EO for UNFCCC Paris

Breakout 3c: Understanding the role of the oceans and polar regions as GHG sources and sinks

e.g. ocean circulation impact on the C sink; ocean biological carbon pump; permafrost emissions of CH_4, etc. (i.e. bottom-up)

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Some initial comments – Polar regions:

- Ice Sheets and glacier melt uncovers new land regions: organic materials known to be present under ice, but GHG release relatively small on shorter time scales ..
- Sea ice melt allow former ice covered oceans to exchange GHG with oceans ..

  Potential sink, gas hydrates potential source ..

- Permafrost thaw major joker: potential for large release of GHG's .. potential large source

  Examples of activities: GTN-P, ESA permafrost CCI, EU Nunataryuk, CENPERM Greenland ..)

Some initial comments – Oceans:

- The absorption of GHG in the ocean affects its acidity and has consequences on biodiversity.
- Do we have all needed information to know the GHG exchanges at the interfaces (ocean surface)?
- Permafrost thaw releases GHG and also contributes to sea level rise (to be quantified)
- Most of the energy on excess on the Earth is absorbed by the ocean: how this process will evolve in the future according to the amount of GHG?

3c: Understanding the role of the oceans and polar regions as GHG sources and sinks

Questions:

1. Identify case **studies based on existing work that illustrate how EO can already support the Paris** agreement.

2. Are there R&D case studies that may in the next 5-10 years lead to new types of actionable information supporting Paris Agreement goals?

3. How can the CCI community contribute to the first Global Stocktake in 2023? (i.e., ideas for projects in CCI+ Phase 2)

Identify case studies based on existing work that illustrate how EO can already support the Paris agreement.

Properties of permafrost: What is content of ice in soil, and potential for thaw? Link missing from soil content to GHG emission. Links to satellites not well-explored, need big step forward to link insitu-observations, ice fractions to satellite EO. Could potentially be similar to anthropogenic contributions to GHG, but very uncertain.

Glacier and ice sheet retreat effect very small, might be sink in more temperate regions due re-vegetation.

Q: Are we in need to make case for earth observations? Need information – EO and in-situ - from Arctic, especially Canada and Russia.

Ocean contribution to GHG emission – not known if it will be taken into account in GST. Here EO plays a key role. Subsea permafrost is completely lacking (EU project Nunataryuk estimate effect based on in-situ).

Southern ocean presumed to be sink for CO2, important to continue research.

For sea ice, the decay of sea-ice cover in the Arctic of course affects GHG, more ocean is exposed to the atmosphere. There are in addition chemical processes when sea-ice forms in winter that capture some atmospheric CO2. A large part is directly dumped to the ocean (brine), but some part stays in the ice and is released in summer melt. Sea ice moves, and as ice thins, there cold be less carbonates stored.

Are there R&D case studies that may in the next 5-10 years lead to new types of actionable information supporting Paris Agreement goals?

River plumes in the Arctic could be potential contributors linked to permafrost thaw, could be studied by EO. Estimate carbon fluxes by combining different CCI data (e.g. temperature, ocean colour, salinity, early snow melt etc.), could be pilot study.

Would increased storminess increase the ocean uptake of GHG? Both waves and coastal erosion could transfer carbon.

Sea ice frost flowers/sea-ice formation are a contribution to calcium carbonate. We might observe frost flowers with some satellite instruments. There might be indirect observations through atmospheric emissions (S5P).

There is generally a need to investigate the coupled system of the land ice/outlet glaciers, the adjacent ocean waters and the atmosphere.

How can the CCI community contribute to the first Global Stocktake in 2023? (i.e., ideas for

Pilot projects as mentioned in 2) could contribute. Need to look carefully on all interactions in polar regions.

Problem that Global Stock Take are contributed nationally, what about the open oceans? Ocean is a major heat sink, GHG uptake could be changed significantly by the open oceans.

/Sep 10, 2020: Jean-Francois Legais, René Forsberg and about 20 subgroup participants