

## **Sentinel Time Series for Next-generation Copernicus High Resolution Layers on Agriculture and Grassland**

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*Keywords: agriculture; Copernicus; CLMS; Earth Observation; grassland; HRL; LCLU; Sentinel; time series analysis*

*Proposed session: “Environmental Compliance Assurance, ECA - GEOINT supporting environmental compliance assurance in rural areas.”*

The Copernicus Programme, headed by the European Commission (EC) in partnership with the European Space Agency (ESA), offers services mainly based on Earth Observation (EO) data provided by ESA through the Copernicus Space Component. As part of the Copernicus Land Monitoring Service (CLMS), the High Resolution Layers (HRLs) are different datasets that target land cover characteristics for 5 thematic areas (Imperviousness, Forest, Grassland, Water/Wetness, Small Woody Features). These layers are produced from multi-temporal EO data on 20 meter spatial resolution, in a consistent manner for 39 European countries (EEA 39) and with INSPIRE-compliant metadata.

Evolution of Copernicus Land Services based on Sentinel data – also called the ECoLaSS project – targets to improve existing and develop next-generation Copernicus Land Services with an implementation schedule from 2020 onwards, focusing on the HRLs. Innovative methods and algorithms, based on dense time series of optical (Sentinel-2) and radar (Sentinel-1) time series, are applied to create various prototypes of improved or novel HRLs. The datasets are accompanied by INSPIRE-compliant metadata, and are made publically available including respective documentation.

This study introduces the ECoLaSS project concept, including user and stakeholder requirements, processing methodologies and prototypes. A special focus is laid on the recently outlined and tested prototypes for potential future HRLs on agriculture or grassland, based on dense Sentinel-1 and -2 time series. On the one hand, the HRL Grassland has just finalized production for the reference year 2015, consisting of a grassland mask with an associated ploughing indicator going six years backwards in time. On the other hand, a possible future HRL on agricultural/arable land would be an entirely novel product consisting of a crop mask and crop type maps. A large site covering five countries: Germany, Austria, Switzerland, Liechtenstein and France is used to demonstrate the prototypes. The input data, pre-processing steps, temporal analysis methods and classification results are explained with a view on potential future Europe-wide implementation. An outlook indicates how ECoLaSS aims at updating Copernicus Land Services with higher temporal frequencies in the future, making use of dense Sentinel time series. As such, the Project offers monitoring techniques and satellite-derived datasets of relevance for Environmental Compliance Assurance.