ECOCLIMAP

Surfex Course

14-16 october 2009

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Plan

- ECOCLIMAP: principle
- Technical aspects in SURFEX
- ECOCLIMAP I
- ECOCLIMAP II Europe
- ECOCLIMAP II Africa

A global database of surface parameters

- A land cover map at 1 km resolution in latlon projection
- **10-day period surface parameters**:

LAI, fraction of vegetation veg, roughness length, emissivity, albedo, minimum stomatal resistance rsmin...

Subdivisions of surface for description of land covers and calculation of surface parameters

4 surface tiles

NATURE
TOWN
WATER
SEA

12 natural functional types

NO (bare soil)
ROCK (bare rock)
SNOW (permanent SNOW and ice)
TREE (deciduous broadleaved forest)
CONI (evergreen needleleaved forest)
EVER (evergreen broadleaved forest)
C3 (C3 crops)
C4 (C4 crops)
IRR (irrigated crops)
GRAS (temperate /C3 grassland)
TROG (tropical /C4 grassland)
PARK (wetlands)

Description of covers in ECOCLIMAP: examples

COV1=100% SEA

COV2=100% WATER

COV7=60% TOWN + 40% NATURE ,
« NATURE » part composed of 50% PARK + 50% TREE

COV197=100% NATURE ,
composed of 40% CONI + 60% C3

…

⇒All combinations are possible among the 4 tiles and the 12 functional types inside the tile « NATURE »

Definition of surface parameters

- Some parameters are defined at **cover + functional type level**:
  - Some of the NATURE parameters: LAI, ground depths, heights of trees + irrigation parameters
  - TOWN parameters
- Other parameters are defined at **functional type level**:
  - Dependence on LAI or height of trees (fraction of vegetation veg, emissivity, roughness length)
  - Independence on LAI (albedos for vegetation, minimal stomatal resistance, coefficient of thermal inertia of vegetation, mesophylle conductance…)

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Composition of 1 cover
natural parameters initialized at cover + functional type level
example

COVER i

TOWN

WATER

SEA

NATURE

NO
LAI profile
soil depths

ROCK
LAI profile
soil depths

SNOW
LAI profile
soil depths

TREE
LAI profile
soil depths
Height of trees

CONI
LAI profile
soil depths
height of trees

EVER
LAI profile
soil depths
height of trees

C3
LAI profile
soil depths

C4
LAI profile
soil depths

IRR
LAI profile
soil depths
seeding date
reaping date
water supply
flag for irrigation

GRAS
LAI profile
soil depths

TROG
LAI profile
soil depths

PARK
LAI profile
soil depths

Definition of LAI profiles: example

Let a cover be composed of 100% of tile « NATURE », of which 50% TREE, 20% NO and 30% C3.

For each of the functional types present in the NATURE tile of this cover, **an individual annual Leaf Area Index (LAI) profile (10-day period : 36 values)** is defined.

- LAI profiles are defined for all 12 natural functional types of covers.
- LAI profiles of NO, ROCK and SNOW are always null in ECOCLIMAP.

Definition of root and total soil depths and of heights of trees

Let a cover be composed of 100% tile « NATURE », of which 50% TREE, 20% NO and 30% C3.

For <u>each of the functional types present</u> in the NATURE tile of this cover, a root depth and a total soil depth are defined, in meters.

For the <u>TREE part</u>, a height of tree is defined.

Root and total soil depths are defined for all 12 natural functional types. (Superficial soil depth is constant = 0.01m)

Heights of trees are defined for TREE, CONI and EVER types (= trees types).

Definition of irrigation parameters

Let a cover be composed of 100% tile « NATURE », of which **50% IRR** and 50% C4 crops.

For the « IRR » functional type of this cover, **4 specific parameters** are initialized:

- seeding date TSEED,
- reaping date TREAP,
- water supply WATSUP (mm),
- flag for irrigation IRRIG.

Definition of town parameters at cover level

COVER i, TOWN fraction not null

roughness length	building fraction	building height	building shape	street / canyon shape
ROOF	*ROAD*	*WALL*	*TRAFIC*	*INDUSTRY*
--------------- albedo -------------------			sensible heat flux	
-------------- emissivity ----------------				
-------------- heat capacity -------------			latent heat flux	
--------- thermal conductivity ---------				
--------------- depth -------------------				

NATURE parameters defined at functional type level <u>independent of LAI</u>

For a given functional type, these parameters keep **the same value in every cover**.

Their initialization relies on lookup tables.

Example for visible albedo of vegetation:

ALBVIS(NO)=0.1	ALBVIS(C3)=0.1
ALBVIS(ROCK)=0.1	ALBVIS(C4)=0.1
ALBVIS(SNOW)=0.1	ALBVIS(IRR)=0.1
ALBVIS(TREE)=0.05	ALBVIS(GRAS)=0.1
ALBVIS(CONI)=0.05	ALBVIS(TROG)=0.1
ALBVIS(EVER)=0.05	ALBVIS(PARK)=0.1

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NATURE parameters defined at functional type level dependant on LAI

	veg	ZH => Z0=max(0.001,0.13*max(0.001,ZH)	EMIS	ALBEDO
NO	0.	0.1	f3(veg,SNOW)	f4(veg,sand)
ROCK	0.	1.	f3(veg,SNOW)	f4(veg,sand)
SNOW	0.	0.01	f3(veg,SNOW)	f4(veg,sand)
TREE	0.95	Height of TREE	f3(veg,SNOW)	f4(veg,sand)
CONI	0.95	Height of CONI	f3(veg,SNOW)	f4(veg,sand)
EVER	0.99	Height of EVER	f3(veg,SNOW)	f4(veg,sand)
C3	f1(LAI)	min(1,exp((LAI-3.5)/1.3)))	f3(veg,SNOW)	f4(veg,sand)
C4	f1(LAI)	min(2.5,exp((LAI-3.5)/1.3)))	f3(veg,SNOW)	f4(veg,sand)
IRR	f1(LAI)	min(2.5,exp((LAI-3.5)/1.3)))	f3(veg,SNOW)	f4(veg,sand)
GRAS	0.95	LAI/6	f3(veg,SNOW)	f4(veg,sand)
TROG	0.95	LAI/6	f3(veg,SNOW)	f4(veg,sand)
PARK	0.95	LAI/6	f3(veg,SNOW)	f4(veg,sand)

f1(LAI)=1-exp(-0.6*LAI)

f3(veg,SNOW)=EMISVEG*veg+EMISSOIL(SNOW)*(1-veg)
f4(veg,sand)=ALBVEG*veg+ALBSOIL(sand)*(1-veg)

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Parameters calculation

- **Definition**: a ***patch*** is a grouping of functional types.

Grouping depens of total number of patchs wished by user.

- In SURFEX each patch is treated separately =>

ECOCLIMAP surface parameters are calculated separately **for each patch**

Aggregation of parameters is necessary, in relation with:

- Number of patchs chosen by user (if <12)
- Spatial resolution and projection chosen by user (if >1km)

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Grouping of functional types in **patchs**

Total number of patchs chosen by user

	12	11	10	9	8	7	6	5	4	3	2	1
NO	1	1	1	1	1	1	1	1	1	1	1	1
ROCK	2	2	1	1	1	1	1	1	1	1	1	1
SNOW	3	3	2	2	2	2	1	1	1	1	1	1
TREE	4	4	3	3	3	3	2	2	2	2	2	1
CONI	5	5	4	4	3	3	2	2	2	2	2	1
EVER	6	6	5	3	3	3	2	2	2	2	2	1
C3	7	7	6	5	4	4	3	3	3	3	1	1
C4	8	8	7	6	5	4	3	3	3	3	1	1
IRR	9	9	8	7	6	5	4	4	4	3	1	1
GRAS	10	10	9	8	7	6	5	5	3	3	1	1
TROG	11	10	9	8	7	6	5	5	3	3	1	1
PARK	12	11	10	9	8	7	6	4	4	3	1	1

ISBA standard can adopt the 12 possibilities

ISBA-AGS only runs with 12 patchs

Parameters aggregation process
<u>linked to number of patchs</u>

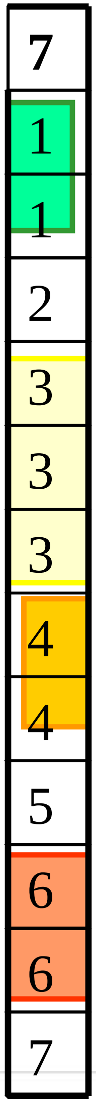
Number of patchs chosen by user is 7.

Let a cover be composed of 100% tile « NATURE »,

of which 30% TREE, 30% CONI, 40% GRAS.

This cover contributes to

- patch 3 : CONI+TREE+EVER at 60%
- patch 6: GRAS+TROG at 40%



In covers, fractions of natural **patchs** are <u>linearly</u> calculated from fractions of natural **functional types**.

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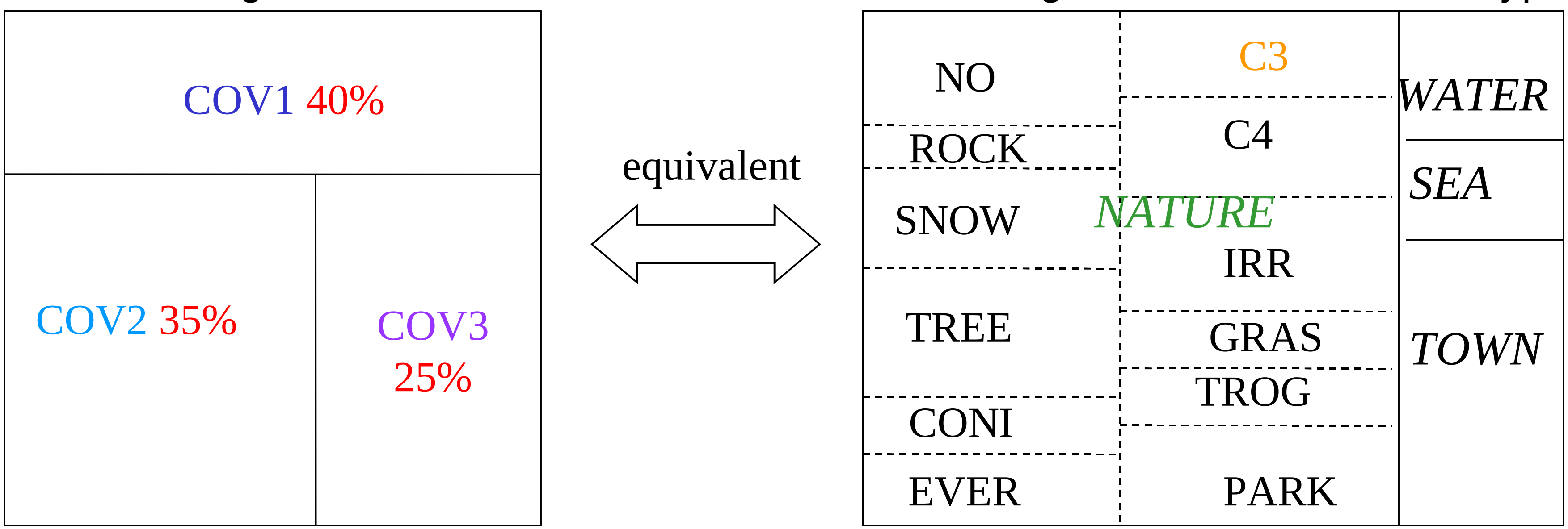
Parameters aggregation process linked to spatial resolution

1 grid POINT at coarser resolution than 1km

Fractioning in covers

Fractioning in tiles and functional types



Fractions of functional types in a grid point are linearly calculated, for example:

FRAC_C3(POINT) = 0.4*FRAC_NATURE(COV1)*FRAC_C3(COV1) + 0.35*FRAC_NATURE(COV2)*FRAC_C3(COV2) + 0.25*FRAC_NATURE(COV3)*FRAC_C3(COV3)

Parameters aggregation process
linked to spatial resolution

Surface parameters are aggregated same way (linear combination), in simple case, for example, for the C3 patch (**PAR_VAL** is « parameter value »):

PAR_VAL_C3(POINT) =

0.4*FRAC_NAT(COV1)*FRAC_C3(COV1)*PAR_VAL(C3,COV1) +

0.35*FRAC_NAT(COV2)*FRAC_C3(COV2)*PAR_VAL(C3,COV2) +

0.25*FRAC_NAT(COV3)*FRAC_C3(COV3)*PAR_VAL(C3,COV3)

If **PAR_VAL** calculation is independent of LAI or height of trees,

PAR_VAL_C3(POINT) = FRAC_C3(POINT) * PAR_VAL(C3)

Linear calculation

From correspondence table

Parameters are averaged on all covers present in grid point and weighted with :

Fraction of cover in grid point * fraction of nature in cover * fraction of patch in cover

Parameters aggregation process linked to spatial resolution: variants

Parameters can also be weighted with other coefficients than the fraction of tile « NATURE », according to their field of application:

- VEG, LAI, fraction of TREE / CONI / EVER, fraction of TOWN, fraction of building, fraction of street.

The mean applied is not always arithmetic, it can be :

- **opposite** : opposite of parameters values are added and the mean is the total number of added values on this sum.

  It concerns RSMIN (minimal stomatal resistance).
- **inverse of square logarithm**: 1 / ln(dz/PAR_VAL)**2 is the averaged quantity. DZ is the height of the first model mass level or 20m by default.

  It concerns Z0 (roughness lenght).

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Namelists associated to ECOCLIMAP in SURFEX

&NAM_FRAC   LECOCLIMAP=T / F

=> Flag to use ECOCLIMAP. Otherwise fractions of tiles are prescribed by user.

&NAM_COVER

YCOVER= name of the file containing the ECOCLIMAP land cover map.

YFILETYPE= DIRECT / BINLLV / BINLLF / ASCLLV => type of this file.

XRM_COVER= treshold fraction before which a cover is removed from a grid point.

XRM_COAST= limit of coast coverage under which the coast is replaced by sea or inland water in grid points.

XRM_LAKE= limit of inland lake coverage under which the water is removed from grid points.

XUNIF_COVER= fractions of covers prescribed by user. If set, YCOVER file isn't used.

&NAM_PGD_ARRANGE_COVER

LWATER_TO_NATURE = T / F

If T, all WATER fractions in covers become NATURE fractions.

LTOWN_TO_ROCK = T / F

If T, all TOWN fractions in covers become ROCK fractions in tile NATURE.

Additional namelist for the use of ECOCLIMAP II Europe

&NAM_ECOCLIMAP2

LCLIM_LAI= T / F

⇒ If .TRUE., mean LAI of 2002-2006 is used. Otherwise, the LAI corresponding to current year (if between 2002 and 2006) is used.

YIRRIG = irrigation file name. This irrigation file contains values of parameters for irrigation.

Other useful namelists
inputs / outputs

&NAM_DIAG_SURF_ATMn

LFRAC = T / F Flag to save in the output file the sea, inland water, town and nature fractions.

&NAM_WRITE_SURF_ATM

LNOWRITE_COVERS = T / F If true, do not write covers fractions in initial/restart files.

&NAM_IO_OFFLINE

LWRITE_COORD = T / F If true, latlon coordinates of grid points are written in ouput files.

&NAM_DIAG_ISBAn

LPGD = T / F flag to save in the ouput file the physiographic fiels of ISBA scheme computed from ECOCLIMAP data.

LPGD_FIX = T / F flag to save in the ouput file the physiographic fiels of ISBA scheme computed from ECOCLIMAP data and that don’t vary in time.

ECOCLIMAP in SURFEX

PGD step :

- Reading of ECOCLIMAP map
- For each Surfex grid point, definition of fractions of present covers => definition of Land / Sea mask
- Writing of fractions of covers by grid point in PGD output file

PREP step:

- Reading of PGD output file to get fractions of covers by grid point
- Writing of fractions of covers by grid point in PREP output file

(+ calculation and writing of surface parameters values if asked by user)

Model Run step:

- Reading of PREP output file to get fractions of covers by grid point
- Calculation of surface parameters values at initial time
- Update of surface parameters values at each time step
- Writing of surface parameters values is asked by user

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ECOCLIMAP files format

- ECOCLIMAP files consist of 2 files, [file name].dir and [file name].hdr.

The « .dir » is a binary file containing land cover map data in raster format.

The « .hdr » contains metadata:

Nodata value (0)

North domain limit in degrees (90)

South domain limit in degrees (-90)

West domain limit in degrees (-180)

East domain limit in degrees (180)

Number of rows (21600)

Number of columns (43200)

Record type (integer 8 bytes)

version	**Nom du fichier**
ECOCLIMAP-1.2	ecoclimats_v2 / ECOCLIMAP_I_GLOBAL
ECOCLIMAP-1.3 (special South West France)	ecoclimats_v3
ECOCLIMAP-2 Europe	ECOCLIMAP_II_EUROP

Other physiographic data needed by SURFEX

- **Orography**: GTOPO30 (USGS, U.S. Geological Survey) or user defined
- **clay fraction**: FAO (Food and Agriculture Organization) or user defined
- **sand fraction**: FAO or user defined
- **subgrid runoff coefficient**: user defined
- **subgrid drainage coefficient**: user defined

Namelists to define associated data files are **NAM_ZS** and **NAM_ISBA**.

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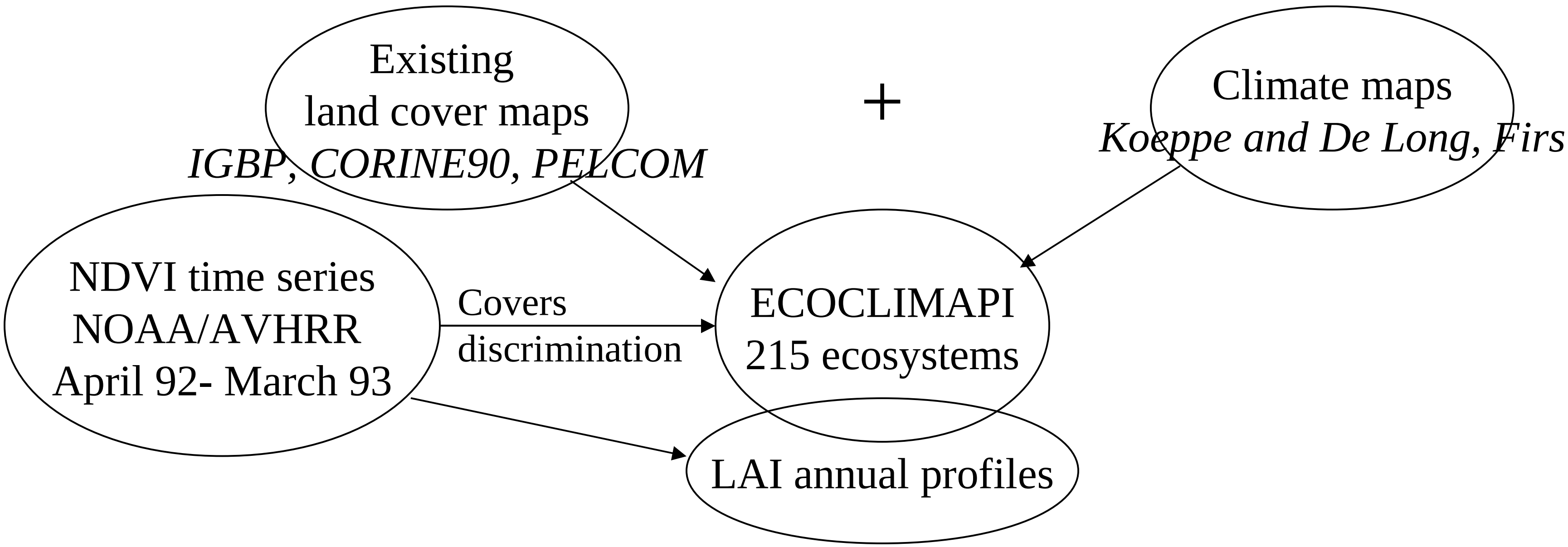
ECOCLIMAP I: realization



LAI profiles of covers are deduced from covers mean NDVI profiles through linear transformations, setting arbitrary LAImin and LAImax.

For mixed ecosystems (more than 1 functional type), the shapes of LAI profiles for the functional types are either the same inside one class, or taken from near pure ecosystems.

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ECOCLIMAP II: objectives

- Use more recent/accurate data concerning:
  - Land cover maps
  - Satellite NDVI time series

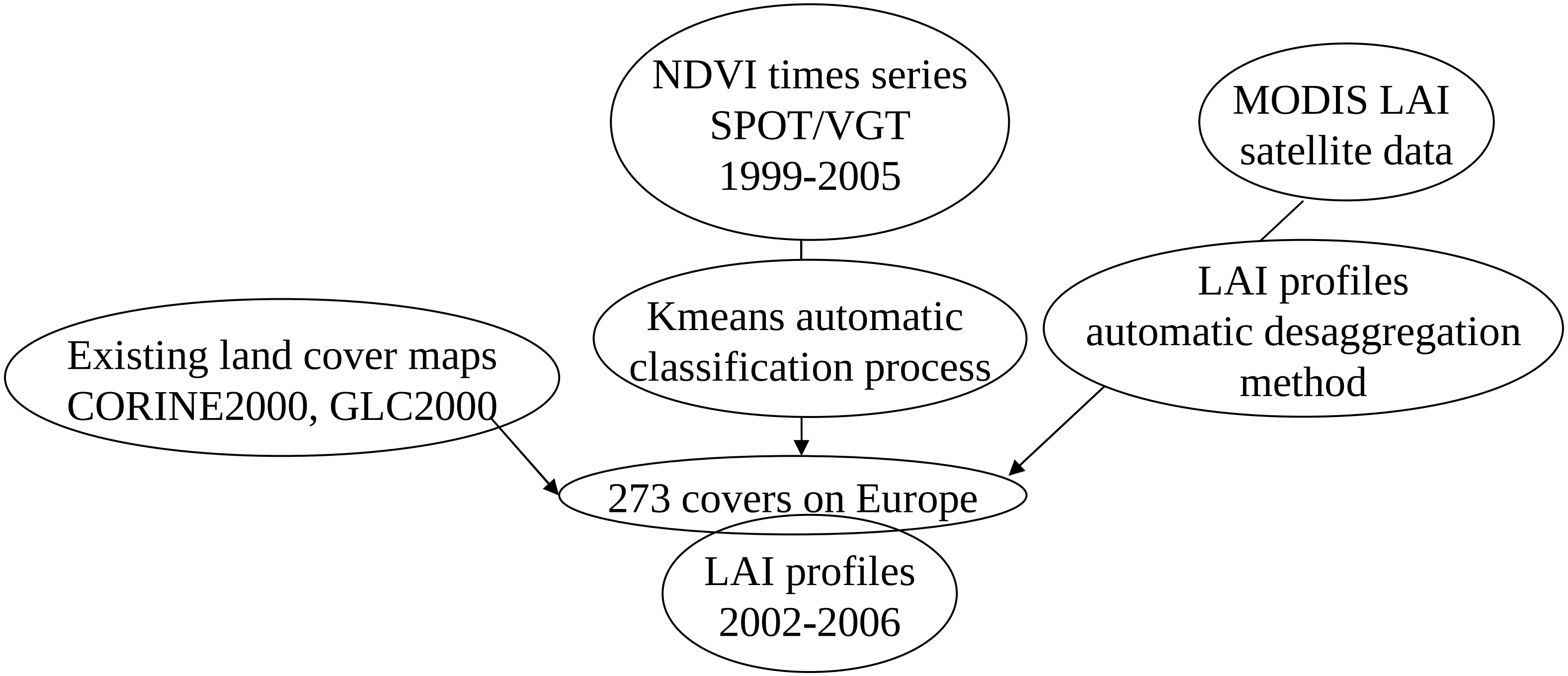
- Process Kmeans automatic classification to discriminate NDVI profiles.

- Use LAI satellite data to fill in ECOCLIMAP LAI profiles.

- Introduce the interannual variability of LAI

NDVI is the Normalized Difference vegetation index, defined by:
nir-red / nir + red
(nir = near infrared satellite band)

ECOCLIMAP II Europe: realization

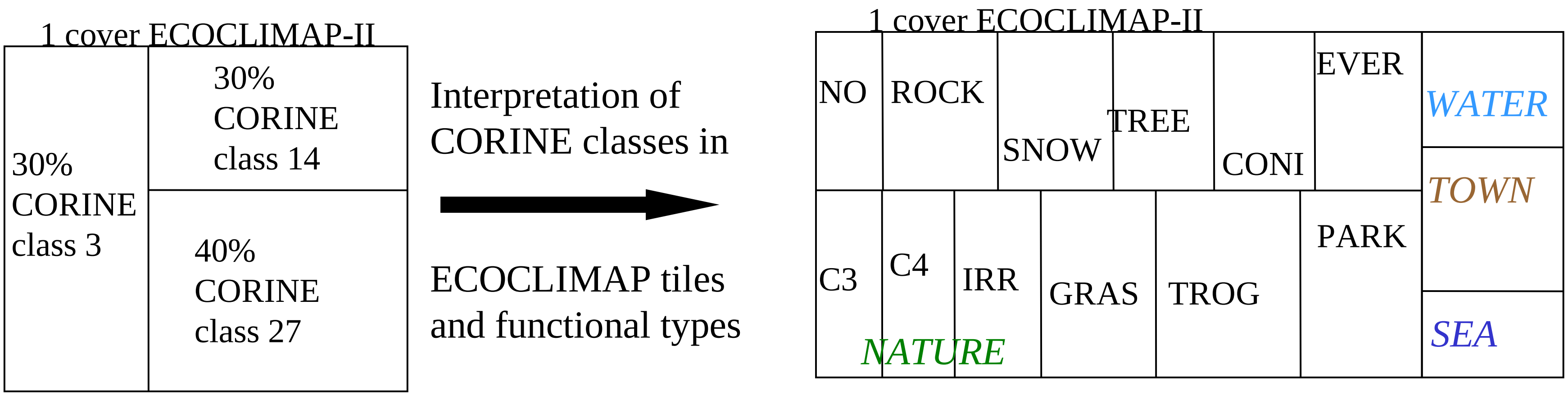


- Kmeans classification process to cluster NDVI profiles in covers
- Existing maps to control class homogeneity in terms of cover types

- MODIS LAI profiles at 1km resolution are smoothed and averaged by cover.
- An automatic desaggregation process allows to pass from covers LAI profiles to functional types LAI profiles.

ECOCLIMAP II Europe:
Definition of fractions of functional types inside covers

Example:



- Same thing done with CORINE2000 100m, CORINE2000 1km, GLC2000.

- Additional data sources are used to refine composition of ECOCLIMAPII covers in tiles and functional types:
  - AGRESTE (Agricultural statistics on France at hectare scale)
  - ISLSCP2 (global map of C4 vegetation fraction at 1° resolution)
  - FORMOSAT (60km side land cover map over South-West Toulouse, at 20m resolution)

ECOCLIMAP II Europe: definition of LAI profiles of functional types of covers

Input data are only **LAI profiles of covers** (from MODIS satellite data) and **fractions of functional types of covers** + use of a **climatic map** (Firs, Koeppe & De Long) to manage the cover neighbourhood.

<u>Automatic method in four steps</u> :

1. In each cover:

Hypothesis: LAI(main functional type in this cover)=LAI(cover)
Then: LAI(other functional types)=LAI(neighbour covers where these types are paramount)

2. New LAI(main functional type in this cover) corrected by subtraction of minor types LAI profiles weighted with their fractions in this cover.

3. Same step as 1 but with new LAI(main fonctional type in this cover)

4. Still new LAI(main functional type in this cover) with same correction as 2.

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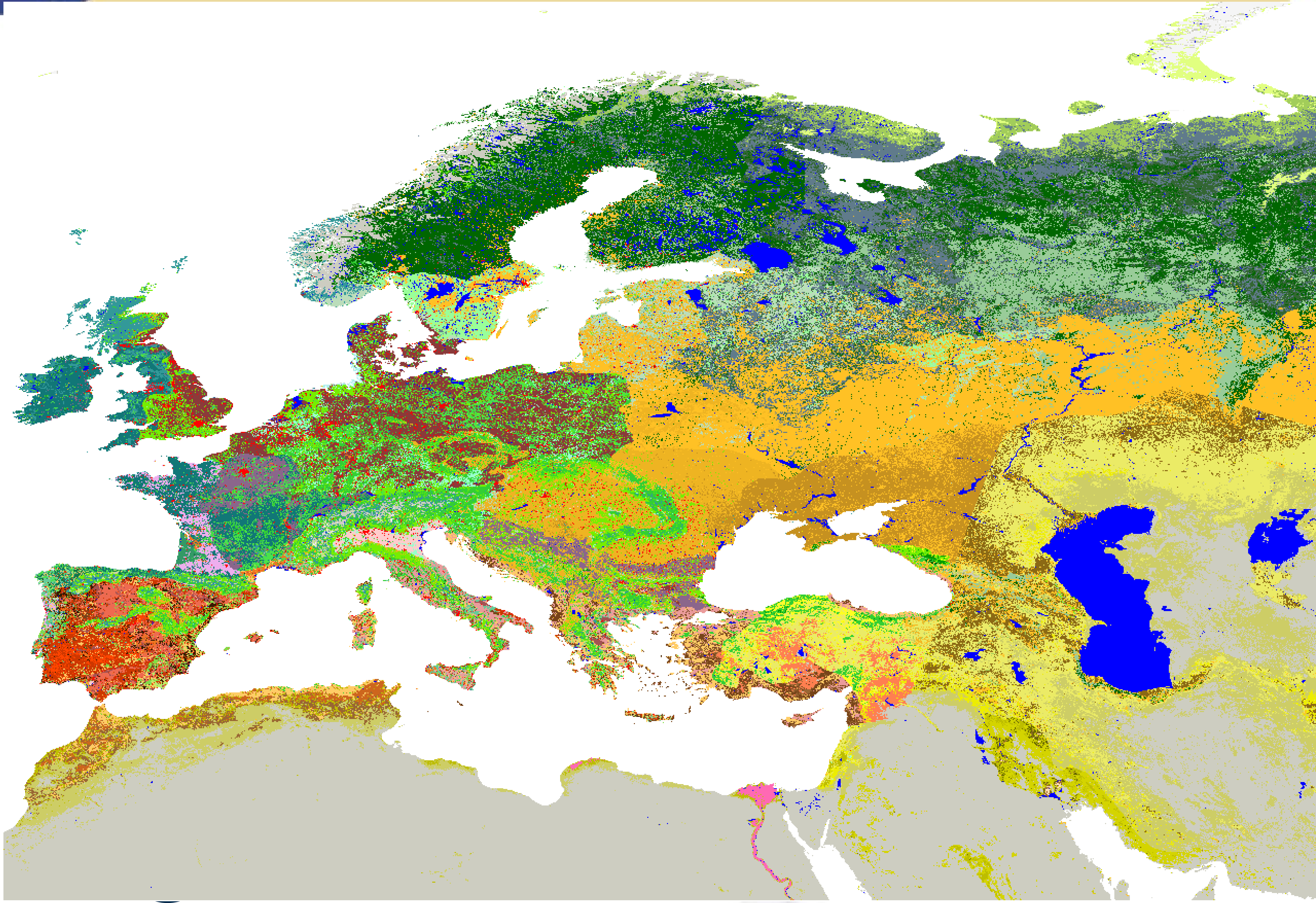
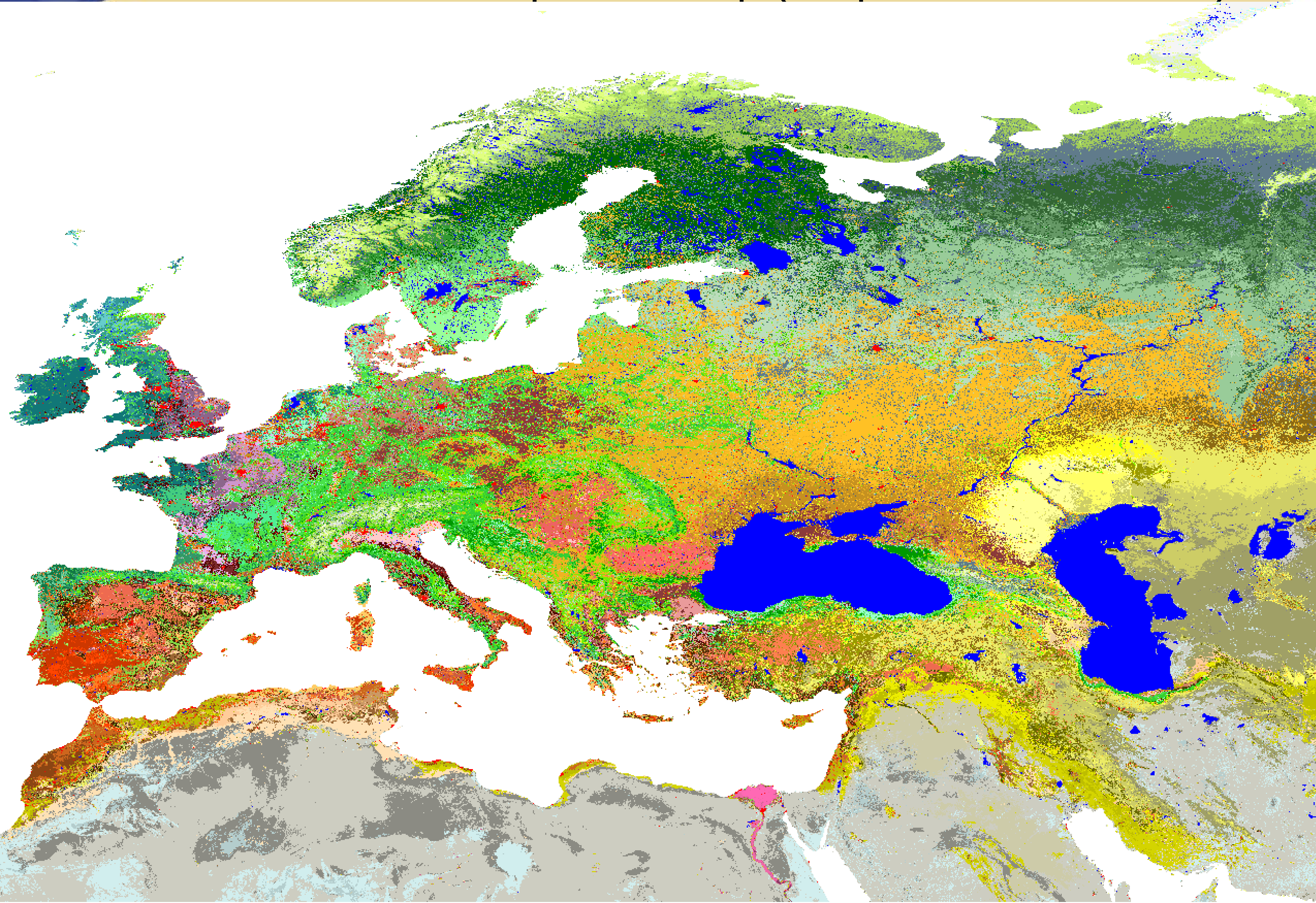
ECOCLIMAP I : the map on Europe



ECOCLIMAP II Europe: the map (simplified 103 classes)



ECOCLIMAP II simplified map Legend

Forest classes

Russian forests

1. North Russian Needleleaved forest
2. South Russian Needleleaved forest
3. Russian broadleaved forest
4. Baltics Mixed Forest

Scandinavian forests

5. Gulf of Bothnia Needleleaved forest
6. South Norvegian mountain Needleleaved forest
7. Swedish intermediate Needleleaved forest
8. South Norvegian coastal Needleleaved forest
9. South Swedish Needleleaved forest

Temperate European forests

10. European high altitude mosaic forest/herbaceous
11. European mean altitude mosaic forest/herbaceous
12. Western Europe mosaic forest/herbaceous

Seaborne forests

13. Galician/North Spain coast mosaic forest/herbaceous
14. Landes Needleleaved forest
15. North Mediterranean mosaic forest/herbaceous
16. North Med. coastal mosaic forest/herbaceous/crops

Mediterranean Forests

17. Turkish needleleaved forest
18. North Mediterranean mosaic forest / herbaceous
19. West Spanish mosaic forest / herbaceous
20. Portuguese 2003 burnt areas

Herbaceous/shrubs classes

Northern Europe

21. New Zemble tundra
22. North tundra
23. Intermediate tundra
24. South tundra

Atlantic meadows

25. North Great Britain meadows
26. Great Britain and Ireland meadows
27. North West Europe meadows

Caspian Sea shrubs

28. Caspian Depression shrubs 1
29. Caspian Depression shrubs 2
30. North East Caspian Sea shrubs
31. Kazakhstan / Turkish shrubs
32. South Kazakhstan / Iranian shrubs
33. South Aral sea mosaic herbaceous / shrubs / crops
34. South Aral sea Semi-desertic areas

Turkey / Iran / Mesopotamia shrubs

35. North Arabian Arc shrubs
36. Mesopotamian / Maghrebian semi-desertic areas 1
37. Mesopotamian / Maghrebian semi-desertic areas 2
38. Anatolia shrubs
39. Turkish sparse herbaceous
40. Syrian irrigated mosaic herbaceous / shrubs / crops

Caucasian shrubs

41. South-East Caucasian shrubs
42. South-East Caucasian/Medit. mosaic shrubs/crops

Maghrebian shrubs

43. Tunisian mosaic shrubs / crops
44. Maghreb/West Spanish /Kopet Dag mosaic shrubs/crops
45. Semi-desertic shrubs

Mediterranean Shrubs

46. Mediterranean Coastal shrubs 1
47. Mediterranean Coastal shrubs 2
48. Mediterranean Coastal shrubs 3
49. North Mediterranean sparse shrubs
50. Mediterranean mosaic shrubs/crops
51. Spanish mosaic herbaceous/forest/permanent crops

Central and West Europe

52. Eastern Europe and Central Asia sparse herbaceous
53. Centre/West Europe sparse mosaic shrubs/forest/crops
54. Massif Central meadows
55. Vendée mosaic herbaceous/crops

Crops classes

Black sea and Russian crops

56. Caucasian C4 crops
57. East Ukrainian South Russia mosaic crops / natural vegetation
58. West Ukrainian Belarus and Baltics mosaic crops / nat. veg.
59. North Black Sea crops
60. Kazakhstan crops

South Europe crops

61. Pô plain C4 rainfed crops
62. Balkan Peninsula crops
63. West Turkish C4 irrigated crops
64. North Mediterranean C4 irrigated crops
65. North Mediterranean dense C3 crops
66. North Mediterranean mosaic crops/other vegetation

South Mediterranean and Spanish crops

67. North Mediterranean dense crops
68. French/Spanish vineyards/other permanent crops
69. Moroccan and Tunisian crops
70. Moroccan crops
71. Turkish/Spanish crops
72. Spanish/North Arabian arc crops
73. Mediterranean sparse crops

Crops associated to a country

74. Bulgarian crops
75. Hungarian crops
76. Swedish crops
77. Poland crops
78. German/North arabian arc crops
79. Danish crops

Nil crops

80. Nil crops 1
81. Nil crops 2
82. Nil crops 3
83. South Nil crops

Spanish Estremadura agro-forestry

84. Estremadura agro-forestry 1
85. Estremadura agro-forestry 2
86. Estremadura agro-forestry 3

North West Europe crops

87. West France crops
88. North East Parisian Basin crops
89. South West Parisian Basin and England Crop

Bare land

Desertic bare land

90. Bare rock 1
91. Bare rock 2
92. Bare land 1
93. Bare land 2
94. Arabian very sparse vegetation 1
95. Caspian sea very sparse vegetation 2

Cold bare land

96. High altitude/latitude bare land
97. Snow and ice

Wetlands

Coastal wetlands

98. West Europe deep coastal wetlands
99. West Europe shallow coastal wetlands

Continental wetlands

100. North Europe wetlands
101. Central Europe wetlands

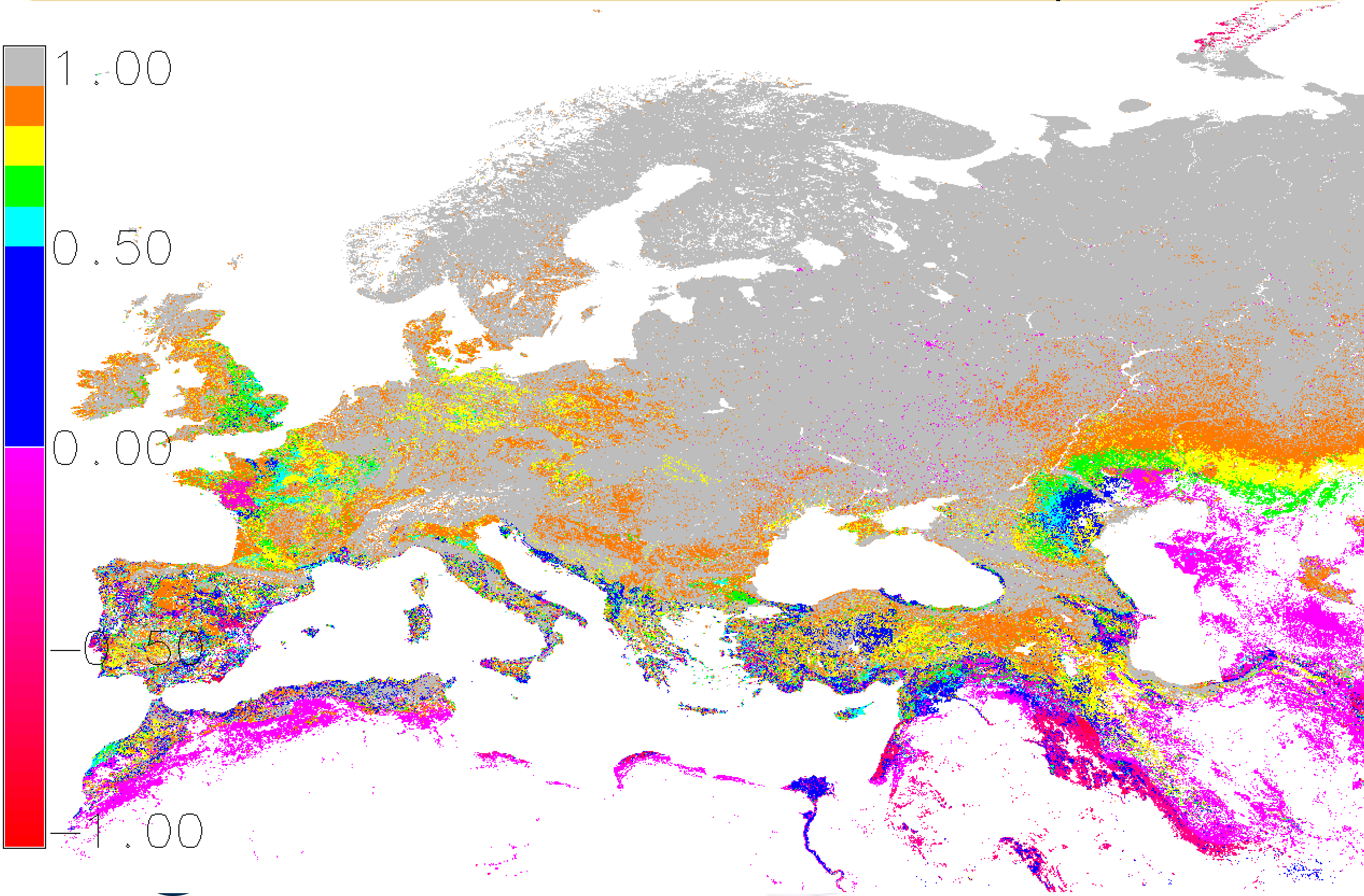
Urban areas

102-123. Urban areas

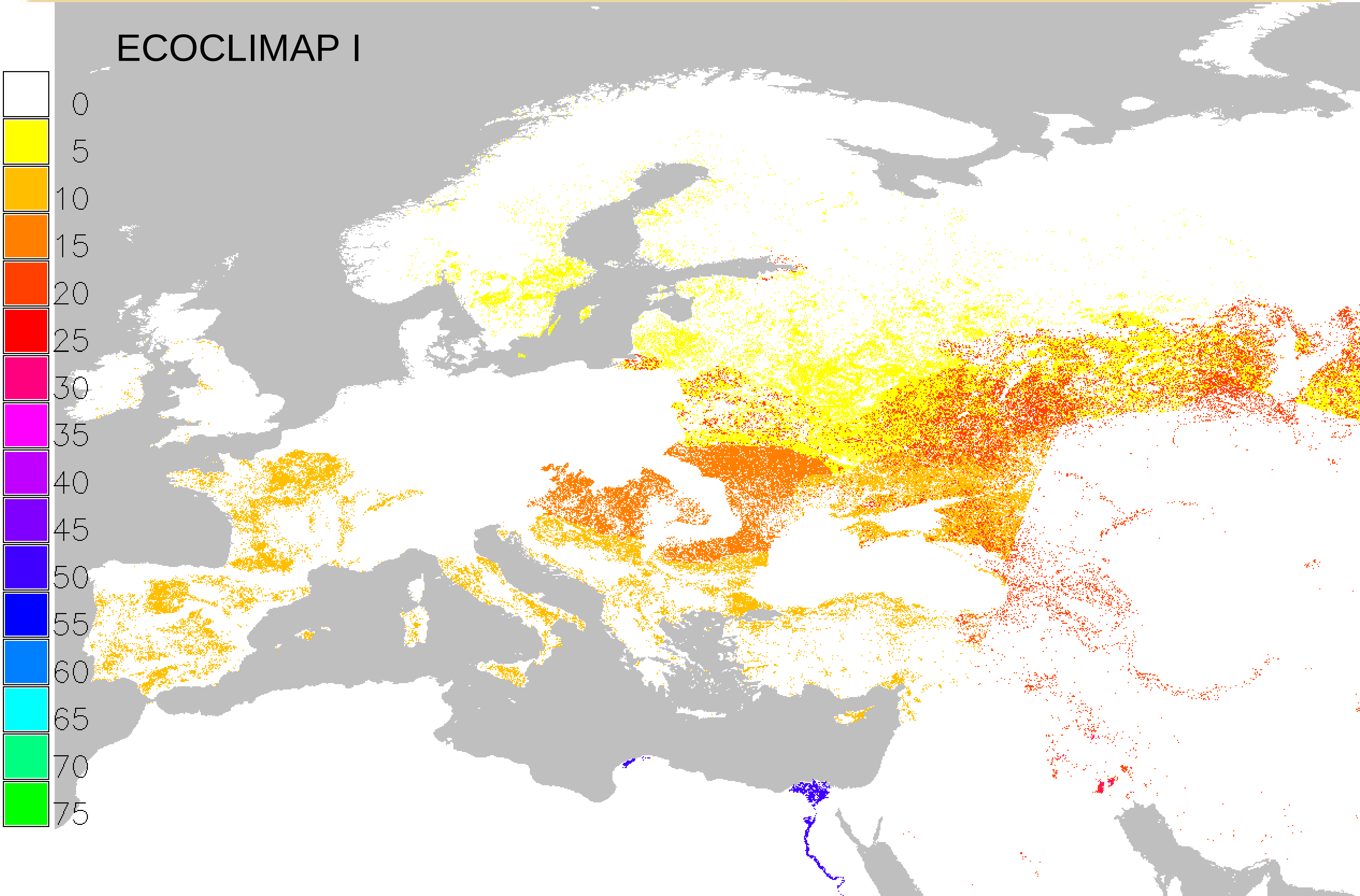
Water bodies

124. Water bodies

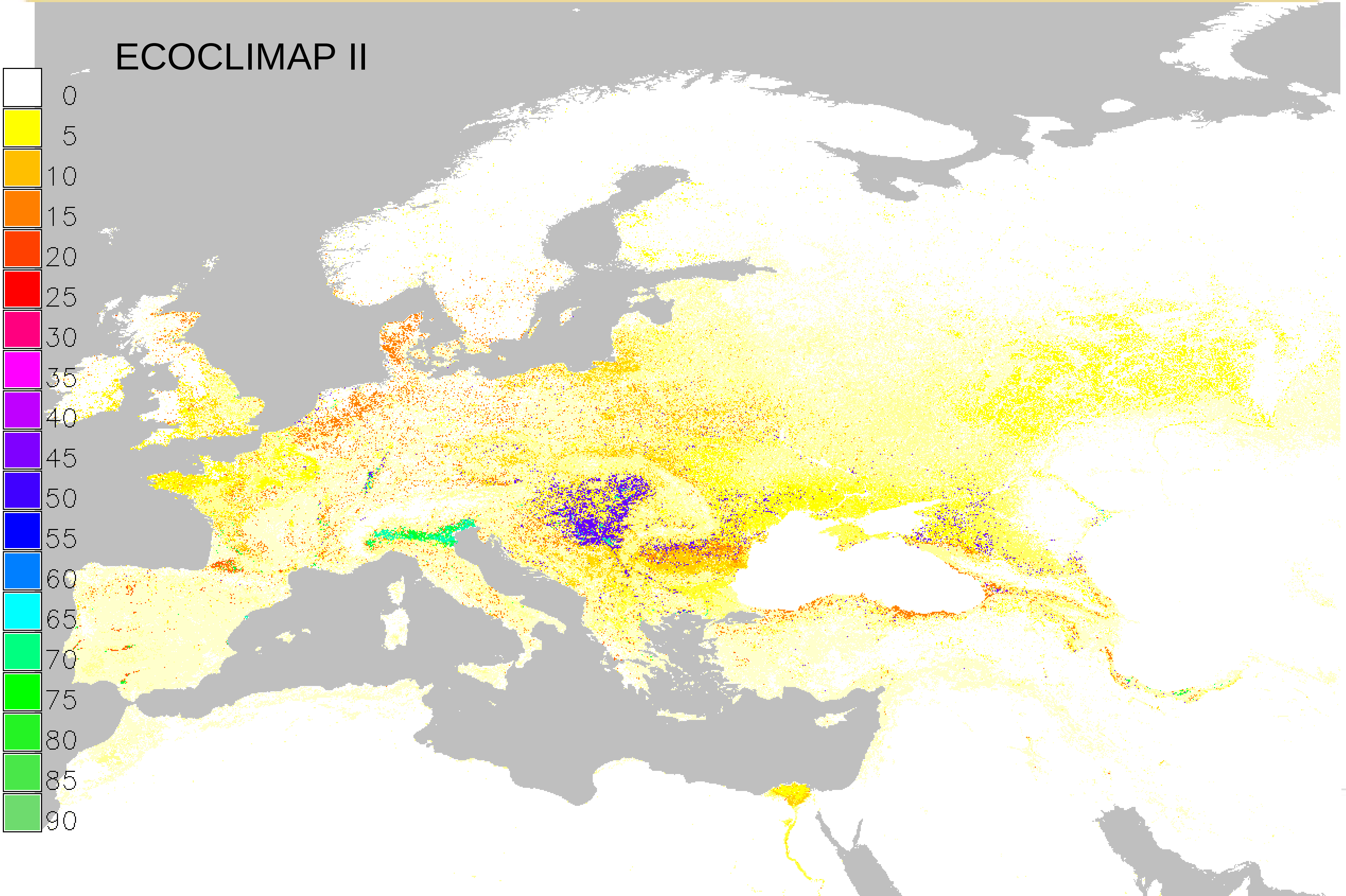
Correlation between LAI profiles of covers ECOCLIMAP I / ECOCLIMAP II on Europe



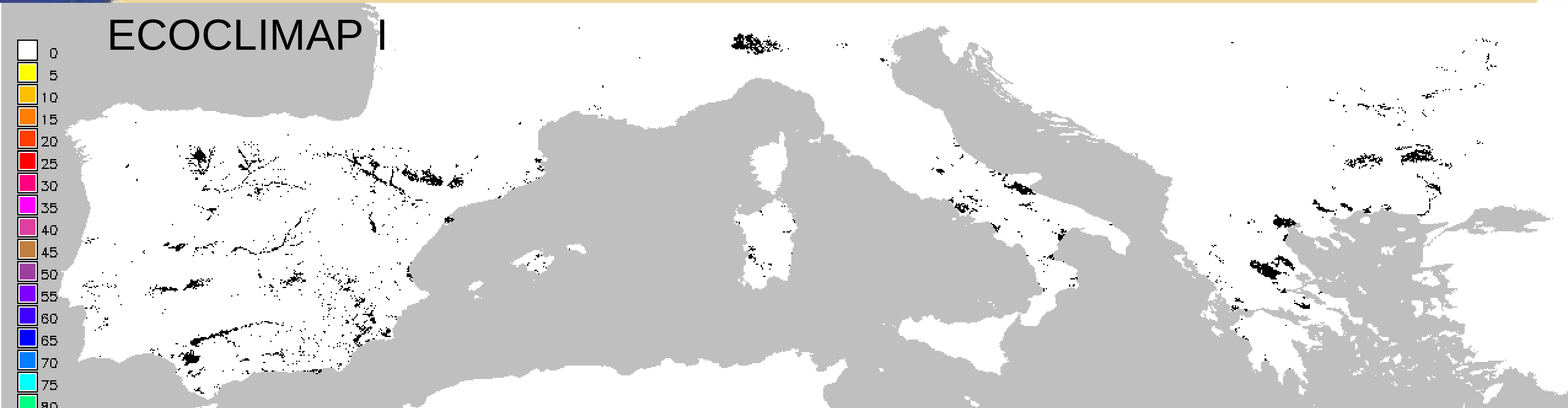
Comparison of C4 fraction on Europe

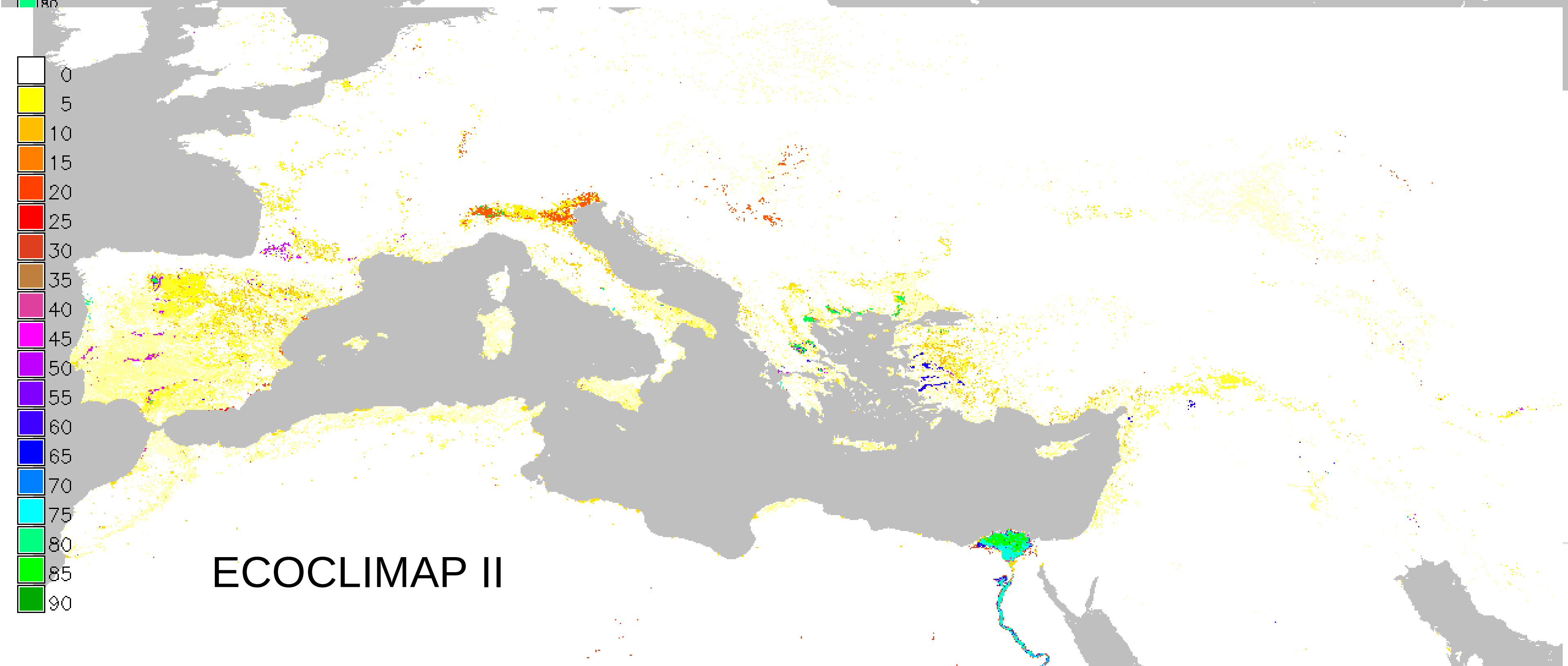


Comparison of C4 fraction on Europe ECOCLIMAPII



Comparison of irrigated crops fractions on Europe





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CNRS

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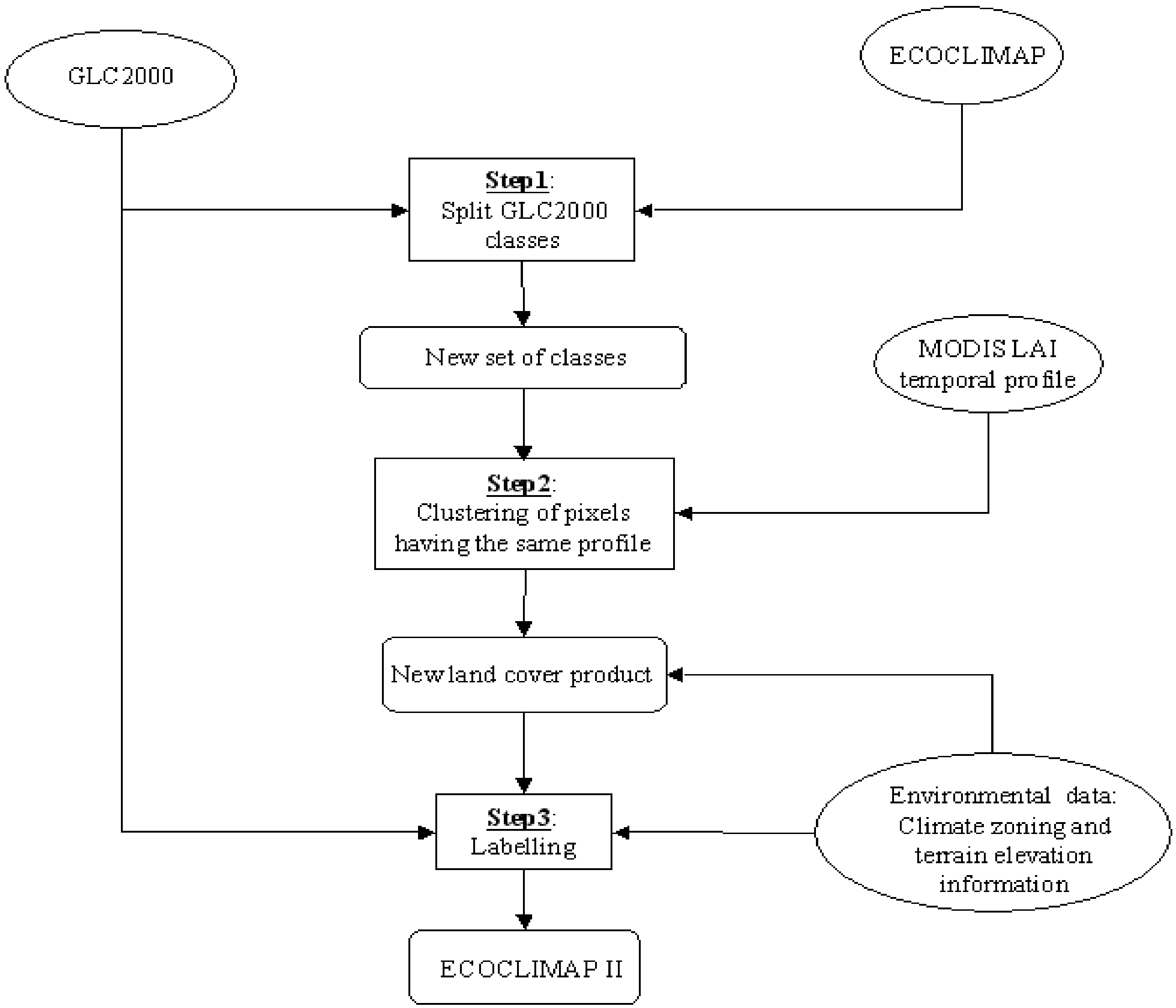
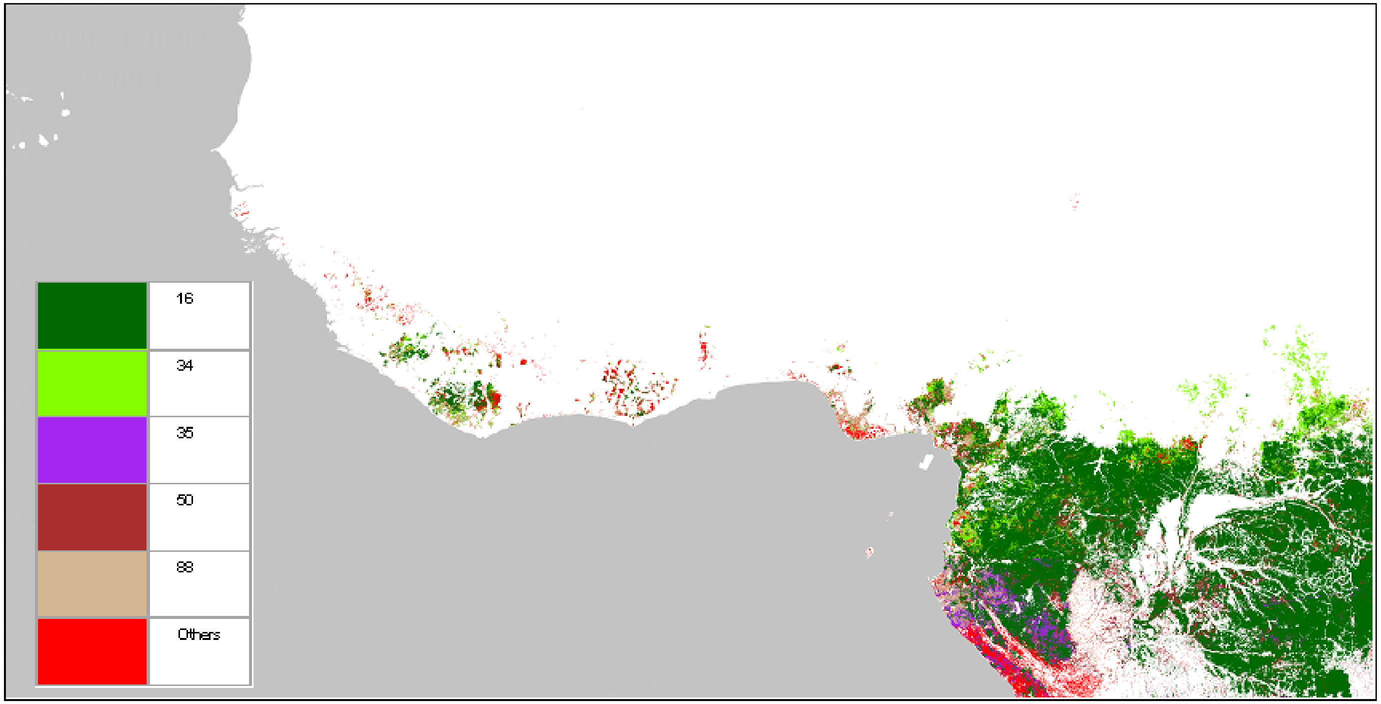
ECOCLIMAP II Africa
Supervised classification over AMMA zone

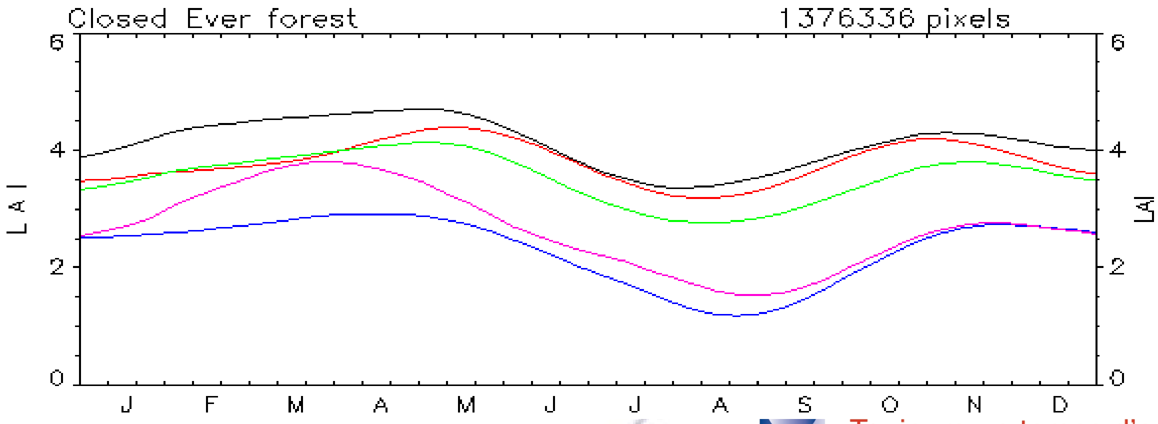


ECOCLIMAP II Africa – First step of the classification

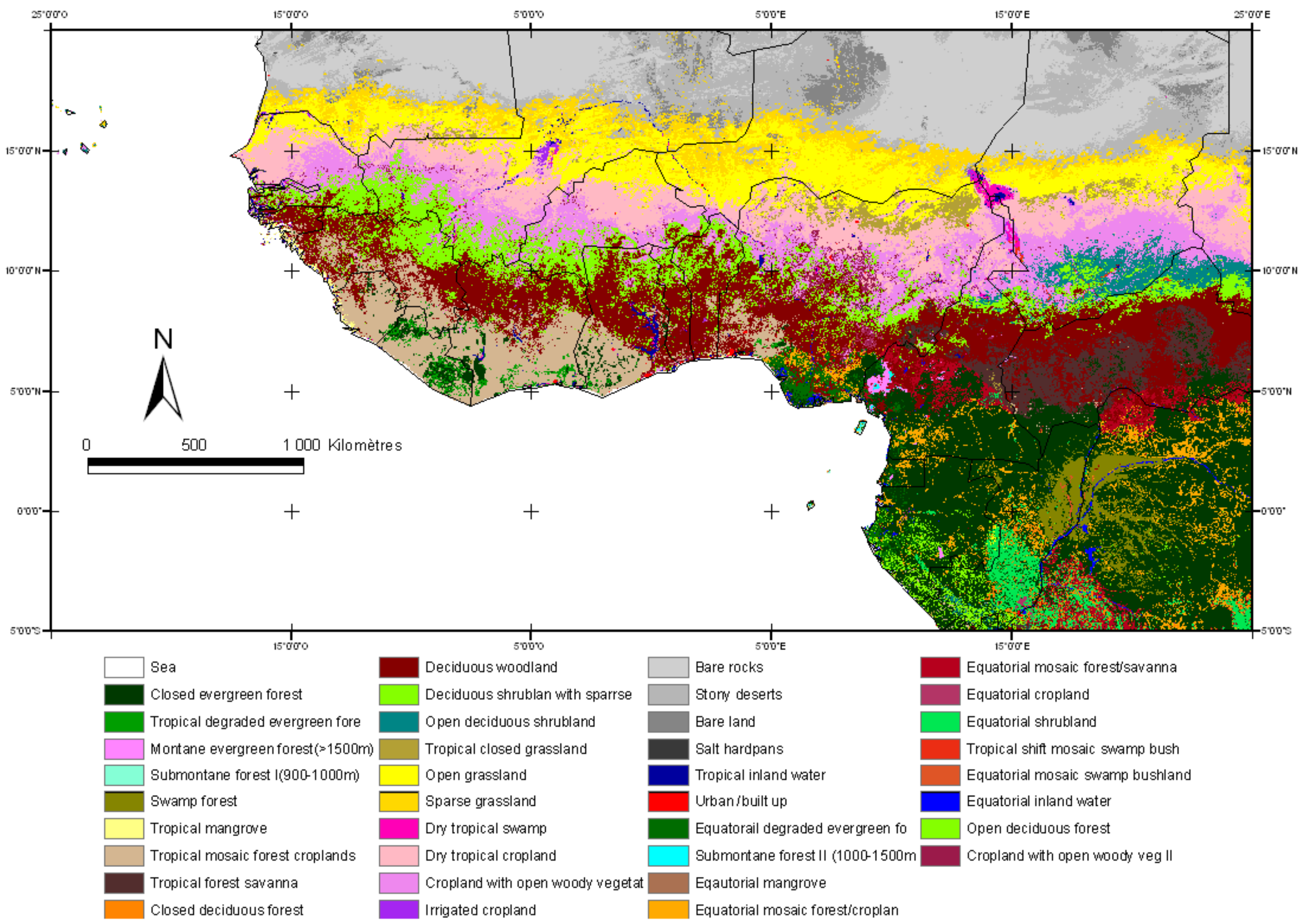
Partition of the 1st class of GLC2000 (*Closed Evergreen forest*) in subsets of class of ECOCLIMAP-I



Average annual temporal profile spanning the period 2000-2007



ECOCLIMAP II Africa – 37 classes over the AMMA box (1km)



75% of agreement with GLOBCOVER(300m)

ECOCLIMAP II Africa – Computation of soil albedo (1 km)

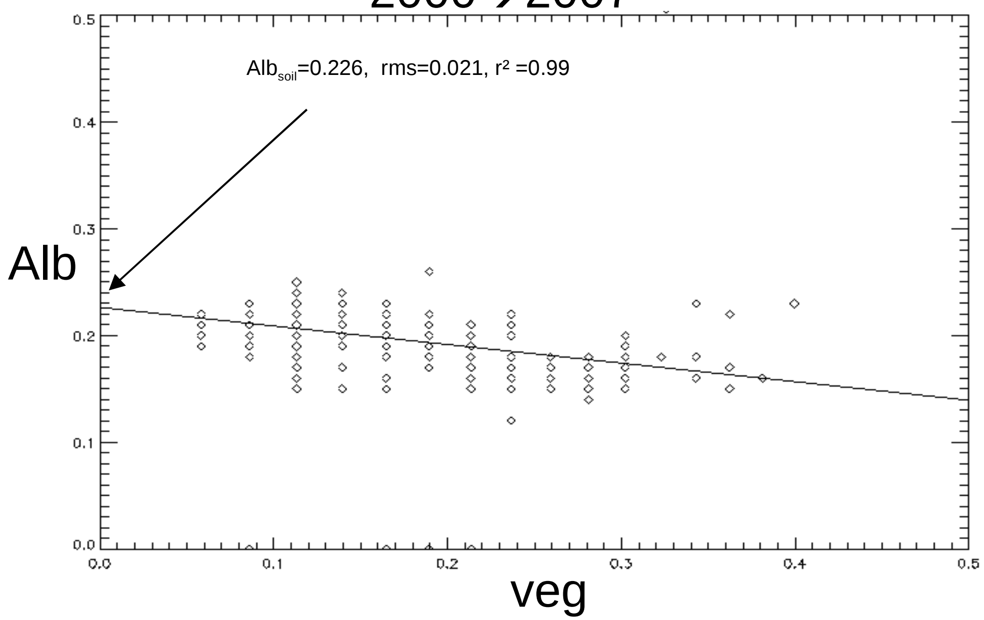
$$Alb = veg * Alb_{veg} + (1 - veg) * Alb_{soil}$$
$$= veg * (Alb_{veg} - Alb_{soil}) + Alb_{soil}$$

$$veg = 1 - e^{(-0.6 * LAI)}$$

[Kaptue et al., RSE, 2009]

The slope $Alb_{veg} - Alb_{soil}$ is spectrally signed (< 0 in the Visible, > 0 in the near infrared)

2000→2007



Banizoumbou (Niger), lat=13.54, lon=2.66 in the visible

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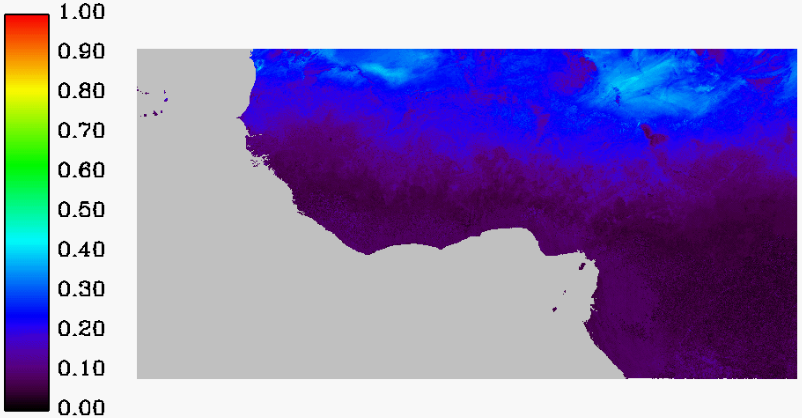
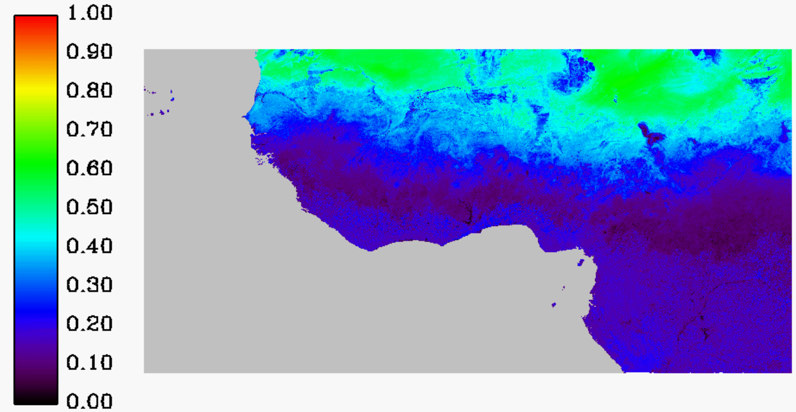
ECOCLIMAP II Africa – Soil albedo

Visible 400-700 µm



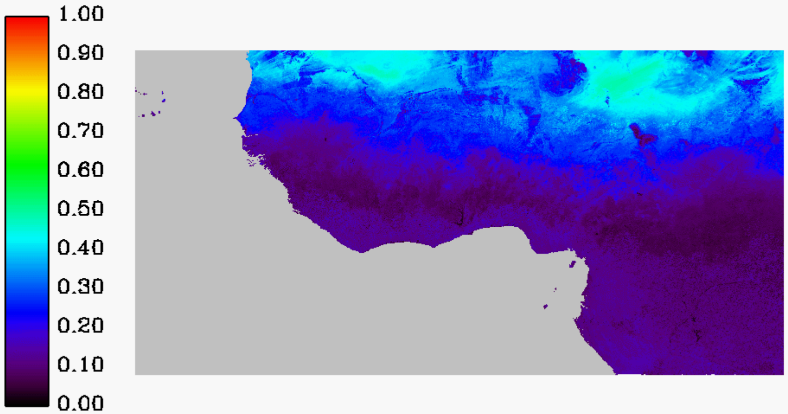
NIR 750-850 µm



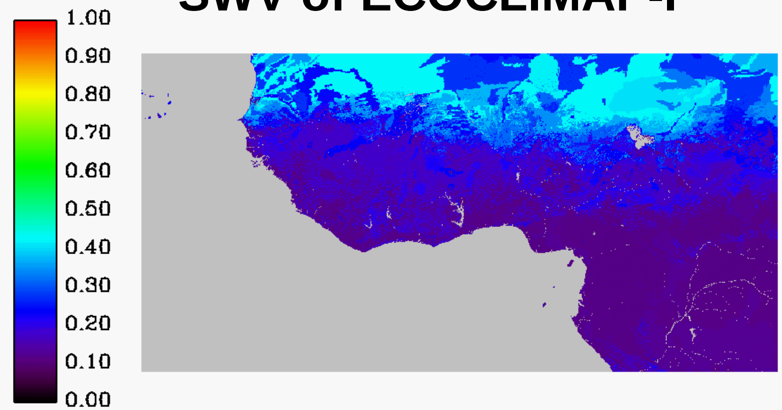
$$1.62 \le \frac{NIR}{VIS} \le 1.92$$ over bare areas

[Zhou et al., GRL, 2005]

SWV=0.457*VIS+0.502*NIR

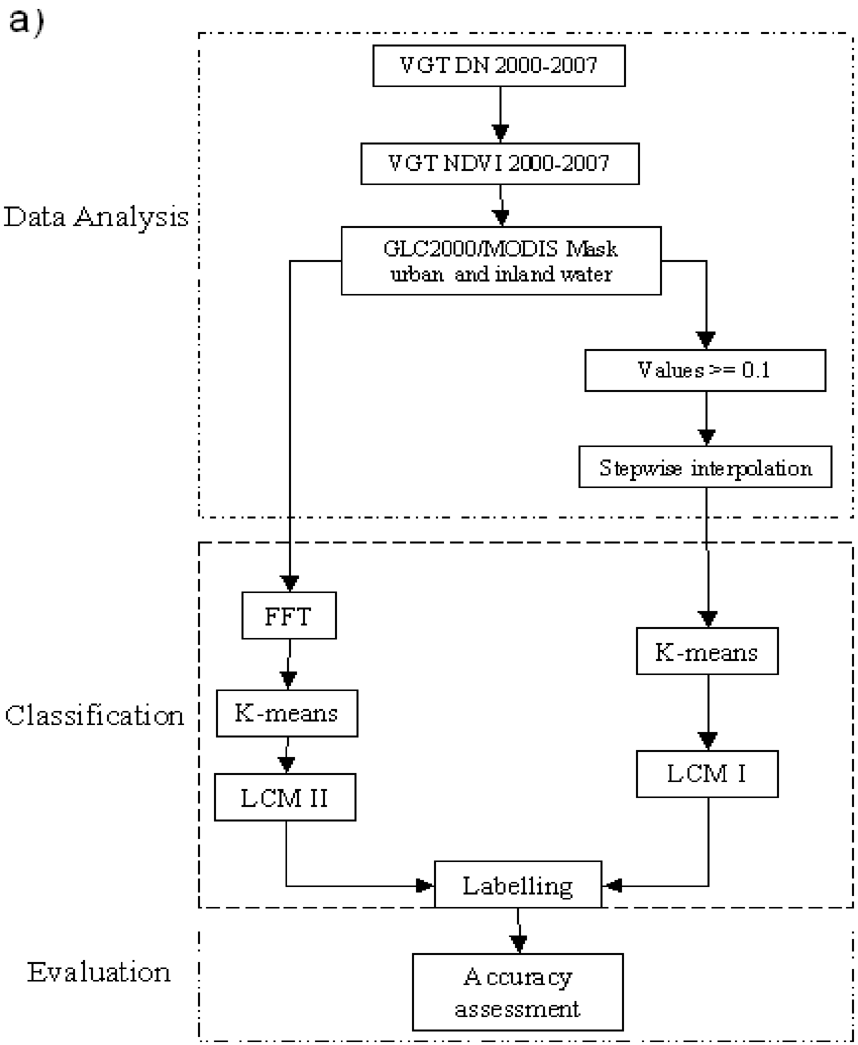


SWV of ECOCLIMAP-I

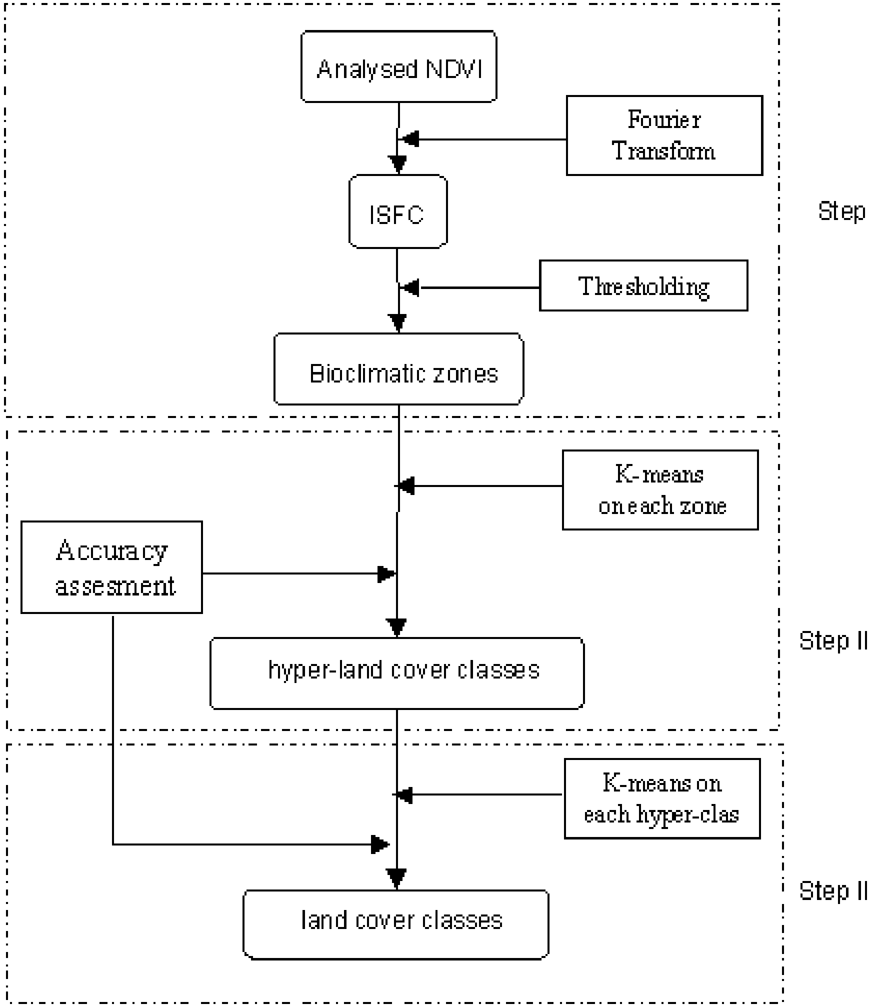


ECOCLIMAP II Africa
Unsupervised classification on the entire Africa

- Production of 2 land cover maps

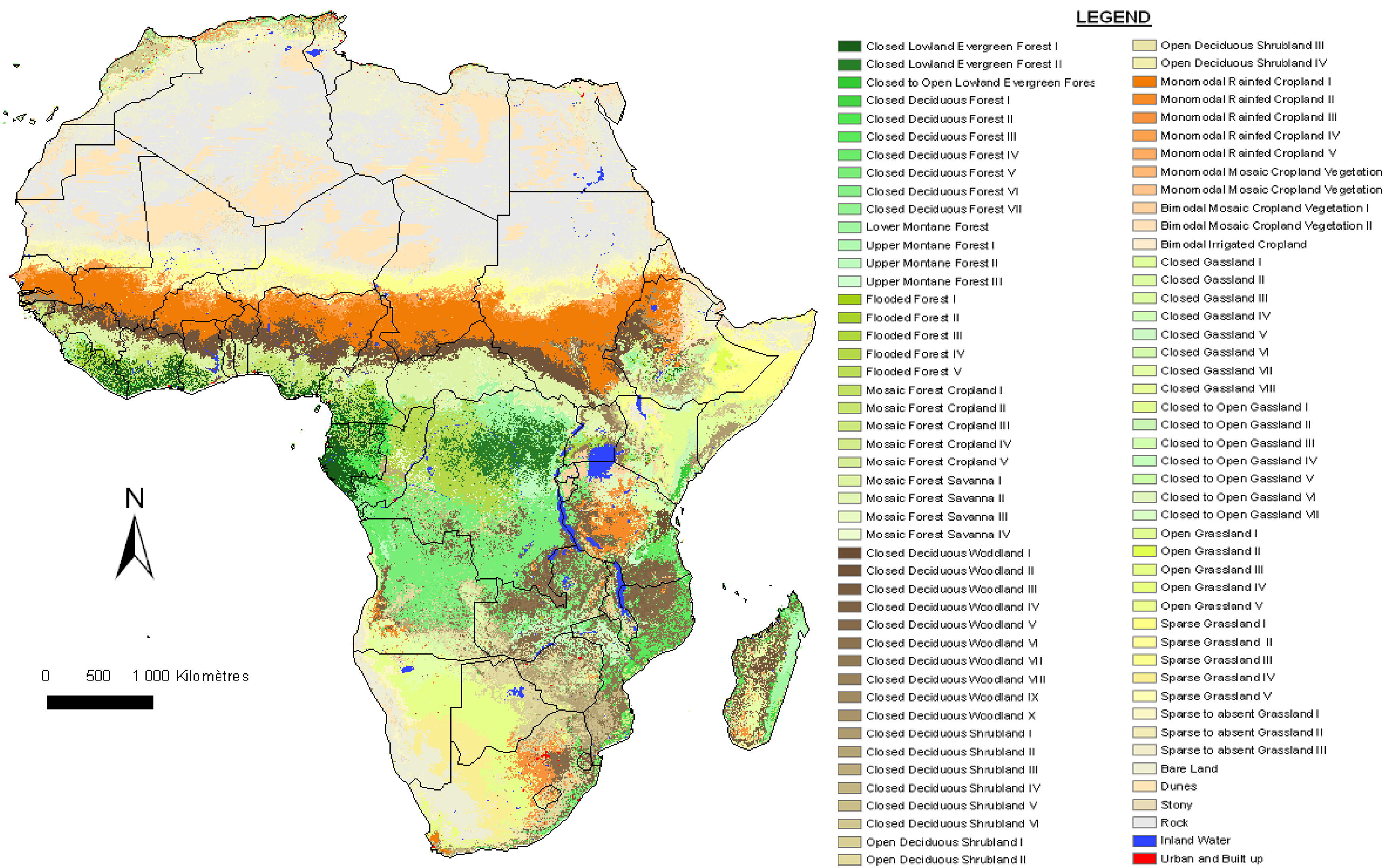


- Stacked segment classification (hybrid approach)

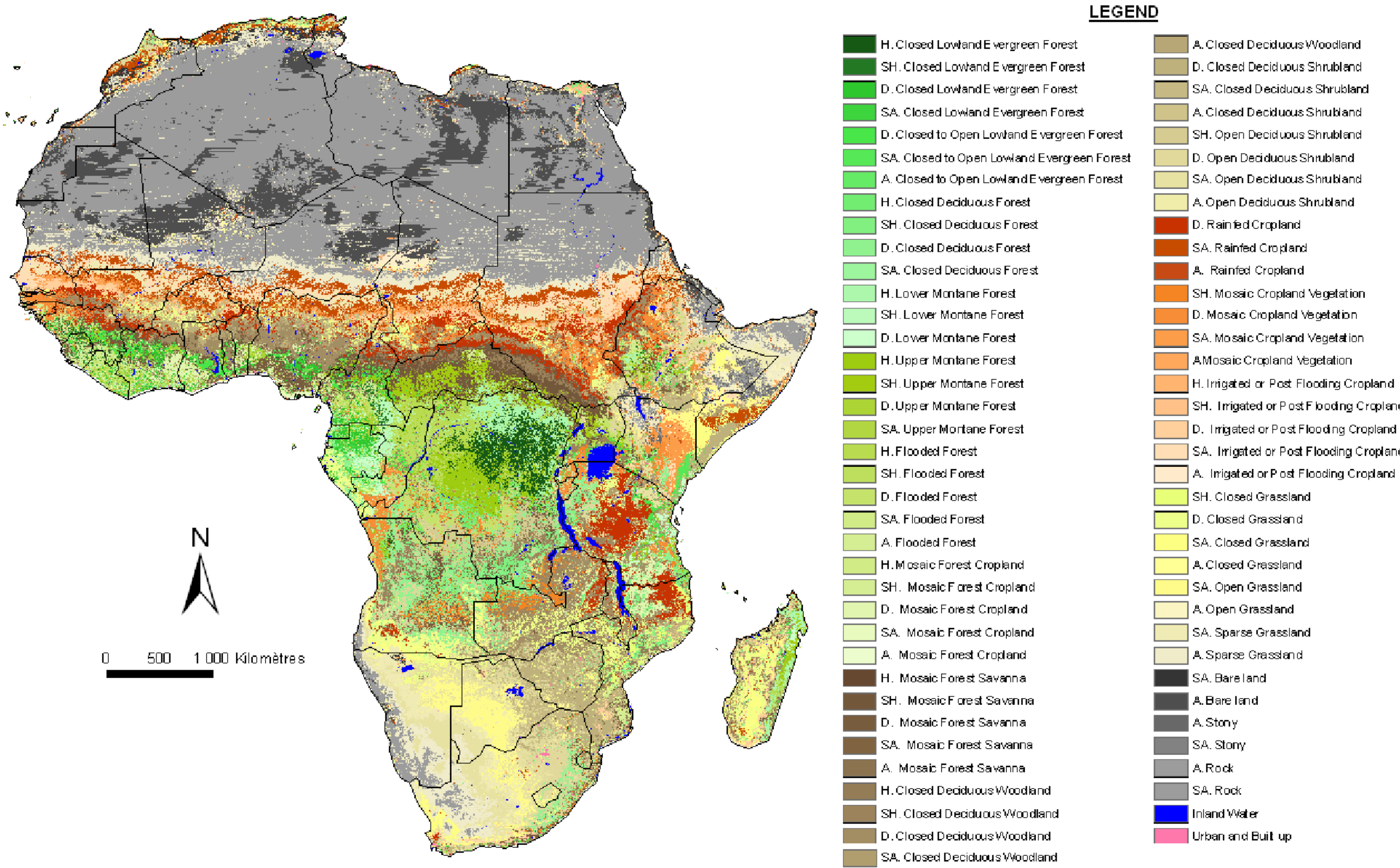


[Kaptue et al., J. Climate in preparation]

ECOCLIMAP II Africa – LCM-I with 90 ecosystems (1km)



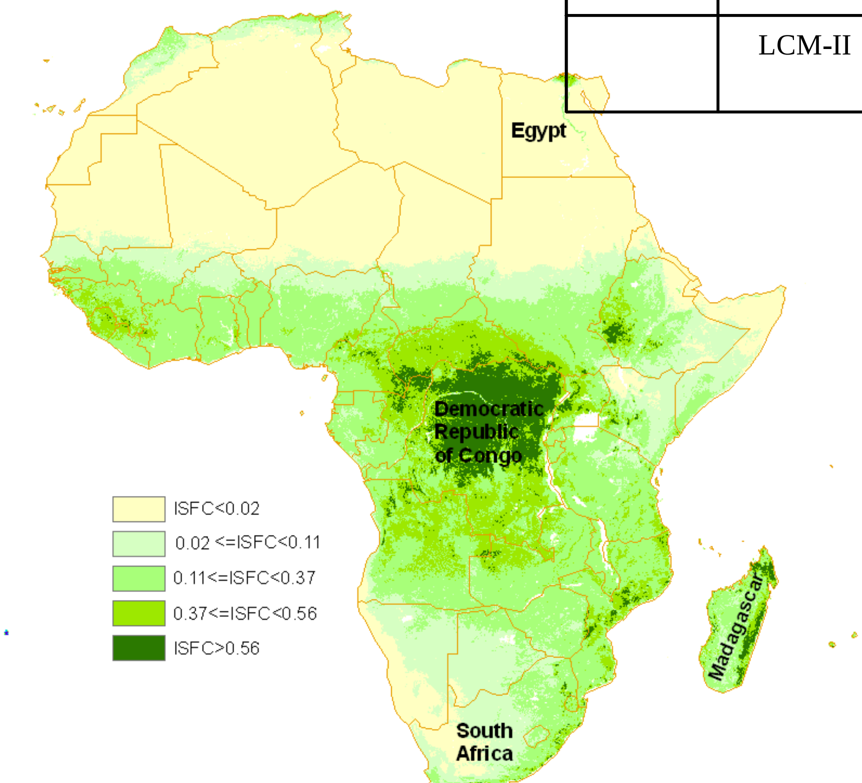
ECOCLIMAP II Africa – LCM-II with 73 ecosystems (1km)



ECOCLIMAP-II Africa– Evaluation

		GLC(1 km)		GLOBCOVER (300 m)	
		Kappa	OA	Kappa	OA
Level I	LCM-I	52.39	62.02	51.85	38.09
	LCM-II	29.61	42.80	19.98	37.27
Level II	LCM-I	24.92	30.24		
	LCM-II	17.97	22.67		

	30 m	OA
LCM-I	Egypt RD Congo South Africa Madagascar	78.19 40.87 36.38 47.88
LCM-II	Egypt RD Congo South Africa Madagascar	17.93 43.15 61.02 81.31



Prospects ECOCLIMAP

- Evaluation of Europe and Africa products:
  - Study of the impact of ECOCLIMAPII Europe in SIM (Safran Isba Modcou)
  - Evaluation of the quality of ECOCLIMAPII Europe LAI
  - Study of the impact of ECOCLIMAPII Africa with ARPEGE-CLIMAT

- Realization of ECOCLIMAPII on other continents isn't planned for the moment. Users returns on Europe and Africa are waited before.

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