

ESA CLIMATE CHANGE INITIATIVE – TERRESTRIAL 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. Updates to Terrestrial ECVs include new global maps of **above ground biomass**, high resolution **land cover**, **lakes**, whilst global products for **land surface temperature** are under development. Continued R&D is improving the climate-quality records for **soil moisture**, **land cover**, and **fire disturbance**.

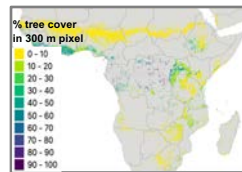


LAND COVER for carbon sink modelling

Accurate estimates of land use and land cover change are crucial to support the global stocktake process. The role of land for storing carbon and its future potential for offsetting carbon emissions is an area of active research. Modelling the interactions between vegetation, climate and greenhouse gases is supported by Earth observation datasets such as **CCI Land Cover** (1992-2019) at 300m and **High Resolution Land Cover** (10-30m) to quantify change consistently across countries.



CCI HRLC in Amazonia (above right panel) is produced by fusing Sentinel-2 (middle panel) with Sentinel-1 images at 10m. CCI LC shown (left panel) for comparison. New detail shows tributaries to the main river and urban area classes otherwise omitted.



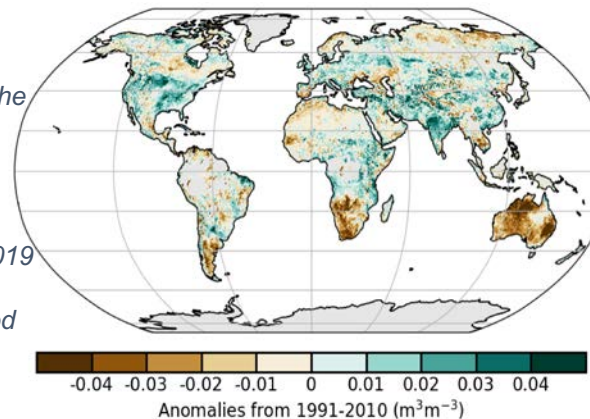
Consistent, annual plant functional type maps (1992-2019) are analysis-ready for climate modelling

SOIL MOISTURE - key climate indicator

As the longest satellite-based global climate record of **daily soil moisture** (1978-2019), the CCI record is used in annual state of the climate assessments. By BAMS and WMO, and is the basis for the Copernicus Climate Change Service operational soil moisture products.

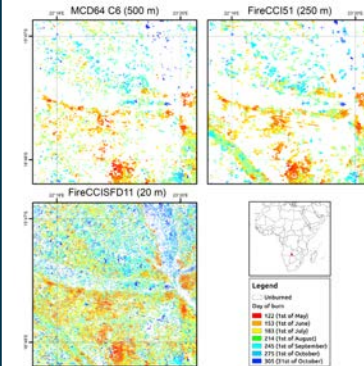
BAMS State of the Climate 2019

CCI v04.7 COMBINED anomalies for 2019 with respect to 1991-2010 period



Improving space detection of FIRE

New, higher resolution **Fire burned area** products covering Africa (from Sentinel-2) and the Amazon (from Sentinel-1) are available.



Over Africa 90% more small fires (<100 ha) were detected than the lower resolution MODIS products (500/250 m versus 20m)

(Ramo et al., 2020, PNAS, in review)