



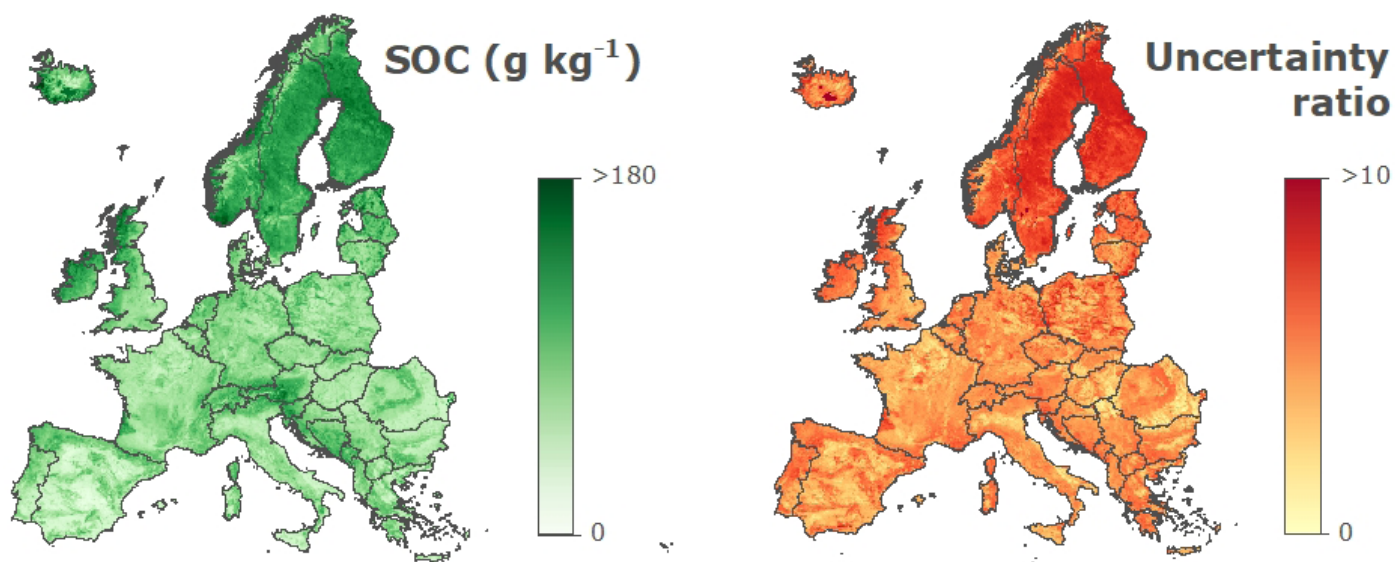
WORLD SOILS

Monitoring global topsoil using space
borne Earth observation data



EUROPEAN TOPSOIL SOC CONTENT AND UNCERTAINTY, 100M.

Product description	SOC content in the 0-20 cm top soil expressed in g kg^{-1} for 100 m resolution pixels
Methodology	Hybrid approach with separate models for permanently vegetated areas and croplands. Empirical models linking the SOC content in LUCAS sample points to spectra acquired by Sentinel 2 in corresponding pixel
Main applications	- First globally consistent and contiguous complete gridded soil property map of Europe - Indicator of soil health, as per Mission Area Soil Health and Food - By 2030, at least 75% of soils in each EU Member State should be in healthy condition or show a significant improvement towards meeting accepted thresholds of indicators, to support ecosystem services
Update frequency	Annual
Uncertainty	Prediction interval of the SOC content in the 0-20 cm topsoil per pixel, expressed as $(\text{P95}-\text{P5})/\text{median}$
Map reliability	More than 83 % of the cross-validation points fall within the 70% prediction interval for the bare soil model. For the vegetated area model 94 % of the points fall within the 90 % prediction interval
Format of product	Classification image in raster format (.tif) and metadata (.txt) Optional delivery online
EO data	High Resolution: Sentinel-2 imagery
Covariates	Copernicus DEM, climate data: ERA5
In situ data	Field soil data is required for the calibration and the validation process. Optimal data sets include: georeferenced soil samples with a standardized sampling and analysis protocol such as the LUCAS soil campaigns
Archive length	2016 – Present
Spatial resolution	100 m
Min. mapping unit	1 ha
Composites length	An interannual composite of images is required to ensure the selection of adequate pixels. Three years, e.g: 2018-2020, 2019-2021, 2020-2022
Spatial coverage	Use of global coverage input data. Customizable at local/regional set up
Validation	A cross validation
Delivery	Download via web browser https://gui.world-soils.com/
Metadata	OGC – EU INSPIRE Standard
Property rights	ESA



REGIONAL TOPSOIL SOC CONTENT AND UNCERTAINTY, 50M.

Product description	SOC content in the 0–20 cm top soil expressed in g kg^{-1} for 50 m resolution pixels
Methodology	Hybrid approach with separate models for permanently vegetated areas and croplands. Empirical models linking the SOC content in LUCAS sample points to spectra acquired by Sentinel 2 in corresponding pixel
Main applications	- Screening of impacts of land management on SOC contents and in the future their evolution - Regular reporting on the state of the soils. However, a threshold for each region with similar soils and land use would have to be defined
Update frequency	Annual
Uncertainty	Prediction interval of the SOC content in the 0–20 cm topsoil per pixel, expressed as $(\text{P95}-\text{P5})/\text{median}$
Map reliability	The reliability is expressed as the percentage of the sample points for which the reference SOC contents fall within the uncertainty range of the SOC prediction (based on the 2018–2020 map): 43 % for Wallonia (Belgium), 33% for the Czech Republic and 54 % for Macedonia (Greece)
Format of product	Classified image in raster format (.tif) and metadata (.txt)
EO data	High Resolution: Sentinel-2 imagery
Covariates	Copernicus DEM, climate data
In situ data	Field soil data is required for the calibration and the validation process. Optimal data sets include: geo-referenced soil samples with a standardized sampling and analysis protocol such as the LUCAS soil campaigns. Higher density data sets are available from the National Reporting Centers, currently used for the validation
Min. mapping unit	1 ha
Composites length	An interannual composite of images is required to ensure the selection of adequate pixels. The length of the composites is: 2018–2020; 2019–2021 and 2020–2022
Spatial coverage	Use of global coverage input data. Customizable to local/regional set up
Validation	Performed against an independent reference SOC dataset in agricultural soils provided by the National Reporting Centers on soils, distributed across agricultural land: - Wallonia: $\text{RMSE} = 7.95 \text{ g kg}^{-1}$; $\text{RPIQ} = 0.88$; $\text{bias} = -0.25 \text{ g kg}^{-1}$ - Czech Republic: $\text{RMSE} = 6.66 \text{ g kg}^{-1}$; $\text{RPIQ} = 0.95$; $\text{bias} = -0.31 \text{ g kg}^{-1}$ - Macedonia: $\text{RMSE} = 8.2 \text{ g kg}^{-1}$; $\text{RPIQ} = 0.71$; $\text{bias} = 2.92 \text{ g kg}^{-1}$
Delivery	Download via web browser https://gui.world-soils.com/
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