



Land Cover CCI+ Medium Resolution



Spatially explicit vegetation fractions for climate models:

A 29-year time series of annual Plant Functional Type (PFT) fraction maps through fusion of the CCI MRLC 300 m land cover dataset and existing high-resolution data products

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The CCI medium-resolution land cover (MRLC) product delineates 22 primary and 15 secondary classes of land cover at 300 meter resolution with global coverage and an annual time step extending from 1992. Previously, translation of the land cover classes into the plant functional types (PFTs) used by Earth system and land surface models required use of the CCI global cross-walking table that defines an invariant PFT fractional composition at pixel level for each land cover class. Here, we present a new data product that circumvents the need for a cross-walking table. We use a quantitative, globally consistent method that fuses the 300 m MRLC product with a suite of existing high-resolution datasets (Beck et al 2018, Hansen et al 2013, Pekel et al 2016, Pesaresi et al 2013, Potapov et al 2021) to develop spatially explicit annual maps of PFT fractional composition at 300 m. The new PFT product exhibits intraclass spatial variability in PFT fractional cover at the 300 m pixel level and is complementary to the MRLC maps since the derived PFT fractions maintain consistency with the original land cover class legend. This dataset is a major step forward towards ready-to-use PFT descriptions for climate modeling at the pixel level. For each of the 29 years, 14 new maps are produced (1 for each of 14 PFTs), with data values at 300 m resolution indicating the percentage cover (0–100%) of the PFT in the given year. An updated user tool assists in the creation of model-ready products to meet individual user needs (e.g., re-mapping, re-projection, PFT conversion, and spatial sub-setting).

22+ categorical land cover classes

- Cropland, rainfed
- Cropland irrigated / post-flooding
- Mosaic cropland / vegetation
- Mosaic vegetation / cropland
- Tree broadleaved evergreen
- Tree broadleaved deciduous
- Tree needleleaved evergreen
- Tree needleleaved deciduous
- Tree mixed leaf type
- Mosaic tree, shrub / HC
- Mosaic HC / tree, shrub
- Shrubland
- Grassland
- Lichens and mosses
- Sparse vegetation
- Tree flooded, fresh water
- Tree flooded, saline water
- Shrub or herbaceous flooded
- Urban areas
- Bare areas
- Water bodies
- Permanent snow and ice
- No data

29 years of annual maps

29 years of annual maps x 14 PFT fractions

Percentage cover (discrete 0–100%) of each PFT per 300 m pixel per year.

10 biotic types:

- Natural grass
- Managed grass
- Shrubs*
- Trees*

4 abiotic types:

- Water
- Permanent snow & ice
- Bare soil
- Built-up (urban)

* Differentiated as: broadleaved vs needleleaved and deciduous vs evergreen

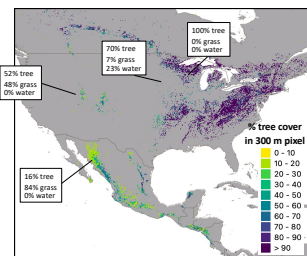
Product availability:

- 1992–2015 LC maps: maps.elie.ucl.ac.be/CCI/viewer/index.php
- 2016–2020 LC maps: climate.copernicus.eu
- 1992–2020 PFT maps (coming soon!):
 - maps.elie.ucl.ac.be/CCI/viewer/index.php
 - climate.esa.int/en/projects/land-cover/data/

The new PFT product exhibits spatial variability in PFT fractions within each land cover class

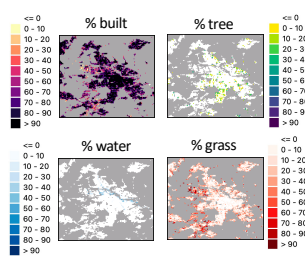
Land cover class: Broadleaved deciduous tree cover (>15%)

Improved tree, grass, and water cover fractions



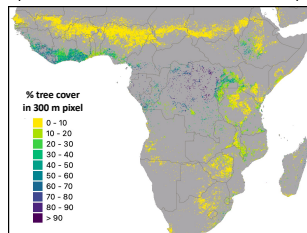
Land cover class: Urban

More realistic representation of urban PFT composition: built-up and urban trees, grass & water



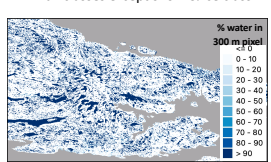
Land cover class: Rainfed cropland

Improved delineation of tree vs. herbaceous cropland



Inland water fraction

New PFT maps allow inland water fraction in all classes except snow & ice class

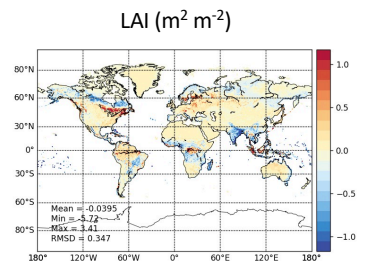


Updated "user tool" to create model-ready, user-specified PFT products:

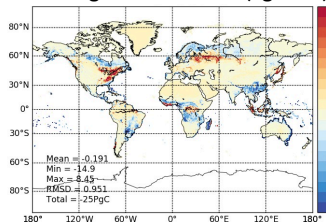
- Choice of spatial resolution & projection
- Conversion of PFTs
- Spatial sub-setting

Land-surface model simulations using the new PFT data product show significant differences relative to the global cross-walking table applied to the medium-resolution land cover maps.

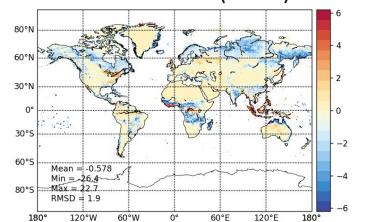
Figures: Annual means (2010–2019) from ORCHIDEE model calculated as simulated variable based on new PFT product minus simulated variable based on PFTs using global cross-walking table



Aboveground biomass (kgC m⁻²)



Latent heat flux (W m⁻²)



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