

Metadata concerning the CLINF climate- and landscape data, disseminated via CLINF GIS.

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Kindly refer to the title, date, and list of authors provided above in all publications that utilise CLINF climate- and/or landscape data.

Introduction to CLINF climate- and landscape data

CLINF has collated and processed openly available satellite data-products in an attempt to cover the same thirty-year climate reference period that has been covered with diseases data. The basic idea is to use the climate- and landscape data in an attempt to statistically explain the spatiotemporal variation of diseases through the climate reference period. The identified statically models may thereafter be equipped with projected regressors, in order to predict future geographies of infectious diseases in the Arctic.

Three different data products have been collated by CLINF; ESA CSI, ERA Interim, and MODIS, all available via the Copernicus OPEN Access Hub (<https://scihub.copernicus.eu/>). ESA CSI contains highly resolved landcover information, ERA Interim contains meteorological and hydrological variables (“weather”), whereas MODIS contains variables that correlate with the density of chlorophyll (“greening”). Since these three different foci typically vary at different spatial and temporal scales, they are provided at different spatial and temporal scales.

Provided the primary spatial and temporal resolutions of CLINF climate- and landscape data, the three remotely sensed products are scaled up onto the CLINF diseases report districts whereupon CLINF diseases data are provided. The exact method for up-scaling varies with the product, and is described as part of the detailed metadata provided below. In the temporal domain, the primary resolutions are scaled up onto years or months depending on their typical scale of variation, and even onto the sub-monthly scale in the case of “greening variables”. As a result, CLINF climate- and landscape data are adapted to the spatiotemporal scales of CLINF diseases data.

At Greenland and Iceland, only the coastal districts are represented with CLINF climate- and landscape data.

ESA CSI metadata

CLINF ESA CSI land-cover data are provided at the annual scale, with primary spatial resolution 0.002777778 arc-degrees which, provided the altitude of the sensor system, represents an on-ground resolution of approximately 300 meters. The CLINF variable values are provided as the proportion of primary raster cells that cover the respective diseases report districts with their center coordinate. Since the entire ground is covered with variables, the sum of proportions equals 1 (one) within every CLINF diseases report district. In the case of a primary temporal resolution higher than one year, land-cover variables are provided as annual average proportions.

CLINF ESA CSI land-cover data are provided with the variables Nation: [GRE = Greenland, ICE = Iceland, NOR = Norway, SWE = Sweden, FIN = Finland, RUS = Russia], District (see separate list of CLINF diseases report districts), District code (Distr_Code = official acronyms), Year, a number of columns containing land-cover proportions per District and Year (see Table 1), and the number of raster cells covering the respective diseases report districts (n).

ESA CSI data covers the period of 1992 to 2015.

Land_use_class	Descr
0	No Data
10	Cropland, rainfed
11	Herbaceous cover
12	Tree or shrub cover
20	Cropland, irrigated or post-flooding
30	Mosaic cropland (>50%) / natural vegetation (tree, shrub, herbaceous cover) (50%) / cropland (15%)
60	Tree cover, broadleaved, deciduous, closed to open (>15%)
61	Tree cover, broadleaved, deciduous, closed (>40%)
62	Tree cover, broadleaved, deciduous, open (15-40%)
70	Tree cover, needleleaved, evergreen, closed to open (>15%)
71	Tree cover, needleleaved, evergreen, closed (>40%)
72	Tree cover, needleleaved, evergreen, open (15-40%)
80	Tree cover, needleleaved, deciduous, closed to open (>15%)
81	Tree cover, needleleaved, deciduous, closed (>40%)
82	Tree cover, needleleaved, deciduous, open (15-40%)
90	Tree cover, mixed leaf type (broadleaved and needleleaved)
100	Mosaic tree and shrub (>50%) / herbaceous cover (<50%)
110	Mosaic herbaceous cover (>50%) / tree and shrub (<50%)
120	Shrubland
121	Evergreen shrubland
122	Deciduous shrubland
130	Grassland
140	Lichens and mosses
150	Sparse vegetation (tree, shrub, herbaceous cover) (<15%)
151	Sparse tree (<15%)
152	Sparse shrub (<15%)
153	Sparse herbaceous cover (<15%)
160	Tree cover, flooded, fresh or brakish water
170	Tree cover, flooded, saline water
180	Shrub or herbaceous cover, flooded, fresh/saline/brakish water
190	Urban areas
200	Bare areas
201	Consolidated bare areas
202	Unconsolidated bare areas
210	Water bodies
220	Permanent snow and ice

Table 1: List of ESA CSI land-cover variables

Plant Functional Types – PFTs’

The CLINF ESA CSI land-cover classes have been combined into so called Plant Functional Types (PFTs’, see Poulter at al., 2015) in accordance with two different schemes, Generic and Biome PFTs’. The objective of this is to upscale from the relatively highly resolved classification of the primary ESA CSI data to combinations of classes that correlate better with standard classifications of ecological biomes and niches. CLINF PFT data provides information regarding the percentage [0, 100] of the respective PFT classes per District and Year, see Table 2.

Generic PFT's:				
Class	Descr			
G_TBE	Tree_Broadleaf_Evergreen			
G_TBD	Tree_Broadleaf_Deciduous			
G_TNE	Tree_Needleleaf_Evergreen			
G_TND	Tree_Needleleaf_Deciduous			
G_SBE	Shrub_Broadleaf_Evergreen			
G_SBD	Shrub_Broadleaf_Deciduous			
G_SNE	Shrub_Needleleaf_Evergreen			
G_SND	Shrub_Needleleaf_Deciduous			
G_NG	Natural_Grass			
G_MG	Managed_Grass			
G_Mos	Mosses			
G_BS	Bare_soil			
G_SV	Sparse_Vegetation			
G_Wat	Water			
G_SI	Snow_Ice			
G_Urb	Urban			
Biome PFT's:				
Class	Descr			
B_BG	Bare_ground			
B_TrBE	Tropical_broadleaf_evergreen			
B_TrBR	Tropical_broadleaf_raingreen			
B_TNE	Temperate_needleleaf_evergreen			
B_TBE	Temperate_broadleaf_evergreen			
B_TBS	Temperate_broadleaf_summergreen			
B_BNE	Boreal_needleleaf_evergreen			
B_BBS	Boreal_broadleaf_summergreen			
B_BND	Boreal_needleleaf_deciduous			
B_C3Gr	C3_grass			
B_C4Gr	C4_grass			
B_C3Ag	C3_agriculture			
B_C4Ag	C4_agriculture			
B_ML	Moss_lichen			
B_BBSh	Boreal_broadleaf_shrubs			

Table 2: List of ESA CSI Plant Functional Types

See Poulter et al. 2015 for information regarding the conversion of ESA CSI landcover data to Plant Functional Types:

Poulter et al., 2015: Plant functional type classification for earth system models: results from the European Space Agency's Land Cover Climate Change Initiative. - Geoscientific Model Development 8, p. 2315 - 2328.

ERA Interim metadata

CLINF ERA Interim "weather data" are provided at a monthly scale, with primary spatial resolution 0.75 arc-degrees which, provided the altitude of the sensor system, represents an on-ground resolution of 28 to 47 kilometres depending on longitude, and 83 km in the latitudinal direction. The CLINF climate- and landscape variable values are provided as the monthly average primary observation weighted by the proportion of primary raster cells that cover the respective diseases report districts (with their center coordinate). Since the entire ground is covered with variables, the sum of proportions equals 1 (one) within every CLINF diseases report district.

CLINF ERA Interim "weather data" are provided with the variables Nation: [GRE = Greenland, ICE = Iceland, NOR = Norway, SWE = Sweden, FIN = Finland, RUS = Russia], District (see separate list of CLINF diseases report districts), District code (Distr_Code = official acronyms), Year, Month, a number

of columns containing variable values per District and Month (see Table 3), the number of raster cells covering the respective diseases report districts (n), and the sum of cell proportions covering the respective diseases report districts (nw). Besides the primary weighted average variable values, every variable is presented with its weighted standard deviation (XXX_std), its minimum value (XXX_min), and its maximum value (XXX_max). The minimum and maximum values represent the respective values of a single pixel through the monthly variation of the variable.

ERA Interim data covers the period of 1979 to 2016.

Class	Descr	Unit
CI	Sea-ice_cover_surface	{0.-.1}
SWVL1	Volumetric_soil_water_layer_1_layer_between_two_depths_below_surface_layer	m3.m-3
SWVL2	Volumetric_soil_water_layer_2_layer_between_two_depths_below_surface_layer	m3.m-4
SWVL3	Volumetric_soil_water_layer_3_layer_between_two_depths_below_surface_layer	m3.m-5
SWVL4	Volumetric_soil_water_layer_4_layer_between_two_depths_below_surface_layer	m3.m-6
SMLT	Snowmelt_surface	m.of.water
SP	Surface_pressure_surface	Pa
STL1	Soil_temperature_level_1_layer_between_two_depths_below_surface_layer	K
STL2	Soil_temperature_level_2_layer_between_two_depths_below_surface_layer	K
STL3	Soil_temperature_level_3_layer_between_two_depths_below_surface_layer	K
STL4	Soil_temperature_level_4_layer_between_two_depths_below_surface_layer	K
SD	Snow_depth_surface	m.of.water.equivalent
MSL	Mean_sea_level_pressure_surface	Pa
10U	10_metre_U_wind_component_surface	m.s-1
10V	10_metre_V_wind_component_surface	m.s-2
2T	2_metre_temperature_surface	K
SSR	Surface_solar_radiation_surface	W.m-2.s
STR	Surface_thermal_radiation_surface	W.m-2.s
E	Evaporation_surface	m.of.water
SUND	Sunshine_duration_surface	s
RO	Runoff_surface	m
TP	Total_precipitation_surface	m

Table 3: List of ERA Interim “weather variables”

MODIS metadata

CLINF MODIS “greening data” are provided at monthly and sub-monthly scales, with primary spatial resolution 0.0090 arc-degrees which, provided the altitude of the sensor system, represents an on-ground resolution of 300 to 570 meters depending on longitude, and 1 km in the latitudinal direction. With MODIS reoccurring at any one position every eighth day, CLINF greening variable values are provided either as the monthly spatiotemporal average value across passages, or as single passage spatial snapshots. Either way, these averages are calculated across the primary raster cells that cover the respective diseases report districts with their center coordinate.

CLINF MODIS “greening data” are provided with the variables Nation: [GRE = Greenland, ICE = Iceland, NOR = Norway, SWE = Sweden, FIN = Finland, RUS = Russia], District (see separate list of CLINF diseases report districts), District code (Distr_Code = official acronyms), Year, Month, Day, and a number of columns containing variable values per District, Month, and Day. Besides the primary average variable values, every variable is presented with its standard deviation (XXX_std), its minimum value (XXX_min), and its maximum value (XXX_max). The monthly minimum and maximum values represent the respective values of a single pixel through the monthly variation of the variable.

Modis data covers the period of 2002 to 2016 – see Table 4.

Class	Descr	Unit
LAI	Leaf Area Index	
FPAR	Fraction of Photosynthetically Active Radiation	{0 ... 1}

Table 4: List of MODIS “greening variables”

Appendix 1

[CLINF diseases report districts](#) (simply click the hyperlink).