



Environmental archetypes explain large and regional-scale biodiversity patterns in Germany

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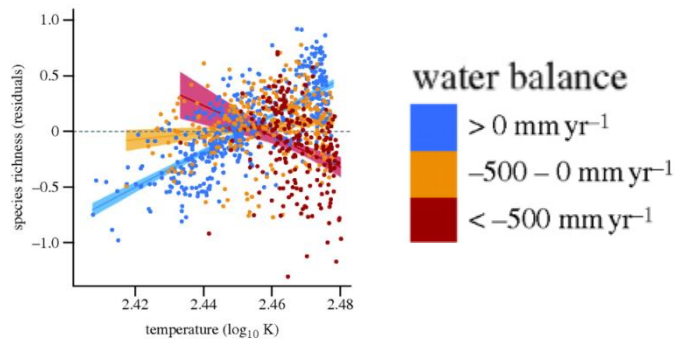
Helsinki, 25.09.2014



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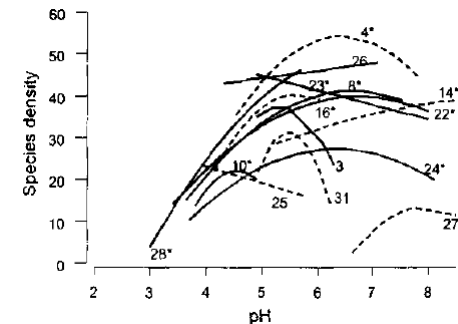
Known Drivers of Plant Species Richness

water-energy hypothesis



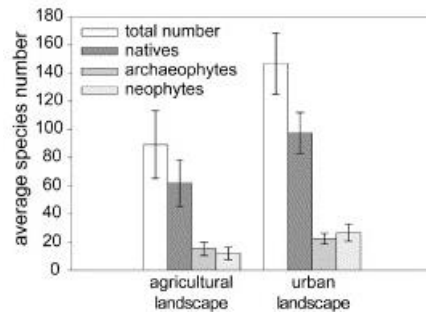
Sommer et al.(2010). Proc. R. Soc. B

soil pH



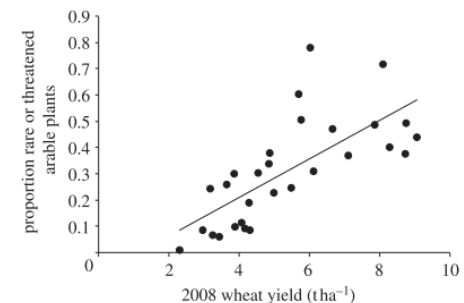
Schuster & Diekmann (2003). Folia Geobot.

land use



Wania et al. (2006), landurbplan

land use intensity



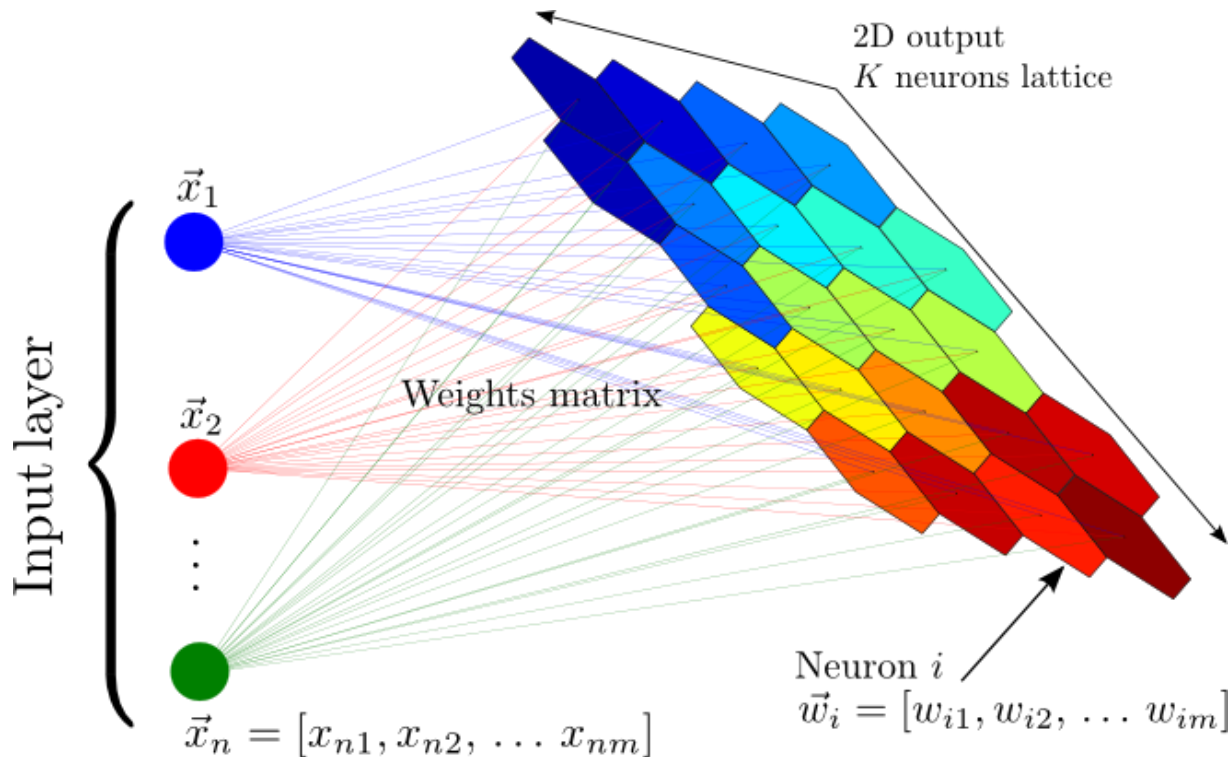
Storkey et al. (2006), Proc. R. Soc. B.

Research Question

Does heterogeneity of environmental archetypes
favor species richness of plants?

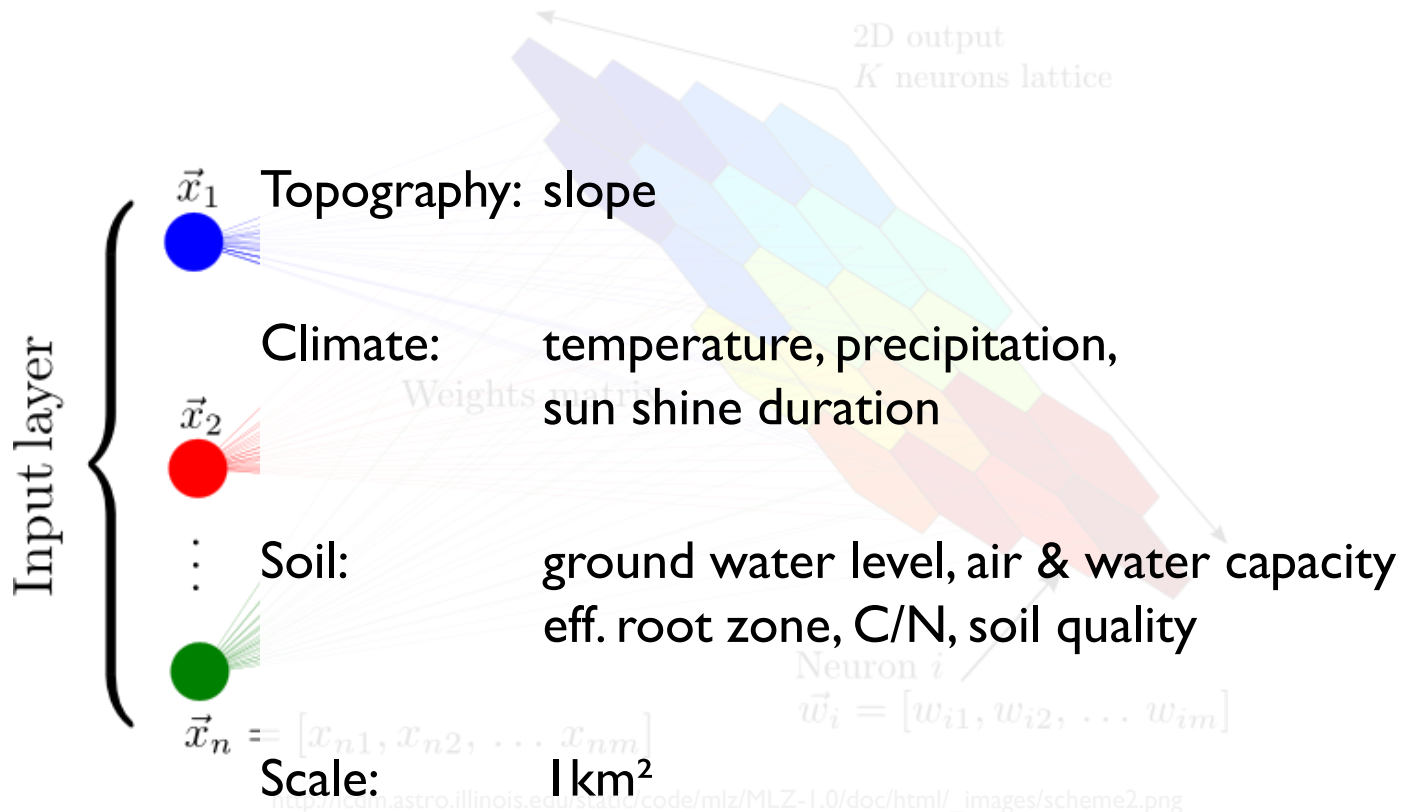
Environmental Archetypes

- **self-organising-map**: unsupervised neural network
 - reduction of dimensionality and cluster analysis (e.g. Skupin & Agarwal (2008))



Environmental Archetypes

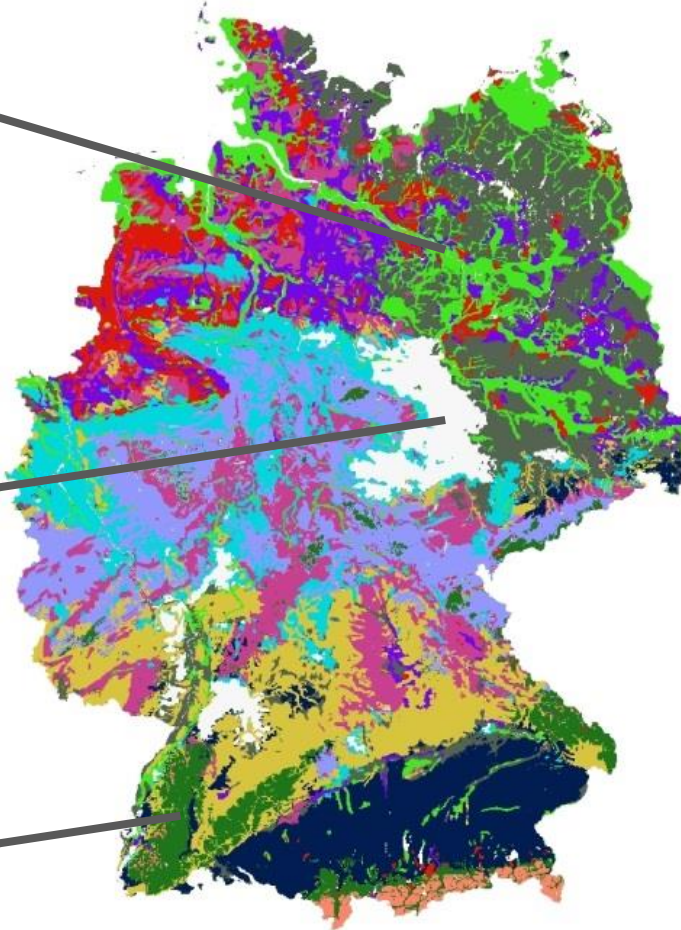
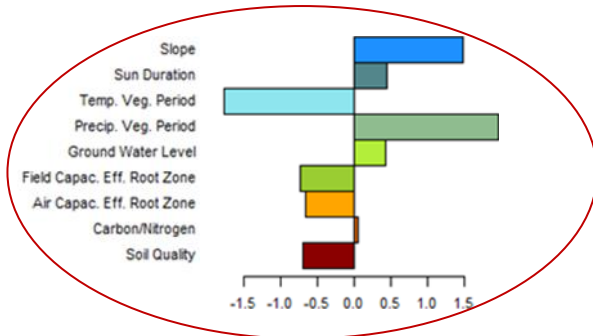
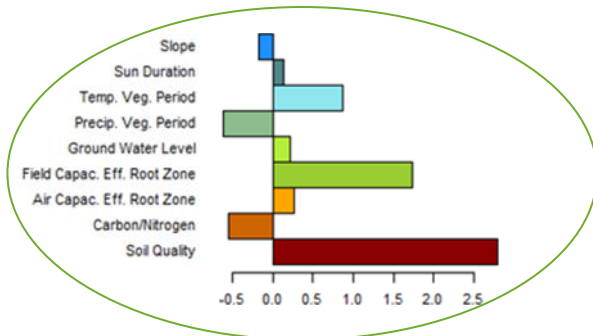
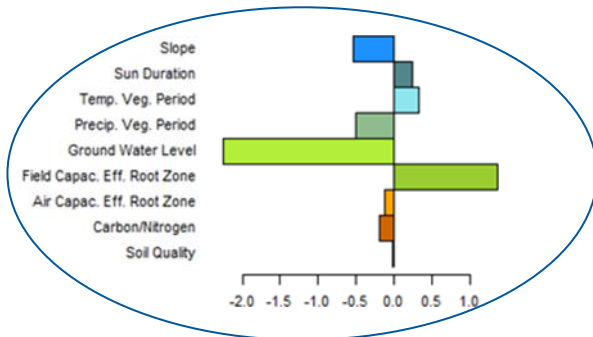
- **self-organising-map**: unsupervised neural network
 - reduction of dimensionality and cluster analysis (e.g. Skupin & Agarwal (2008))



Environmental Archetypes

- **self-organising-map**: unsupervised neural network
 - reduction of dimensionality and cluster analysis (e.g. Skupin & Agarwal (2008))
- various applications of method
 - mapping global land systems (Václavík et al. 2013);
 - prediction of aquatic insect species richness (Park et al. 2003)

Environmental Archetypes



http://www.botanische-spaziergaenge.at/Bilder/Lumix_30/PI030651.JPG



<http://images.fotocommunity.de/bilder/archiv-2011-2012/deutsche-landschaften/magdeburger-boerde-ce411046-7d14-4294-b13a-03b76ebd1e93.jpg>



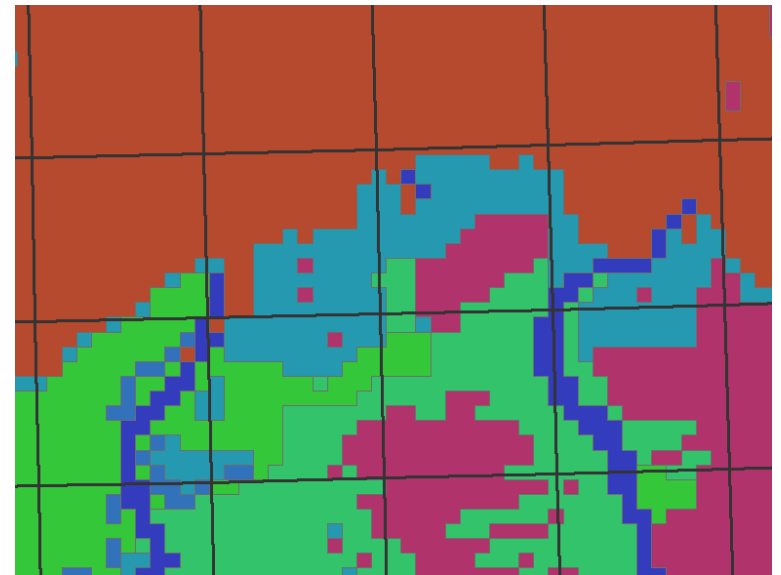
http://www.planet-wissen.de/laender_leute/mittelgebirge/schwarzwald/img/tempx2_schwarzwald1_g.jpg

Conducted Analysis

SR of plants vs. diversity of environmental archetypes

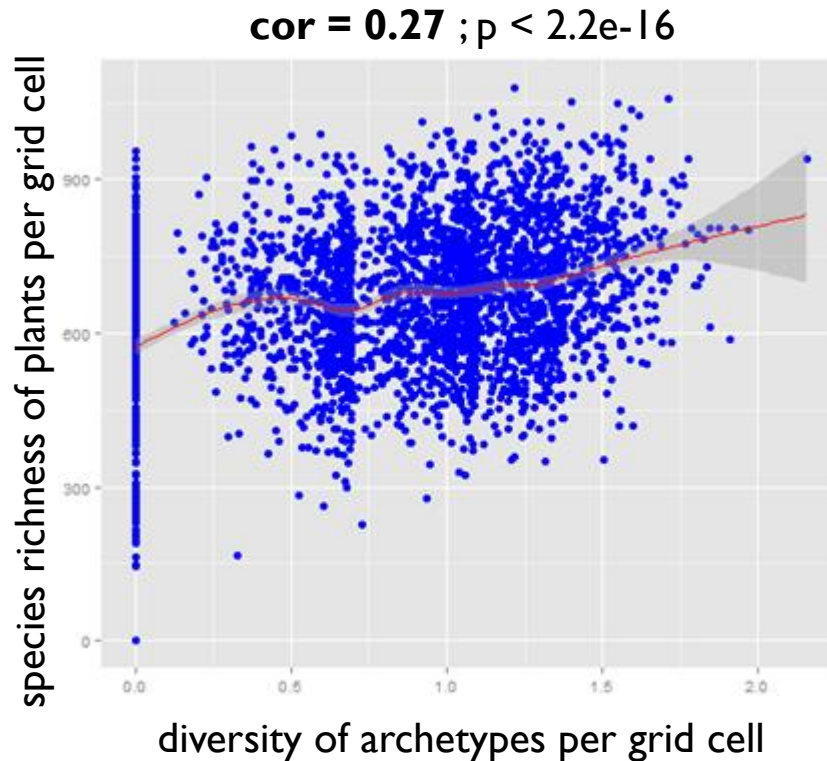
806	922	854	481
674	786	773	668
956	939	925	818
967	816	839	926

FLORKART of Germany



Shannon Diversity

Does Heterogeneity of Environmental Archetypes favor Species Richness of Plants?

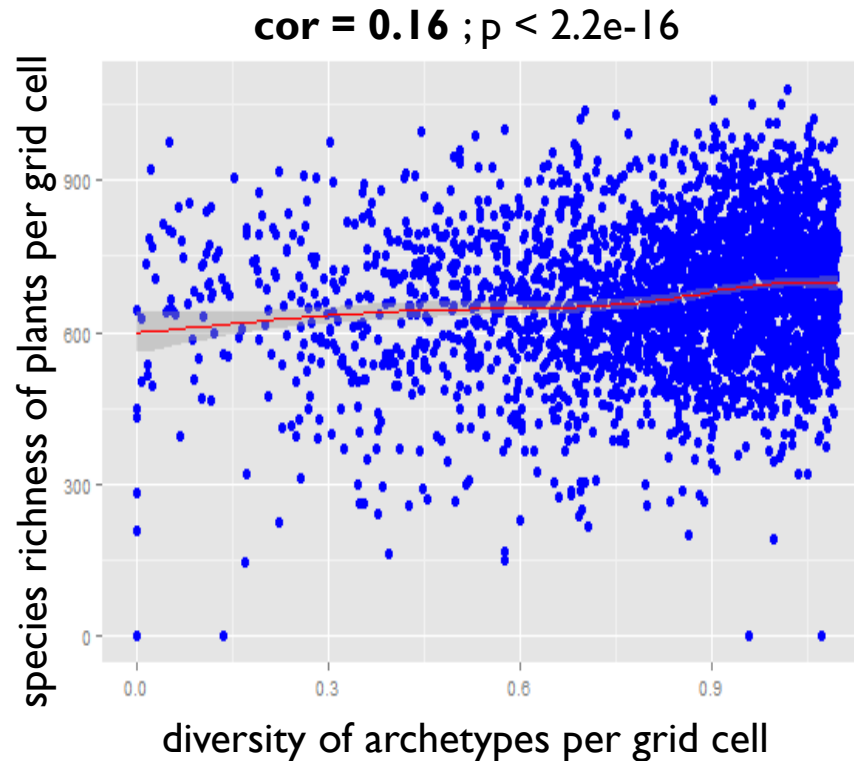


Is diversity of land use a better proxy than heterogeneity of environmental archetypes for species richness in Germany?

Do Archetypes represent Land use/cover?

		% of grid cell covered by land use/cover type:				
		crop land	pasture	forest	heathland	peat bog
						
% of grid cell covered by archetype:	I	0.15	-0.19	-0.14	-0.05	-0.08
	II	-0.09	-0.05	0.11	-0.04	0.05
	III	-	-0.04	-	0.26	0.12
	IV	0.09	0.10	-0.15	-	0.33
	V	-0.28	-	0.22	-0.05	-0.10
	VI	-0.07	-0.06	0.13	-0.04	-0.11
	VII	0.24	-0.18	-0.12	0.04	-0.08
	VIII	0.14	0.26	-0.30	-	-
	IX	-0.23	0.07	0.18	-	-
	X	-0.34	0.15	0.36	-	-
	XI	-0.04	0.15	-	-0.04	-
	XII	0.29	-0.17	-0.20	-	-0.06

Is Heterogeneity of Land use/cover a better Proxy for Species Richness of Plants?

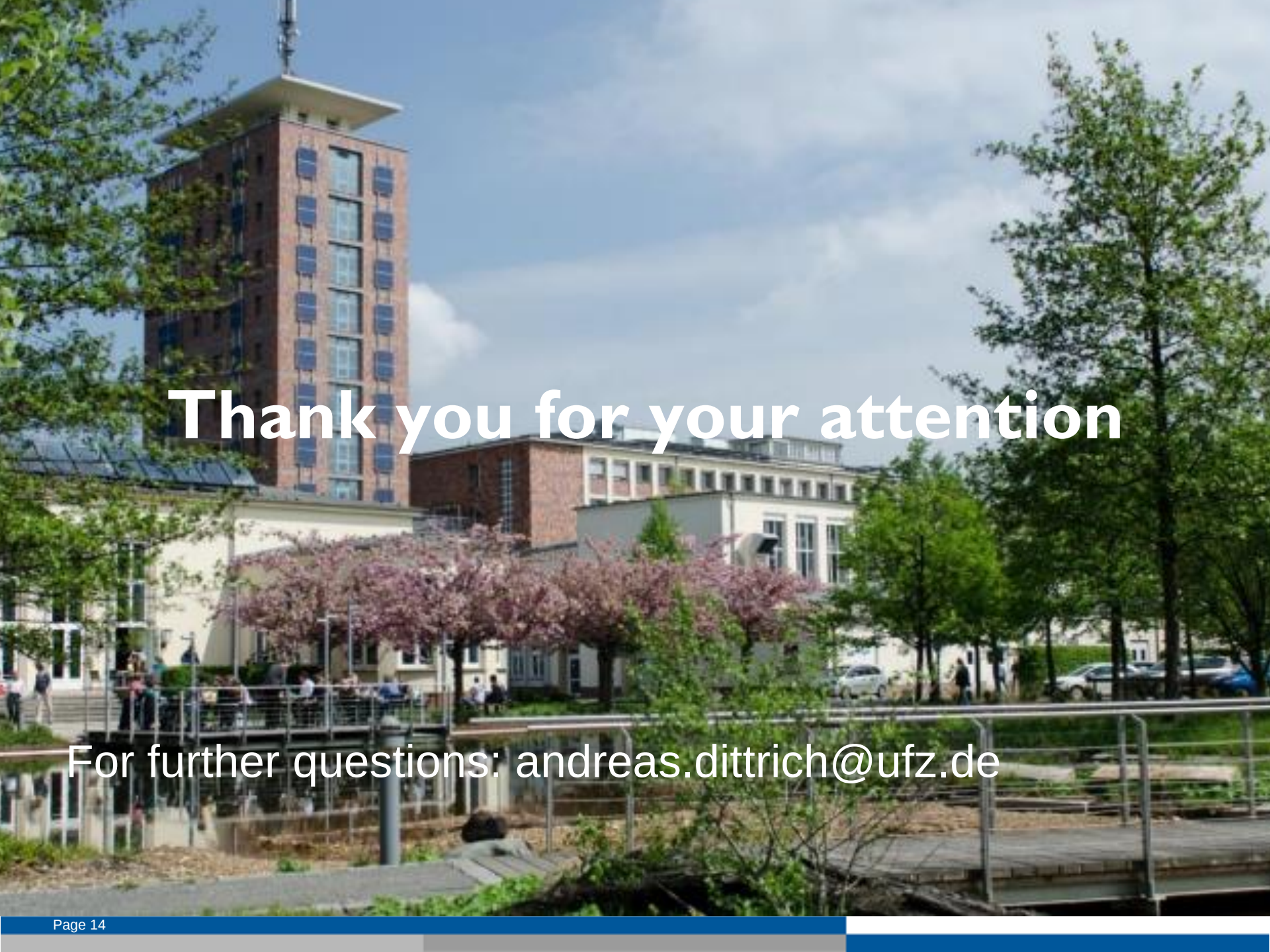


What did we find out?

- heterogeneity of environmental archetypes is positively correlated with species richness of plants
 - the found correlation is lower than expected, but indicate that in areas with diverse environmental archetypes the distribution ranges of different plant communities overlap, which trigger species richness
- environmental archetypes are only to some extent good proxies for LULC
 - human land use partly independent from environment
- diversity of LULC alone is a rather bad proxy at this scale
 - however land use intensity not considered in analysis

Future Direction of Research

- I Extension of biodiversity data on other taxa (e.g. breeding birds)
- II Analysis of environmental archetypes regarding ecosystem services

A photograph of a modern university building. On the left, a tall brick tower with a flat roof and a small antenna on top. The tower has several windows with blue shutters. To the right of the tower is a lower, multi-story building with a mix of brick and light-colored walls. In the foreground, there is a courtyard with several trees, including some with pink blossoms. A metal railing runs across the bottom of the image. People are visible walking in the courtyard. The sky is blue with some clouds.

Thank you for your attention

For further questions: andreas.dittrich@ufz.de