Interactive dialogue talking points

Your Excellencies, Ladies and Gentlemen: It is a great honor for me to attend this timely and important gathering of the world community.

Please allow me to share few thoughts about an overarching theme I have heard often at this conference – *our shared responsibility to lead climate action and to protect the oceans*.

Specifically, I would like to develop three related ideas this morning:

- We must act now – CDR is required to stay under 1.5° warming
- Science must stay ahead of solutions - Announce the OVSN
- We must do this ethically and responsibly, beginning with a code of conduct on ocean CDR

1. We must act now

- IPCC AR6: "All paths limiting future warming to 1.5C require CDR"
- The ocean was seen as victim or villain, can be the hero
- Oceans take up 90% heating, 25% of carbon
- The ocean is the world's largest carbon reservoir: all emissions = 1%!
- How the oceans take up carbon - solubility and biologic pump
- Key – understanding ocean's ability to take up carbon naturally to be stored durably for centuries-millennia (get below 1000m)

- National Academies report (2021) – 6 different approaches
- A requirement for all of these approaches – be able to measure, monitor, verify carbon uptake and storage at the scale at which these processes occur in the ocean
- We cannot do this now: global observation systems (Argo) too coarse, lack sensing capabilities, C export flux uncertainty too high

2. Science must lead the way

- What is needed is a purpose-built ocean observing network that can observe with much greater precision and fidelity the ocean carbon, nutrient, and biomolecular fluxes that define the strength and efficiency of the ocean's movement of carbon from the surface to depth.
- Observe and report indicators of ocean heath and ecosystem vitality.
- What I am describing today is a capability society MUST HAVE regardless of who does it, indeed this is in invitation for international collaboration.
- An additional motivation for this is to protect the oceans: Ocean CDR is a potential multi-trillion carbon market. We need to monitor and understand is we are to manage such a complex undertaking.
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- OVSN - Today I am announcing our intention to begin this urgent & important work.

- I represent WHOI, the largest independent ocean science and engineering institution … 1000 science/tech/engineers marine operations
- What is OVSN?
  - Size – an "ocean data cube" twice the size of France, full ocean depth - What we intend to build is unlike anything we have today size, scope, or resolution
  - What - Always-on, always-connected, ocean internet of intelligent devices sensing ocean carbon and nutrient flows in the full ocean volume, ocean health and ecosystem indicators at the characteristic time and space scales of natural ocean processes.
  - How - Envision a network of moorings, gliders, floats, and intelligent autonomous vehicles. Powered communication hubs with 5G satellite data download, recharge for persistent remote observations. "Curious robots" that can talk to each other, exchange data, learn and track
  - We do this already – OOI, ARGO, OTZ … (full names)
  - Where? For now, in the nearby NW Atlantic, but can be deployed in any ocean.
  - Goal: Reduce our ocean carbon flux uncertainties by 1-2 orders of magnitude
  - What it will do: The OVSN will revolutionize our understanding of how ocean life transports carbon to the deep subsurface water,

efficiency of intentional CDR approaches and their impacts on ocean health and ecosystems.

- A collaborative ocean innovation sandbox
- Lead a new era of deep ocean exploration and discovery, while at the same time informing ocean CDR solutions
- Lead a new era of research inclusion, democratizing data, sharing of data and analysis tools
- Lastly, OVSN is bigger than any one institution. We will need partners – Scripps, Canada's Ocean Frontiers Institute. We need everyone.
- *OVSN will do for ocean science what the Hubble Space Telescope did for our appreciation of the cosmos.*

3. We must do this ethically and responsibly

- The need for a code of conduct !
- Yesterday, two articles were published in Nature Communications and WEF Forum on the need for responsible, inclusive research on ocean CDR. (Lead author Ken Beussler from WHOI.)
- Specifically, the ocean CDR code of conduct recommends that we:
  - Prioritize collective benefit for humankind and the environment
  - Establish clear lines of responsibility to oversee and permit studies
  - Commit to open and cooperative research, including risk assessments
  - Perform independent evaluation and assessment

- Involve the public and regional stakeholders in decision-making processes.

To conclude, I'd like to summarize my three main take away points:

1. **We, as a community, must act now** – CDR is required to stay under 1.5° warming
2. **Science must lead the way** - The OVSN will provide unprecendented observation platform for monitoring ocean carbon flows, ecosystem health, and assessing ocean CDR efficacy and impacts.
3. **We must do this ethically and responsibly** - The need for an inclusive, code of conduct framing ocean CDR research.

Thank you for your kind attention.