

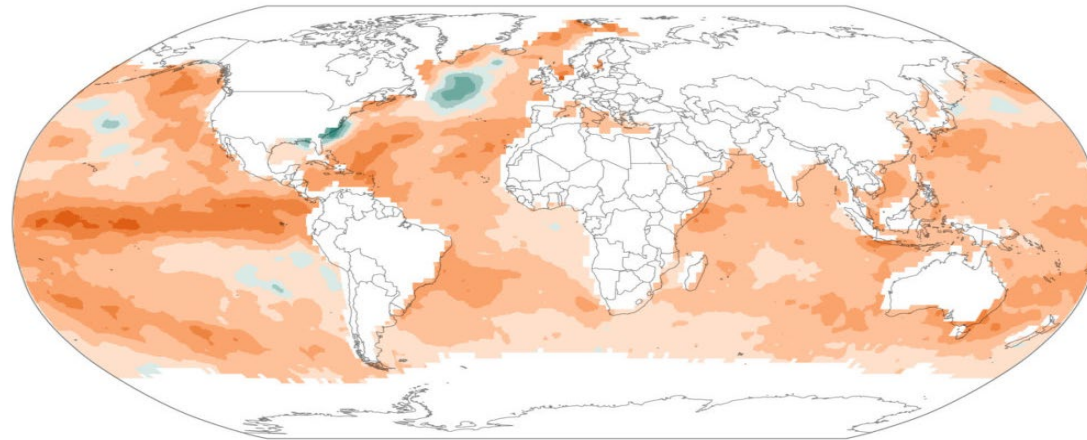
# Agora Session: Earth System Science

High level Scientific Challenges and Opportunities: Ocean

Global warming - Climate change - Loss of Biodiversity - Acidification - Pollution - Microplastic - Overfishing



Extremes - Marine heat waves - Sea level rise - Sea ice area/volume decline



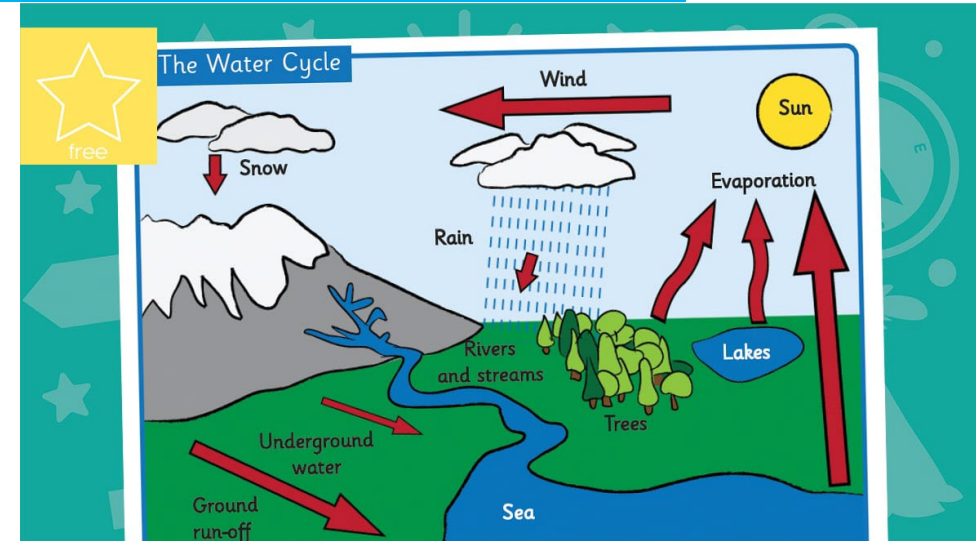
Number of heat wave days 1987-2016 versus 1925-1954. Orange-red indicate 18-36 more days.

Source: *Nature Climate Change* | By *The New York Times*.

# Agora Session: Earth System Science

## High level Scientific Challenges and Opportunities: CYCLES

- Carbon Cycle
- Energy Cycle
- Water Cycle



Movement of water between:

- oceans, seas, lakes, rivers, artificial reservoirs;
- atmospheric water (water vapor, clouds);
- subsurface water (soil moisture, groundwater);
- frozen water (glaciers, ice sheets, sea ice, snow, permafrost);
- biosphere water (storages in vegetation).

Key fluxes linking the storages :

- evaporation and sublimation;
- precipitation;
- Uptake/release in cryosphere, lakes, reservoirs/aquifers;
- surface water runoff;
- recharge and depletion of water bodies by humans.

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## High level Scientific Challenges and Opportunities: Ocean

Strengthening opportunities through Destination Earth and Digital Twin Ocean development.

In turn Observing System will improve and knowledge gaps be reduced.



**Collaboration between ESA (FutureEO) and the EC (Horizon Europe) is a key driver**

- Agree and Prioritize the Big Scientific Challenges;
- Co-design of programs and coordination of calls that strengthen satellite-based Earth System research and application in combination with advances in DTO