CSQ-25 Summary

Question	Knowledge Advancement Objectives	Geophysical Observables	Measurement Requirements	Tools & Models	Policies / Benefits
How does the cryosphere impact on Polar ecosystems, and how is the changing climate altering these feedbacks?	Determine the impact of the cryosphere on Polar ecosystems, such as through freshwater input to the ocean.	● Freshwater input to the ocean from the cryosphere ● Ocean colour in the Polar-ocean and sea ice marginal zone ● Sediment plume location and frequency ● Primary productivity measurements ● Sea ice extent	Fine temporal (weekly) resolution, with enough sensitivity to measure change Multi-decadal record of change required over last 30-40-years, updating continuously high (100 m) spatial resolution for all components.	EO satellite datasets. Auxiliary data including ocean bathymetry in the polar regions. Polar ecosystem counts (e.g. number of seals and penguins)	Climate change adaptation and mitigation policy. IPCC monitoring. Foreign commonwealth fisheries and ecological monitoring. Polar region treaties (e.g. Antarctic treaty)
	Measure how change in the polar regions is impacting these feedbacks, e.g. through nutrient cycling and primary productivity.	As above.	As above.	As above.	

CSQ-25 Narrative:

Ice mass loss from the cryosphere delivers large volumes of cold freshwater input, and nutrients into the ocean. These freshwater inputs are visible as meltwater plumes around the ice sheets and marine terminating glaciers and ice caps, and may also cause change in the nutrient content of proglacial lakes on land terminating ice regions. In the ocean, these meltwater plumes serve as an important source of nutrients, driving the formation of algal blooms which are observable themselves from multi-spectral optical images, which in-turn are a source of food for krill. As the food chain goes up, krill are a vital source of protein for many larger mammals including whales, seals, fish and penguins, supporting the whole of the Polar ecosystem. As ice mass loss increases over time, the freshwater input to the oceans is changing, which may also alter the primary productivity of our oceans. Other polar datasets such as sea ice, provide an important habitat that breeding populations of penguins live on in the Antarctic, and polar bears hunt on in the Arctic. As sea ice extent and thickness change over time, this will impact these populations, and these changes must be monitored by satellite measurements (Fretwell et al., 2021).

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