

Agroisolab GmbH

Update on identification of
timber origin with stable
isotopes



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Our history.

2012 More than 100 different databases:

- *agricultural products (e.g. apple)*
- *chemical products (e.g. pesticide)*
- *commodities (e.g. timber)*
- *various goods (e.g. ivory)* <http://ivoryid.org>

2008 Winner of the Innovation Award in the Aachen region
„Active marking on food and non food products by means of stable isotopes“

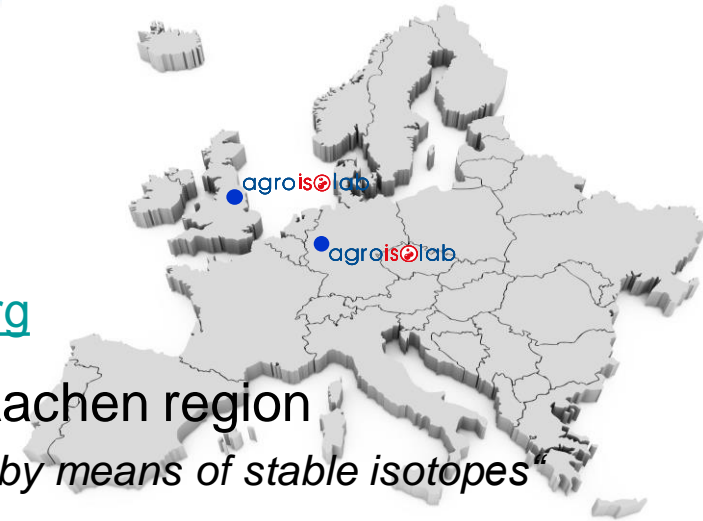
2006 Accreditation of Agroisolab laboratory

2003 Best Practice Award of North Rhine Westphalia

2002 Technology Award of Research Centre Jülich

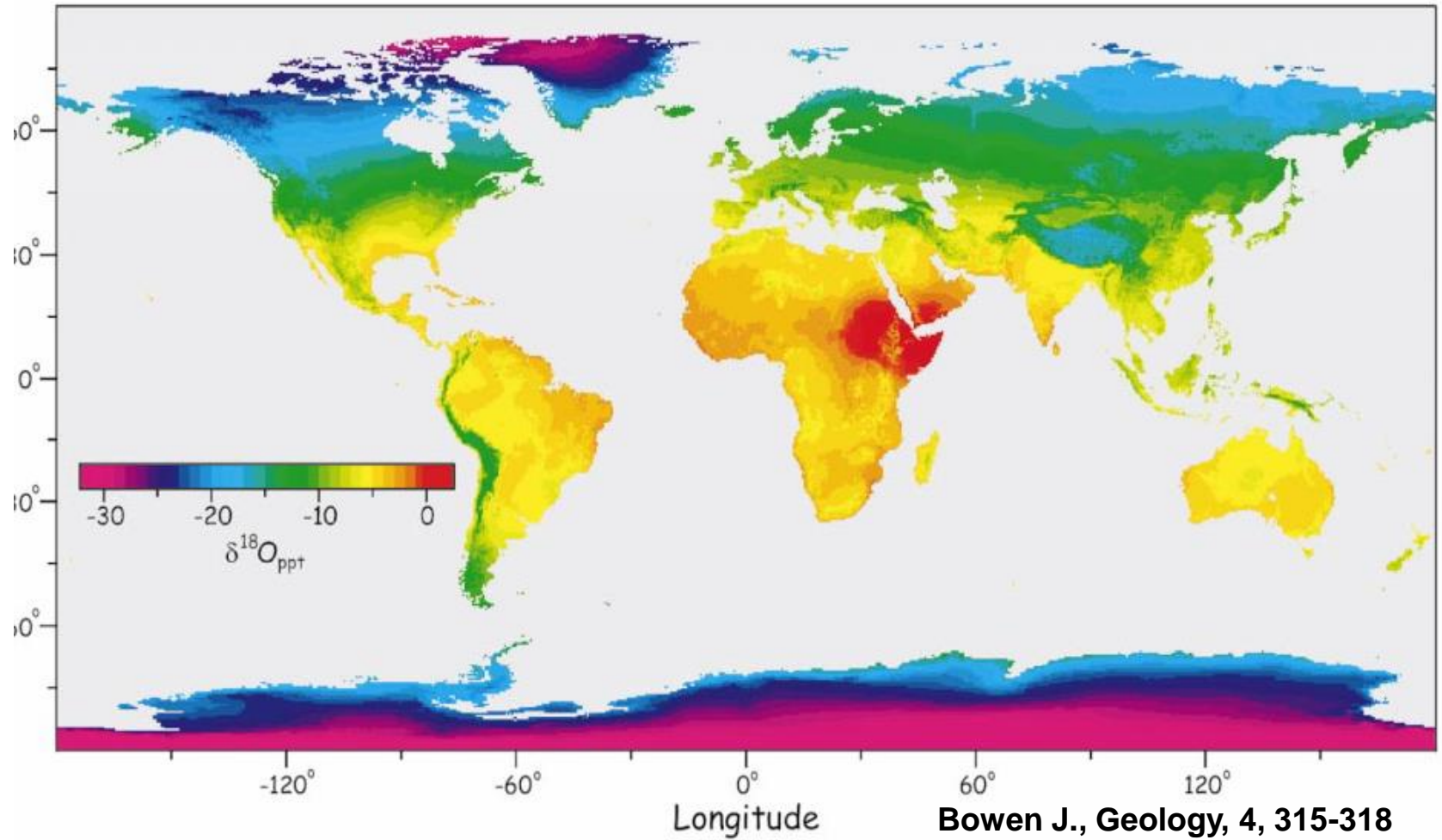
2002 Collaboration Award of North Rhine Westphalia

2002 Founding of Agroisolab GmbH (spin-off from the Research Centre Jülich)



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Isotopic patterns in the global water cycle.



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Stable isotopes – Principle to track the origin



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Official food laboratories



Review

Stable isotope techniques for verifying the declared geographical origin of food in legal cases

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PGI

Legal cases

Fraud

Mislabeling

ABSTRACT

Background: Consumers are increasingly interested in the provenance of the foods and Europe require protection against the mislabelling of premium foods. Methods for testing authenticity robust analytical techniques that can be utilised by the various regulatory authorities. Of these techniques, the most widely-used method is stable isotope ratio analysis.

Scope and approach: Focus is on the use of stable isotope ratios of H, C, N, O, S and Sr for verifying geographical origin of food, cross-referencing it with examples of legal cases. State of the art rules for building an authentic sample reference database (commonly called databank) and interpreting the results obtained in actual cases is described. The overall objective is to provide stakeholders and competent authorities dealing with fraud, with a best-practice guide for its use.

Key findings and conclusions: Stable isotope ratios can differentiate foods on the basis of geographical origin and, especially for light elements, can be measured reliably in routine different matrices and compared successfully between different laboratories. Examples of legal cases are grape products, orange juices, olive oil, cheese, butter, caviar. Sometimes, the case is brought directly to the court, but before further verifications (e.g. paper traceability, forensic accreditation) are conducted. The system can satisfy the court when a robust databank of authentic samples and methods used are officially recognized, validated and accredited, and the expert demonstrates conclusions are sufficiently robust and reliable to stand up to the required level of proof.

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The higher the risk of corruption in a specific case, the more it is necessary to get additional evidence to mitigate the risk of illegal timber entering the EU market. Examples of such additional evidence may include third-party-verified schemes (see section 6 of this guidance document), independent or self-conducted audits, or timber tracking technologies (e.g. with genetic markers or stable isotopes).

GUIDANCE DOCUMENT
FOR THE EU TIMBER REGULATION

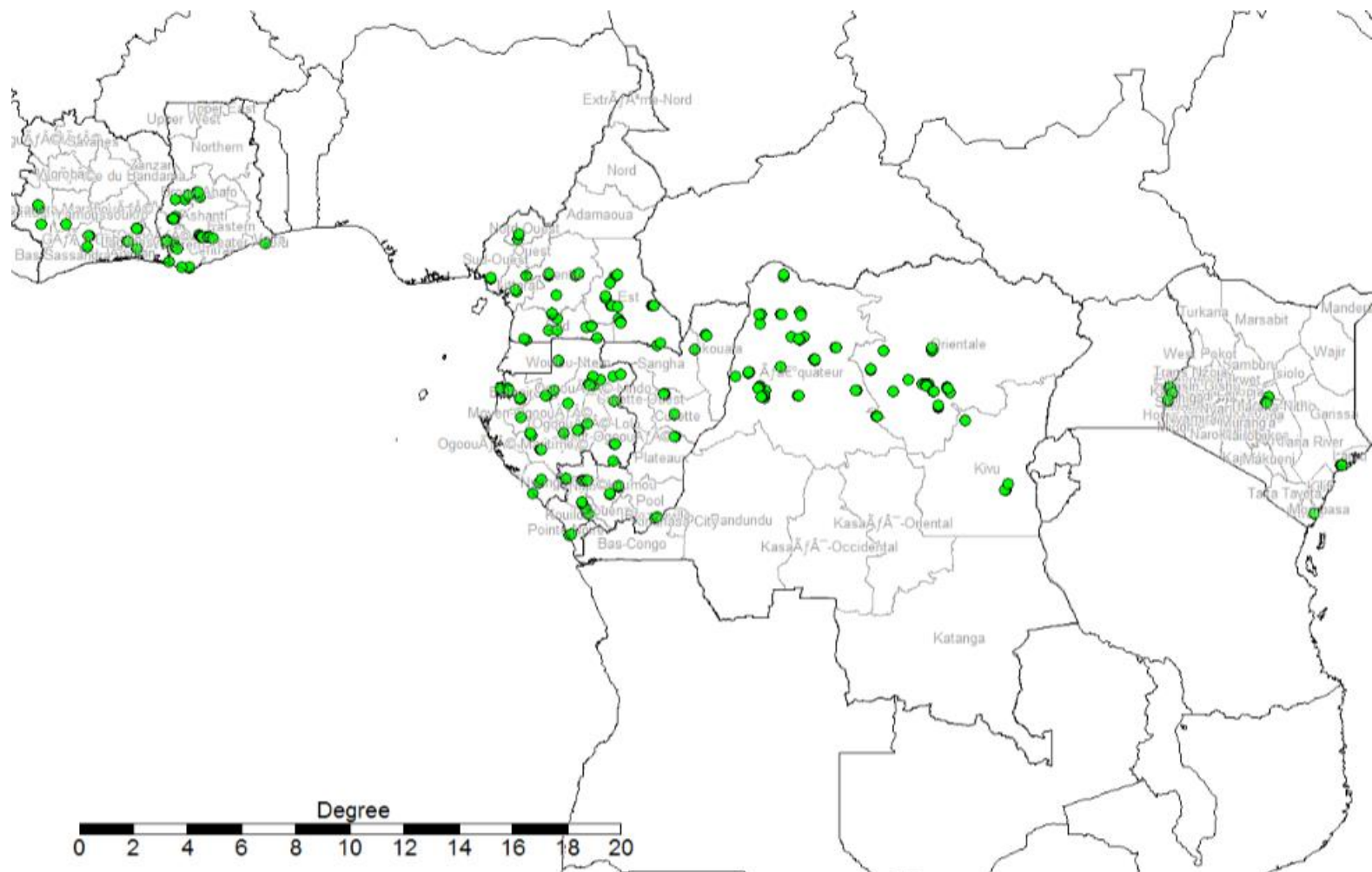
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Our influential projects in timber tracking

Prob en-Nr	Baumart	Herkunft aus der Konzession?		von wem	Nr	Genetic results	Isotope results		Bewertung GTZ
		ja	nein, sondern						
1	Iroko	-	Ivory Coast	East Brothers	I, J	Outside CFC	Likely from CFC	Genetik besser	
2	Sapelli	+	Cameroon (CFC concession)	East Brothers	E, F	Outside CFC	Likely from CFC	Isotope besser	
3	Sapelli	+	Cameroon (CFC concession)	East Brothers	A, B	Likely from CFC	Likely from CFC		
4	Utile - Sipo Timber	-	Congo	East Brothers	G, H	Likely from CFC	Outside CFC	Isotope besser	
5	Sapelli	-	Congo (CIB concession - SGS)	Latham	E, F	Likely from outside CFC	Outside CFC		
6	Sapelli	-	Congo (CIB concession - FSC)	Latham	A, B	Likely from outside CFC	Likely from CFC	Genetik besser	
7a	Sapelli	+	Cameroon (CFC concession)	East Brothers	C, D	Likely from CFC	Likely from CFC		
7	Iroko	-	Cameroon, Alpi FMU 10-026 (<100km Distanz)	Treemex	H	cannot be excluded	Likely from CFC		
8	Iroko	-	Cameroon, Alpi FMU 10-026 (<100km Distanz)	Treemex	F	cannot be excluded	Outside CFC	Isotope besser	
9	Iroko	-	Cameroon, Alpi FMU 10-026 (<100km Distanz)	Treemex	E	cannot be excluded	Outside CFC	Isotope besser	
10	Sapelli	-	Congo (CIB concession - FSC)	Latham	C, D	Outside CFC	Outside CFC		
11	Iroko	-	Cameroon, Alpi FMU 10-026 (<100km Distanz)	Treemex	A	cannot be excluded	Outside Cameroon	Isotope besser	
12	Iroko	-	Cameroon, Alpi FMU 10-026 (<100km Distanz)	Treemex	D	cannot be excluded	Outside Cameroon	Isotope besser	
13	Iroko	-	Cameroon, Alpi FMU 10-026 (<100km Distanz)	Treemex	B	cannot be excluded	Outside Cameroon	Isotope besser	
14	Iroko	-	Cameroon, Alpi FMU 10-026 (<100km Distanz)	Treemex	G	cannot be excluded	Outside Cameroon	Isotope besser	
15	Iroko	-	Cameroon, Alpi FMU 10-026 (<100km Distanz)	Treemex	E	cannot be excluded	Outside Cameroon	Isotope besser	

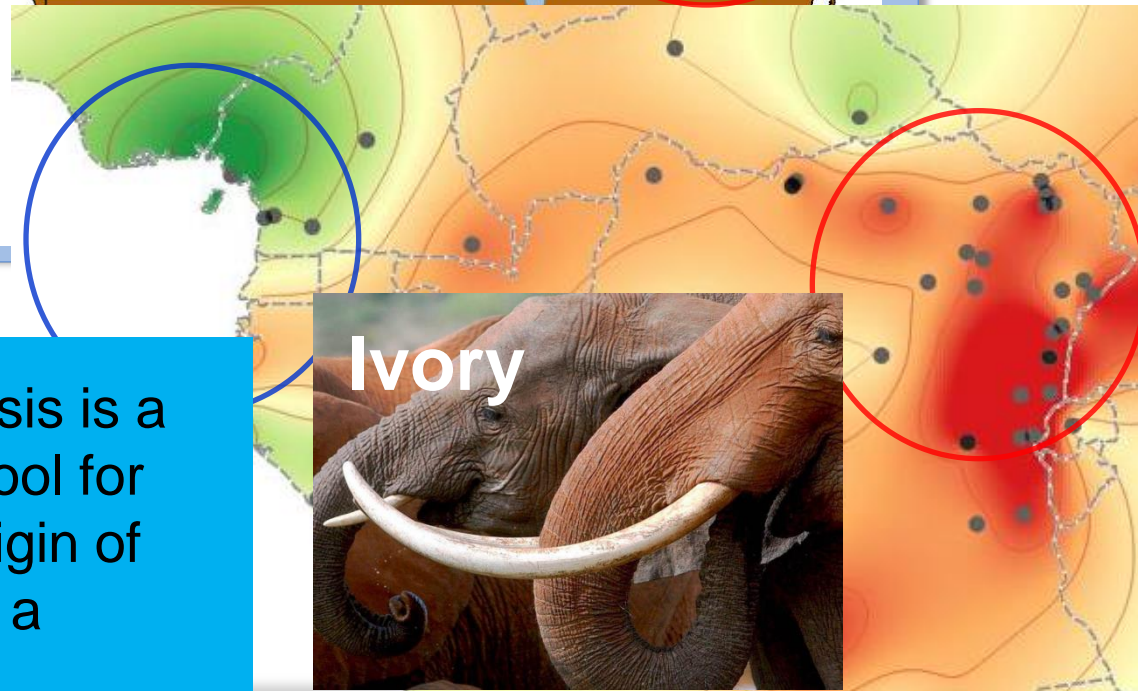
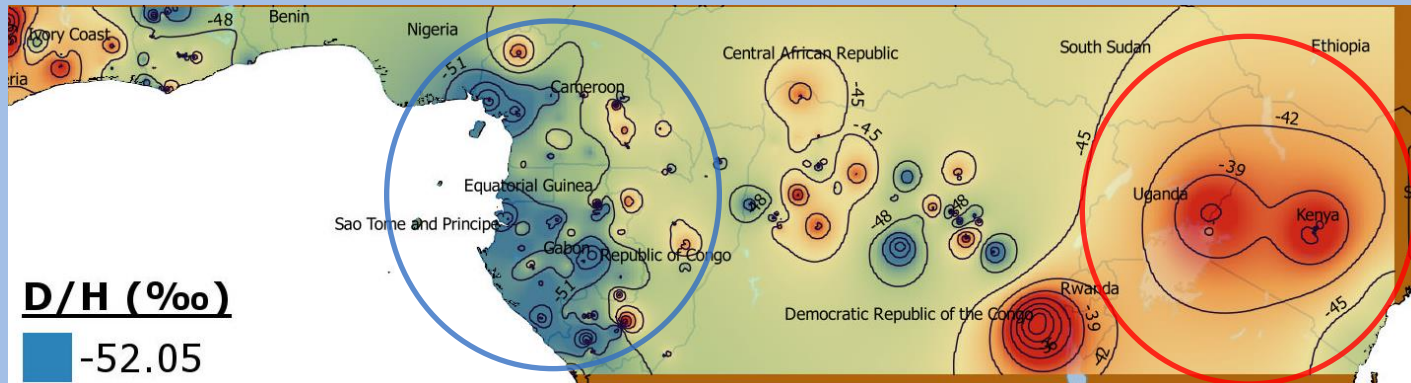


ITTO-project: sampling location in Africa (Iroko)



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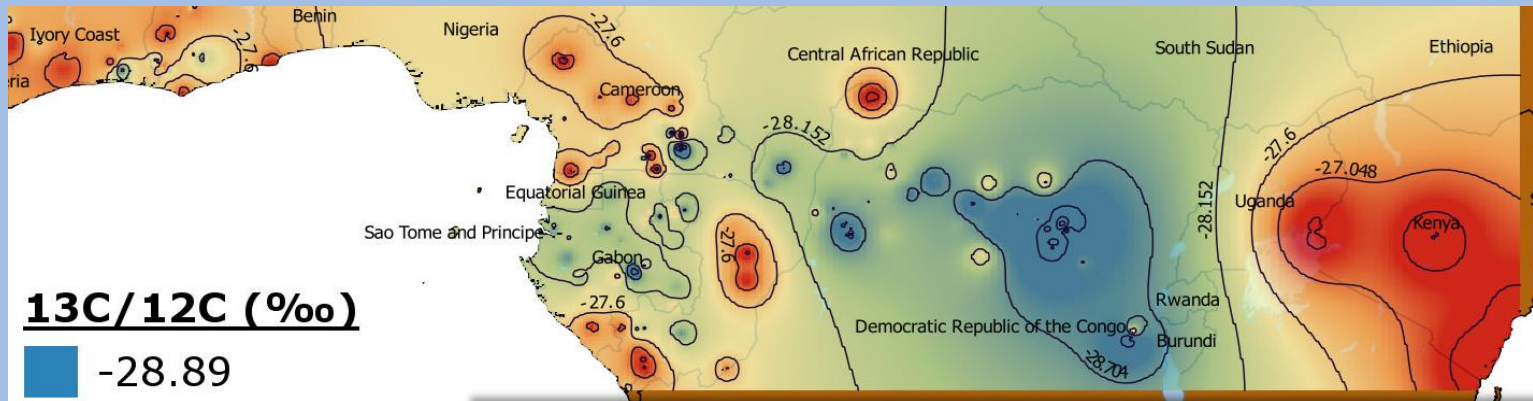
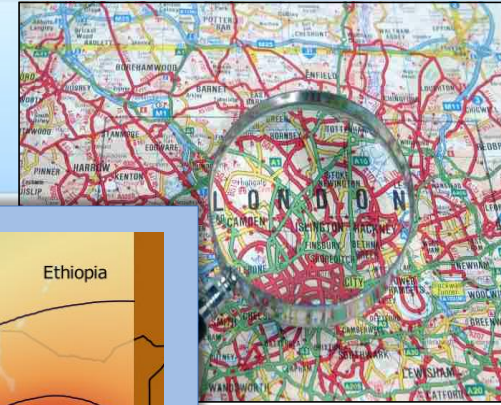
ITTO-project: hydrogen and oxygen ratios in timber (Iroko)



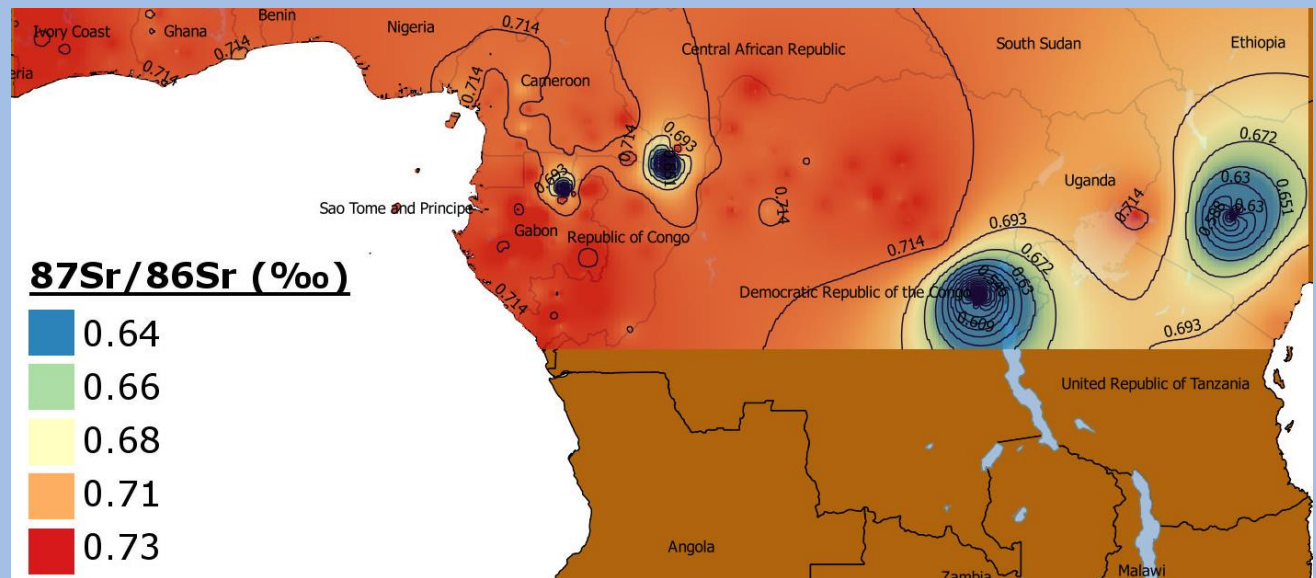
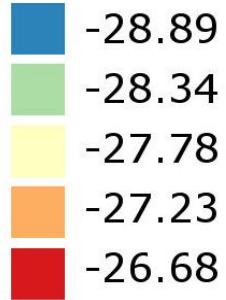
Stable Isotope Analysis is a universal analytical tool for authenticating the origin of biological material to a location.

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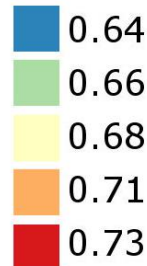
ITTO-project: carbon and strontium ratios (Iroko)



$^{13}\text{C}/^{12}\text{C}$ (‰)

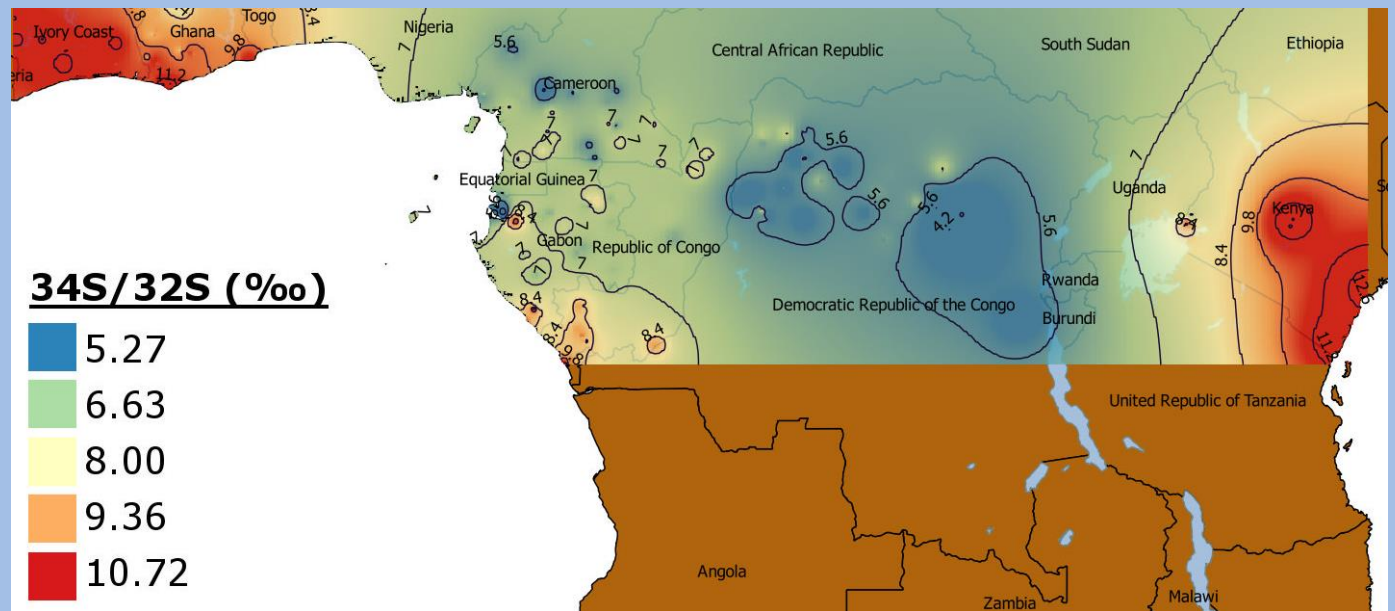
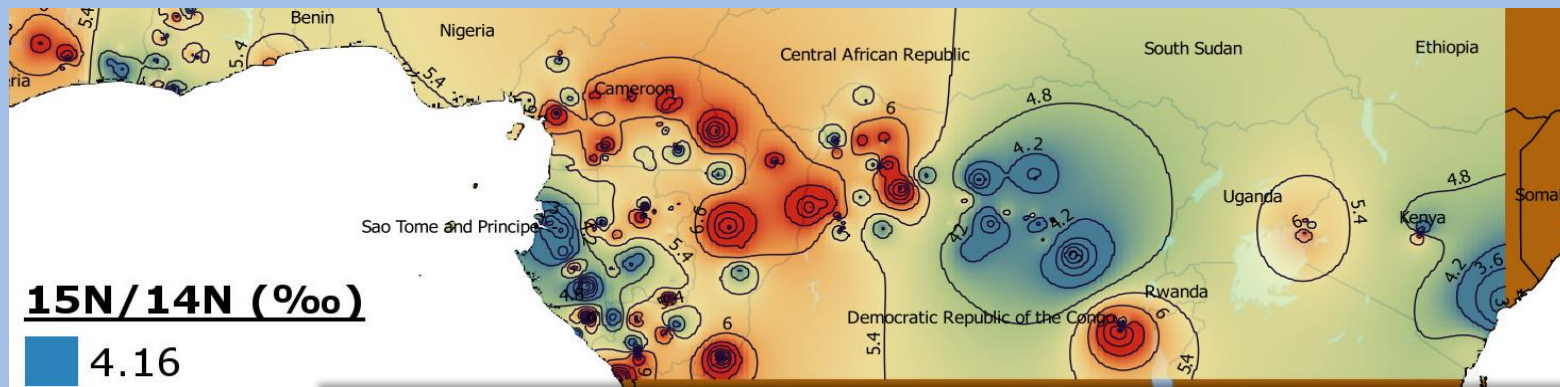


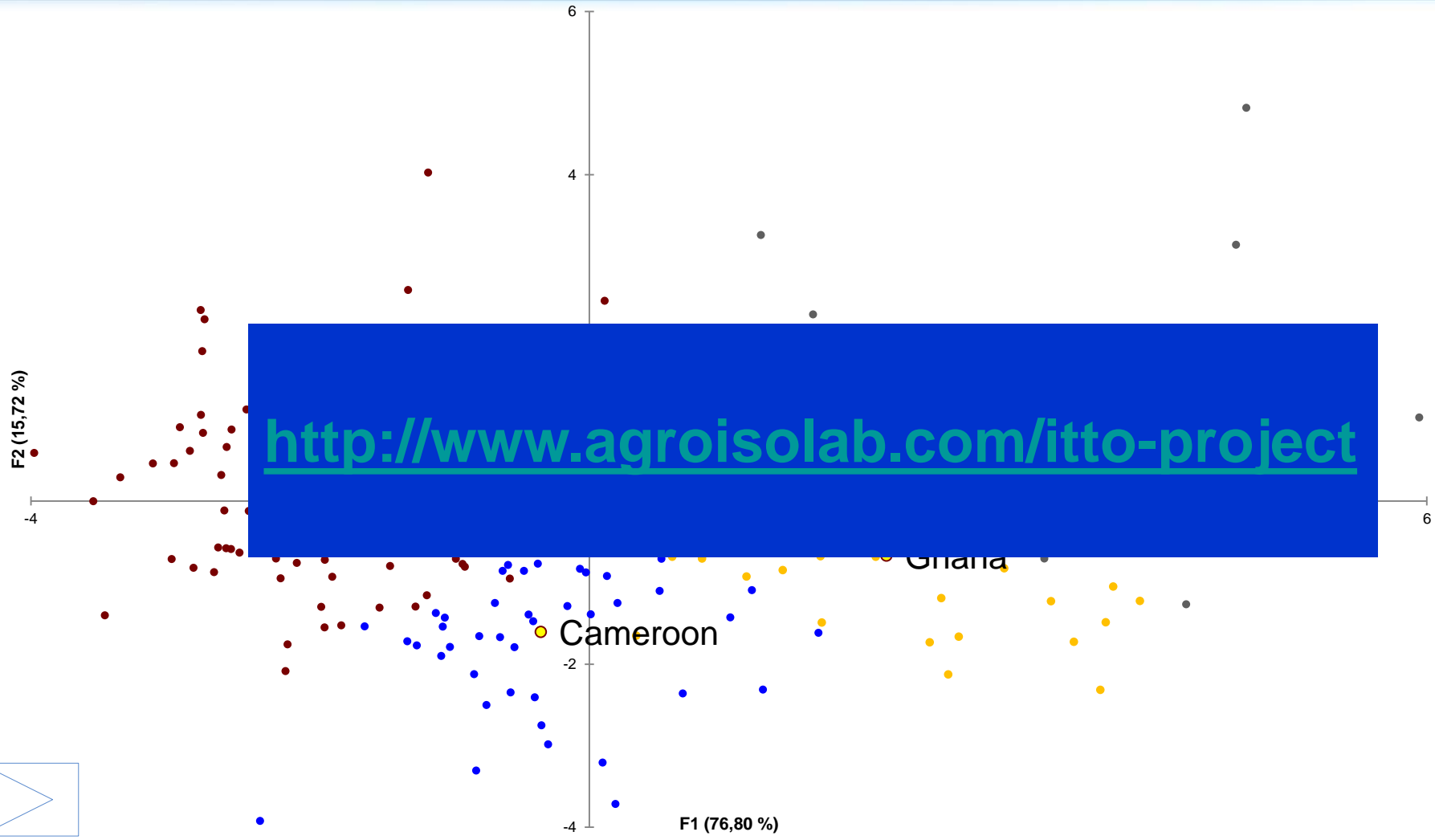
$^{87}\text{Sr}/^{86}\text{Sr}$ (‰)



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ITTO-project: Nitrogen and sulfur ratios (Iroko).

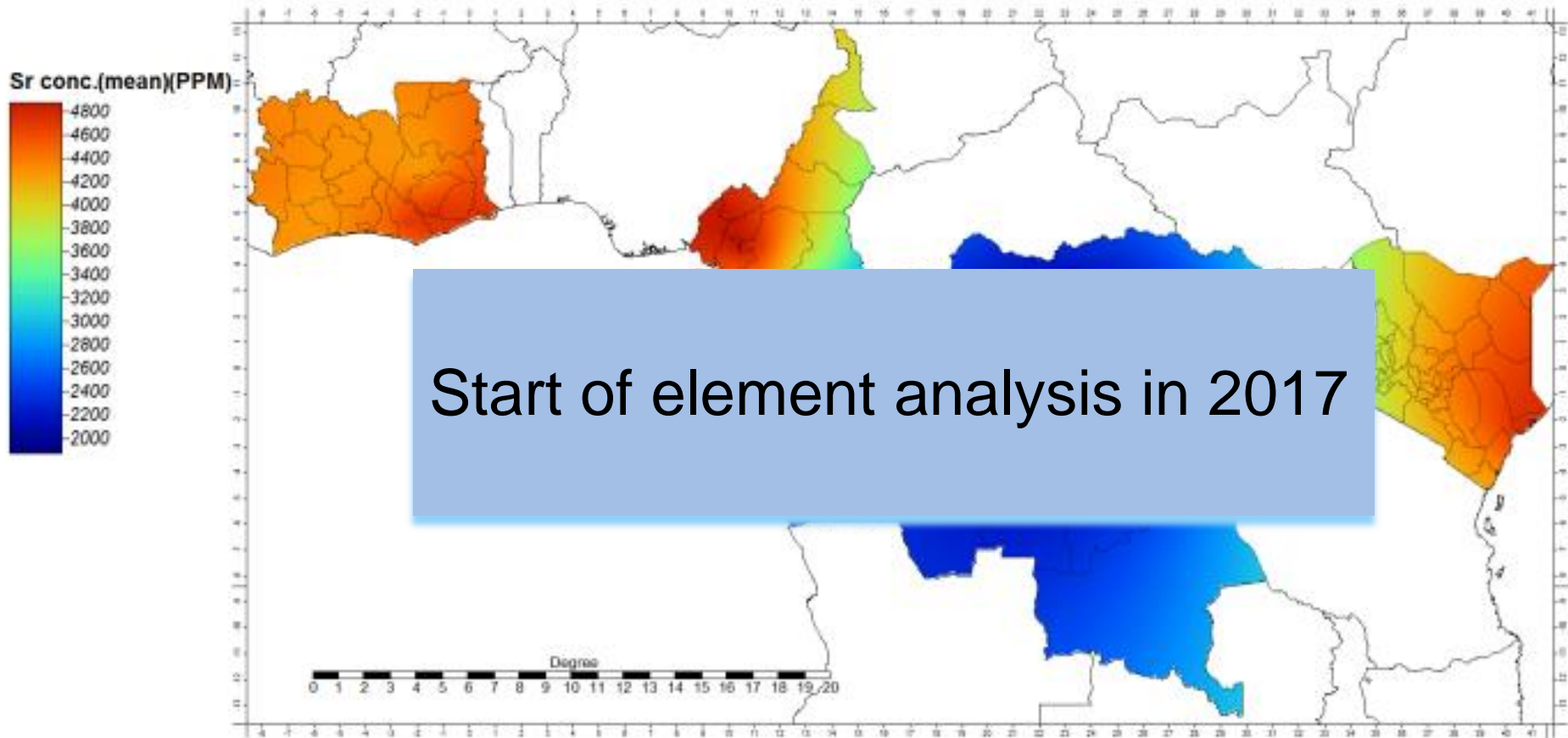


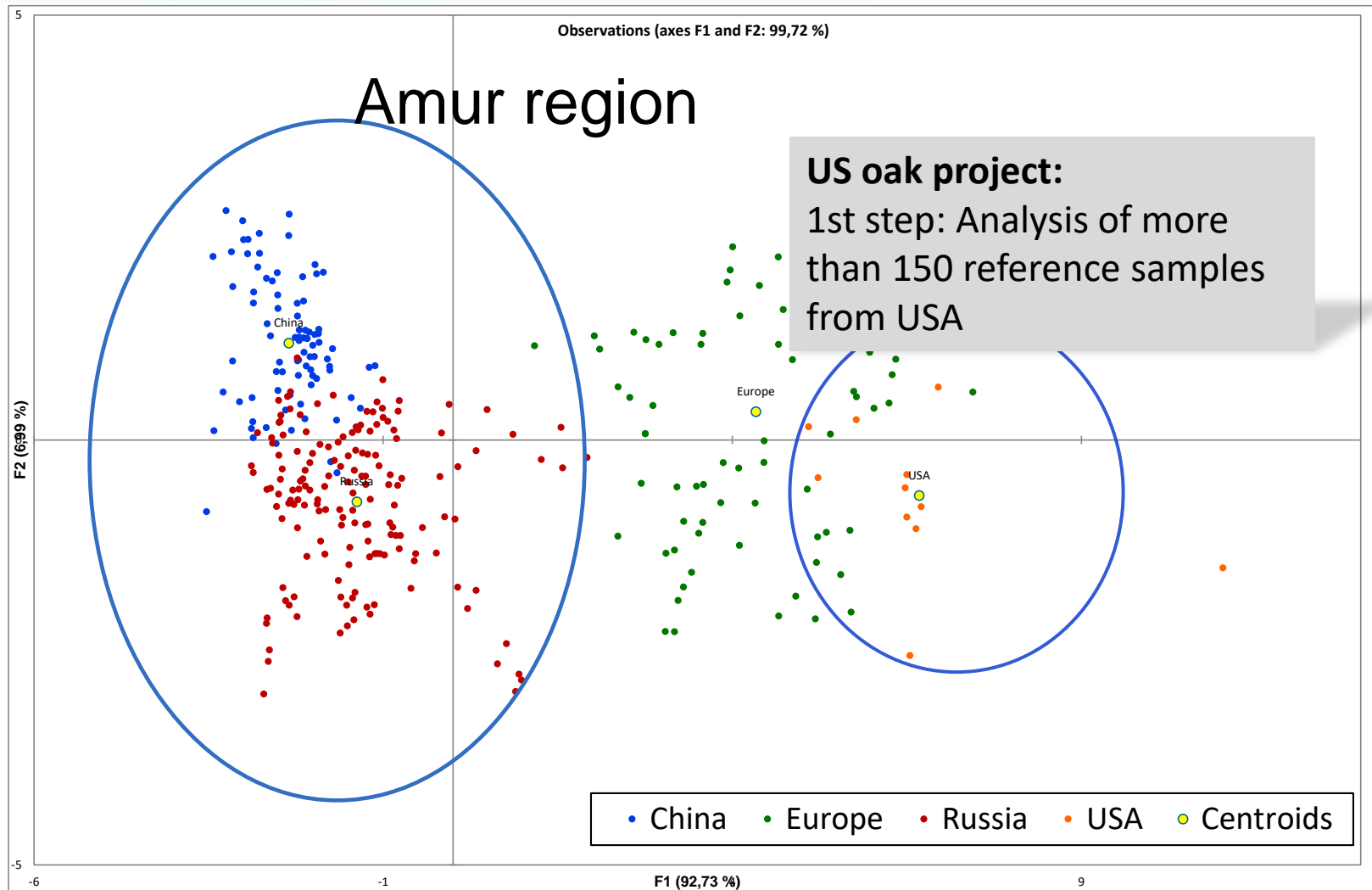


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ITTO-Project: Mapping of 8 African countries; results of the blindtest

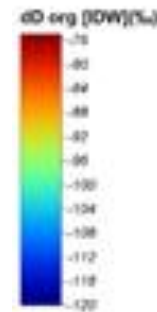
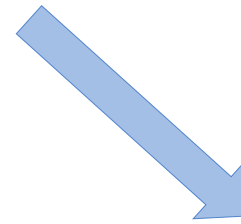
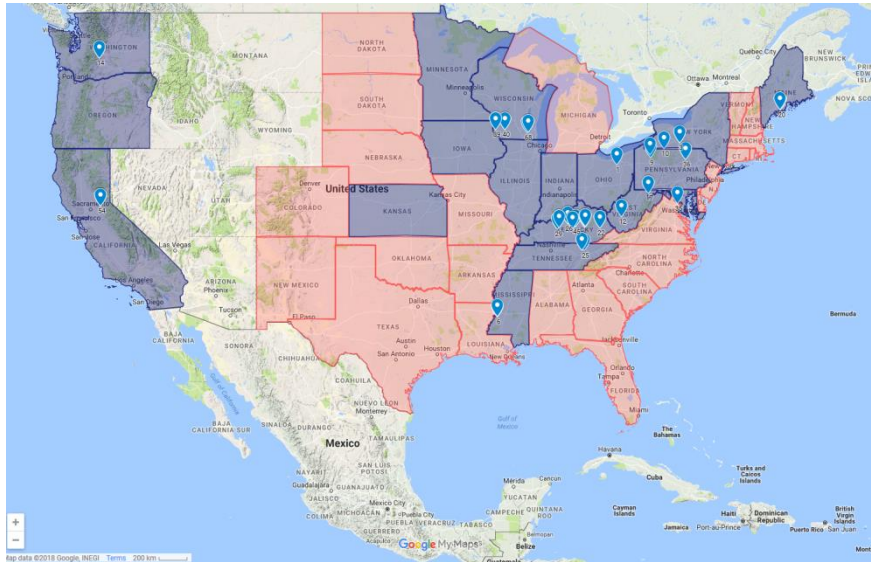
Country level	species	Blind test partner	Evaluation in blindtest			Performance of isotopes in %	
			Right	Wrong	No answer		
Stable isotopes laboratories			Right	Wrong	No answer		
Agroisolab	Milica Excelsa	WWF	7	3	0	72	
		G2S	7	3	0		
Fera	Enfandrophragma cylindricum	WWF	7	3	0		
		G2S	9	1	0		
Josephinum	Triploc hitno scelorxylon	WWF	5	5	0		
		G2S	8	1	1		
Total			43	16	1		
Reference sample used			828				
Genetic laboratories							Performance of Genetic in %
VTI-Thünen	Milica Excelsa	WWF	4	6	0		50
		G2S	6	4	0		
VTI-Thünen	Enfandrophragma cylindricum	WWF	5	5	0		
		G2S	6	3	1		
Adelaide	Triploc hitno scelorxylon	WWF	5	3	2		
		G2S	4	1	5		
Total			30	22	8		
Reference sample used			3324				



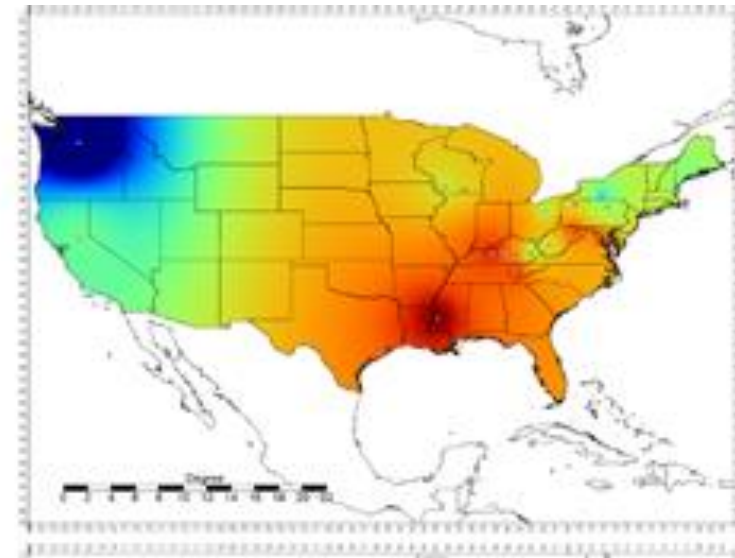


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Status: half time in sampling



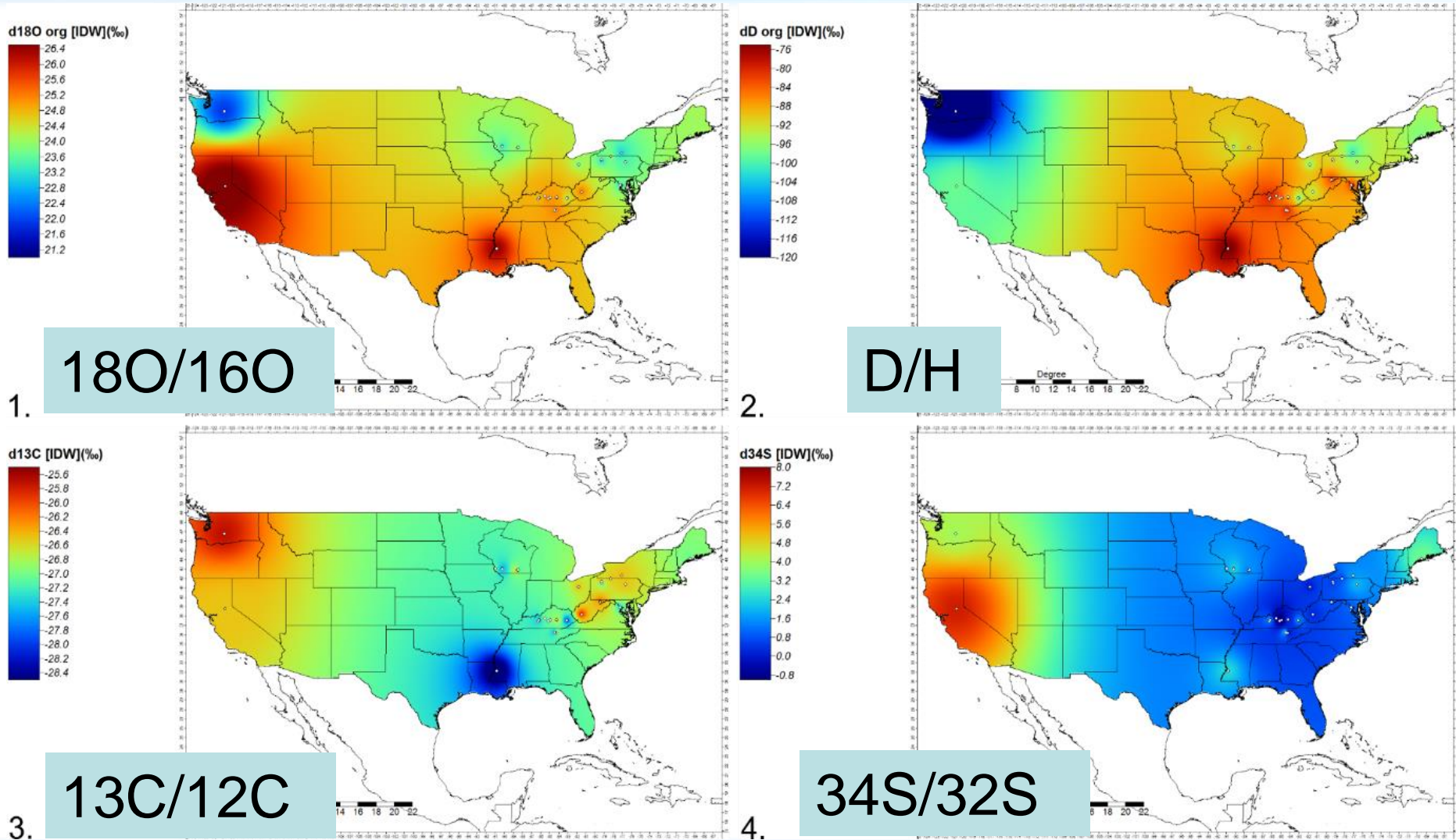
2.



Blue = reference samples obtained
Red = still in sampling

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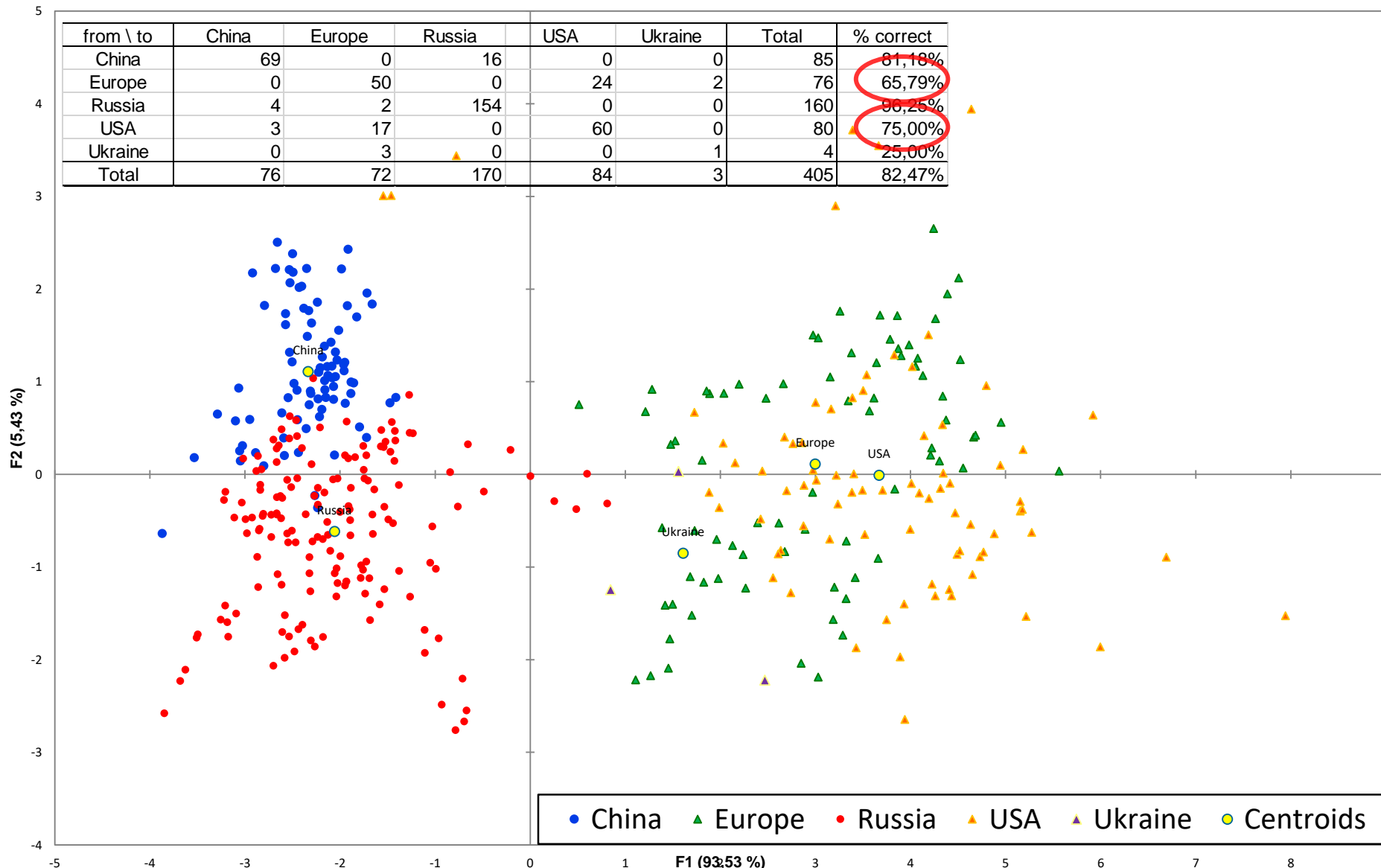
Current overview of the stable isotopic signatures in USA (oak)



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Current status of discrimination using SIRA

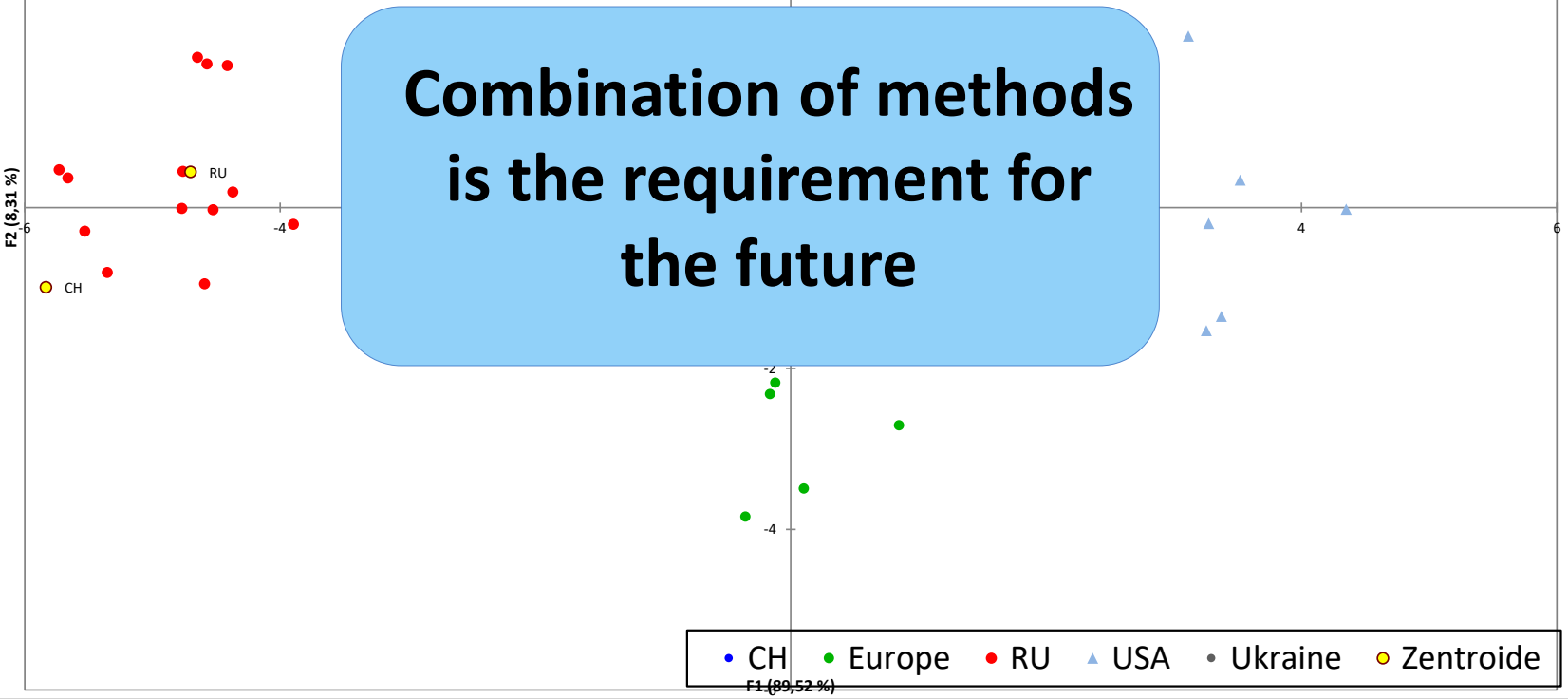
Observations (axes F1 and F2: 98,96 %)



Further improvement: Adding elemental analysis (cRb, cSr, cBa, cTi)

Beobachtungen (Achsen F1 und F2: 97,83 %)

von \ nach	CH	Europe	RU	USA	Ukraine	Gesamtwert	% korrekt
CH	2	0	0	0	0	2	100,00%
Europe	0	12	0	6	1	19	63,16%
RU	0	0	14	0	0	14	100,00%
USA	0	0	0	47	0	47	100,00%
Ukraine	0	0	0	0	2	2	100,00%
Gesamtwert	2	12	14	53	3	84	91,67%



Stable isotopes

Element analysis (ICP-MS)

Near Infrared profiling

Origin



Prediction models

* Uni. Basel

Origin (Additional information)

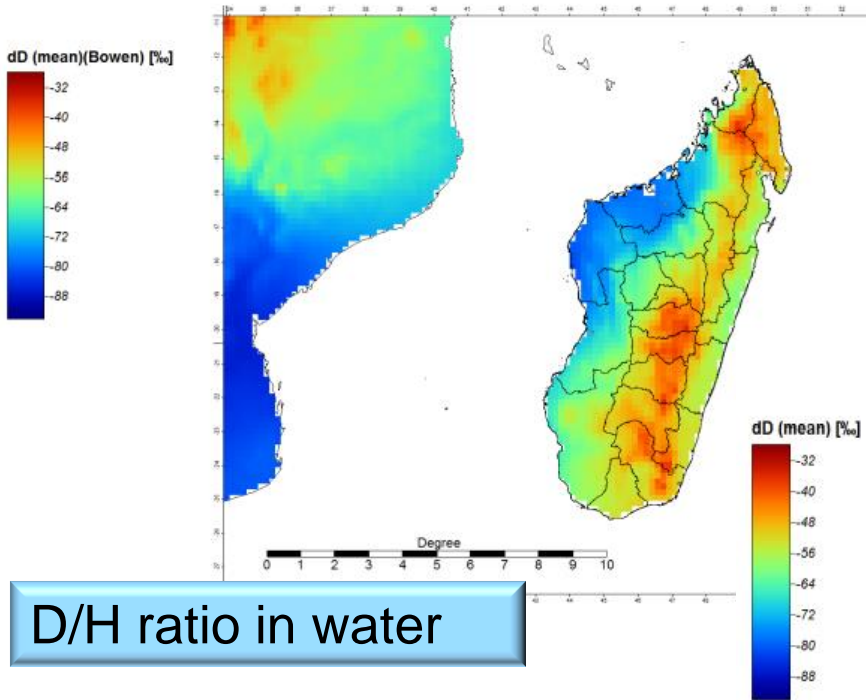
(Origin, species)

External partnership

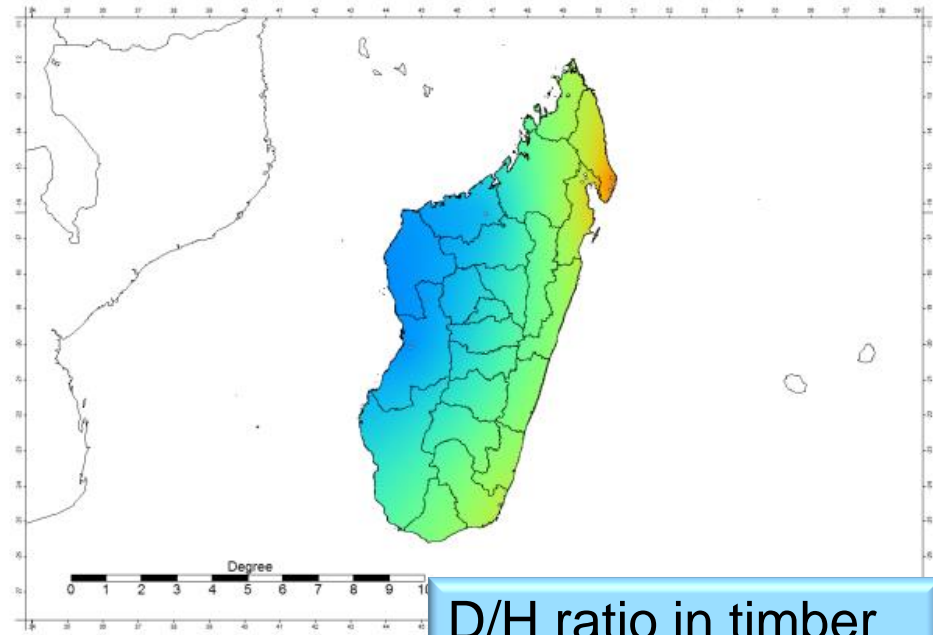
DNA



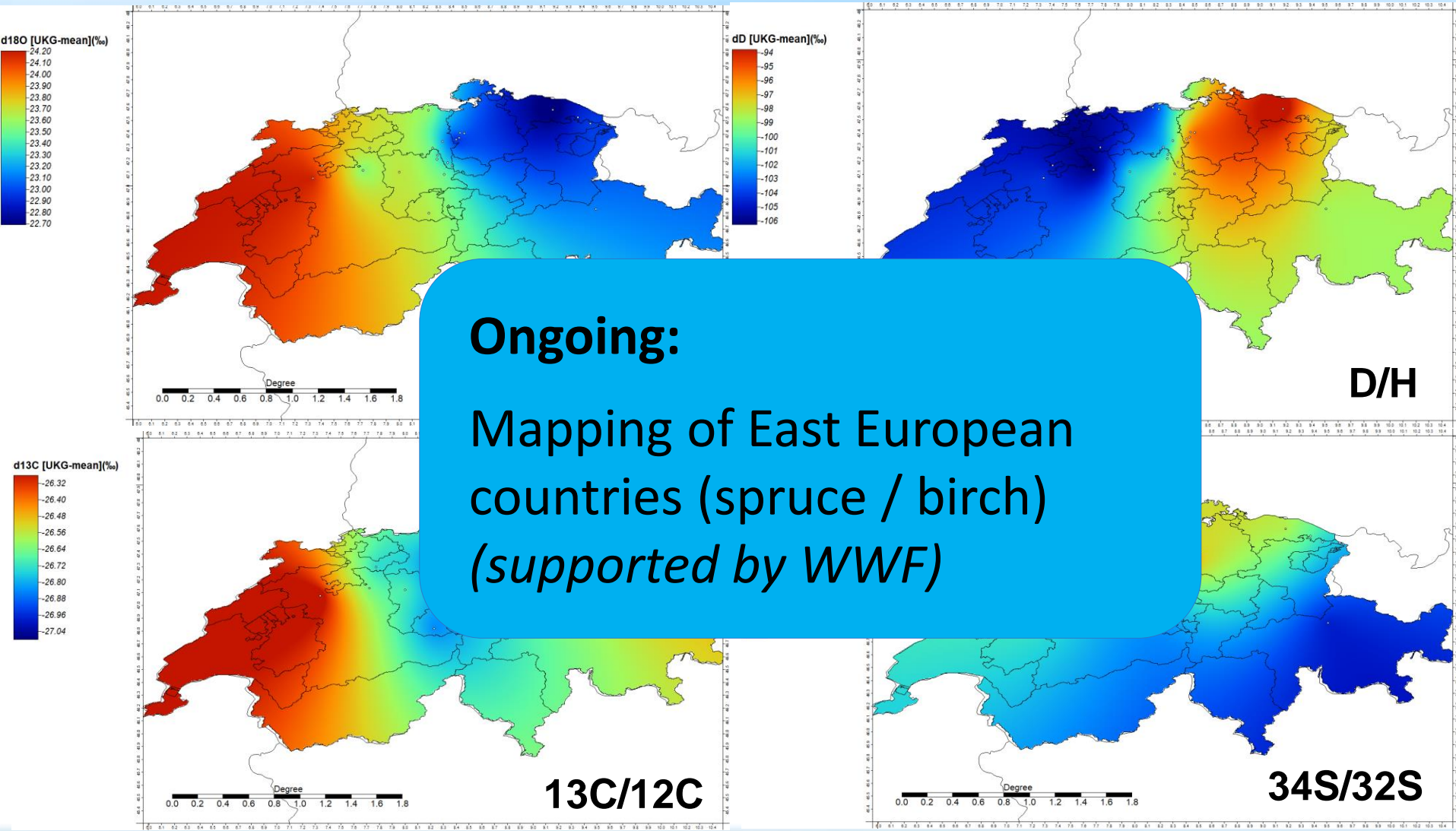
Species (Test kits)



D/H ratio in water



D/H ratio in timber





Nature ignores borders !

***Thank you very much
for your attention***

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