

ESA CLIMATE CHANGE INITIATIVE - CRYOSPHERE SATELLITE DATA RECORDS FOR ESSENTIAL CLIMATE VARIABLES



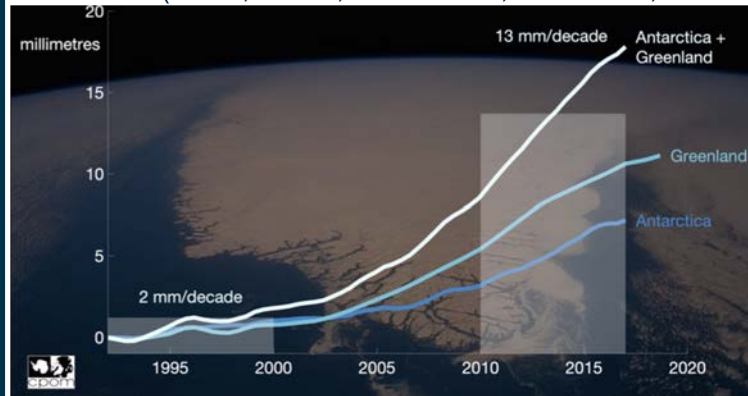
ESA Climate Change Initiative

The European Space Agency's Climate Change Initiative (CCI) is leading efforts to generate global, long-term and stable satellite-derived time series for 21 Essential Climate Variables (ECVs). These observational datasets enable scientists to identify climate trends, test models to predict future change and inform decision pathways towards meeting the goals of the Paris Agreement. ESA is improving existing satellite-derived Climate Data Records for the cryospheric-ECVs on **Ice Sheets**, **Sea Ice** and **Glaciers**. New **Permafrost** and **Snow** datasets are now also available from the CCI Open Data Portal. Visit climate.esa.int/data.



ICE SHEETS responsible for 1/3 of all sea level rise

CCI R&D improves Antarctic and Greenland ice sheet mass loss estimates. The rate of mass loss has changed from 2 mm/decade in the 1990s, accelerating six-fold to 13 mm/decade in the past five years. This is pushing sea level up by 17.7 mm, tracking the IPCC's worst-case climate warming scenario that predicts an additional mean contribution of 179 mm by 2100. This scenario would put 44-66 million people at risk to annual coastal flooding. (IMBIE, Nature, 2019 & 2020; Slater *et al.*, Nat. Clim. Change. 2020)



Antarctica and Greenland contribution to global sea level rise

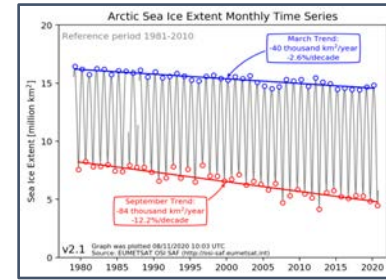
SEA ICE – continued decline

Arctic Sea Ice extent continues to decline.

September trend:

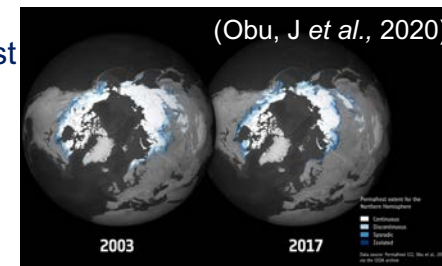
- 84,000 km²/year
- (-12.2%/decade)

EUMETSAT OSI SAF Sea Ice Concentration data with R&D input from CCI (1979-2020)



PERMAFROST – monitoring at scale

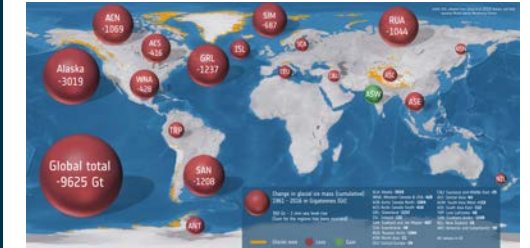
Greenhouse gas emissions from thawing Arctic permafrost are a major source of climate uncertainty. CCI R&D on EO data assimilation will enable the permafrost ECV to be monitored at scale.



(Obu, J *et al.*, 2020)

GLACIER mass loss (1961-2016)

9,625 Gt of ice lost globally. CCI's space-based ECV of glacier mass loss supports attribution assessments of sea level rise.



SNOW – first reliable snow mass estimate (1980-2018)

Annual maximum NH snow mass estimate narrowed to 3062 ± 35 Gt using 39-years of satellite data.

Pulliainen *et al.*, Nature, 2020