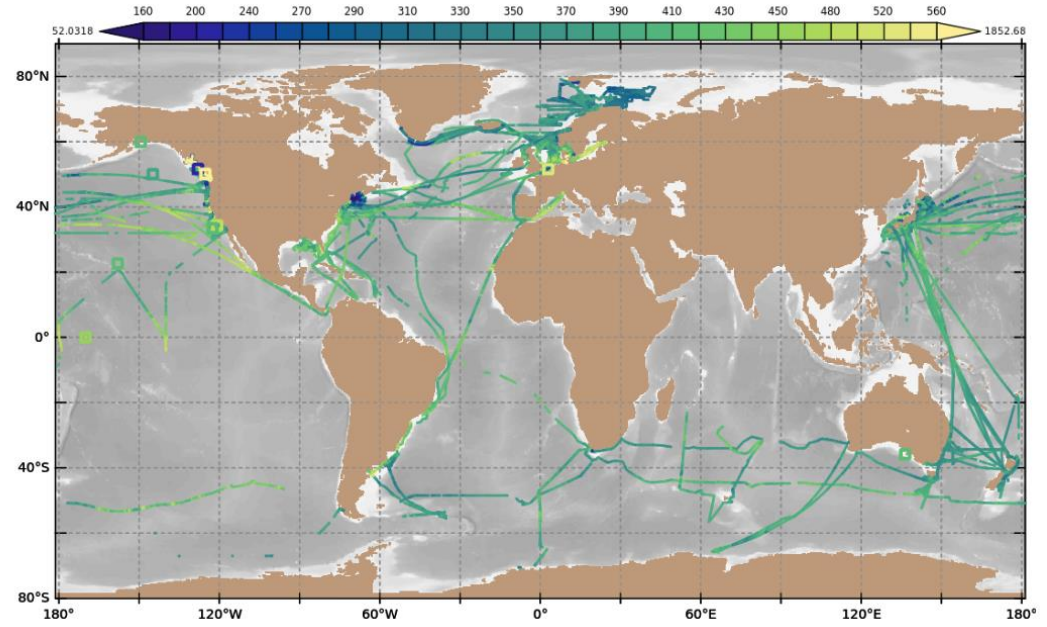
^a Marine Policy Center, Woods Hole Oceanographic Institution, Woods Hole, MA 02543, United States of America

^b Marine Chemistry & Geochemistry Department, Woods Hole Oceanographic Institution, Woods Hole, MA 02543, United States of America



Where do we need more data

- Pretty Much everywhere!
- Pacific
- South Atlantic
- Indian
- Arctic
- Southern



What We need to do

- Put systems on ships (and elsewhere), download and calibrate the data, report it to ICOS / SOCAT
- Use Autonomous Observations
- Work out how to integrate data from multiple networks
- Organise our networks better to give confidence to investors
- How will we organise, run, pay for, analyse these systems together?

Ocean components of G3W and the wider GOOS ocean carbon networks



The G3W



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Green light for global greenhouse gas tracking network



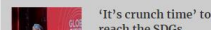
Unsplash/Johannes Plenio | Carbon dioxide levels and other greenhouse gas concentrations, continued at record levels, despite the economic slowdown caused by the COVID-19 pandemic.

24 May 2023 | Climate and Environment



A hundred and ninety-three countries have [unanimously approved](#) the creation of a global greenhouse gas monitoring mechanism, the World Meteorological Organization (WMO) announced on Wednesday.

RELATED STORIES



Community Response

Surface Ocean pCO₂ workshop,
6-9 November 2023, Oostende, Belgium,



Progress so far



The Global Ocean Observing System

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News

Three emerging observing networks join the Global Ocean Observing System

August 12, 2024

The Fishing Vessel Observing Network (FVON), Surface Ocean CO₂ Observing Network (SOCONET) and Science Monitoring And Reliable Telecommunications (SMART) Subsea Cables are three new emerging networks aiming to grow and contribute to the Global Ocean Observing System by providing sustained and interoperable ocean data to fill known gaps.

Community Response

welcome to the united nations

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Operationalising the Surface Ocean Carbon Value Chain

ICOS Ocean Thematic Centre (Non-governmental organization (NGO))
#OceanAction57443

Declaration on Operationalising Surface Ocean Carbon Value Chain

DESCRIPTION | SDG 14 TARGETS COVERED | DELIVERABLES & TIMELINE | RESOURCES MOBILIZED | PROGRESS REPORTS

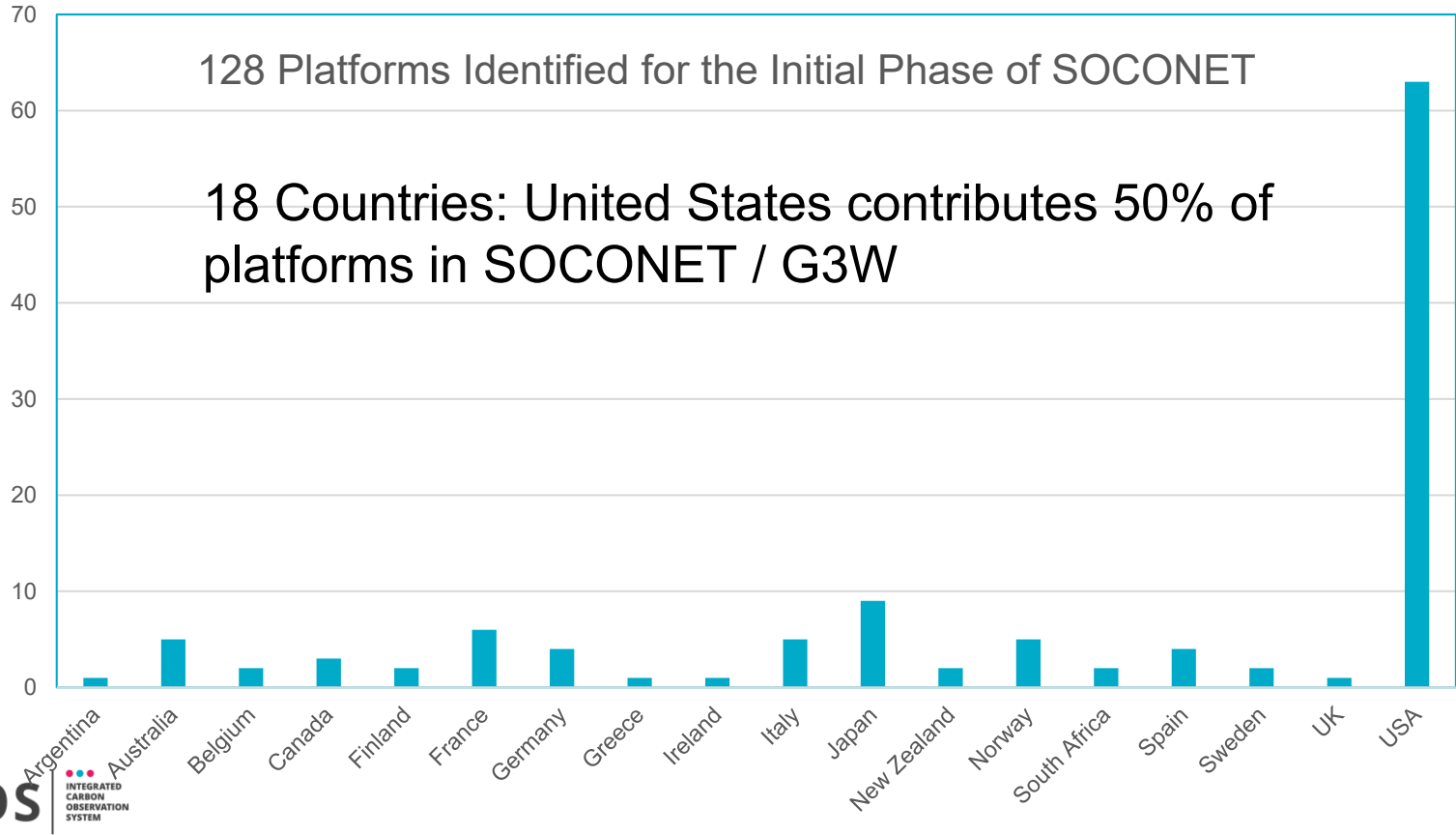
Description

The ocean is a key component of the Global Carbon Cycle, absorbing about a quarter of our CO₂ emissions, slowing climate change, and giving us time to implement mitigation, adaptation and CDR actions. Any reduction in this uptake will reduce the time available for us to adjust, leading to extra costs, hence there is a strong economic imperative to measure ocean uptake in near real time as part of the 'system of systems' needed for the global stocktake. This uptake is measured via the 'Ocean Carbon Value Chain' which links observing, data management and synthesis together to provide annual estimates of ocean uptake to the COP in support of policy making. However, this chain is weakening, with reductions in data availability leading to higher uncertainty in our estimates of ocean C

Action Network



Progress so far



Summary and suggested actions

- The Ocean takes up about 25% of the CO₂ emit
- Our best efforts to measure and model this do not agree, impeding evidence based policy making
- We need more data everywhere, and to be more organised
- Scientists have come together globally to define key next steps and needs
- We need funding agencies to step up
- Time is of the essence: 50% of the global network is supported by the US
- Talk to your scientific community, talk to your funding agencies
- Consider if you can host a system
- Rough cost is 150K Euros for 'gold standard' system plus 3 to 6 Mo per year pay
- Help is available with installations, data issues, standards training etc for modest costs if you are in Europe and your country is in ICOS.
- Overall, this is a fantastic opportunity for you to