δ^{15}N ISOTOPIC SIGNATURES IN MOSSES FROM EUROPE: A GIS solution to get information and make statistical correlation analysis

CESIG 2014

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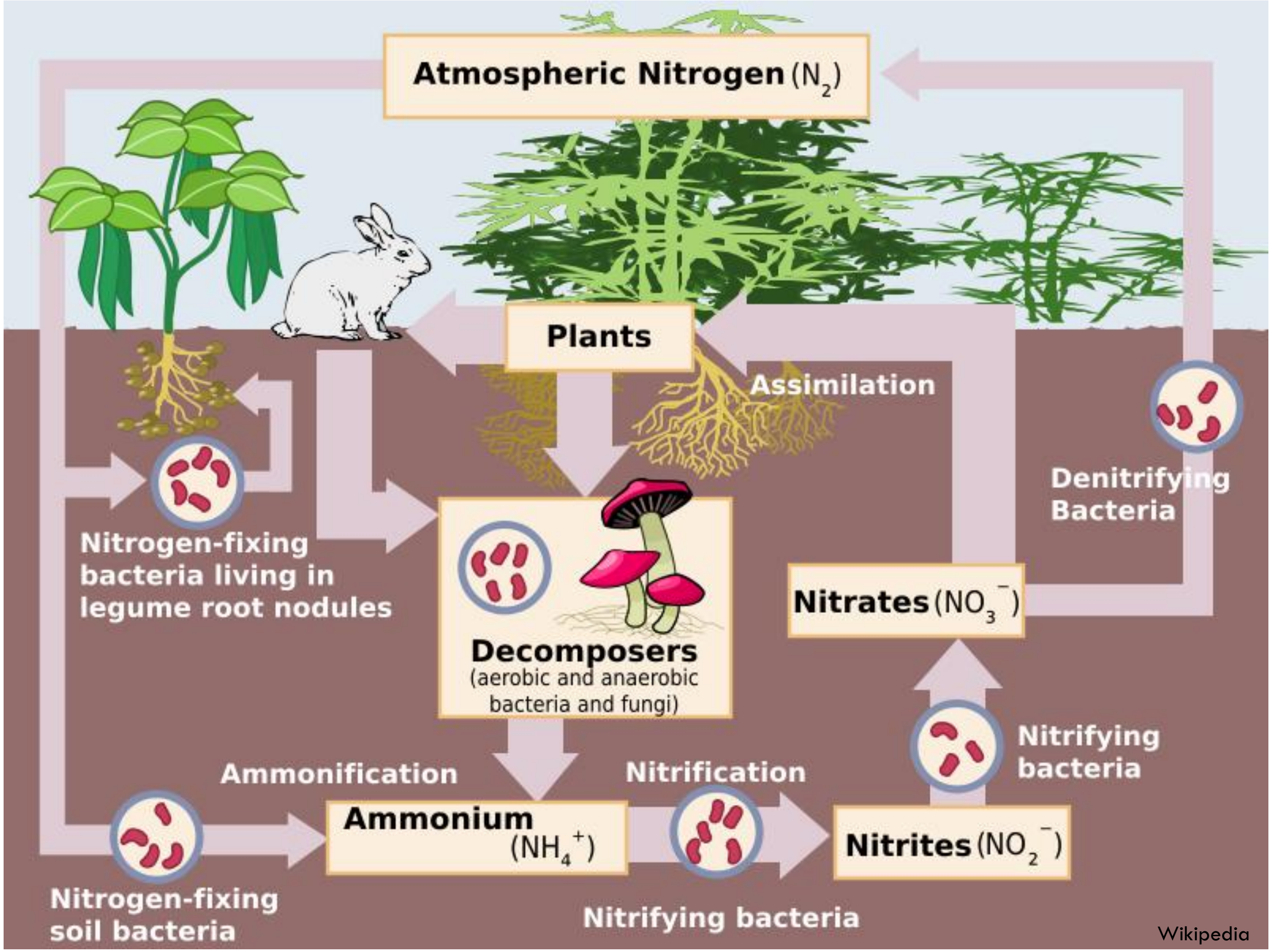
1. Why Nitrogen?



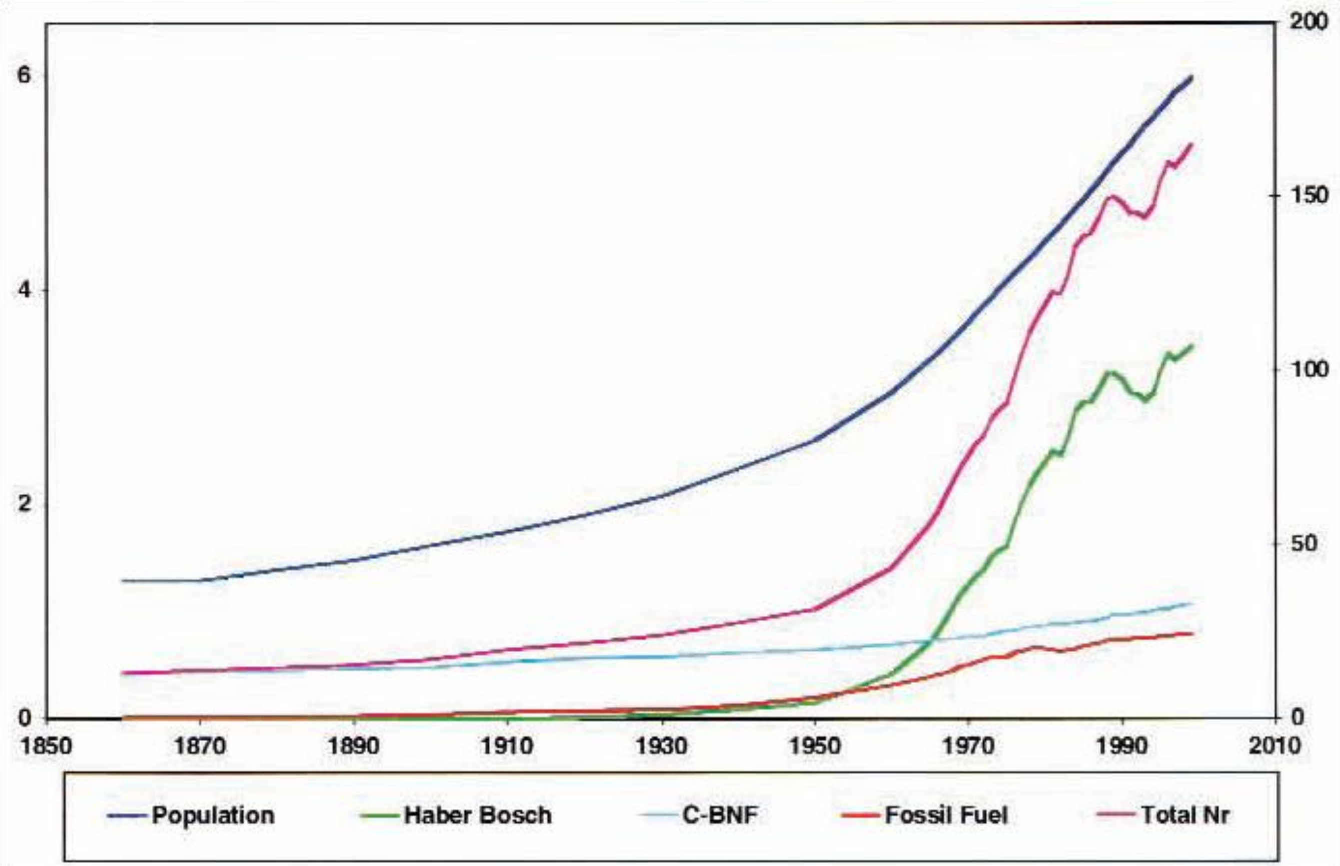
Wikipedia

1. Why Nitrogen?

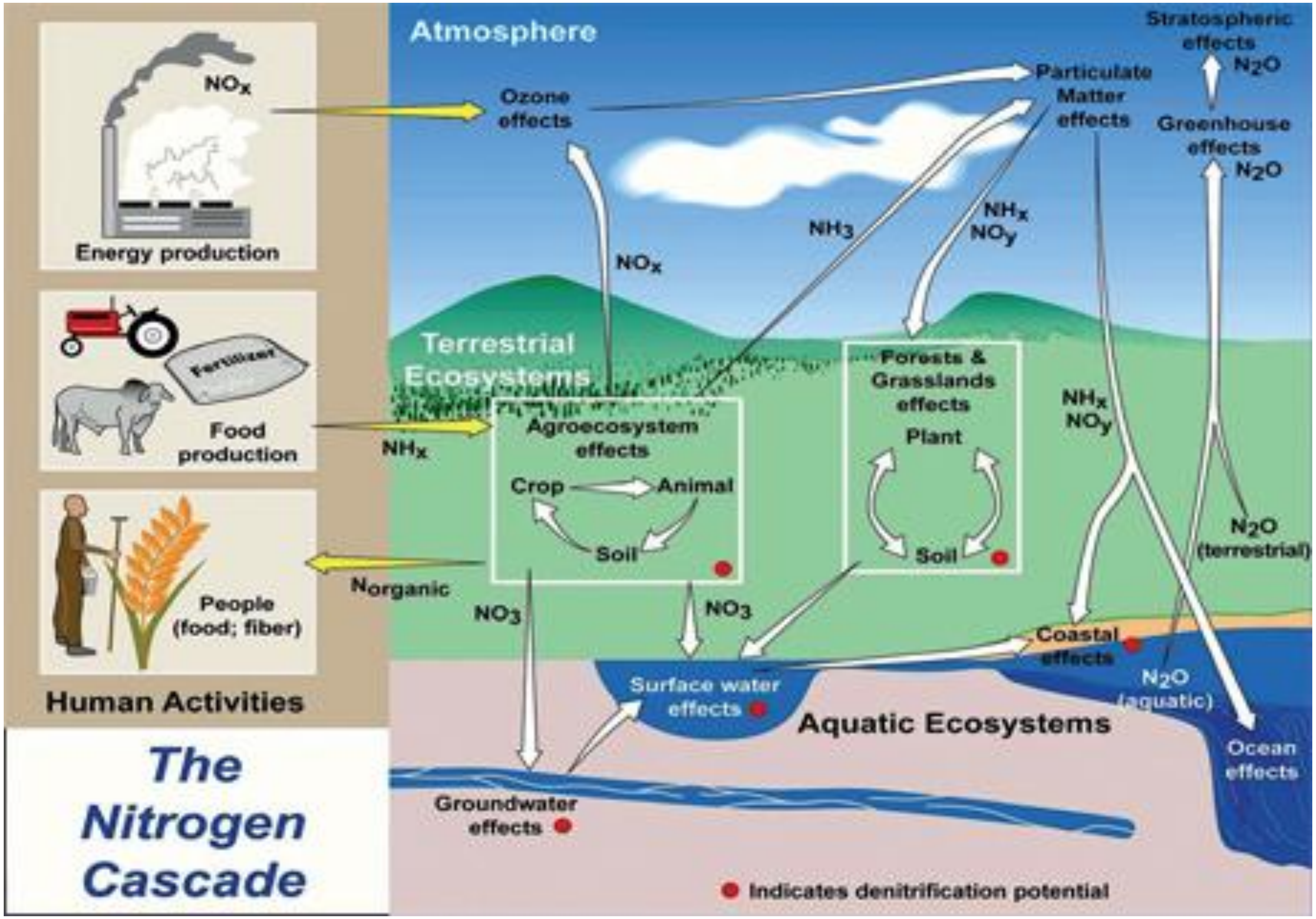
► 1860 to 2005: Nitrogen production has been increased from 15TgN to 187TgN

► From 1970: world population has been increased in 70% and nitrogen production in 120%

(Galloway 2008)



1. Why Nitrogen?



1. Why mosses?

- Lack of a well developed root system or water-conducting tissue
- High cationic exchange capacity
- Large surface to weight ratio
- Wide distribution

1. Why $\delta^{15}N$?

$$R = \frac{^{15}N}{^{14}N}$$

⇨ The more ^{15}N-enriched a sample, the more positive its $d^{15}N$

NHy: depleted in ^{15}N (livestock)

NOx: enriched in ^{15}N (combustion)

2. General aim

- To prove that stable isotopes can detect emissions from anthropogenic sources.
- Biomonitoring surveys using mosses might be a simple approach to determine not only the atmospheric deposition of nitrogen but also its origin.

  - Land Uses → emission factor
  - NHy Total Deposition → inmission factor
  - NOx Total Deposition → inmission factor
  - Precipitation → inmission factor
  - Height → Long-Range Transboundary air pollution factor

3. Available data

Country	Provided data	Moss Samples
• Austria • Belgium • Croatia • Finland • France • Germany • Italy • Macedonia • Slovenia • Spain • Sweden • Switzerland • Turkey • Uk	• Country code • Sampling date • Latitude • Longitude • DATUM • Moss species • Species Code • Height	• % Nitrogen • $\delta^{15}N$

3. Available data

Dear Sheila

It is good to hear that you are finalising the analyses of the nitrogen isotope data, thank you!

I assume with 'DATUM' you mean the date of sampling. You should have received this data from the UK (please let me know if not). You might specifically like to e-mail the countries from which you have not received the date of sampling yet, so the others will know who should respond to you as soon as possible.

It would be great to see a paper on this work drafted soon.

Dear Sheila,
The geographic coordinates are GPS coordinates.
I added the height above sea level for the different sampling spots. There are also 2 changes in the coordinates that I sent to Jesus (in blue).

...

Dear Sheila,
There are in the excel sheet: Coordinate_N = Longitude, Coordinate E = Latitude. For me, these are the official coordinates for the world.

Is this clear now?

3. Available data

nr. CODA	Site name	Coordinates (N	Coordinates (E	Date sampled	Site name	Site description	species
1	Kalmthout	51' 22' 36"	4' 27' 06"	21-sep-05	Withoefse Heide	mixed deciduous-conifer	*Hylocomium splendens*
4	Zedelgem	51' 09' 40"	3' 12' 54"	13-sep-05	Zedelgem	deciduous trees	*Pseudoscleropodium purum*
5	Ursel	51' 15' 39"	3' 45' 17"	13-sep-05	Drongengoedbos	mixed deciduous-conifer	*Pseudoscleropodium purum*
6	Sinaai	51' 12' 09"	3' 59' 47"	11-sep-06	Wullebos	heathland	*Pseudoscleropodium purum*
7	Haasdonk	51' 10' 07"	4' 11' 44"	11-sep-06	Heikapel	heathland	*Pseudoscleropodium purum*
M7	Lichtaart	51' 21' 59" 39	4' 90' 73" 90	21-sep-05	Hoge Berg	conifers	*Rhytidiadelphus squarrosus*
M8b	Leopldsburg	51' 10' 00"	5' 17' 45"	21-sep-05	Domein van Pijnven	conifers - heath	*Pseudoscleropodium purum*
8	Ardooie	51' 20' 50"	3' 14' 00"	20-sep-05	t Veld	conifers - heath	*Pseudoscleropodium purum*
9	Buggenhout	51' 00' 27"	4' 12' 43"	11-oct-05	Buggenhoutbos	mixed deciduous-conifer	*Pseudoscleropodium purum*
12	Brakel	50' 45' 55"	3' 42' 55"	11-oct-05	Brakelbos	conifers	*Pseudoscleropodium purum*
15	Tervuren	50' 80' 29" 37	4' 49' 37" 67	19-sep-05	Aboretum Zoniënwoud	conifers	*Pseudoscleropodium purum*
16	Eupen	50' 36' 15"	6' 02' 30"	19-oct-06	Spitzberg Westhertogenwald	conifers	*Pseudoscleropodium purum*
17	Huy	50' 29' 21"	5' 16' 05"	18-oct-05	Grand Bois de Barse	conifers	*Pseudoscleropodium purum*
18	Ovifat	50' 28' 54"	6' 06' 39"	18-oct-05	Hautes Fagnes	conifers	*Rhytidiadelphus squarrosus*
19	Malmedy	50' 28' 03"	6' 01' 45"	19-oct-06	Hautes Fagnes	conifers	*Pseudoscleropodium purum*
22	Yvoir	50' 20' 17"	4' 57' 44"	18-oct-05	L'Vôye des Loges Herbois	pin/bruyère	*Pseudoscleropodium purum*
23	Rosée	50' 13' 27"	4' 42' 27"	06-oct-05	Bois de Rosée	mixed deciduous-conifer	*Pleurozium schreberi*
24	Rosée	50' 13' 27"	4' 42' 27"	06-oct-05	Bois de Rosée	mixed deciduous-conifer	*Pseudoscleropodium purum*
M43	Nismes	50' 03' 26"	4' 37' 00"	06-oct-05	Les Grèvières Forêt de Nismes	conifers	*Pleurozium schreberi*
M44	Froid Chapelle	50' 06' 39"	4' 22' 27"	06-oct-05	Forêt de Senzeille	conifers	*Pleurozium schreberi*
26	Nassogne	50' 11' 54" 17	5' 38' 24"	12-sep-05	Les Sabotîs	conifers	*Rhytidiadelphus squarrosus*
27	Bras	49' 99' '71" 92	5' 45' 09"	12-sep-05	Bois de Freux	conifers	*Hypnum cupressiforme*
28	Bastogne	50' 01' 51"	5' 45' 30"	12-sep-05	Bois de Corbeaux	conifers	*Pseudoscleropodium purum*
29	Betrix	49' 52' 27"	5' 27' 77" 25	25-ago-05	Bois du Nouveau Ban	conifers	*Pleurozium schreberi*
30a	Betrix	49' 52' 27"	5' 27' 77" 25	24-ago-05	Bois du Nouveau Ban	conifers	*Hylocomium splendens*
30b	Betrix	49' 87' 67" 01	5' 27' 77" 25	25-ago-05	Bois du Nouveau Ban	conifers	*Rhytidiadelphus squarrosus*
31	Virton	49' 60' 01" 97	5' 73' 32" 27	12-sep-05	Bois de Ste-Marie	conifers	*Pseudoscleropodium purum*
32a	Arlon	49' 68' 29" 23	5' 71' 33" 39	12-sep-05	Bois de Stochem	conifers	*Pseudoscleropodium purum*
32b	Arlon	49' 68' 29" 23	5' 71' 33" 39	12-sep-05	Bois de Stochem	conifers	*Rhytidiadelphus squarrosus*
33a	As	50' 96' 55" 49	5' 61' 78" 95	07-sep-06	Mechelse Heide	deciduous trees	*Pleurozium schreberi*
33b	As	50' 96' 55" 50	5' 61' 78" 96	14-sep-05	Mechelse Heide	deciduous trees	*Pseudoscleropodium purum*
34a	Scherpenheu	51' 01' 34"	4' 57' 21"	13-sep-06	Merode	heathland	*Pseudoscleropodium purum*
35	Koksijde	51' 07' 00"	2' 39' 50"	13-sep-06	doornpanne	dunes	*Pleurozium schreberi*

Code site 2006	Code_2006	Lat_WGS84_degré	Lat_WGS84_minute	Lat_WGS84_seconde	Lat_WGS8	Long_WGS	Long_WGS	Long_WGS	Long_WGS	2006_Lambert II_X (m)	2006_Lambert II_Y (m)
AG 40	2006_AG 40	50	30	26	N	2	34	6	E	616481	2612529
AG 50	2006_AG 50	49	29	24	N	2	24	7	E	604747	2499194
AG 66	2006_AG 66	49	11	30	N	0	45	13	W	374645	2470415
AG 71	2006_AG 71	49	36	23	N	1	34	54	W	316603	2519218
AL 01	2006_AL 01	48	51	51	N	0	9	36	W	416762	2432450
AL 16	2006_AL 16	49	34	12	N	1	21	1	W	333136	2514361
AMJ 03	2006_AMJ 03	45	28	47	N	0	40	39	W	364366	2057776
AR 118	2006_AR 118	43	56	5	N	1	15	44	E	513643	1882059
AR 125	2006_AR 125	44	40	13	N	0	2	53	E	418450	1965914
AR 127	2006_AR 127	44	24	3	N	0	27	53	E	450784	1935086
AR 143	2006_AR 143	42	46	1	N	2	24	27	E	605818	1751514
AR 154	2006_AR 154	44	3	25	N	2	31	2	E	614490	1895079
AR 158	2006_AR 158	44	16	57	N	3	49	48	E	719305	1921281
AR 161	2006_AR 161	43	47	59	N	4	9	25	E	746662	1868148
AR 19	2006_AR 19	43	23	12	N	1	33	38	W	283842	1828335
AR 27	2006_AR 27	43	22	21	N	0	6	19	W	401805	1821997
AR 33	2006_AR 33	43	31	44	N	3	16	55	E	676533	1836778
AR 39	2006_AR 39	44	33	37	N	3	1	50	E	655171	1951281
AR 41	2006_AR 41	43	28	2	N	0	24	33	E	443809	1831374
AR 46	2006_AR 46	43	3	38	N	1	20	24	E	518661	1784715
AR 73	2006_AR 73	43	5	7	N	2	50	50	E	641661	1787085
AR 76	2006_AR 76	46	14	10	N	3	42	20	E	705584	2138248
AR 79	2006_AR 79	46	30	23	N	3	6	41	E	659466	2167663
AV 01	2006_AV 01	45	52	23	N	1	5	46	E	503695	2097737
CG 01	2006_CG 01	46	48	11	N	4	15	38	E	746839	2202141
CHS 10	2006_CHS 10	48	17	54	N	4	27	36	E	757567	2368720
CHS 35	2006_CHS 35	48	10	43	N	1	32	12	W	312028	2360377
CHS 58	2006_CHS 58	46	58	12	N	3	39	38	E	700740	2219750
CHS 81	2006_CHS 81	44	2	40	N	1	44	53	E	552785	1893850
CHS 86	2006_CHS 86	46	37	32	N	0	29	38	E	458908	2182271
CP 03	2006_CP 03	44	6	7	N	7	5	41	E	981117	1911604
CP 05	2006_CP 05	44	37	55	N	5	39	34	E	863748	1964580
CP 06	2006_CP 06	44	36	16	N	5	51	30	E	879661	1962213
CP 11	2006_CP 11	46	9	41	N	6	27	56	E	918752	2137396
CP 12	2006_CP 12	46	16	35	N	6	41	31	E	935503	2151101
CP 13	2006_CP 13	45	28	27	N	5	30	22	E	847810	2057633
CPS 77	2006_CPS 77	48	27	15	N	2	42	55	E	628025	2383993
CV 01	2006_CV 01	48	27	59	N	4	51	23	E	786372	2388271
CVH 01	2006_CVH 01	50	14	19	N	3	46	55	E	703291	2583518

liste ech | BRAMM_méta_don2006

ID	Huso	X	Y	Altura (m)	LatLon
1	29N	590345	4839832	88	
2	29N	605370	4840339	59	
3	29N	575644	4810384	382	
4	29N	605242	4811759	558	
5	29N	634623	4809872	403	
6	29N	515011	4794561	96	
7	29N	530490	4795099	126	
8	29N	559918	4795322	136	
9	29N	590717	4795632	514	
10	29N	604990	4795647	480	
11	29N	635237	4795254	524	
12	29N	485106	4764258	134	
13	29N	514941	4763821	370	
14	29N	528895	4765422	241	
15	29N	560304	4764675	245	
16	29N	590600	4765161	708	
17	29N	604838	4765264	485	
18	29N	635173	4764988	564	
19	29N	666644	4763563	457	
20	29N	514768	4735131	381	
21	29N	530007	4735743	195	
22	29N	560092	4735215	316	
23	29N	574807	4735376	399	
24	29N	605200	4734985	578	
25	29N	634461	4735268	585	
26	29N	665706	4735449	927	
27	29N	500254	4719942	119	
28	29N	530278	4719569	154	
29	29N	559978	4720271	734	

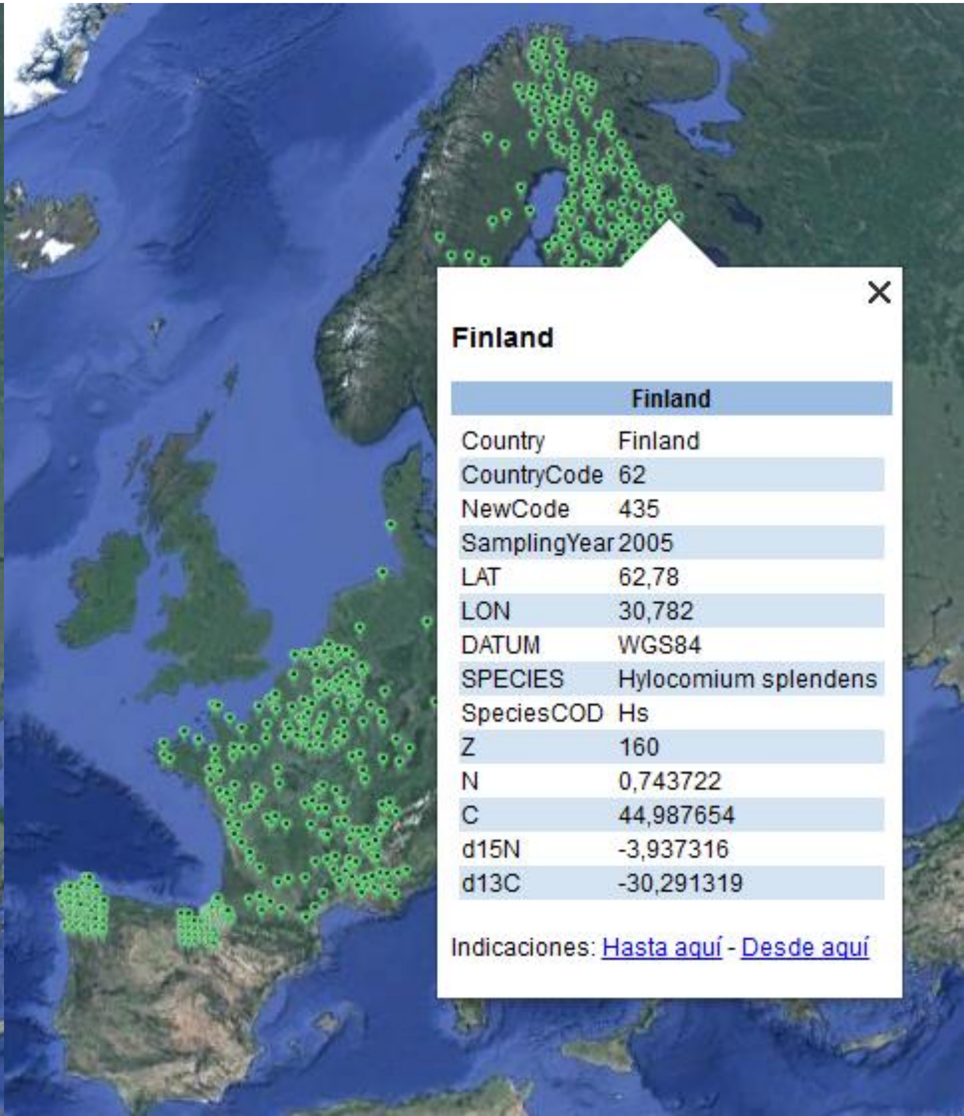
UTM ED50 29N_text | UTMED5029N_num

No	Sample No.	N	E	Altitude	Species
1	MKD-1	42° 02'12"	21° 45'08"	285	*Homalothecium sericeum* (Hedw.) B.S.G
2	MKD-2	42°12'18"	21° 50'08"	385	*Homalothecium sericeum* (Hedw.) B.S.G
3	MKD-3	42° 09'50"	21° 52'58"	352	*Homalothecium sericeum* (Hedw.) B.S.G
4	MKD-4	42° 10'19"	22° 12'50"	535	*Homalothecium sericeum* (Hedw.) B.S.G
5	MKD-5	42° 13'12"	22° 23'51"	740	*Homalothecium sericeum* (Hedw.) B.S.G
6	MKD-6	42° 02'46"	22° 03'41"	567	*Homalothecium sericeum* (Hedw.) B.S.G
7	MKD-7	42° 01'12"	22° 11'34"	655	*Homalothecium sericeum* (Hedw.) B.S.G
8	MKD-8	41° 48'00"	22° 17'58"	519	*Homalothecium sericeum* (Hedw.) B.S.G
9	MKD-9	41° 46'50"	21° 55'27"	356	*Homalothecium sericeum* (Hedw.) B.S.G
10	MKD-10	41° 53'10"	21° 50'42"	338	*Homalothecium sericeum* (Hedw.) B.S.G
11	MKD-11	41° 42'14"	22° 09'22"	307	*Homalothecium sericeum* (Hedw.) B.S.G
12	MKD-12	41° 57'40"	22° 22'40"	885	*Homalothecium sericeum* (Hedw.) B.S.G
13	MKD-13	41° 51'05"	22° 26'24"	441	*Homalothecium sericeum* (Hedw.) B.S.G
14	MKD-14	41° 52'42"	22° 36'44"	547	*Homalothecium sericeum* (Hedw.) B.S.G
15	MKD-15	41° 59'13"	22° 42'40"	556	*Homalothecium sericeum* (Hedw.) B.S.G
16	MKD-16	41° 58'26"	22° 48'54"	556	*Homalothecium sericeum* (Hedw.) B.S.G
17	MKD-17	41° 51'19"	22° 51'14"	749	*Homalothecium sericeum* (Hedw.) B.S.G
18	MKD-18	41° 42'24"	22° 50'19"	846	*Homalothecium sericeum* (Hedw.) B.S.G
19	MKD-19	41° 38'40"	22° 51'20"	940	*Scleropodium purum* (Hedw.) Limpr.

3. Available data

Country	CountryCode	NewCode	SamplingYear	LAT	LON	DATUM	SPECIES	SpeciesCOD	Z	N	C	d15N	d13C
Austria	5-1	1	2005	48,869444	14,991667	WGS84	Pleurozium schreberi	Ps	500	1,173	45,504	-7,491	-31,888
Austria	6-1	2	2005	48,944444	15,191667	WGS84	Pleurozium schreberi	Ps	620	1,160	44,029	-8,408	-32,698
Austria	7-1	3	2005	48,880556	15,336111	WGS84	Pleurozium schreberi	Ps	580	0,993	44,685	-7,780	-31,816
Austria	8-1	4	2005	48,775000	15,636111	WGS84	Pleurozium schreberi	Ps	540	1,281	45,309	-6,850	-31,168
Austria	9-1	5	2005	48,850000	15,861111	WGS84	Abiatinella abietina	Aa	420	1,573	43,987	-5,959	-29,798
Austria	11-1	6	2005	48,763889	16,600000	WGS84	Abiatinella abietina	Aa	330	1,129	44,106	-8,418	-29,653
Austria	13-1	7	2005	48,541667	13,633333	WGS84	Pleurozium schreberi	Ps	700	1,558	45,491	-7,620	-31,373
Austria	14-1	8	2005	48,708333	13,952778	WGS84	Pleurozium schreberi	Ps	960	1,382	44,315	-6,154	-19,437
Austria	14-2	9	2005	48,561111	13,886111	WGS84	Pleurozium schreberi	Ps	550	1,705	44,012	-7,392	-31,713
Austria	15-1	10	2005	48,555556	14,141667	WGS84	Pleurozium schreberi	Ps	640	1,114	45,102	-7,908	-30,093
Austria	16-1	11	2005	48,516667	14,400000	WGS84	Pleurozium schreberi	Ps	720	1,072	45,140	-7,872	-31,158
Austria	17-1	12	2005	48,560000	14,690278	WGS84	Pleurozium schreberi	Ps	870	1,207	44,258	-7,502	-31,533
Austria	18-1	13	2005	48,716667	15,033333	WGS84	Pleurozium schreberi	Ps	590	1,000	44,609	-6,627	-31,843
Austria	18-2	14	2005	48,516667	14,858333	WGS84	Pleurozium schreberi	Ps	950	0,940	44,496	-6,580	-29,011
Austria	19-1	15	2005	48,583333	15,100000	WGS84	Pleurozium schreberi	Ps	610	1,095	45,098	-6,816	-32,808
Austria	20-1	16	2005	48,730556	15,352778	WGS84	Pleurozium schreberi	Ps	570	1,206	45,791	-7,184	-31,038
Austria	20-2	17	2005	48,578056	15,488056	WGS84	Pleurozium schreberi	Ps	540	1,416	44,706	-6,162	-33,098
Austria	21-1	18	2005	48,548611	15,744444	WGS84	Pleurozium schreberi	Ps	520	1,357	43,976	-7,198	-32,927
Austria	22-1	19	2005	48,630556	15,955556	WGS84	Abiatinella abietina	Aa	320	1,048	43,223	-7,212	-29,692
Austria	23-1	20	2005	48,650000	16,168056	WGS84	Abiatinella abietina	Aa	310	1,324	38,992	-7,227	-28,998
Austria	24-1	21	2005	48,647778	16,562778	WGS84	Hypnum cupressiforme	Hc	240	1,416	44,418	-8,126	-29,978
Austria	24-2	22	2005	48,533333	16,352778	WGS84	Abiatinella abietina	Aa	350	1,462	43,529	-7,112	-28,398
Austria	25-1	23	2005	48,591667	16,752778	WGS84	Abiatinella abietina	Aa	280	1,280	42,695	-7,704	-30,136
Austria	26-1	24	2005	48,713889	16,880556	WGS84	Pleurozium schreberi	Ps	170	1,433	41,041	-6,530	-32,722

3. Available data



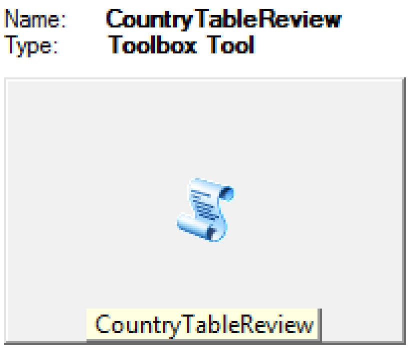
3. Available data

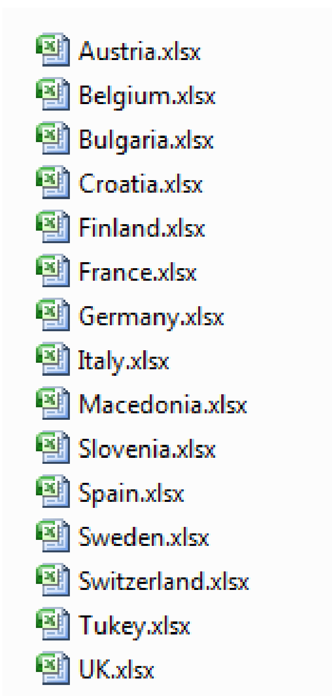
P
R
O
B
L
E
M
S

Lack of Longitude or Latitude data

Duplicates: same coordinates, different moss species

3.1. Correct data






```
import arcpy, os

arcpy.env.overwriteOutput = 'True‘

arcpy.env.scratchWorkspace = arcpy.GetParameterAsText(0)
arcpy.env.workspace = arcpy.GetParameterAsText(1)
out_GDB = arcpy.GetParameterAsText(2)

ListaPaises = arcpy.ListFiles({'*.xlsx'})

arcpy.AddMessage(ListaPaises)
```

3.1. Correct data

```
for Pais in ListaPaises:
    FCpais= Pais.replace('.xlsx','')
    paisS = FCpais+'_statistics'
    arcpy.TableToTable_conversion(Pais+r'\Hoja1$',out_GDB,FCpais)
    ListaCampos = arcpy.ListFields(Pais+r'\Hoja1$')
    for campo in ListaCampos:
        print campo.name
    arcpy.MakeTableView_management (out_GDB+os.sep+FCpais,Pais.replace('.xlxs','_Tview'),
                                    'LAT IS NULL OR LON IS NULL')
    arcpy.DeleteRows_management(Pais.replace('.xlxs','_Tview'))
    arcpy.Statistics_analysis(out_GDB+os.sep+FCpais,arcpy.env.scratchWorkspace+os.sep+paisS,
                              [['LAT','COUNT'],['LON','COUNT']],['LAT','LON'])
    rowTable = out_GDB+os.sep+FCpais
    stsTable = arcpy.env.scratchWorkspace+os.sep+paisS
```

3.1. Correct data

```
with arcpy.da.SearchCursor(rowTable,['speciesCOD'],sql_clause=(None,'DISTINCT')) as BuscaEspecie:
        for fila in BuscaEspecie:
            arcpy.AddField_management(stsTable,fila[0],'LONG')
            stsTableFields= arcpy.ListFields(stsTable)
            for field in stsTableFields:
                print field.name
            field_names= field.name
    arcpy.AddField_management(rowTable,'LAT2','TEXT')
    expressionLAT2 = 'str(!LAT!)[0:6]'
    arcpy.CalculateField_management(rowTable,'LAT2',expressionLAT2,'PYTHON')
    arcpy.AddField_management(rowTable,'LON2','TEXT')
    expressionLON2 = 'str(!LON!)[0:6]'
    arcpy.CalculateField_management(rowTable,'LON2',expressionLON2,'PYTHON')
    arcpy.AddField_management(stsTable,'LAT2','TEXT')
    arcpy.CalculateField_management(stsTable,'LAT2',expressionLAT2,'PYTHON')
    arcpy.AddField_management(stsTable,'LON2','TEXT')
    arcpy.CalculateField_management(stsTable,'LON2',expressionLON2,'PYTHON‘)
```

3.1. Correct data

```
with arcpy.da.SearchCursor(rowTable,['LAT2','LON2','speciesCOD']) as CoincidenciaSPS:
    for coincidencia in CoincidenciaSPS:
        condicion = "LAT2 ='" +coincidencia[0] +"' AND LON2 ='" +coincidencia[1] + "'"
        print condicion
        print coincidencia
        print stsTable
        with arcpy.da.UpdateCursor(stsTable,['LAT2','LON2',coincidencia[2]], condicion) as Actualiza:
            for filaActualiza in Actualiza:
                print filaActualiza
                filaActualiza[2]=1
                Actualiza.updateRow((filaActualiza[0],filaActualiza[1],filaActualiza[2]))
                print filaActualiza
```

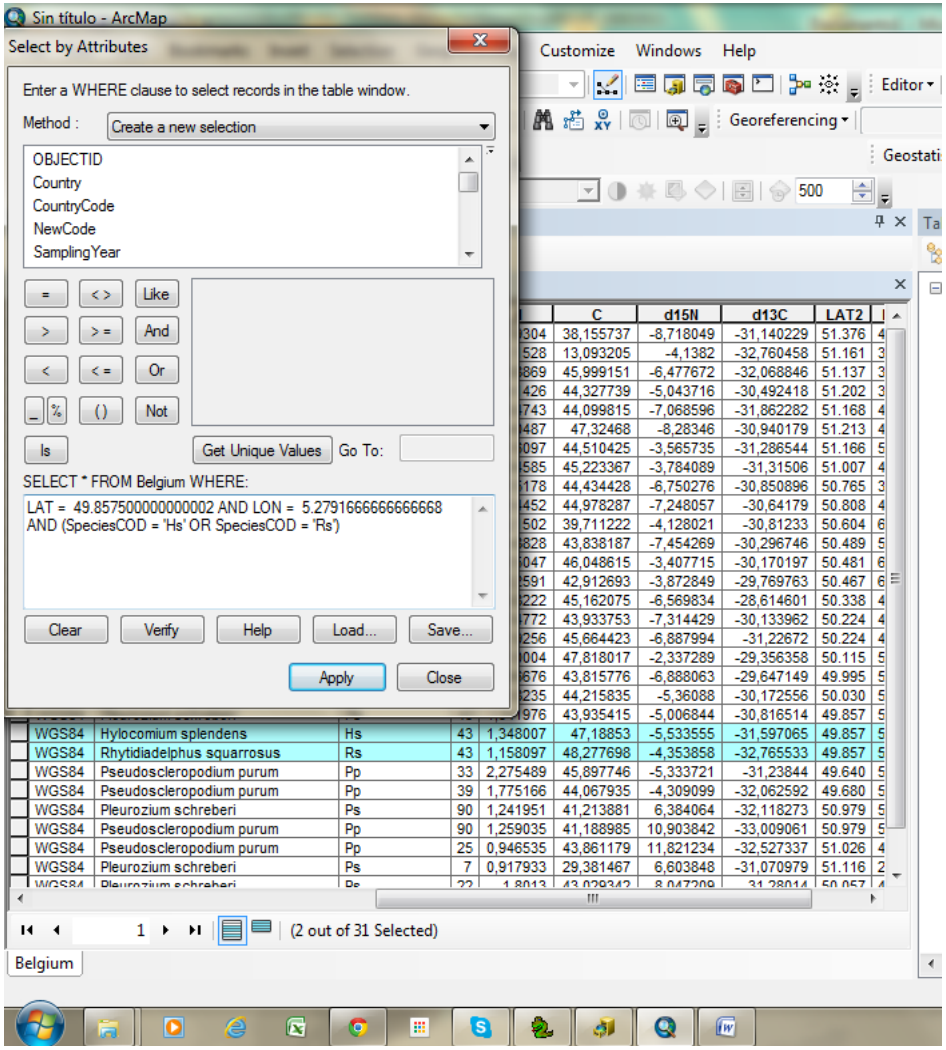
3.1. Correct data

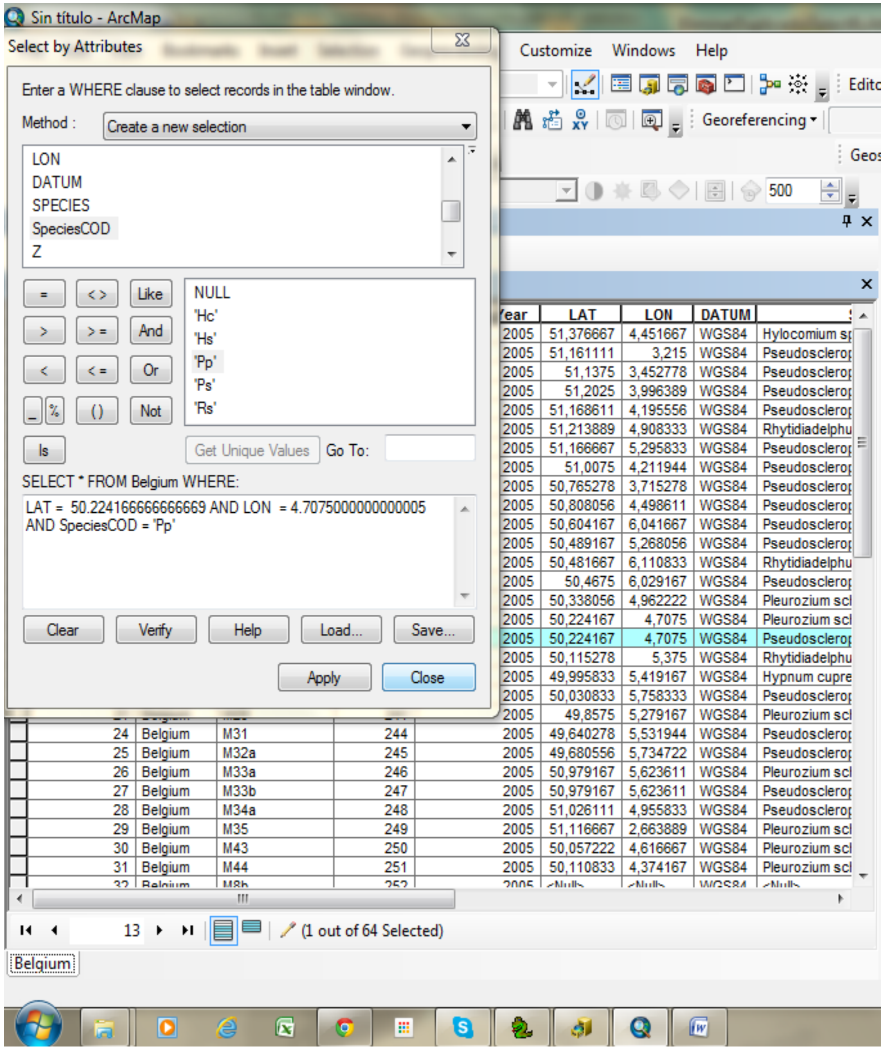
Name: **UK_statistics**
Type: **File Geodatabase Table**

UK_statistics

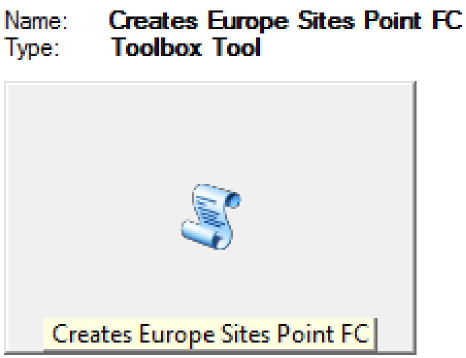
OBJECTID *	LAT	LON	FREQUENCY	COUNT_LAT	COUNT_LON	Ps	Hs	Hc	Rs	Pp	LAT2	LON2
40	52,34594	-2,738346	1	1	1			1			52.345	-2.738
41	52,38949	-2,407663	1	1	1				1		52.389	-2.407
42	52,40792	-1,592755	1	1	1				1		52.407	-1.592
43	52,42793	0,5964403	1	1	1	1					52.427	0.5964
44	52,48235	-3,72604	1	1	1	1					52.482	-3.726
45	52,48263	-0,2144157	1	1	1				1		52.482	-0.214
46	52,50206	-0,5206882	1	1	1				1		52.502	-0.520
47	52,56048	-1,850996	1	1	1			1			52.560	-1.850
48	52,58229	-3,015516	1	1	1	1					52.582	-3.015
49	52,66973	0,5943393	1	1	1			1			52.669	0.5943
50	52,724	-3,918087	1	1	1	1					52.724	-3.918
51	52,75041	1,223335	1	1	1			1			52.750	1.2233
52	52,84017	-4,051596	1	1	1	1					52.840	-4.051
53	52,9025	-2,785435	1	1	1			1			52.902	-2.785
54	52,9264	-2,145794	1	1	1				1		52.926	-2.145
55	52,94004	-3,528395	2	2	2	1	1				52.940	-3.528
56	53,10223	-3,610628	1	1	1	1					53.102	-3.610
57	53,11584	-3,072874	1	1	1	1					53.115	-3.072
58	53,11998	-3,843397	1	1	1	1					53.119	-3.843
59	53,14705	-0,1681561	1	1	1			1			53.147	-0.168
60	53,16325	-1,626031	1	1	1			1			53.163	-1.626
61	53,16517	-3,268587	1	1	1	1					53.165	-3.268
62	53,20693	-1,067111	1	1	1	1					53.206	-1.067
63	53,22453	-4,000706	2	2	2			1	1		53.224	-4.000
64	53,27334	-1,052168	1	1	1	1					53.273	-1.052
65	53,2808	-3,215007	1	1	1				1		53.280	-3.215

3.1. Correct data





3.2. Create ‘Europe_sites’ FC



- import arcpy, os

- arcpy.env.overwriteOutput = 'True'
- arcpy.env.scratchWorkspace = arcpy.GetParameterAsText(0)
- arcpy.env.workspace = arcpy.GetParameterAsText(1)
- out_GDB = arcpy.GetParameterAsText(2)
- out_scratch = arcpy.GetParameterAsText(3)

- ListaPaises = arcpy.ListTables()

- arcpy.AddMessage(ListaPaises)

- ListaPais_Sites = [ ]

3.2. Create 'Europe_sites' FC

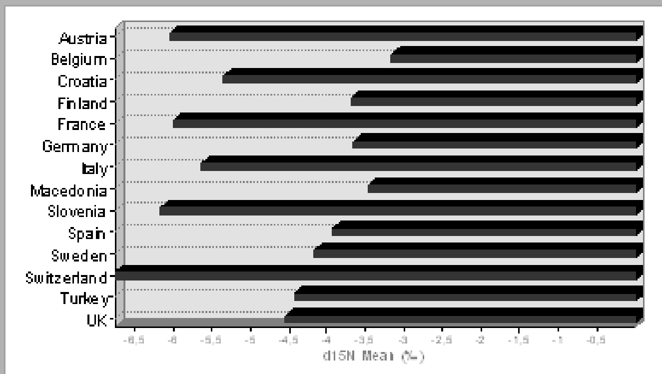
```
for Pais in ListaPaises:
    FCpais= Pais
    rowTable = out_GDB+os.sep+FCpais
    CoorX = 'LON'
    CoorY = 'LAT'
    out_layer = rowTable+'_layer'
    spRef_WGS84 = arcpy.SpatialReference(4326)
    spRef_ED50 = arcpy.SpatialReference(4230)
    spRef_D48 = arcpy.SpatialReference(104131)
    FC_name = FCpais+'_Sites'
    FC_nameED50 = FCpais+'_ED50'
    FC_nameD48 = FCpais+'_D48'
    FC_ED50 = arcpy.env.scratchWorkspace+os.sep+FC_nameED50
    out_project = arcpy.env.scratchWorkspace+os.sep+FC_name
    FC_D48 = arcpy.env.scratchWorkspace+os.sep+FC_nameD48
    TransED50 = 'ED_1950_To_WGS_1984_NTv2_Peninsula'
    TransD48 = 'D48_To_WGS_1984_2007'
```

3.2. Create 'Europe_sites' FC

```
with arcpy.da.SearchCursor(rowTable,['LAT','LON','DATUM'],sql_clause=(None,'DISTINCT')) as BuscaDatum:
    for datum in BuscaDatum:
        if datum[2] == 'WGS84':
            arcpy.MakeXYEventLayer_management(rowTable,CoorX,CoorY,out_layer,spRef_WGS84)
            arcpy.FeatureClassToFeatureClass_conversion(out_layer,arcpy.env.scratchWorkspace,FC_name)
        if datum[2] == 'ED50':
            arcpy.MakeXYEventLayer_management(rowTable,CoorX,CoorY,out_layer,spRef_ED50)
            arcpy.FeatureClassToFeatureClass_conversion(out_layer,arcpy.env.scratchWorkspace,FC_nameED50)
            arcpy.Project_management(FC_ED50,out_project,spRef_WGS84,TransED50,spRef_ED50)
        if datum[2] == 'D48':
            arcpy.MakeXYEventLayer_management(rowTable,CoorX,CoorY,out_layer,spRef_D48)
            arcpy.FeatureClassToFeatureClass_conversion(out_layer,arcpy.env.scratchWorkspace,FC_nameD48)
            arcpy.Project_management(FC_D48,out_project,spRef_WGS84,TransD48,spRef_D48)
    ListaPais_Sites.append(arcpy.env.scratchWorkspace+os.sep+FC_name)
    print ListaPais_Sites
out_merge = out_GDB+os.sep+'Europe_Sites'
arcpy.Merge_management(ListaPais_Sites,out_merge)
```

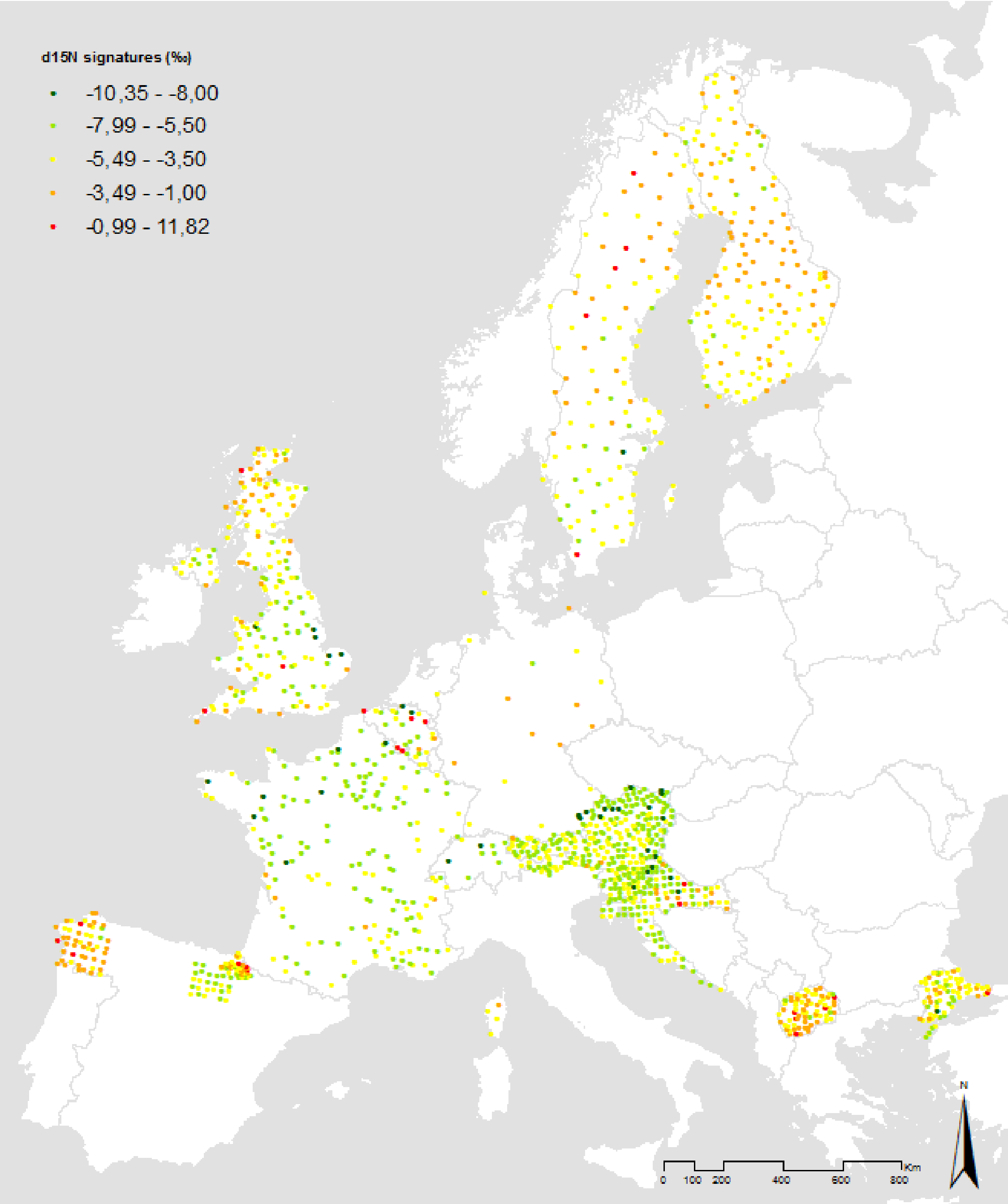
Nitrogen Isotopic Signatures in mosses from Europe

This map shows the geographical distribution of d15N isotopic signatures in Europe. A total of 1282 moss samples from the 2005 ICP-Vegetation campaign were analysed.
A summary of the main statistics per country can be found on the below graph and table.



d15N					
	n	Mean	Max.	Min.	STD
Austria	219	-6,04	-2,45	-10,01	1,28
Belgium	27	-3,16	11,82	-8,72	5,54
Croatia	90	-5,34	1,63	-9,18	1,70
Finland	150	-3,69	-1,17	-6,69	1,04
France	166	-6,00	-2,10	-9,05	1,33
Germany	17	-3,65	-1,57	-6,17	1,13
Italy	20	-5,62	-3,96	-7,36	0,83
Macedonia	72	-3,47	-0,38	-6,03	1,36
Slovenia	55	-6,15	-3,70	-9,75	1,20
Spain	115	-3,92	1,85	-7,25	1,87
Sweden	100	-4,17	0,17	-8,09	1,50
Switzerland	10	-6,75	-4,80	-10,35	1,90
Turkey	72	-4,43	0,81	-8,32	1,64
UK	169	-4,54	3,64	-8,89	1,76

sizqueta
June 23th 2014
FP_NitrogenIsotopesMap



4. Project Aim

- The objective of the present work is to extract information from Corine Land Cover (2006) and from The European Monitoring and Evaluation Programme (EMEP) to correlate it with the nitrogen isotopic signatures obtained in mosses from Europe.

5. Procedure

European Environment Agency

Topics | Data and maps | Indicators | Publications

You are here: Home / Publications / CORINE Land Cover

CORINE Land Cover

Topics: Biodiversity

In 1985 the Corine programme was initiated in the European Union. Corine means 'coordination of information on the environment' and it was a prototype project working on many different environmental issues. The Corine databases and several of its programmes have been taken over by the EEA. One of these is an inventory of land cover in 44 classes, and presented as a cartographic product, at a scale of 1:100 000. This database is operationally available for most areas of Europe.

5. Procedure

Convention on Long-range Transboundary Air Pollution

emep

Co-operative programme for monitoring and evaluation of the long-range transmissions of air pollutants in Europe

emep.int pages:

- EMEP Home
- EMEP Overview
- EMEP Publications
- EMEP Meetings
- EMEP Grid

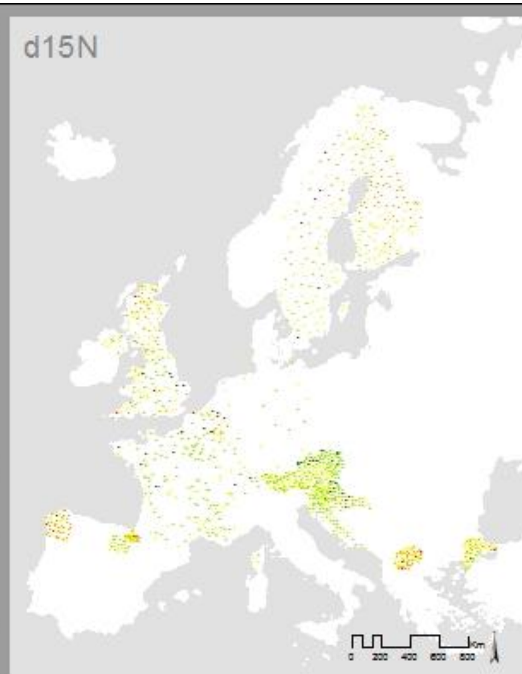
EMEP

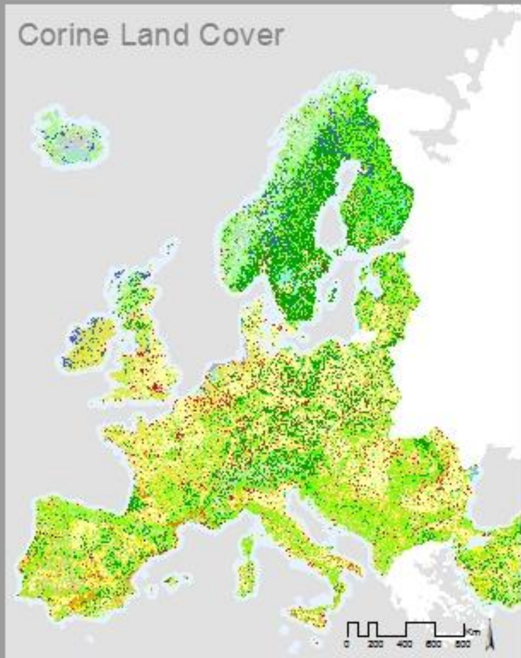
The European Monitoring and Evaluation Programme (EMEP) is a scientifically based and policy driven programme under the Convention on Long-range Transboundary Air Pollution (CLRTAP) for international co-operation to solve transboundary air pollution problems.

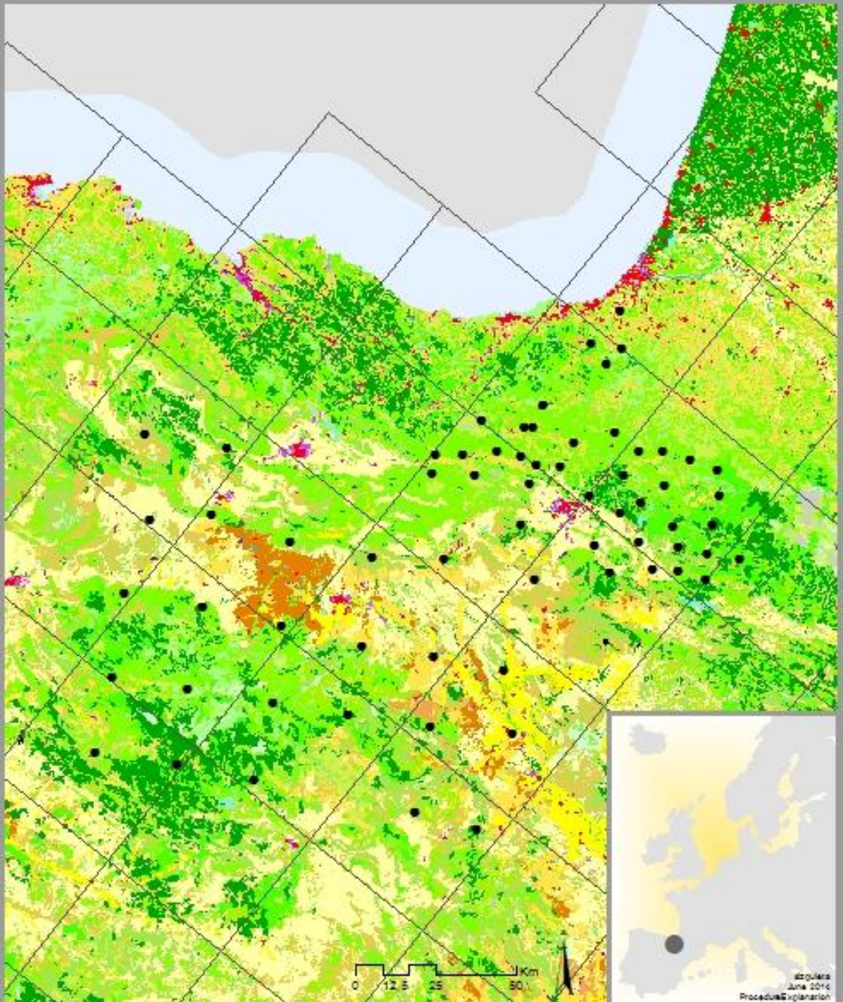
Five EMEP Centers and four Task Forces undertake efforts in support of the EMEP work plan. We refer to the respective websites for in-depth information:

Project Aim

To extract information from Corine Land Cover (CLC)
and The European Monitoring and Evaluation Programme (EMEP)
to correlate it with the nitrogen isotopic signatures obtained in
mosses from Europe

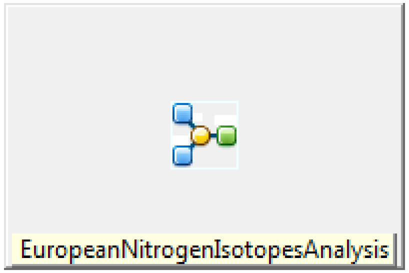


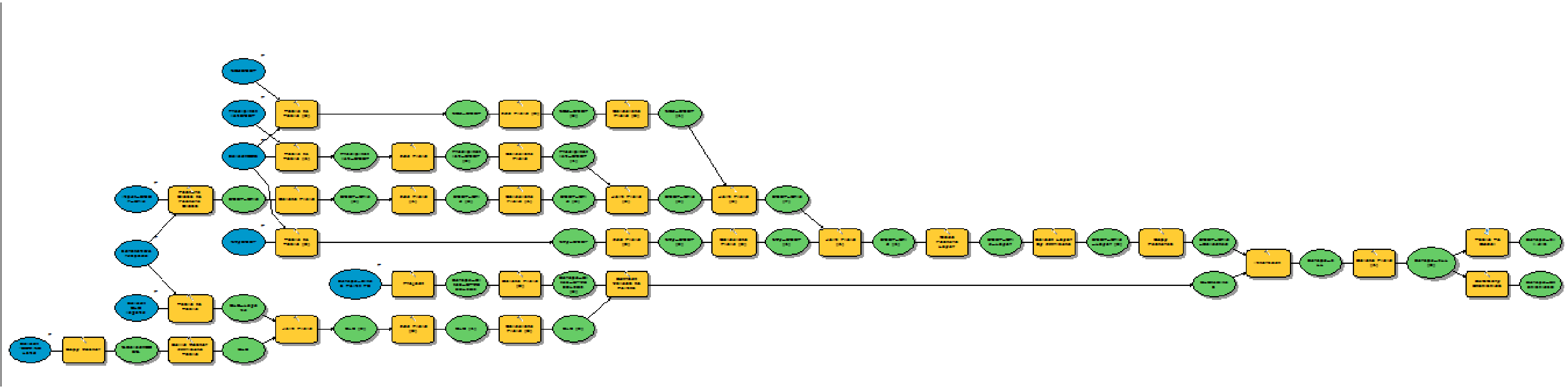




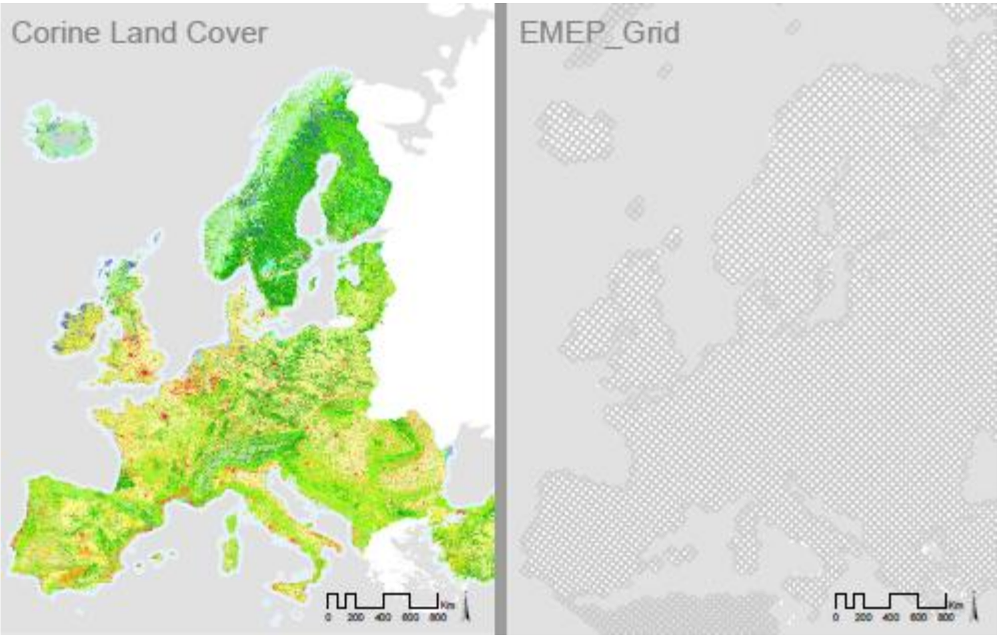
5. Procedure

Name: **EuropeanNitrogenIsotopesAnalysis**
Type: **Toolbox Tool**





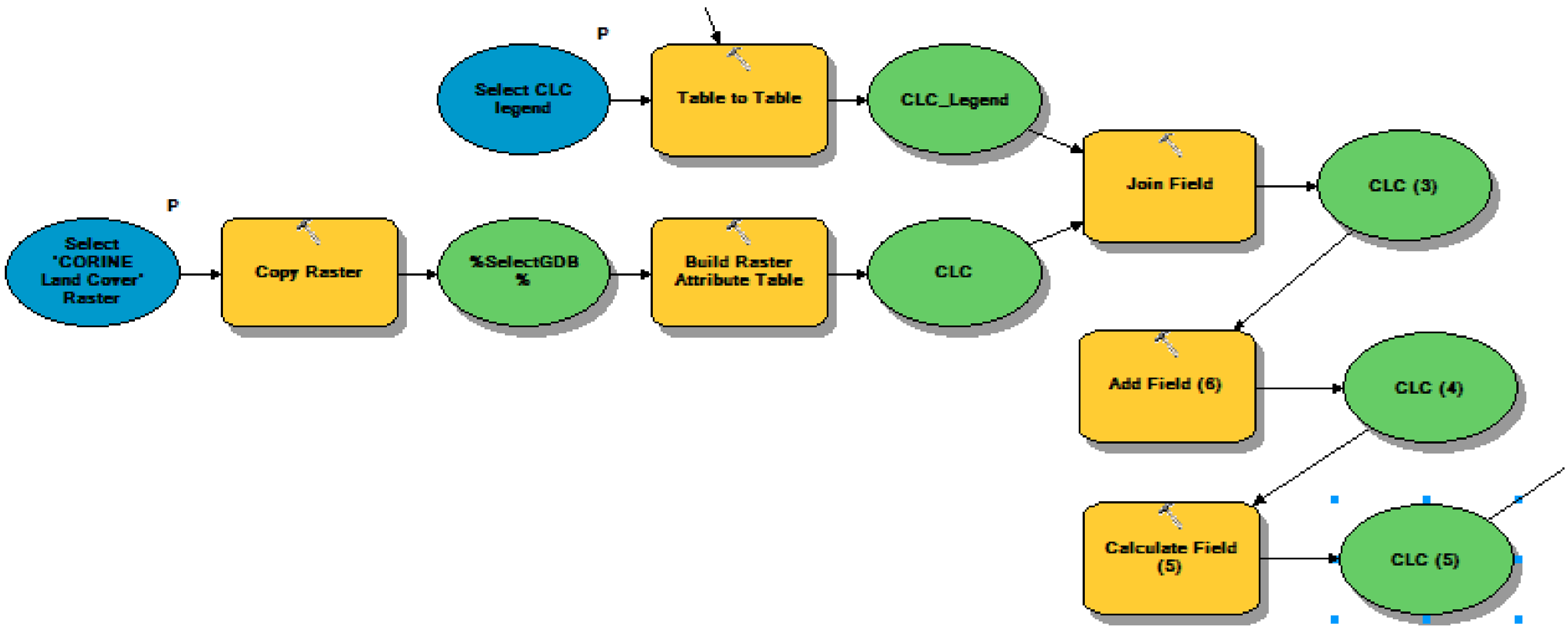
5. Procedure



ETRS89_LAEA

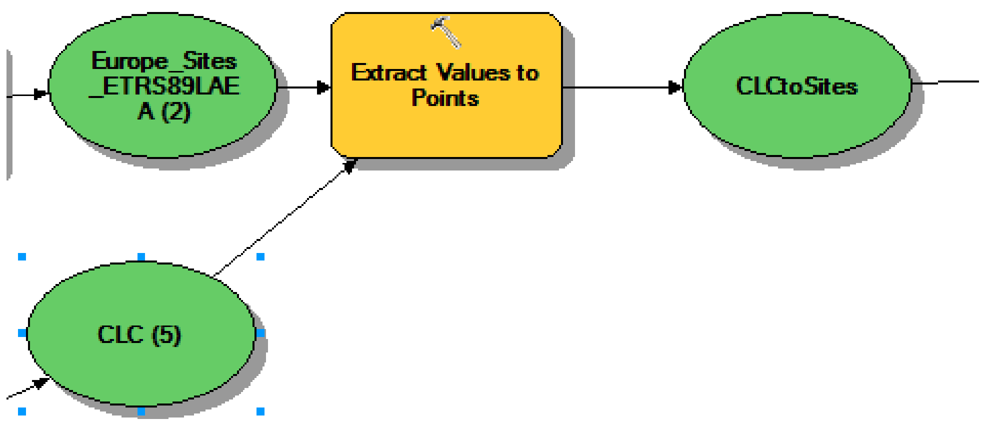
5. Procedure

- EXTRACT DATA FROM CLC



5. Procedure

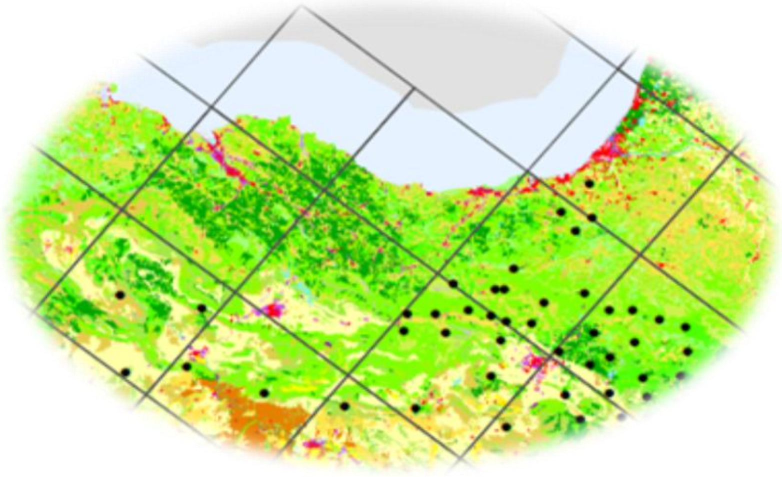
- EXTRACT DATA FROM CLC

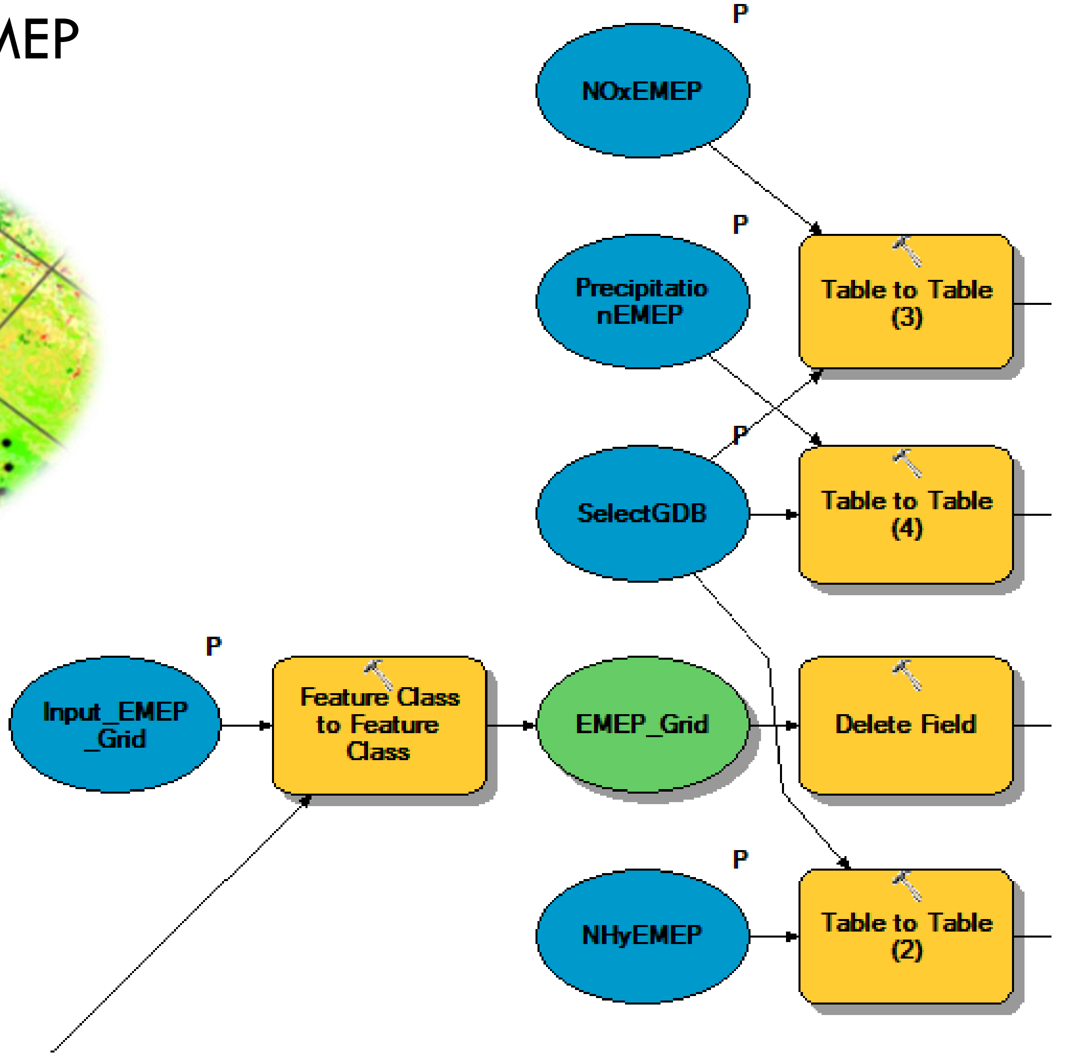


Countr	Cou	Ne	Samplin	LAT	LON	DATUM	SPECIES	Spec	Z	N	C	d15N	d13	RASTER	LandCover1	LandUseCode
Austria	5-1	1	2005	48,869	14,9916	WGS84	Pleuroziu	Ps	500	1,173476	45,50377	-7,49	-31,	24	Forest and semi natural areas	2
Austria	6-1	2	2005	48,944	15,1916	WGS84	Pleuroziu	Ps	620	1,159808	44,02859	-8,40	-32,	24	Forest and semi natural areas	2
Austria	7-1	3	2005	48,880	15,3361	WGS84	Pleuroziu	Ps	580	0,992828	44,68478	-7,78	-31,	24	Forest and semi natural areas	2
Austria	8-1	4	2005	48,775	15,6361	WGS84	Pleuroziu	Ps	540	1,281364	45,30939	-6,85	-31,	24	Forest and semi natural areas	2
Austria	9-1	5	2005	48,85	15,8611	WGS84	Abiatinella	Aa	420	1,573376	43,98698	-5,95	-29,	25	Forest and semi natural areas	2
Austria	11-1	6	2005	48,763	16,6	WGS84	Abiatinella	Aa	330	1,128906	44,10609	-8,41	-29,	12	Agricultural areas	1
Austria	13-1	7	2005	48,541	13,6333	WGS84	Pleuroziu	Ps	700	1,558427	45,49090	-7,62	-31,	24	Forest and semi natural areas	2
Austria	14-1	8	2005	48,708	13,9527	WGS84	Pleuroziu	Ps	960	1,381762	44,31535	-6,15	-19,	24	Forest and semi natural areas	2
Austria	14-2	9	2005	48,561	13,8861	WGS84	Pleuroziu	Ps	550	1,705368	44,01173	-7,39	-31,	20	Agricultural areas	1
Austria	15-1	10	2005	48,555	14,1416	WGS84	Pleuroziu	Ps	640	1,114331	45,10164	-7,90	-30,	18	Agricultural areas	1
Austria	16-1	11	2005	48,516	14,4	WGS84	Pleuroziu	Ps	720	1,072437	45,13952	-7,87	-31,	20	Agricultural areas	1
Austria	17-1	12	2005	48,56	14,6902	WGS84	Pleuroziu	Ps	870	1,207063	44,25826	-7,50	-31,	24	Forest and semi natural areas	2
Austria	18-1	13	2005	48,716	15,0333	WGS84	Pleuroziu	Ps	590	0,999647	44,60859	-6,62	-31,	24	Forest and semi natural areas	2
Austria	18-2	14	2005	48,516	14,8583	WGS84	Pleuroziu	Ps	950	0,940056	44,49580	-6,58	-29,	20	Agricultural areas	1
Austria	19-1	15	2005	48,583	15,1	WGS84	Pleuroziu	Ps	610	1,094808	45,09842	-6,81	-32,	20	Agricultural areas	1

5. Procedure

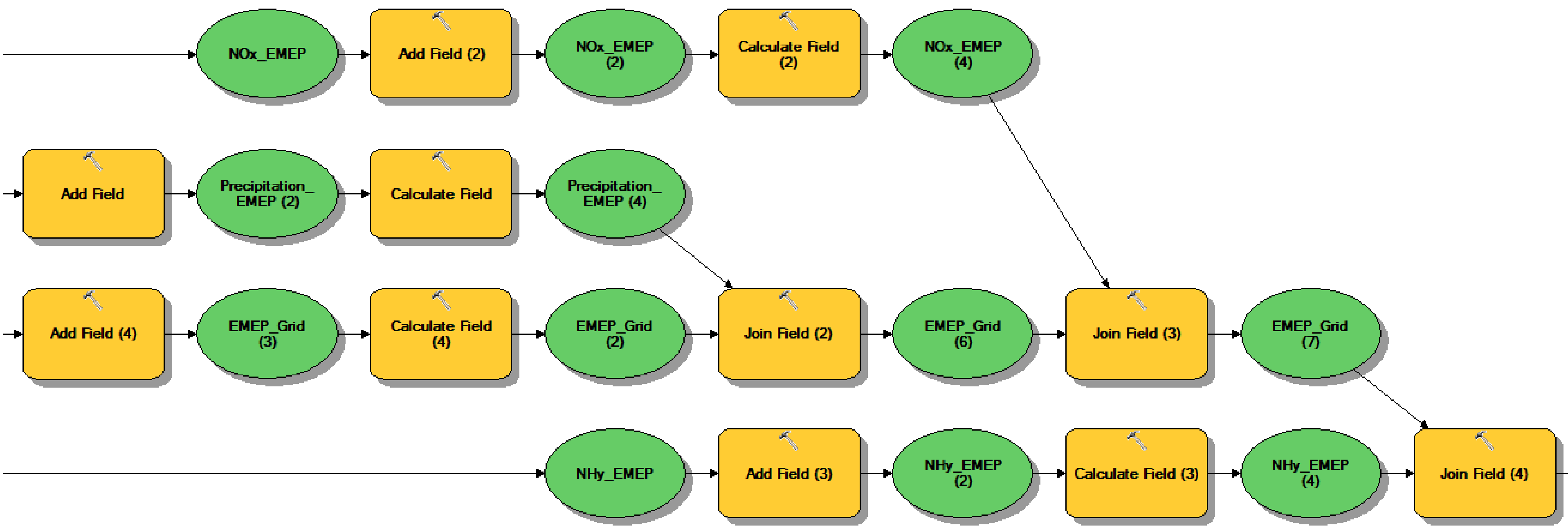
- EXTRACT DATA FROM EMEP





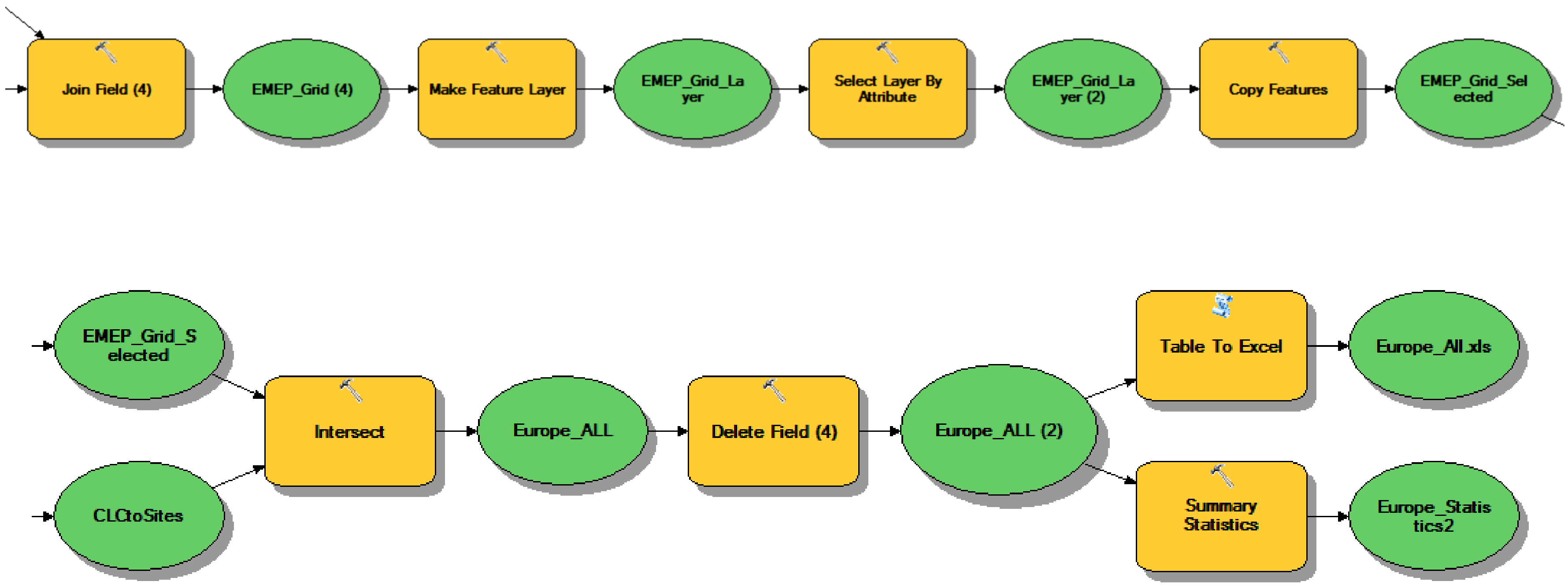
5. Procedure

- EXTRACT DATA FROM EMEP



5. Procedure

- EXTRACT DATA FROM EMEP



5. Procedure

- FINAL TABLE

Contents | Preview | Description

OBJE	S	Country	Countr	New	Sampl	LAT	LON	DATUM	SPECIES	SpeciesCOD	Z	N	C	d15N	d13C	LandCover1	Land	UNIT	precipitation	UNIT_N	NOx_con	UNIT_NH	NHy_con
1	P	Turkey	16	1095	2005	40,1286	26,23	WGS84	Brachiteci	B	132	1,29	42,7	-7,365	-30,28	Forest and semi n	2	mm	575,762024	mgN/m2	345,005	mgN/m2	229,1716
2	P	Macedonia	MKD60	786	2005	40,9519	20,89	WGS84	Hypnum c	Hc	875	0,97	43,7	-3,412	-29,77	Forest and semi n	2	mm	1487,709961	mgN/m2	442,239	mgN/m2	363,5751
3	P	Macedonia	MKD50	776	2005	40,9038	21,33	WGS84	Homalothe	Hos	759	1,47	43,2	-1,012	-29,36	Forest and semi n	2	mm	1468,57605	mgN/m2	601,999	mgN/m2	452,4132
4	P	Turkey	17	1096	2005	40,1994	26,35	WGS84	Brachiteci	B	15	1,29	42,4	-5,426	-29,39	Forest and semi n	2	mm	575,762024	mgN/m2	345,005	mgN/m2	229,1716
5	P	France	FD 08	582	2005	41,5569	8,982	WGS84	Hypnum c	Hc	40	0,81	42,3	-4,051	-30,46	Agricultural areas	1	mm	488,108002	mgN/m2	324,248	mgN/m2	151,9771
6	P	Macedonia	MKD61	787	2005	40,9455	21,12	WGS84	Homalothe	Hos	865	0,90	43,8	-0,867	-28,05	Forest and semi n	2	mm	1468,57605	mgN/m2	601,999	mgN/m2	452,4132
7	P	Turkey	18	1097	2005	40,2702	26,40	WGS84	Hypnum c	Hc	35	1,09	42,7	-5,855	-30,08	Agricultural areas	1	mm	575,762024	mgN/m2	345,005	mgN/m2	229,1716
8	P	Macedonia	MKD49	775	2005	40,9669	21,63	WGS84	Homalothe	Hos	581	1,42	44,0	-2,321	-29,23	Forest and semi n	2	mm	1112,573975	mgN/m2	386,410	mgN/m2	363,9850
9	P	Macedonia	MKD59	785	2005	41,0752	20,95	WGS84	Homalothe	Hos	979	1,35	43,2	-4,431	-29,37	Forest and semi n	2	mm	1487,709961	mgN/m2	442,239	mgN/m2	363,5751
10	P	Macedonia	MKD52	778	2005	41,0672	21,10	WGS84	Scleropodi	Sp	1187	1,47	43,0	-2,926	-29,18	Forest and semi n	2	mm	1468,57605	mgN/m2	601,999	mgN/m2	452,4132
11	P	Macedonia	MKD72	798	2005	41,1025	20,82	WGS84	Homalothe	Hos	785	1,26	43,5	-1,128	-28,10	Agricultural areas	1	mm	1487,709961	mgN/m2	442,239	mgN/m2	363,5751
12	P	Turkey	19	1098	2005	40,3502	26,52	WGS84	Brachiteci	B	43	1,08	41,9	-5,722	-28,58	Agricultural areas	1	mm	643,640015	mgN/m2	392,944	mgN/m2	176,3271
13	P	Macedonia	MKD51	777	2005	41,0952	21,30	WGS84	Homalothe	Hos	692	0,94	44,9	-2,911	-28,02	Forest and semi n	2	mm	1468,57605	mgN/m2	601,999	mgN/m2	452,4132
14	P	Macedonia	MKD48	774	2005	41,0969	21,57	WGS84	Homalothe	Hos	948	1,63	43,8	-1,427	-29,70	Forest and semi n	2	mm	1112,573975	mgN/m2	386,410	mgN/m2	363,9850
15	P	Macedonia	MKD47	773	2005	41,0888	21,66	WGS84	Homalothe	Hos	531	1,15	44,1	-1,307	-30,33	Forest and semi n	2	mm	1112,573975	mgN/m2	386,410	mgN/m2	363,9850
16	P	Turkey	20	1099	2005	40,4047	26,64	WGS84	Brachiteci	B	39	1,09	42,0	-4,128	-29,39	Agricultural areas	1	mm	643,640015	mgN/m2	392,944	mgN/m2	176,3271
17	P	Macedonia	MKD58	784	2005	41,2255	20,90	WGS84	Homalothe	Hos	796	1,43	43,7	-3,804	-28,03	Forest and semi n	2	mm	1487,709961	mgN/m2	442,239	mgN/m2	363,5751
18	P	Macedonia	MKD62	788	2005	41,2272	21,16	WGS84	Homalothe	Hos	771	1,93	42,6	-3,831	-32,17	Forest and semi n	2	mm	1487,709961	mgN/m2	442,239	mgN/m2	363,5751
19	P	Macedonia	MKD57	783	2005	41,2755	20,78	WGS84	Homalothe	Hos	748	1,75	42,7	-4,279	-29,40	Agricultural areas	1	mm	1487,709961	mgN/m2	442,239	mgN/m2	363,5751
20	P	Macedonia	MKD45	771	2005	41,1675	21,80	WGS84	Homalothe	Hos	746	0,90	44,3	-2,744	-29,88	Forest and semi n	2	mm	1112,573975	mgN/m2	386,410	mgN/m2	363,9850
21	P	Macedonia	MKD53	779	2005	41,3691	20,59	WGS84	Homalothe	Hos	654	1,53	42,3	-3,386	-28,51	Agricultural areas	1	mm	1744,534058	mgN/m2	450,661	mgN/m2	488,1484
22	P	Macedonia	MKD44	770	2005	41,2705	21,57	WGS84	Hypnum c	Hc	969	1,90	43,3	-2,250	-30,73	Agricultural areas	1	mm	1112,573975	mgN/m2	386,410	mgN/m2	363,9850
23	P	Macedonia	MKD42	768	2005	41,2344	22,04	WGS84	Hypnum c	Hc	310	1,40	43,7	-3,015	-28,41	Forest and semi n	2	mm	821,672974	mgN/m2	345,960	mgN/m2	287,2372
24	P	Turkey	23	1102	2005	40,6419	26,25	WGS84	Hypnum c	Hc	49	1,42	41,1	-3,562	-28,44	Artificial surfaces	5	mm	543,950989	mgN/m2	316,498	mgN/m2	197,0630
25	P	Macedonia	MKD37	763	2005	41,2019	22,45	WGS84	Hypnum c	Hc	167	1,14	43,9	-5,407	-29,61	Forest and semi n	2	mm	781,205017	mgN/m2	282,618	mgN/m2	395,7158
26	P	Turkey	24	1103	2005	40,6305	26,45	WGS84	Brachiteci	B	46	1,31	41,4	-5,475	-29,57	Agricultural areas	1	mm	543,950989	mgN/m2	316,498	mgN/m2	197,0630
27	P	Macedonia	MKD56	782	2005	41,4008	20,95	WGS84	Hypnum c	Hc	809	1,17	39,9	-3,531	-28,98	Forest and semi n	2	mm	1487,709961	mgN/m2	442,239	mgN/m2	363,5751
28	P	Macedonia	MKD63	789	2005	41,3802	21,22	WGS84	Homalothe	Hos	1382	1,21	42,8	-0,831	-29,44	Forest and semi n	2	mm	1262,437988	mgN/m2	361,302	mgN/m2	351,1043
29	P	Turkey	25	1104	2005	40,6436	26,62	WGS84	Hypnum c	Hc	38	0,99	42,2	-4,917	-29,56	Forest and semi n	2	mm	543,950989	mgN/m2	316,498	mgN/m2	197,0630
30	P	Macedonia	MKD36	762	2005	41,2388	22,63	WGS84	Homalothe	Hos	196	1,21	42,2	-4,006	-29,91	Agricultural areas	1	mm	882,525024	mgN/m2	285,659	mgN/m2	361,0953
31	P	France	FD 07	581	2005	42,0408	9,198	WGS84	Hypnum c	Hc	973	1,10	41,5	-3,537	-29,98	Forest and semi n	2	mm	680,947998	mgN/m2	546,910	mgN/m2	258,0475
32	P	Macedonia	MKD64	790	2005	41,4075	21,27	WGS84	Homalothe	Hos	778	0,90	42,4	-3,479	-28,51	Agricultural areas	1	mm	1262,437988	mgN/m2	361,302	mgN/m2	351,1043
33	P	Turkey	22	1101	2005	40,7377	26,12	WGS84	Hypnum c	Hc	28	2,40	41,9	-1,932	-28,32	Agricultural areas	1	mm	496,063995	mgN/m2	233,700	mgN/m2	248,0932
34	P	Turkey	74	1151	2005	40,6805	26,47	WGS84	Hypnum c	Hc	127	1,23	39,8	-2,562	-28,76	Forest and semi n	2	mm	543,950989	mgN/m2	316,498	mgN/m2	197,0630
35	P	Macedonia	MKD46	772	2005	41,3875	21,59	WGS84	Homalothe	Hos	766	1,13	41,5	-2,122	-30,05	Forest and semi n	2	mm	1262,437988	mgN/m2	361,302	mgN/m2	351,1043

5. Procedure

- FINAL TABLE

Finland

Finland	
Country	Finland
CountryCode	64
NewCode	437
SamplingYear	2005
LAT	62,906
LON	22,611
DATUM	WGS84
SPECIES	Hylocomium splendens
SpeciesCOD	Hs
Z	35
N	0,766783
C	44,470551
d15N	-3,358851
d13C	-32,173848
LandCover1	Forest and semi natural areas
LandUseCode	2
UNIT_pp	mm
precipitation	682,336975
UNIT_NOx	mgN/m2
NOx_conc	195,470535
UNIT_NHy	mgN/m2
NHy_conc	223,849945

Indicaciones: Hasta aquí - Desde aquí

6. Conclusions

- The tools showed in the present project allow to:
  - Make a review of the initial data sheets, correct the lack of coordenates and identify duplicates.
  - Create a point FC in WGS84 with all sampling sites from Europe (regardless of the original DATUM of each country).
  - Extract data from CLC and EMEP to those sampling sites.
  - Obtain a complete table ready to be used in further statistical analysis.

Thank you for your attention!!!!