

The cryosphere influences Earth's albedo: let's chill!

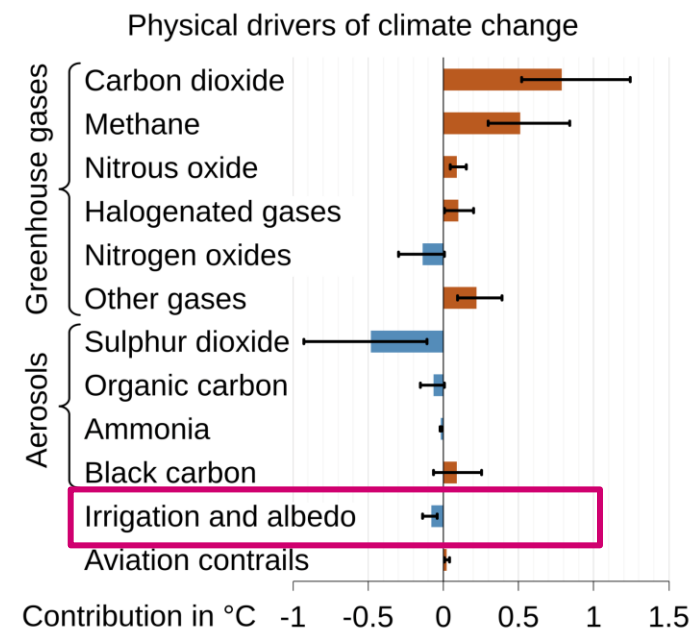
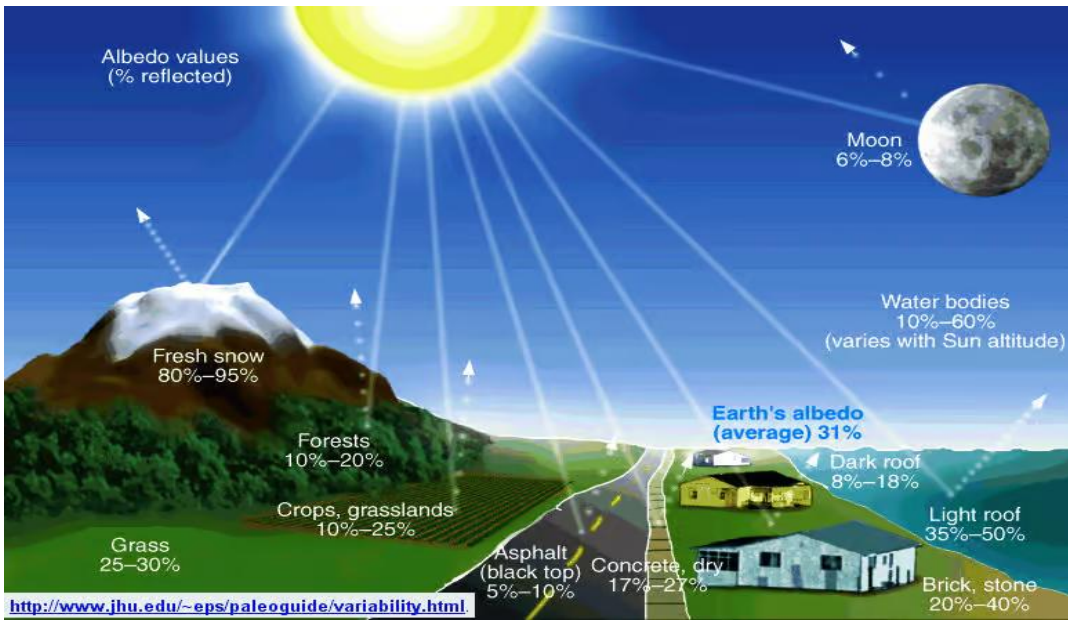


Snow : 90%
ice : 60% - 90%

VS

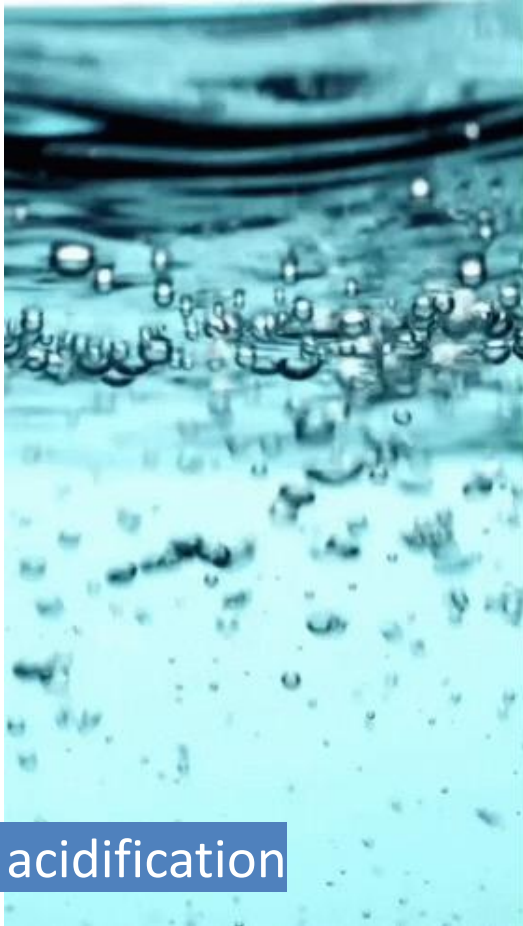
Ocean 10% - 15%
Earth: 31% (average;
asphalt 10% - 15%)

Albedo : direct reflection of solar radiation



Source: https://en.wikipedia.org/wiki/Radiative_forcing#/media/File:Physical_Drivers_of_climate_change.svg

What are the key consequences of atmospheric CO2 concentration increase and warming climate on the ocean & cryosphere?



Ocean acidification

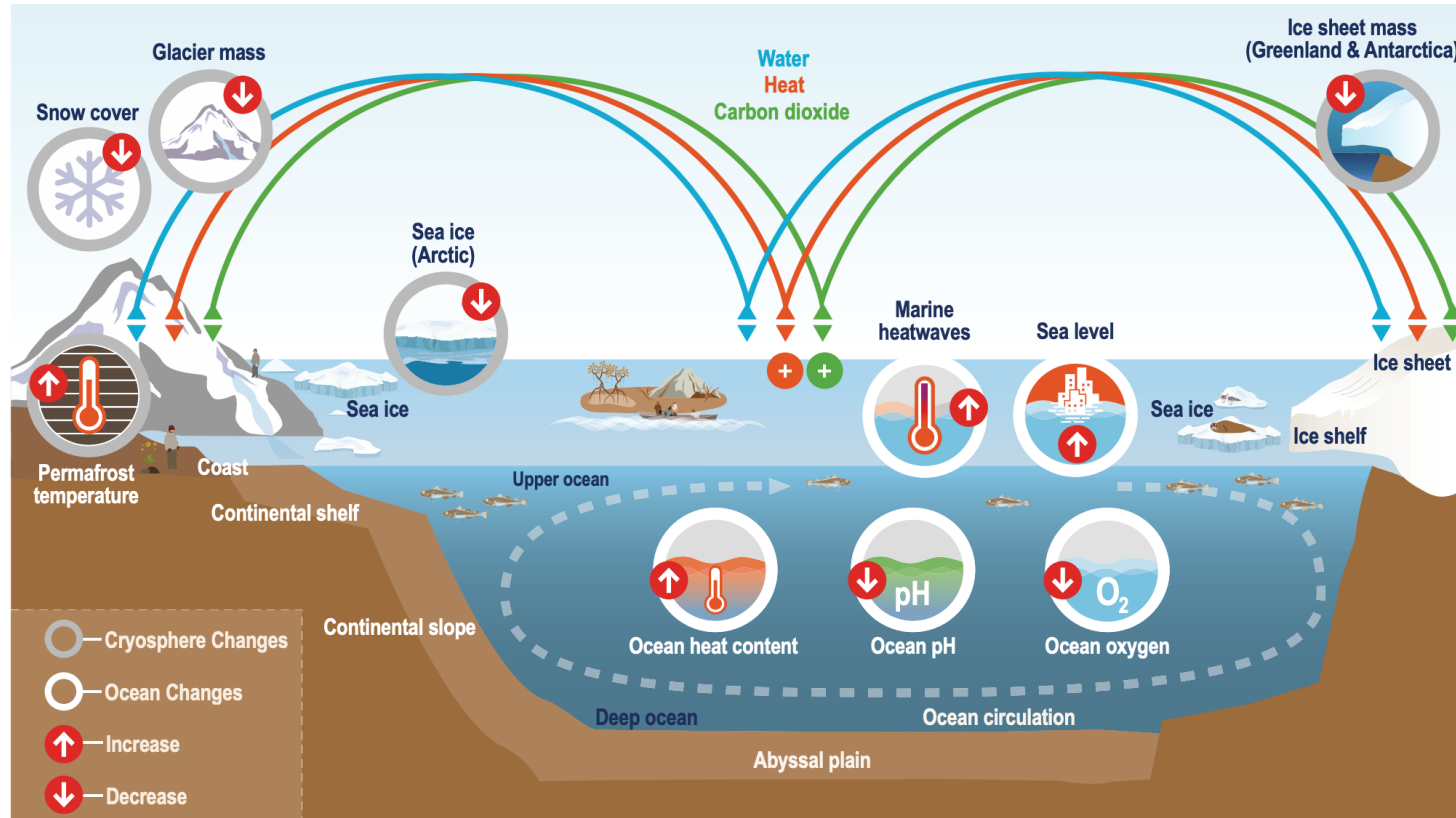
Sea level rise



Temperature increase



Consequences of climate change on the Ocean and Cryosphere

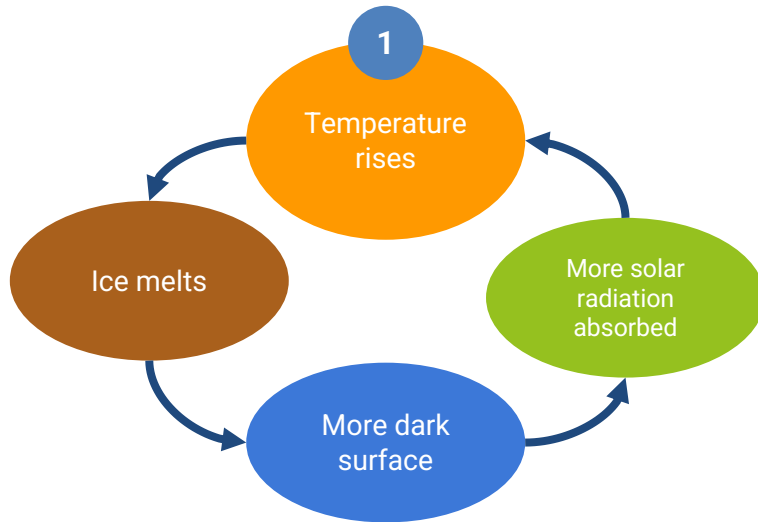


Physical and biological parameters change:

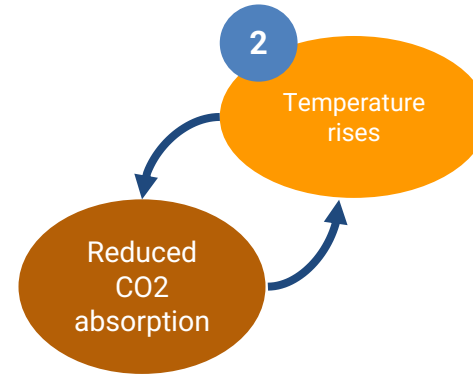
- Retraction of snow and ice sheet mass: ↘ albedo, sea level rise
- Melting of permafrost: GHG [CH₄ (methane) emissions]
- Increase of surface water temperatures, marine heatwaves: impact on biodiversity, ↘ CO₂ absorbed
- Change in thermohaline circulation, acidification: impact on biodiversity

Positive feedback loops will make it worse!

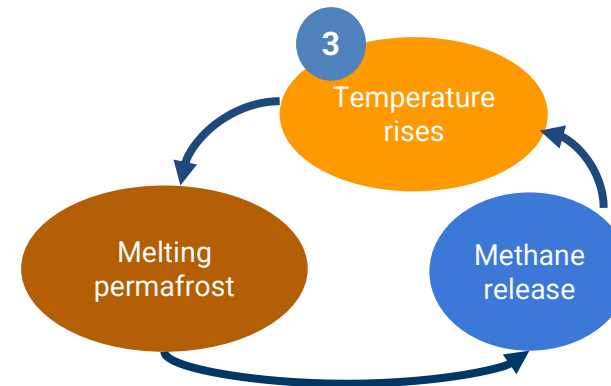
Ice-albedo feedback



Albedo effect decreases as climate warms



Carbon store is sensitive to climate warming



CO₂eq concentration, ocean acidification & sea level rise

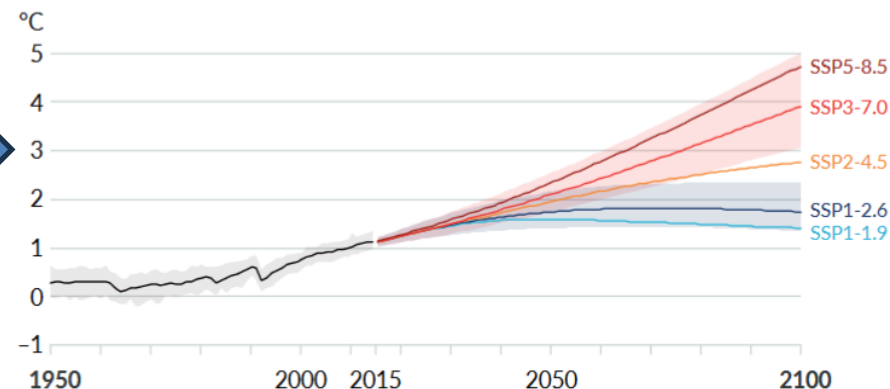
SSP: Shared Socioeconomic Pathways

SSP5-8.5 & SSP3-7.0 : SSPs spanning between 5.0 - 8.5 (very high GHG emissions: CO₂ emissions triple by 2075) & 3.0 – 7.0 W/m² of radiative forcing GHG emissions (CO₂ emissions double by 2100), respectively

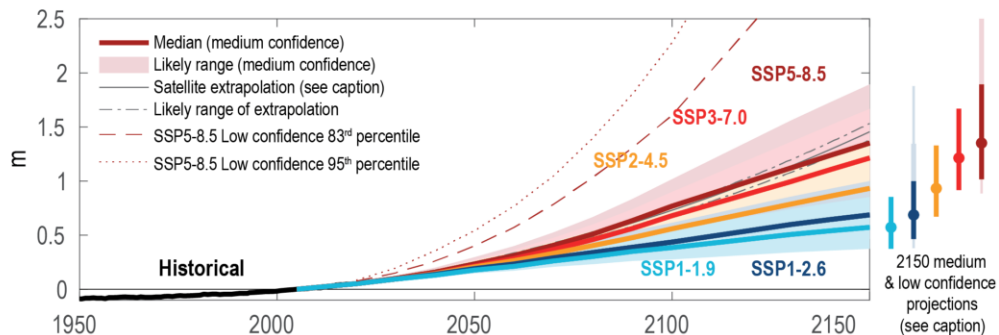
SSP2-4.5 : CO₂ emissions around current levels until 2050, then falling but not reaching net zero by 2100 (**2°C in 2050 and 2,7°C in 2100**)

SSP1-2.6 et **SSP1-1.9** : low, and very low GHG emissions with net zero reached in 2025, or 2075, respectively (compatible with Paris Agreements)

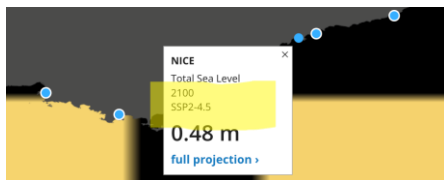
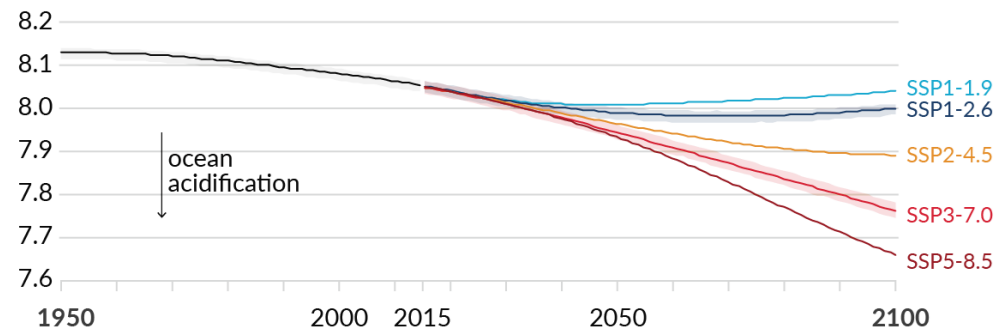
(a) Global surface temperature change relative to 1850–1900



Projected global mean sea level rise under different SSP scenarios



Average acidity of oceanic water



Conclusion ...

The interrelations between ocean / cryosphere and the climate are **complex** and **numerous**

- The ocean plays a crucial role in regulating the climate of continents
- The increase in atmospheric GHG and global warming are modifying the physical and biological parameters of this complex machinery
 - Threat to marine life (acidification, increased sea temperatures)
 - Sea level rise
 - Retraction of snow and ice sheet mass
 - Positive feedback loops make it worse, and add prediction uncertainty



How to communicate this complex science?



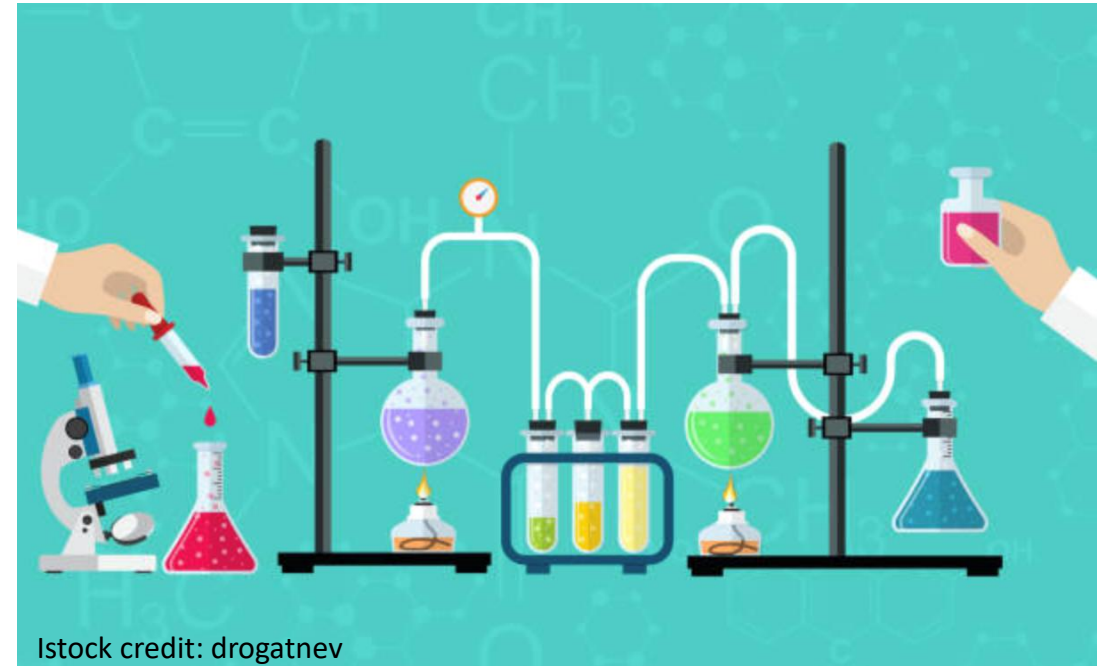


Inspire

voices of Ocean action



- ✓ Let's focus:
acidification and biodiversity loss,
sea level rise
- ✓ Let's play and experiment with
vinegar, pH indicator paper, ice
cubes, stones



Istock credit: drogatnev



Inspire

voices of Ocean action



1 Tap water vs sparkling water: which one is the most *acid*?



2 What is the effect of acidity on an *eggshell* (calcium carbonate)?



3 What is the source of *sea level rise*?





Inspire

voices of Ocean action



Feedback from the team:



The public participates and is **ENGAGED**



Seeing the experiment, even if basic, makes it **TRUE**



Experimenting helps **ANCHORING** the information



The “mini-TP” (mini experiments)
were first launched in May 2024

Used in >10 workshops and schools,
with >100 participants

More to come ...





Inspire

voices of
Ocean action

THANK YOU

