Linguistic Geography and GIS

Philipp Stoeckle, University of Zurich

Tools and Techniques in Geolinguistics, Kiel

22 August 2014

philipp.stoeckle@ds.uzh.ch

Outline

- Linguistics and Geography
- What is a GIS?
- The ArcGIS user interface
- Case Study 1: Perceptions of local dialects in southwest Germany
- Case Study 2: Swiss-German dialect syntax

Introduction

Linguistics and Geography

"In general, a map is a visual representation of spatially arranged objects."
(Kehrein, Lameli & Rabanus 2011: xiii)

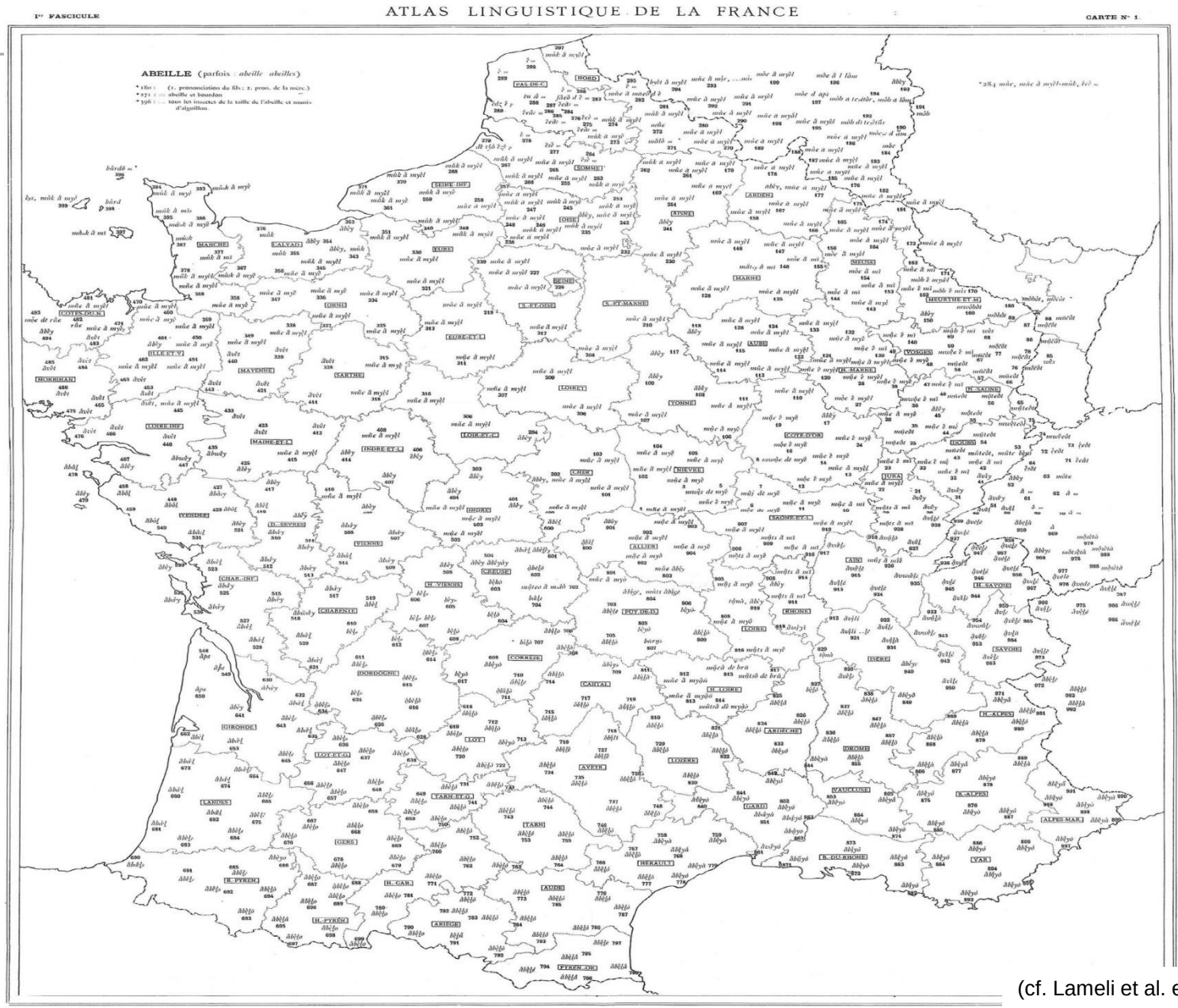
"[A] linguistic map can be described on several levels […] [which] can be characterized with the help of guiding questions:

- What is the aim of mapping? (the functional level)
- What is mapped? (the thematic level)
- How is it mapped? (the structural level)
- Which mental picture does the linguistic map produce? (the cognitive level)"

(Girnth 2011: 99f.)

Universität Zürich[UZH]

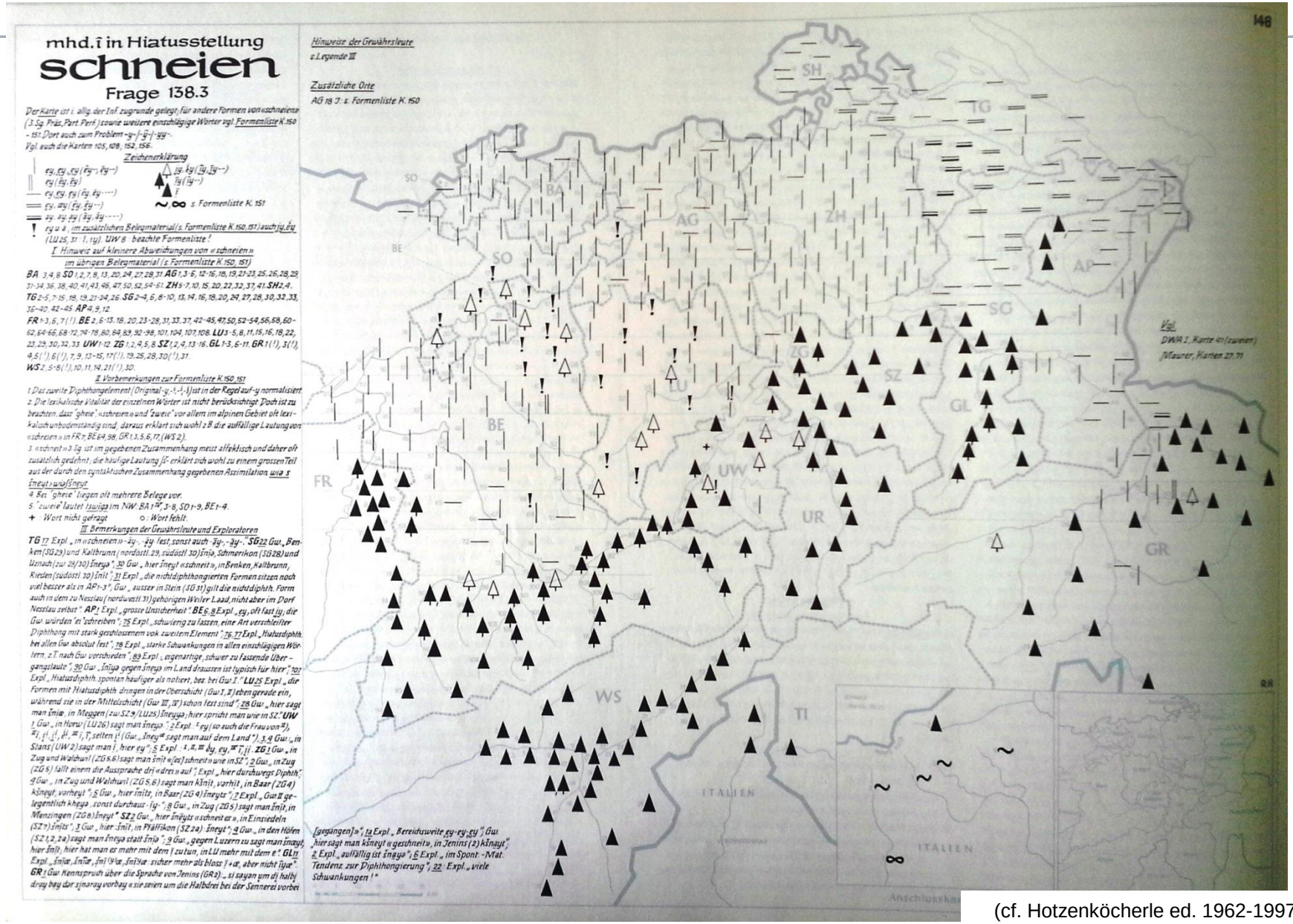
Introduction



(cf. Lameli et al. eds. 2011: 1306)

Universität Zürich[UZH]

Introduction

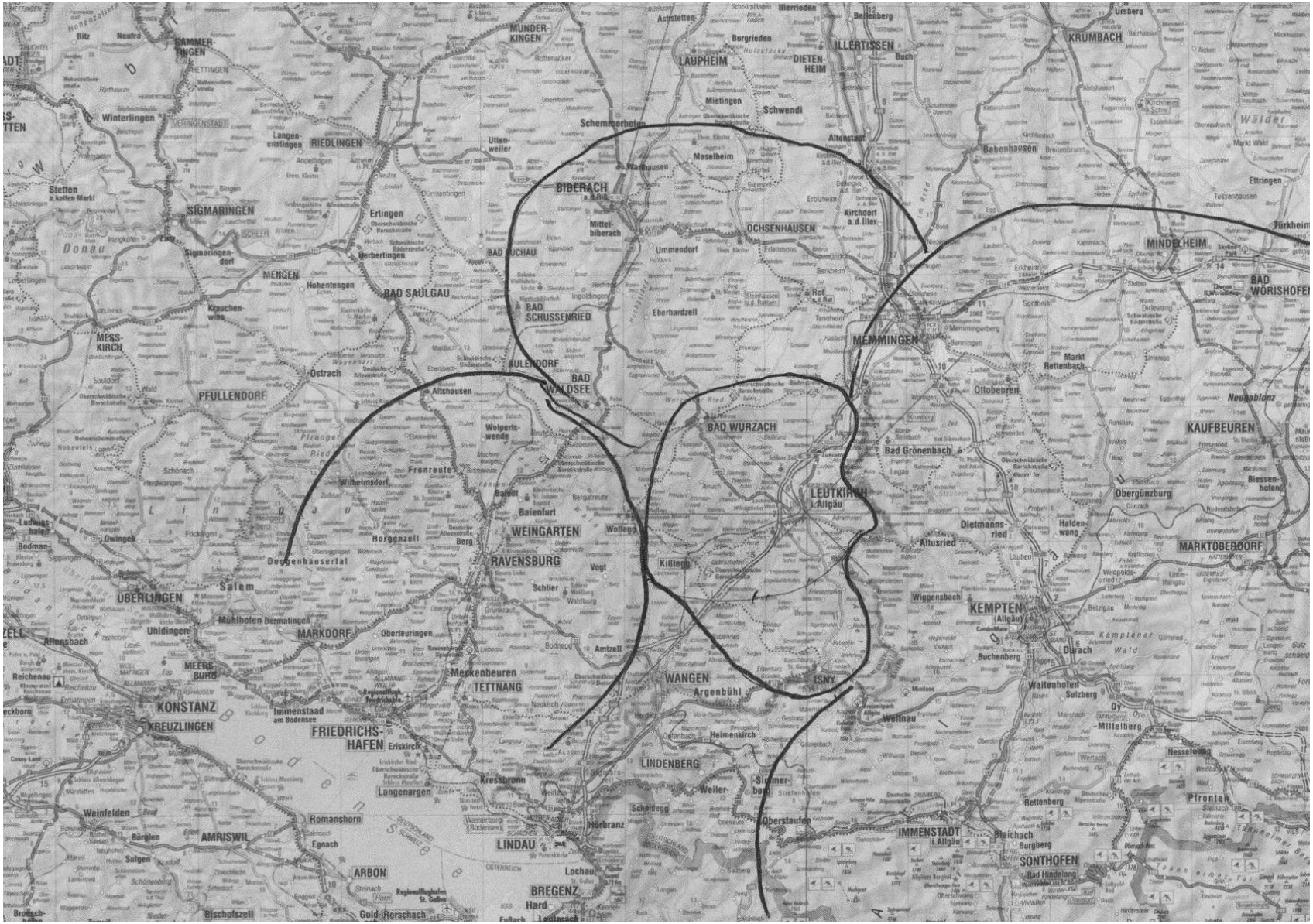


(cf. Hotzenköcherle ed. 1962-1997)

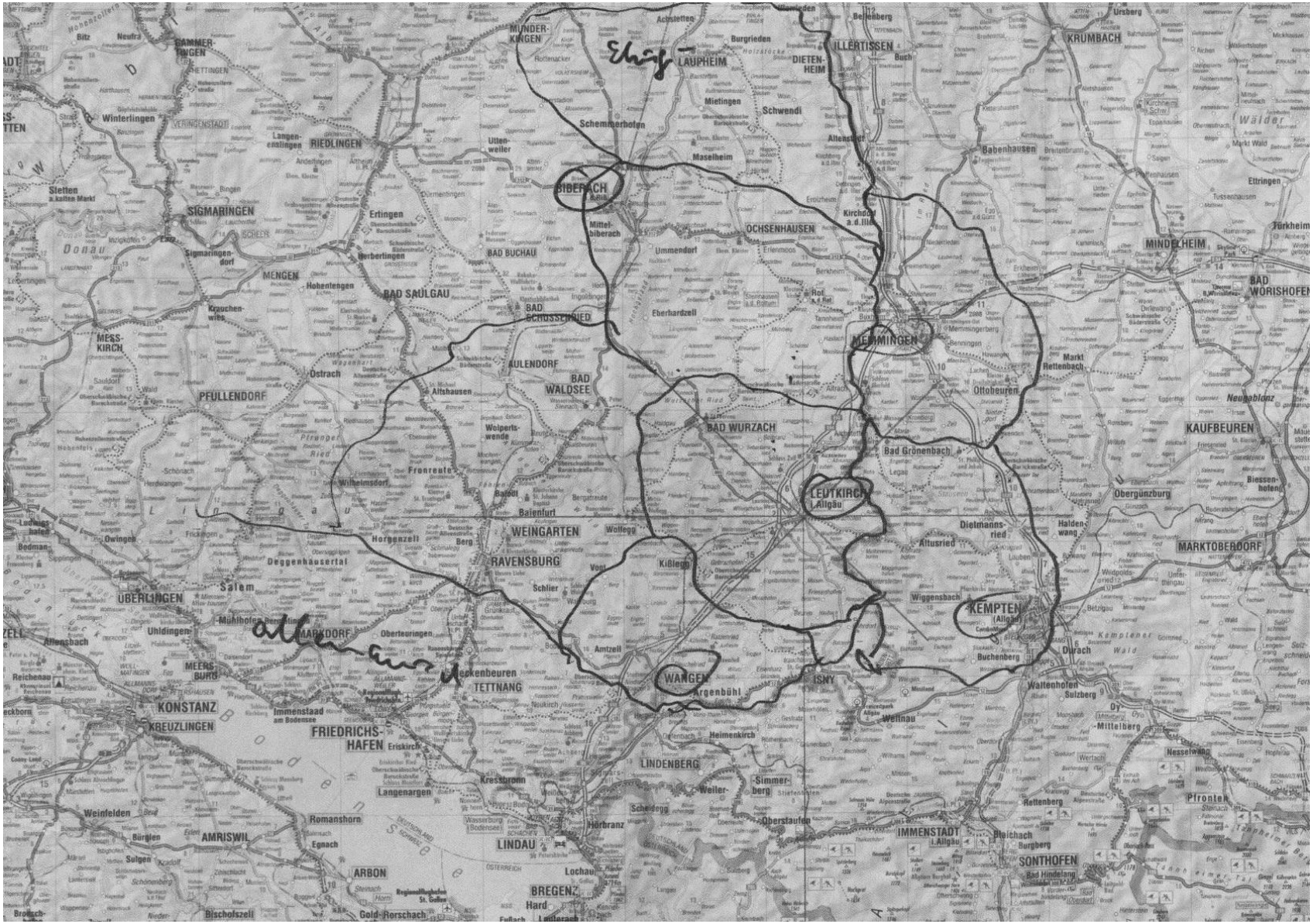
Introduction

(cf. Christen et al. 2012)

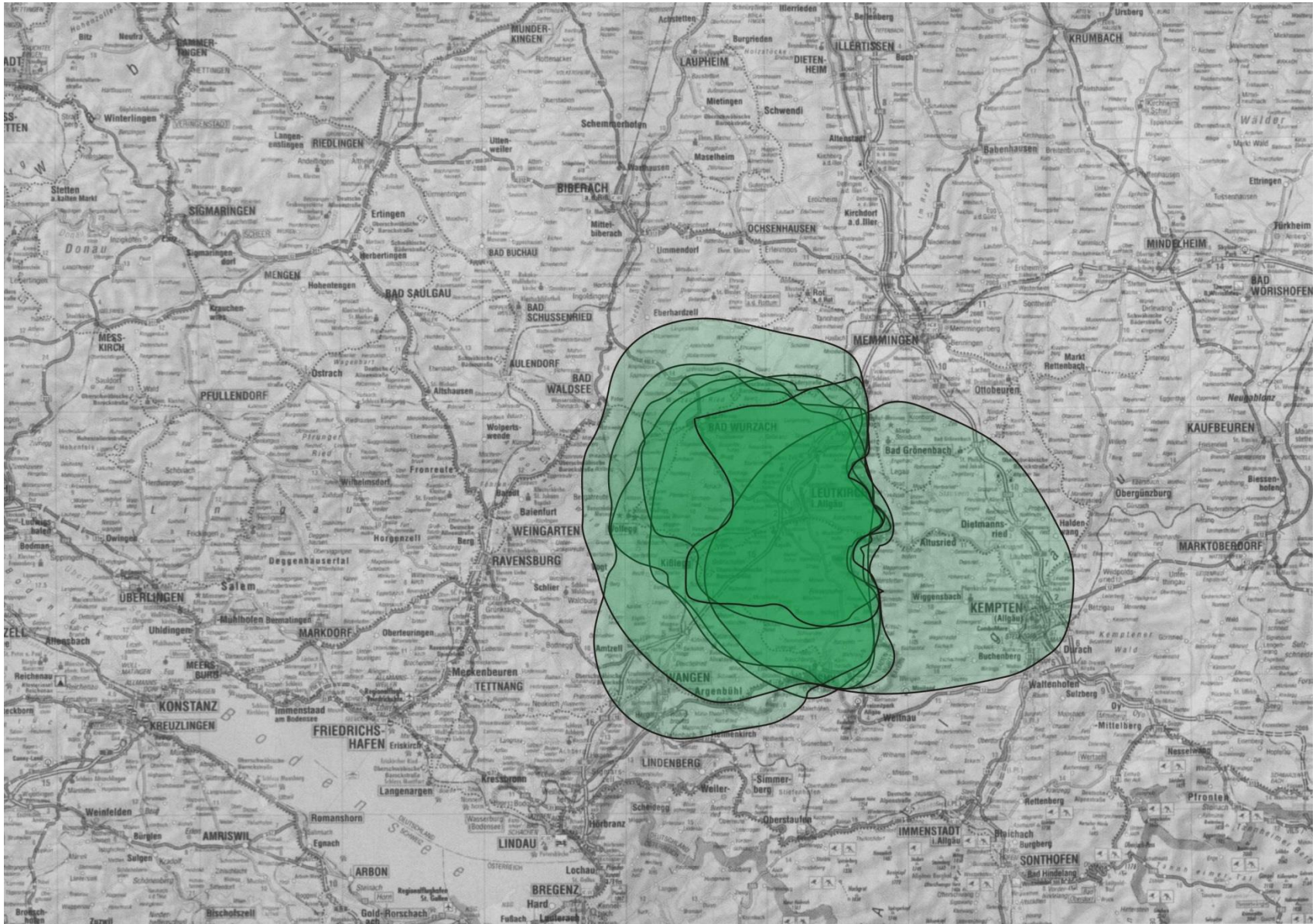
Introduction



Introduction



Introduction



Introduction

Requirements for geographic mapping of linguistic data

- High quality and manifold visualization techniques
- Work with large numbers of data (aggregate data, quantitative mapping)
- Geocoding (include different types of linguistic/extra-linguistic data, compare data)
- Work with datasets that contain attributes (linguistic, social, …)
- Perform spatial and geostatistic analyses (interpolation, clustering, …)
- …

What is a GIS?

Many different definitions (cf. Bartelme 2005: 15-16; Heywood, Cornelius & Carver 2006: 18; Bill 2010: 8)

“A geographic information system (GIS) is a system used to describe and characterize the earth and other geographies for the purpose of visualizing and analyzing spatially referenced information. This work is primarily performed using maps.

The purpose of GIS is to create, share, and apply useful map-based information products that support the work of organizations as well as to create and manage the supporting geographic information.

Maps portray logical collections of geographic information as map layers. […]”

(cf. ESRI 2014)

What is a GIS?

Principles of GIS

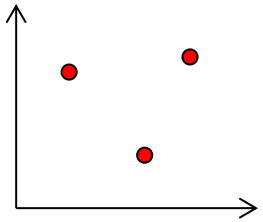
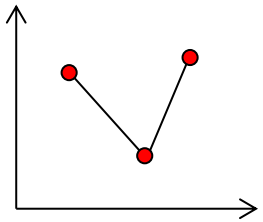
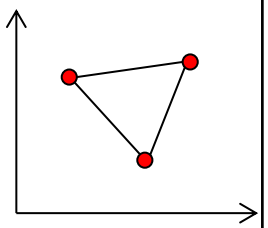
- Combining different types of data
- Linking these date to the earth‘s surface

GIS data types

- Vectors (basic units: coordinates)
- Rasters (basic units: pixels)
- Attributes

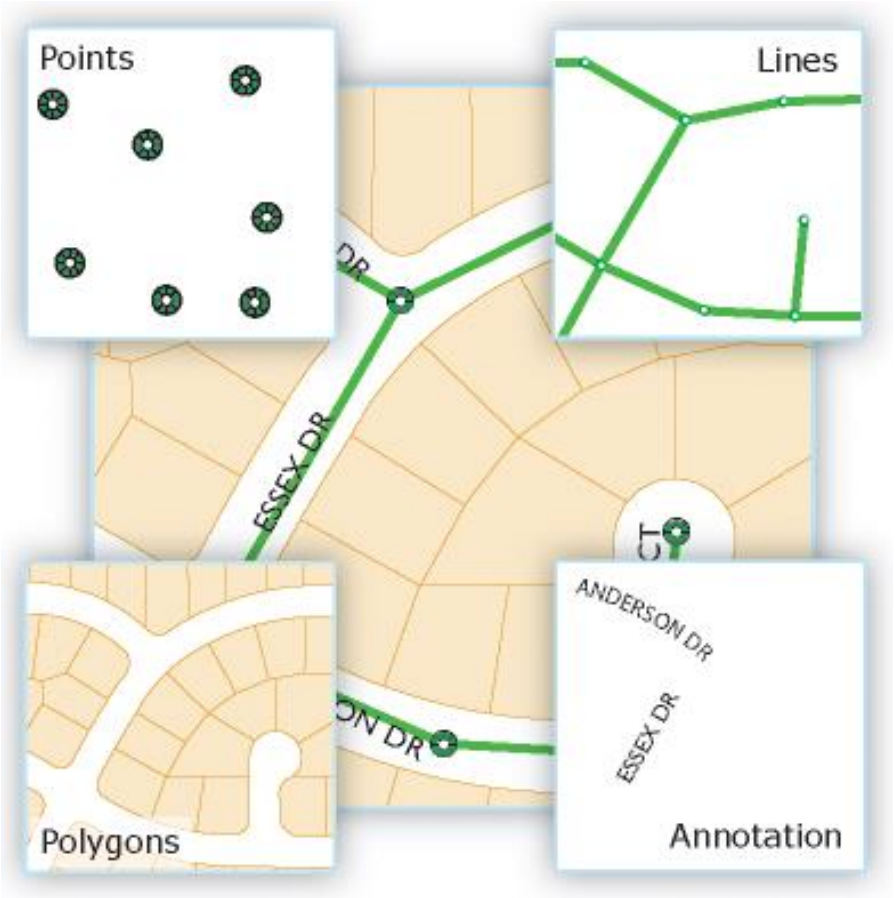
What is a GIS?

Vector: Stored as points, lines and polygons

"Real world"	**GIS**
Locations • Villages, cities, fire departments, police stations, … • In dialectology: places of investigation	Point features 
Borders, connections • Political/administrative borders, streets, rivers, … • In dialectology: isoglosses	Line features 
Areas • Countries, land use, districts, … • In dialectology: dialect areas, Thiessen polygons, *mental maps*	Polygon features 

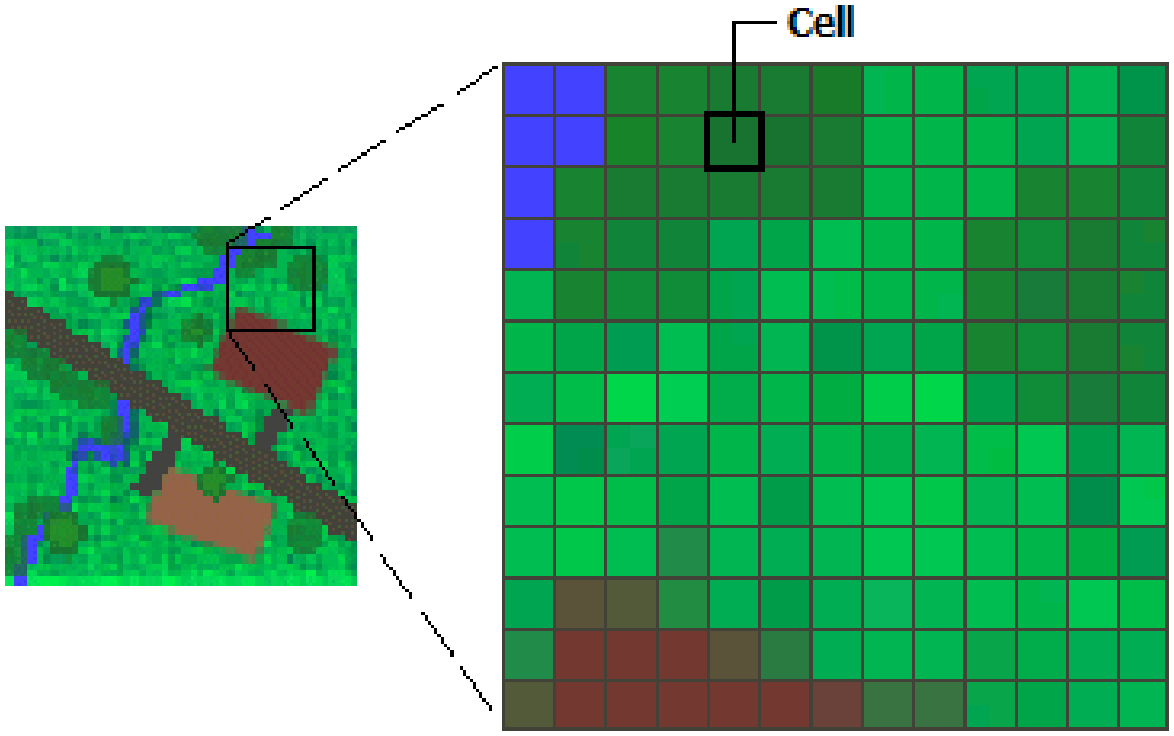
What is a GIS?

Vector: Stored as points, lines and polygons



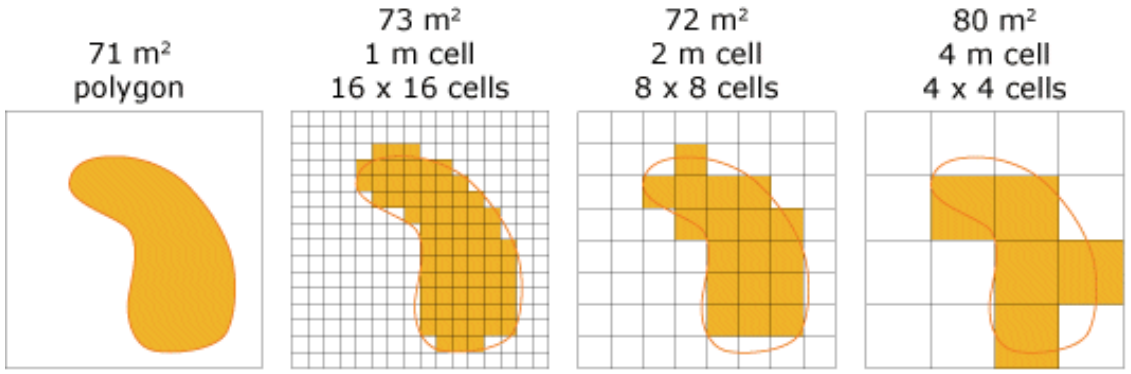
What is a GIS?

Raster: surfaces, images



What is a GIS?

Raster: surfaces, images

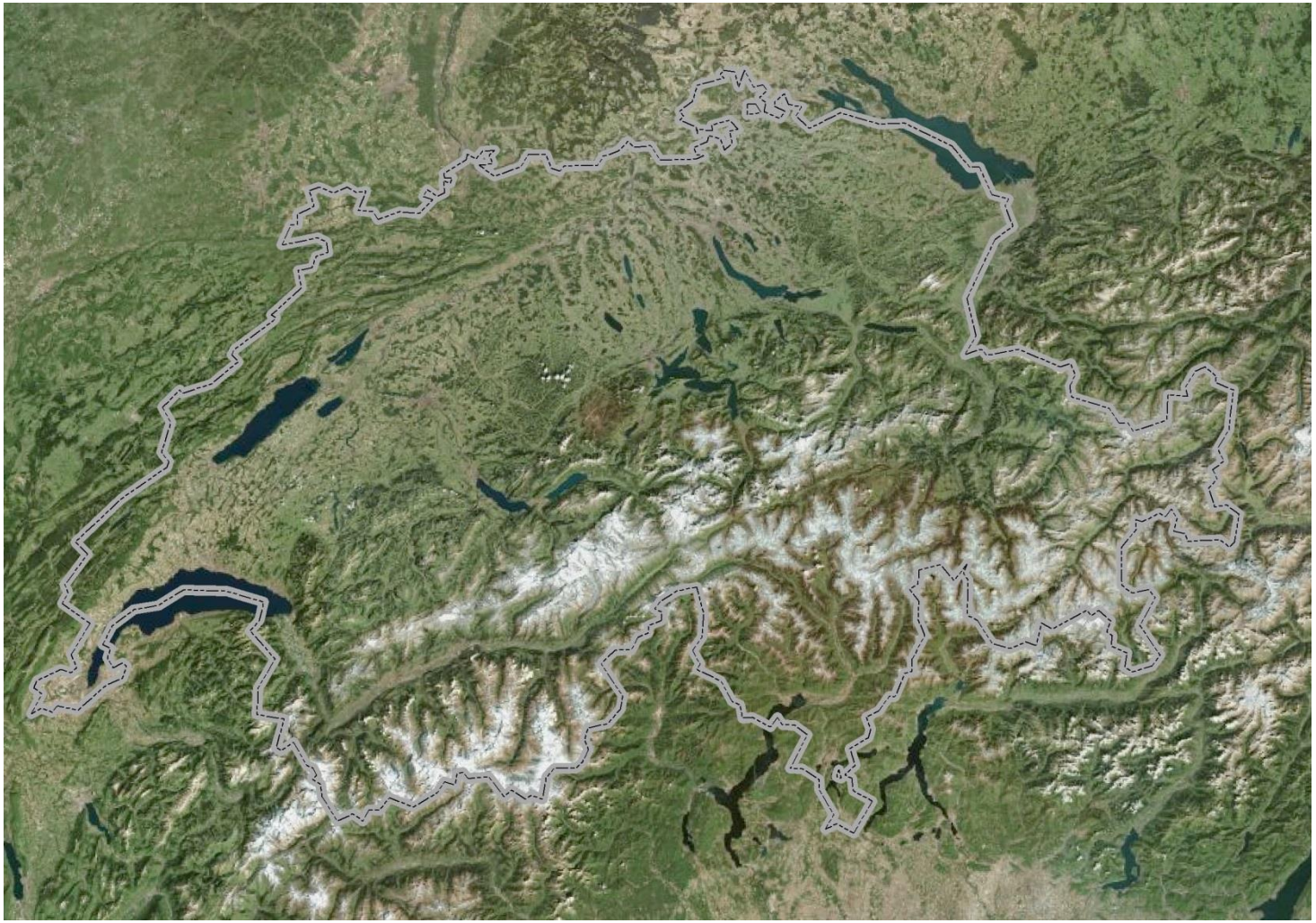


What is a GIS?

Raster: surfaces, images

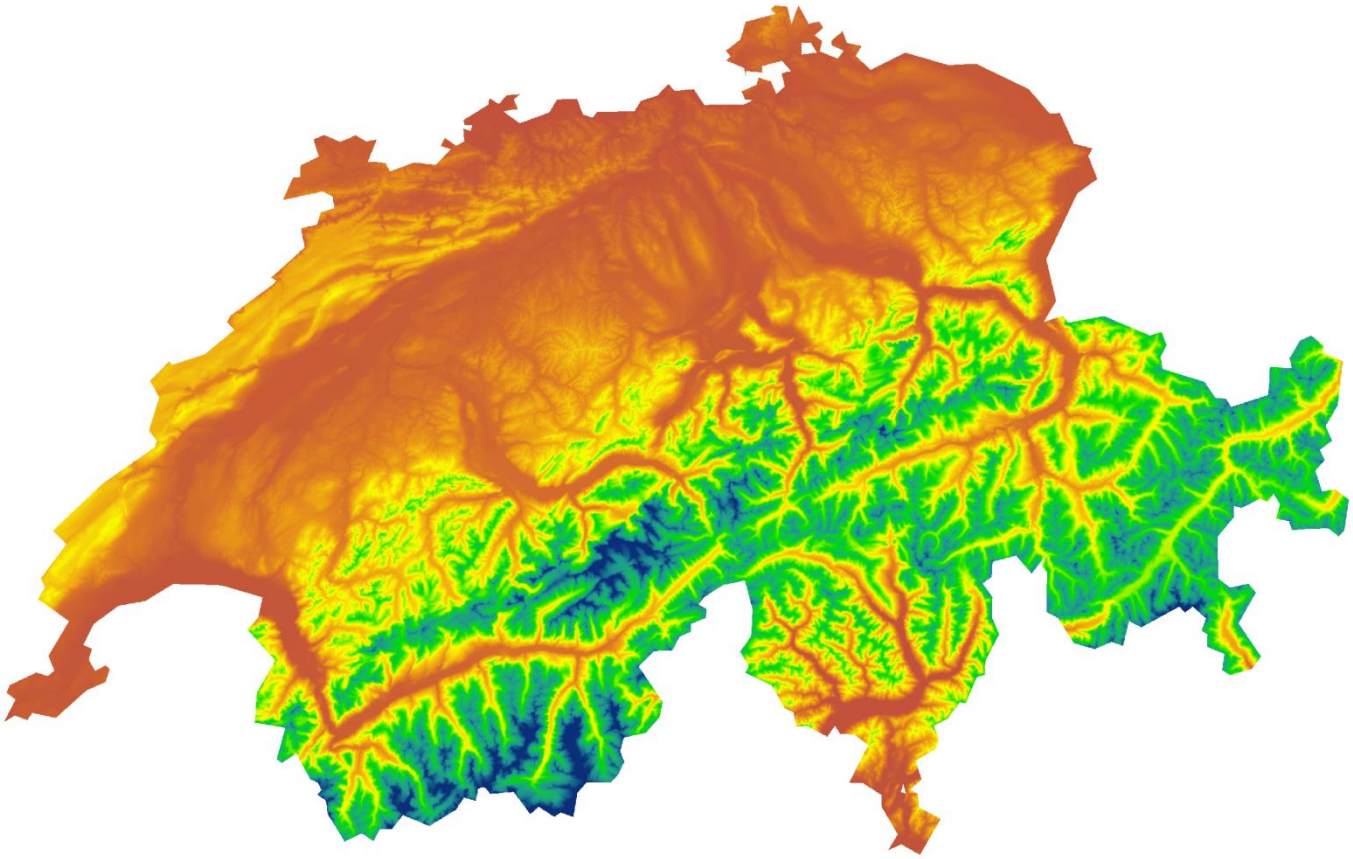
What is a GIS?

Raster: surfaces, images



What is a GIS?

Raster: surfaces, images

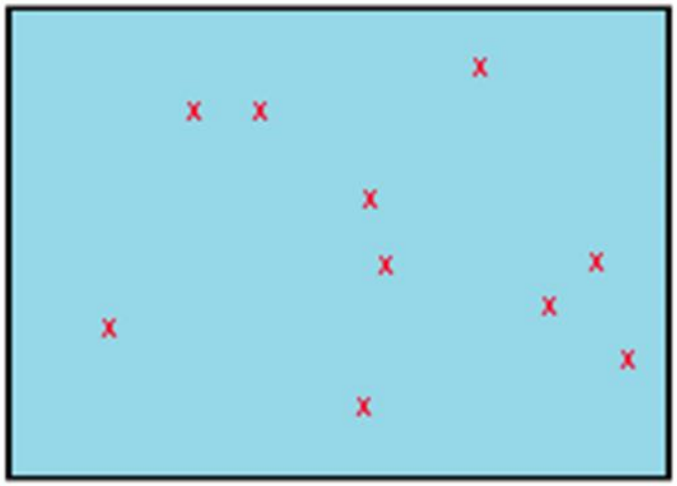


What is a GIS?

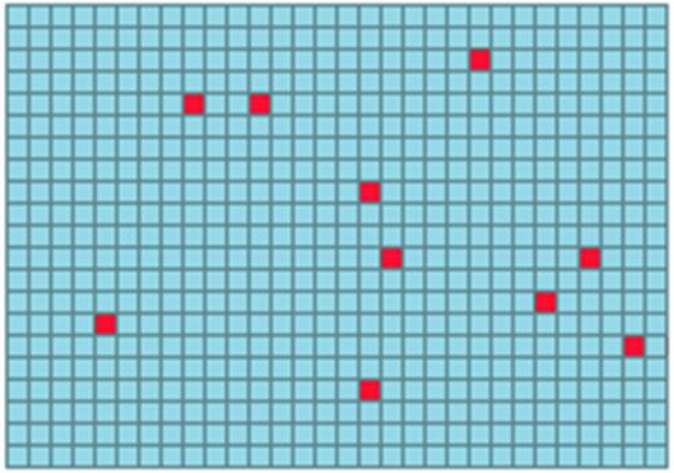
Raster: surfaces, images

What is a GIS?

Raster: surfaces, images



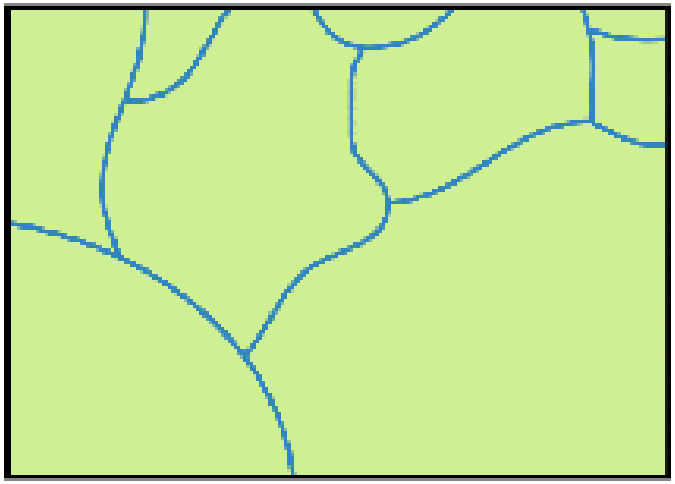
Point features



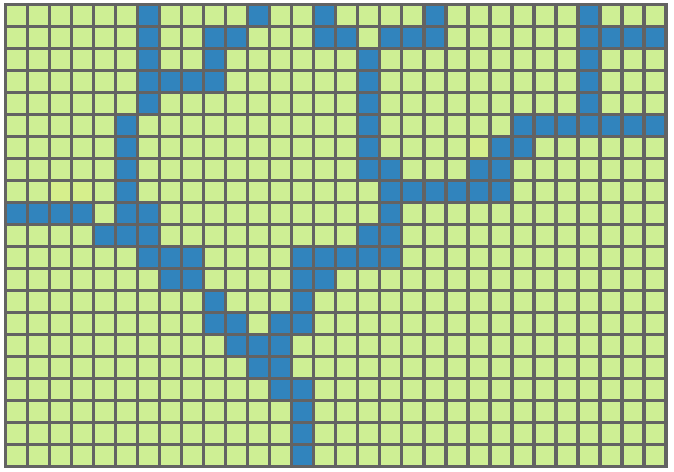
Raster point features

What is a GIS?

Raster: surfaces, images



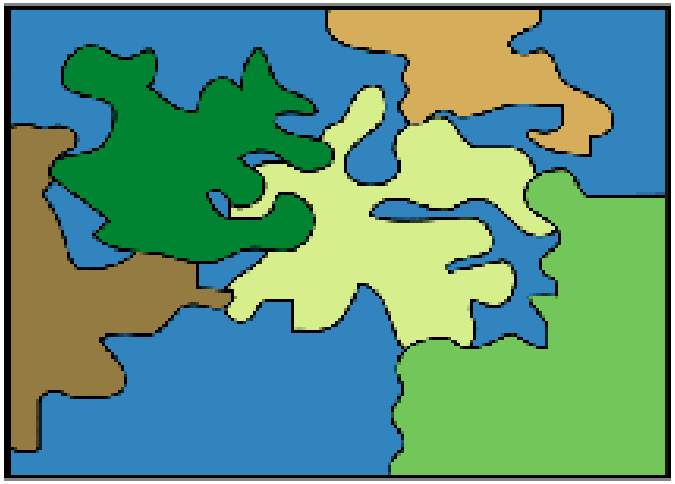
Line features



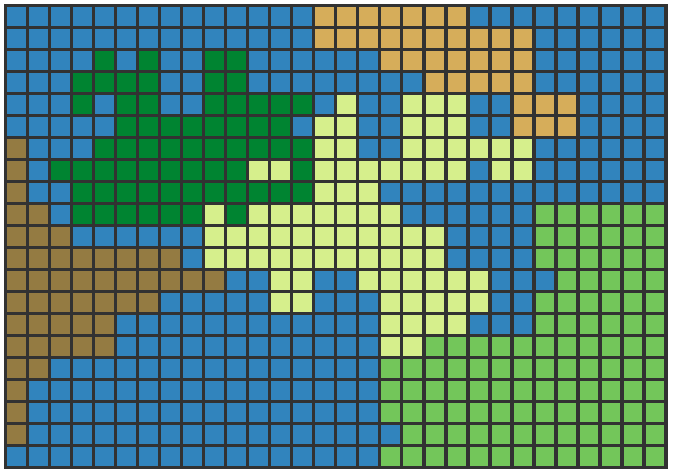
Raster line features

What is a GIS?

Raster: surfaces, images



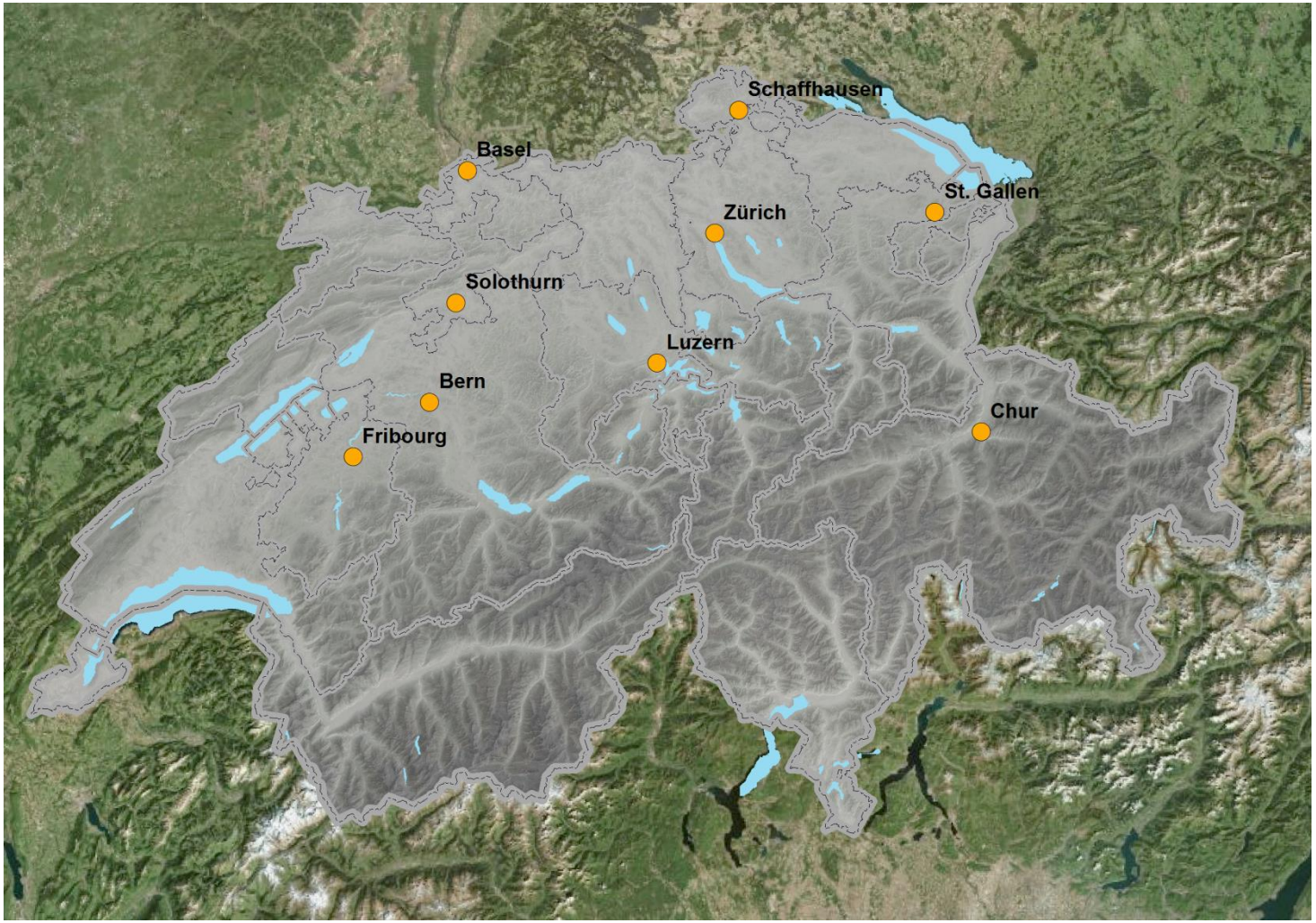
Polygon features



Raster polygon features

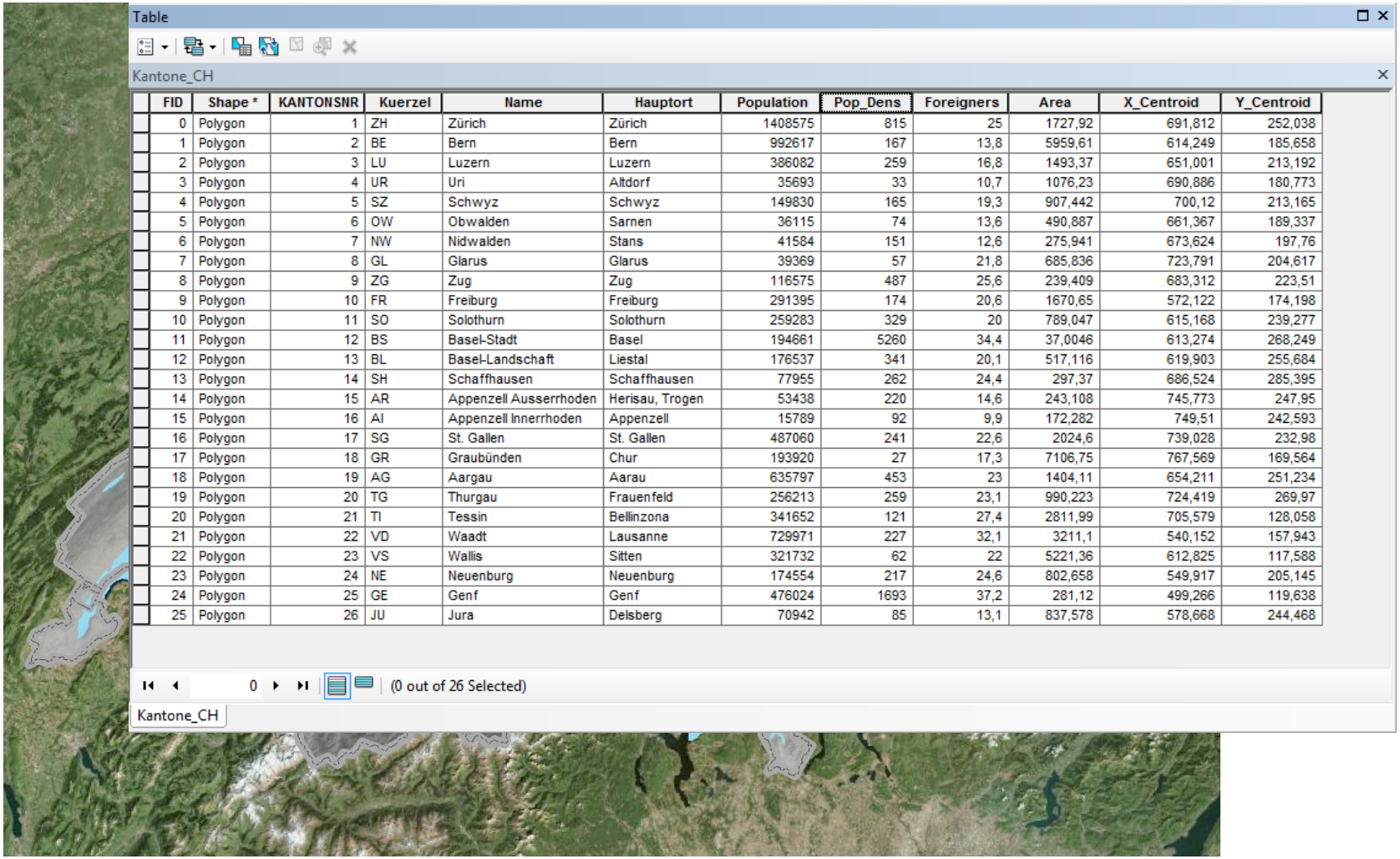
What is a GIS?

Combined Map



What is a GIS?

Attributes



Table

Kantone_CH

FID	Shape *	KANTONSNR	Kuerzel	Name	Hauptort	Population	Pop_Dens	Foreigners	Area	X_Centroid	Y_Centroid
0	Polygon	1	ZH	Zürich	Zürich	1408575	815	25	1727,92	691,812	252,038
1	Polygon	2	BE	Bern	Bern	992617	167	13,8	5959,61	614,249	185,658
2	Polygon	3	LU	Luzern	Luzern	386082	259	16,8	1493,37	651,001	213,192
3	Polygon	4	UR	Uri	Altdorf	35693	33	10,7	1076,23	690,886	180,773
4	Polygon	5	SZ	Schwyz	Schwyz	149830	165	19,3	907,442	700,12	213,165
5	Polygon	6	OW	Obwalden	Sarnen	36115	74	13,6	490,887	661,367	189,337
6	Polygon	7	NW	Nidwalden	Stans	41584	151	12,6	275,941	673,624	197,76
7	Polygon	8	GL	Glarus	Glarus	39369	57	21,8	685,836	723,791	204,617
8	Polygon	9	ZG	Zug	Zug	116575	487	25,6	239,409	683,312	223,51
9	Polygon	10	FR	Freiburg	Freiburg	291395	174	20,6	1670,65	572,122	174,198
10	Polygon	11	SO	Solothurn	Solothurn	259283	329	20	789,047	615,168	239,277
11	Polygon	12	BS	Basel-Stadt	Basel	194661	5260	34,4	37,0046	613,274	268,249
12	Polygon	13	BL	Basel-Landschaft	Liestal	176537	341	20,1	517,116	619,903	255,684
13	Polygon	14	SH	Schaffhausen	Schaffhausen	77955	262	24,4	297,37	686,524	285,395
14	Polygon	15	AR	Appenzell Ausserrhoden	Herisau, Trogen	53438	220	14,6	243,108	745,773	247,95
15	Polygon	16	AI	Appenzell Innerrhoden	Appenzell	15789	92	9,9	172,282	749,51	242,593
16	Polygon	17	SG	St. Gallen	St. Gallen	487060	241	22,6	2024,6	739,028	232,98
17	Polygon	18	GR	Graubünden	Chur	193920	27	17,3	7106,75	767,569	169,564
18	Polygon	19	AG	Aargau	Aarau	635797	453	23	1404,11	654,211	251,234
19	Polygon	20	TG	Thurgau	Frauenfeld	256213	259	23,1	990,223	724,419	269,97
20	Polygon	21	TI	Tessin	Bellinzona	341652	121	27,4	2811,99	705,579	128,058
21	Polygon	22	VD	Waadt	Lausanne	729971	227	32,1	3211,1	540,152	157,943
22	Polygon	23	VS	Wallis	Sitten	321732	62	22	5221,36	612,825	117,588
23	Polygon	24	NE	Neuenburg	Neuenburg	174554	217	24,6	802,658	549,917	205,145
24	Polygon	25	GE	Genf	Genf	476024	1693	37,2	281,12	499,266	119,638
25	Polygon	26	JU	Jura	Delsberg	70942	85	13,1	837,578	578,668	244,468

0 (0 out of 26 Selected)

Kantone_CH

The ArcGIS user interface

Two main applications: ArcMap and ArcCatalog

ArcCatalog

- Organize and manage different types of geographic information data (e.g. geodatabases, raster files, shapefiles, …)
- cf. Windows Explorer

→ Explorer does not read the different file formats!

→ In order to manage / copy geodata always use ArcCatalog

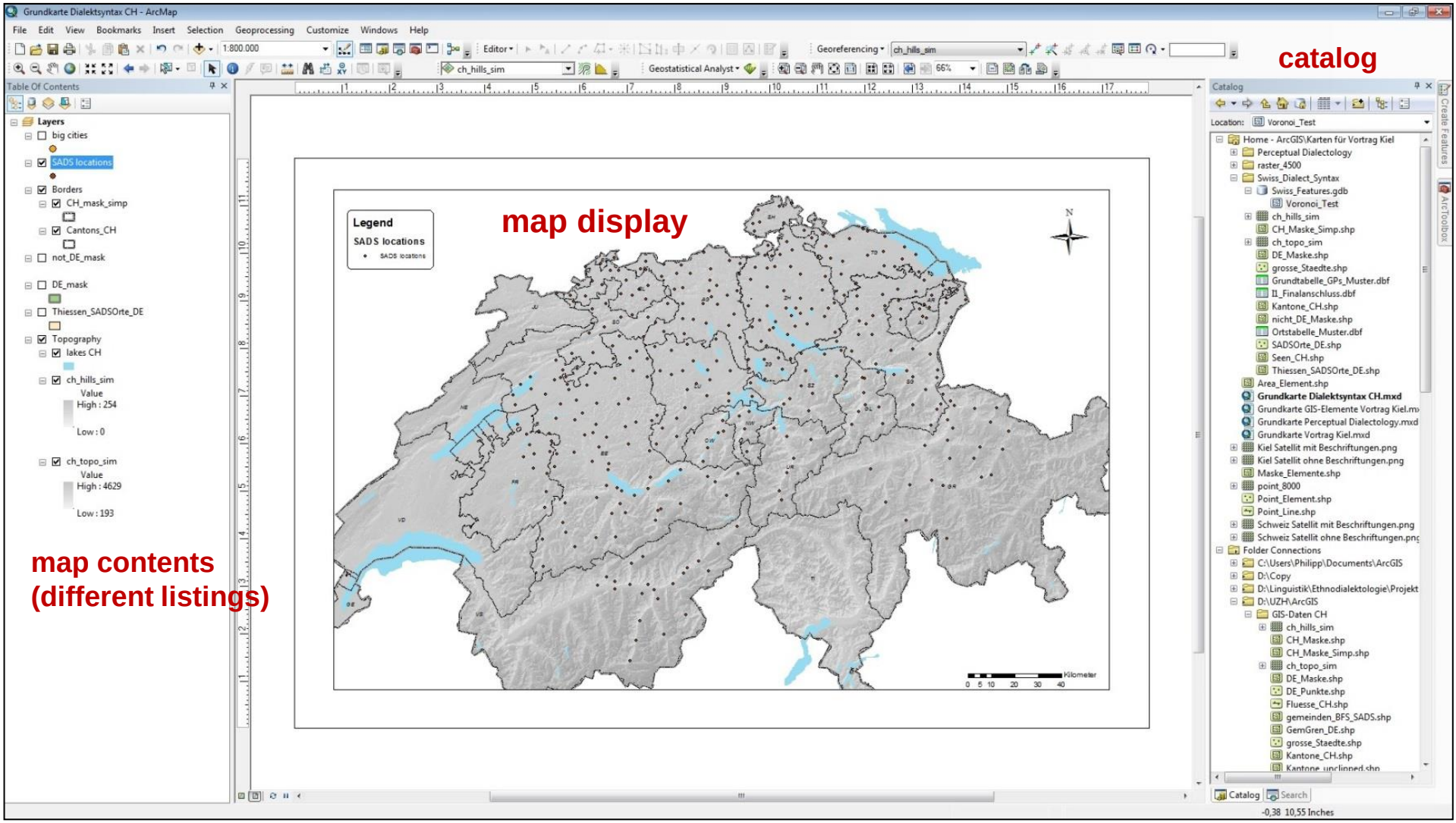
ArcMap

- Explore and display GIS data, assign symbols, perform analyses, create layouts
- Create and edit datasets
- Primary application in ArcGIS

Universität Zürich[UZH]

The ArcGIS user interface

Deutsches Seminar



map display

catalog

map contents (different listings)

Case Study 1: Perceptual Dialectology

Research Background

- In the last decades: growing interest in speakers‘ (i.e. linguistic laypeople‘s) ideas about language/dialects
- Assumptions:
  - Speakers‘ ideas and attitudes can influence their linguistic behaviour and thus have an impact on variation and change
  - Languages / dialects play an important role for the creation of a regional identity
- Dennis R. Preston (1982 ff.): *Folk linguistics, folk dialectology, perceptual dialectology*
- Surveys in Germany: Anders (2010), Purschke (2011), Stoeckle (forthc.)
- Different methods → here: *Draw-a-map* task

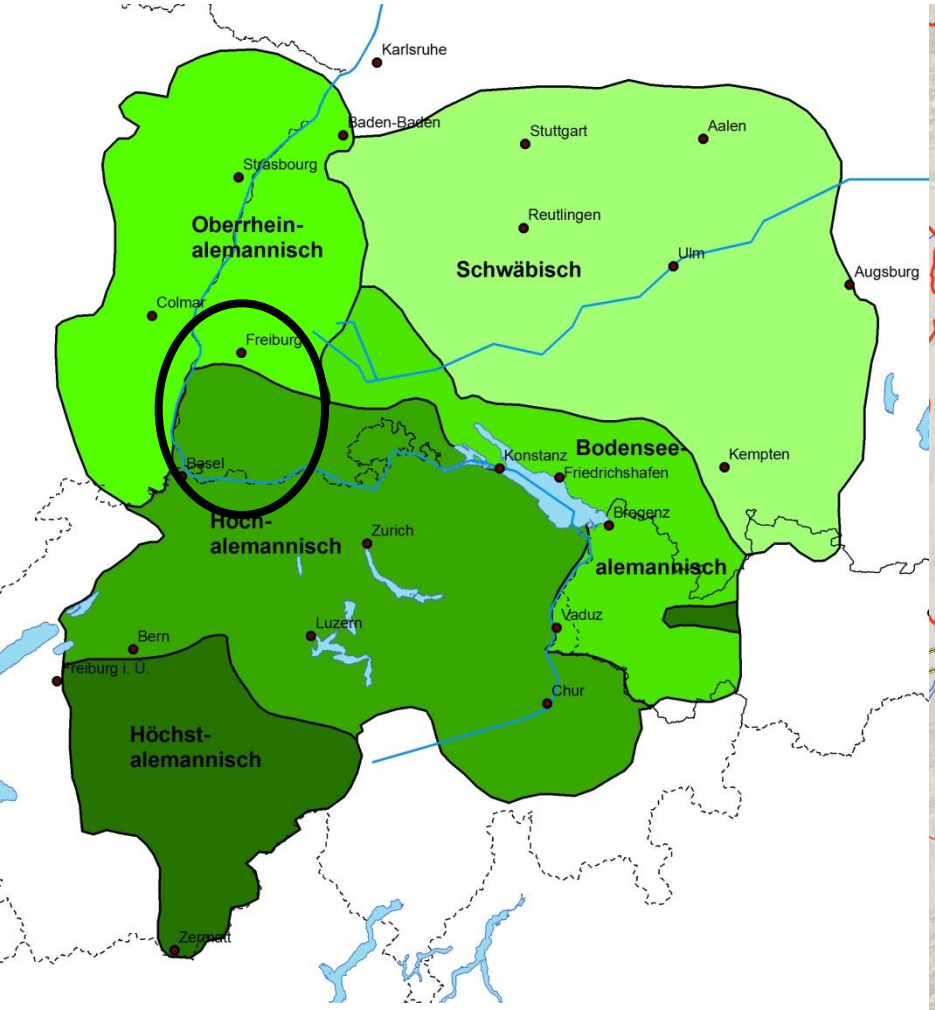
Case Study 1: Perceptual Dialectology

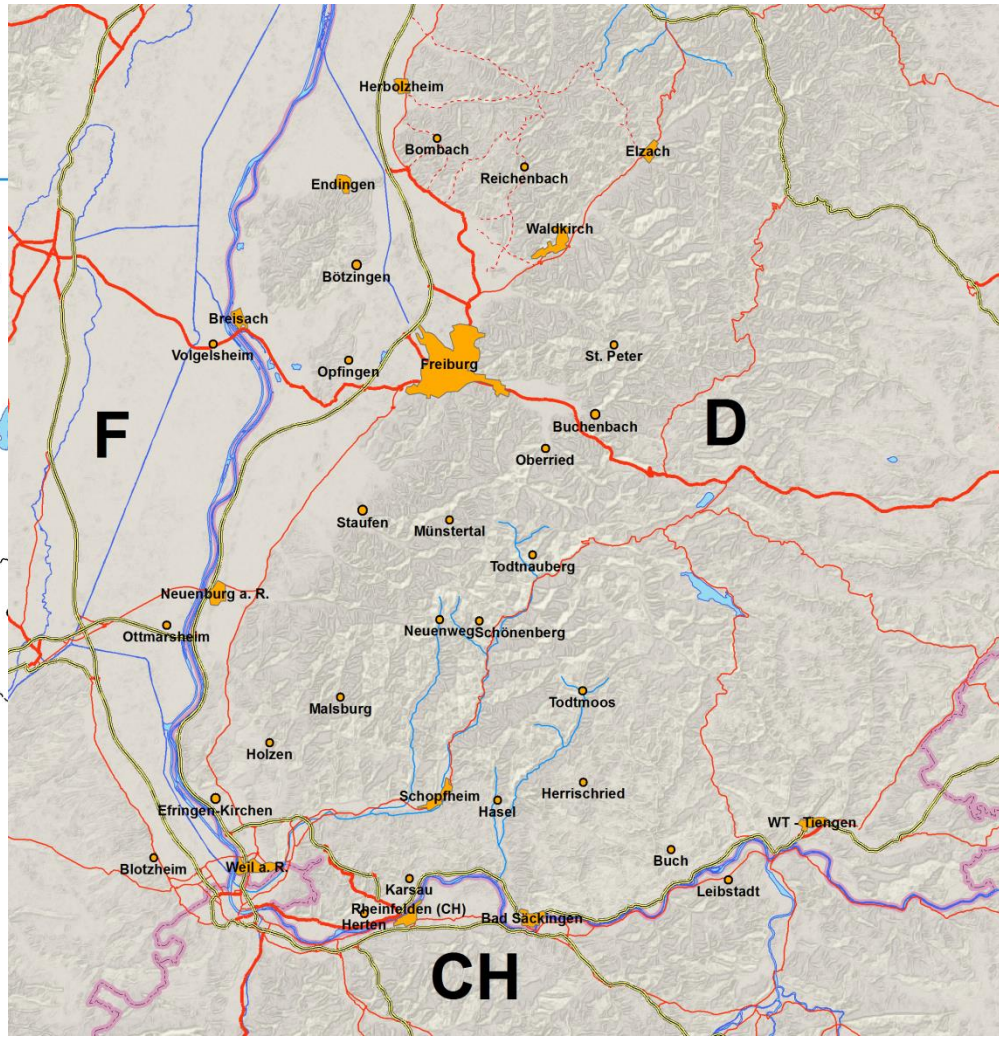
“Subjective Dialect Areas in the Alemannic Border Triangle”

Central Questions:

- What strategies do speakers use to construct local dialect areas? Which ones are the most important?
- What constitutes a dialect area (from a lay perspective)?
- What is the relationship between geographical linguistic knowledge?
- What role do dialects play for the speakers’ construction of their regional identity?

Case Study 1: Perceptual Dialectology





37 locations, 6 informants per location (differentiated by age, sex, profession)

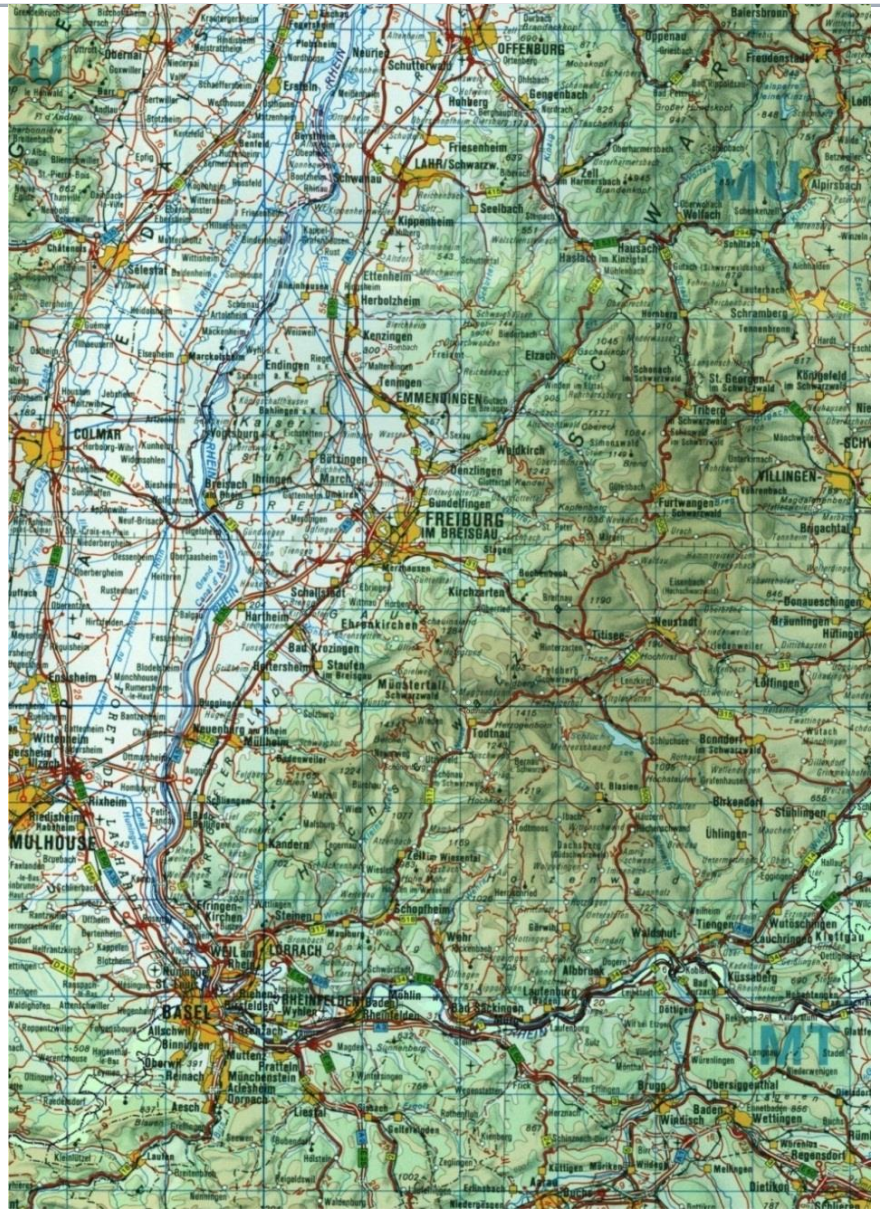
Case Study 1: Perceptual Dialectology

Draw-a-map task

In many studies “blank maps” were used in order to avoid stimulus effects (cf. Preston 1993, Montgomery 2006, Lameli/Purschke/ Kehrein 2008)

Here

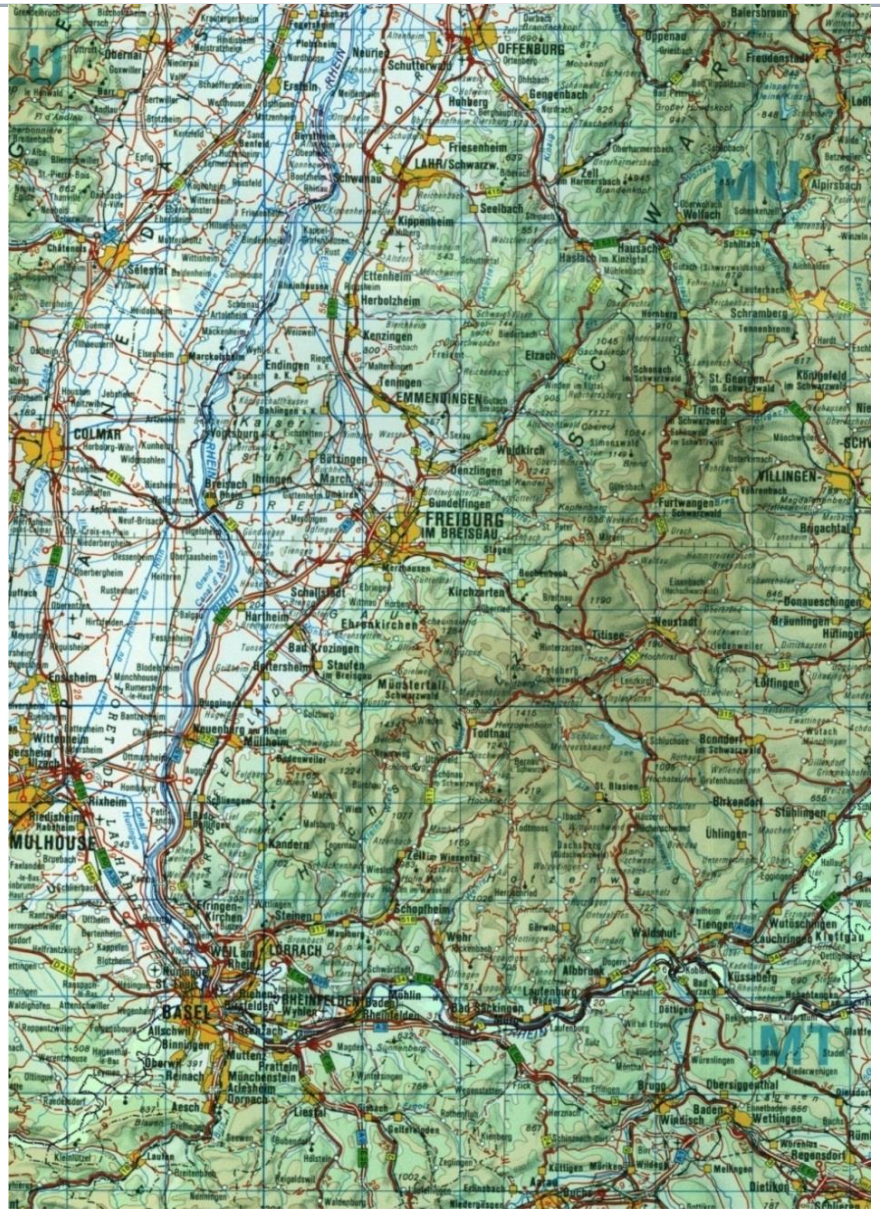
- Detailed map
- Concepts which are based on everyday experiences
- No “dominant” stimulus



Case Study 1: Perceptual Dialectology

The Interview

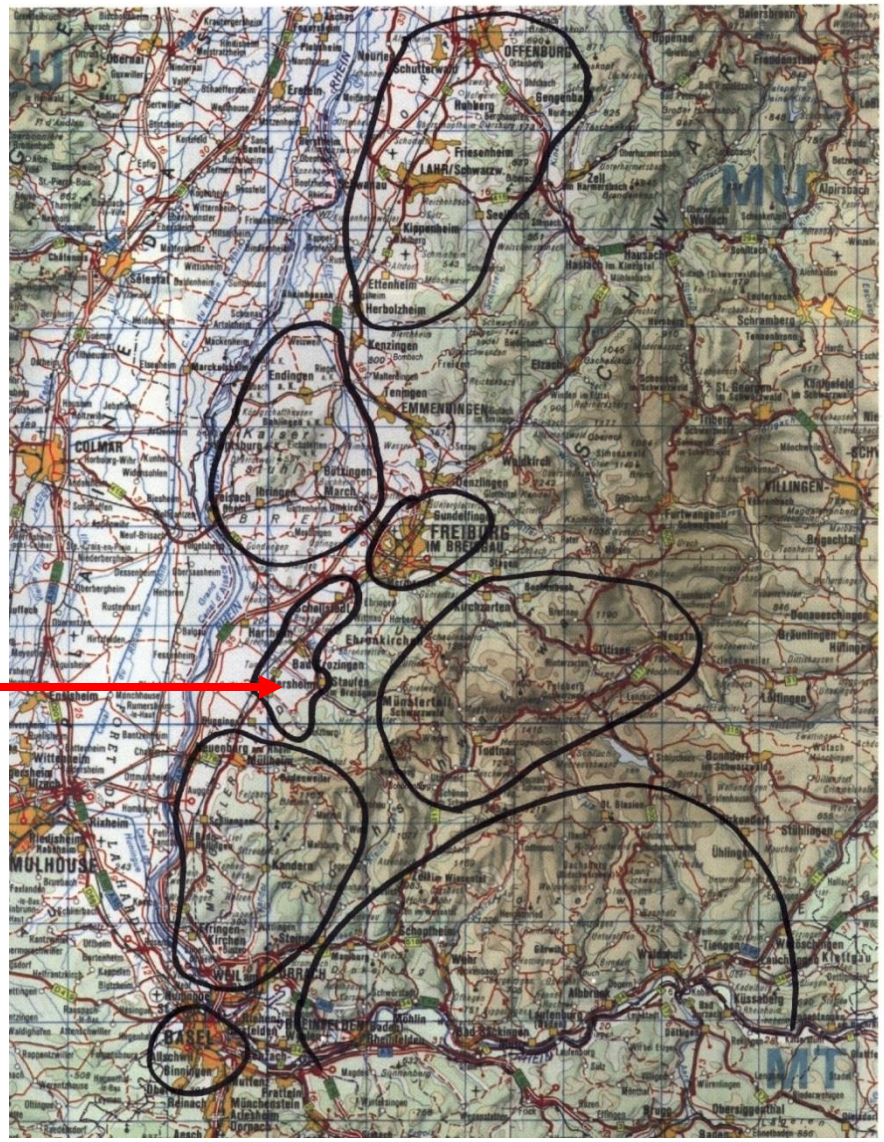
1. "Indicate the area (by drawing a line), in which **the same dialect as in your place** is spoken."
2. "Draw and name the **surrounding dialect areas**."
3. "Can you name **features** of the dialects you indicated?"
4. "Which of the surrounding dialects you indicated is **the most similar** to your own dialect, which one is **the most different**?"
5. "Which of the areas you indicated (incl. your own) is **most dialectal**, which one is **least dialectal**?"
6. "Which of the dialects you indicated (incl. your own) do you find the **most pleasant**, which one the **most unpleasant**?"



Case Study 1: Perceptual Dialectology

Sample map:

Informant from Staufen



Case Study 1: Perceptual Dialectology

Objectives

- Aggregate data
- Query data based on certain attributes
- Incorporate other (linguistic or extra-linguistic) datasets
- Visualize results

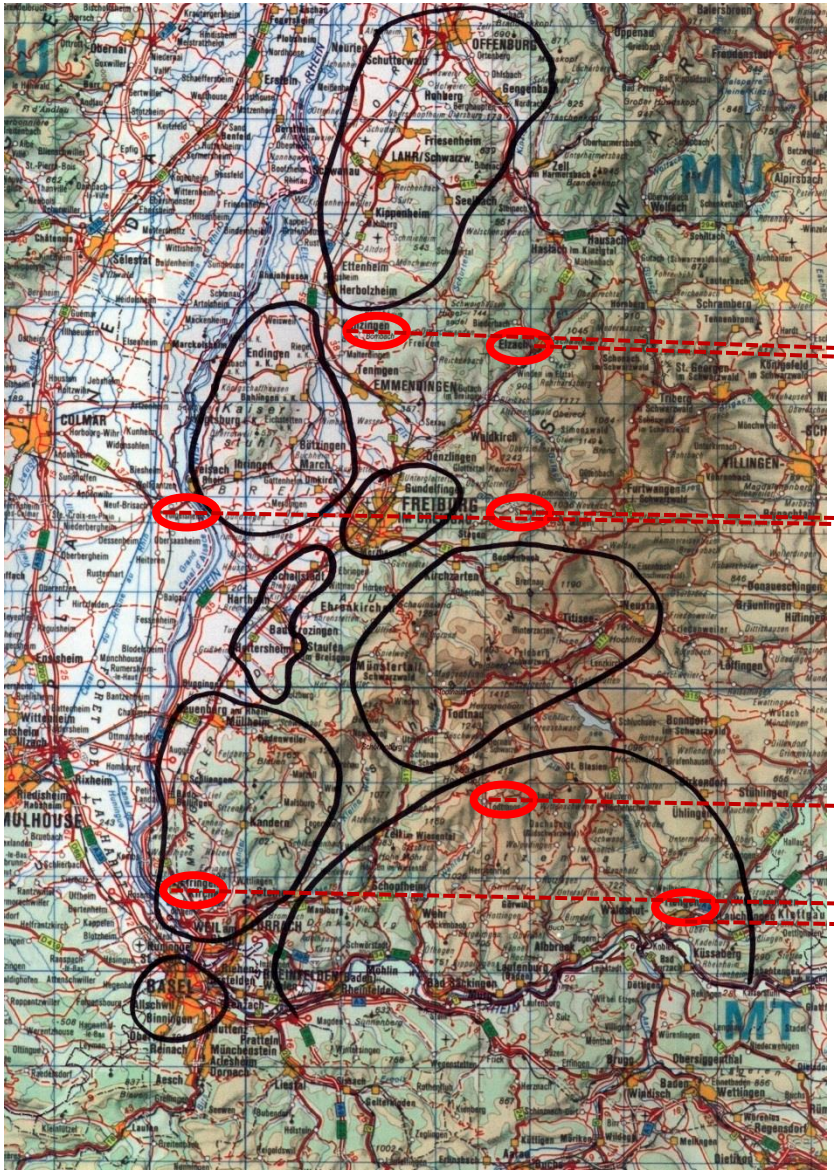
Case Study 1: Perceptual Dialectology

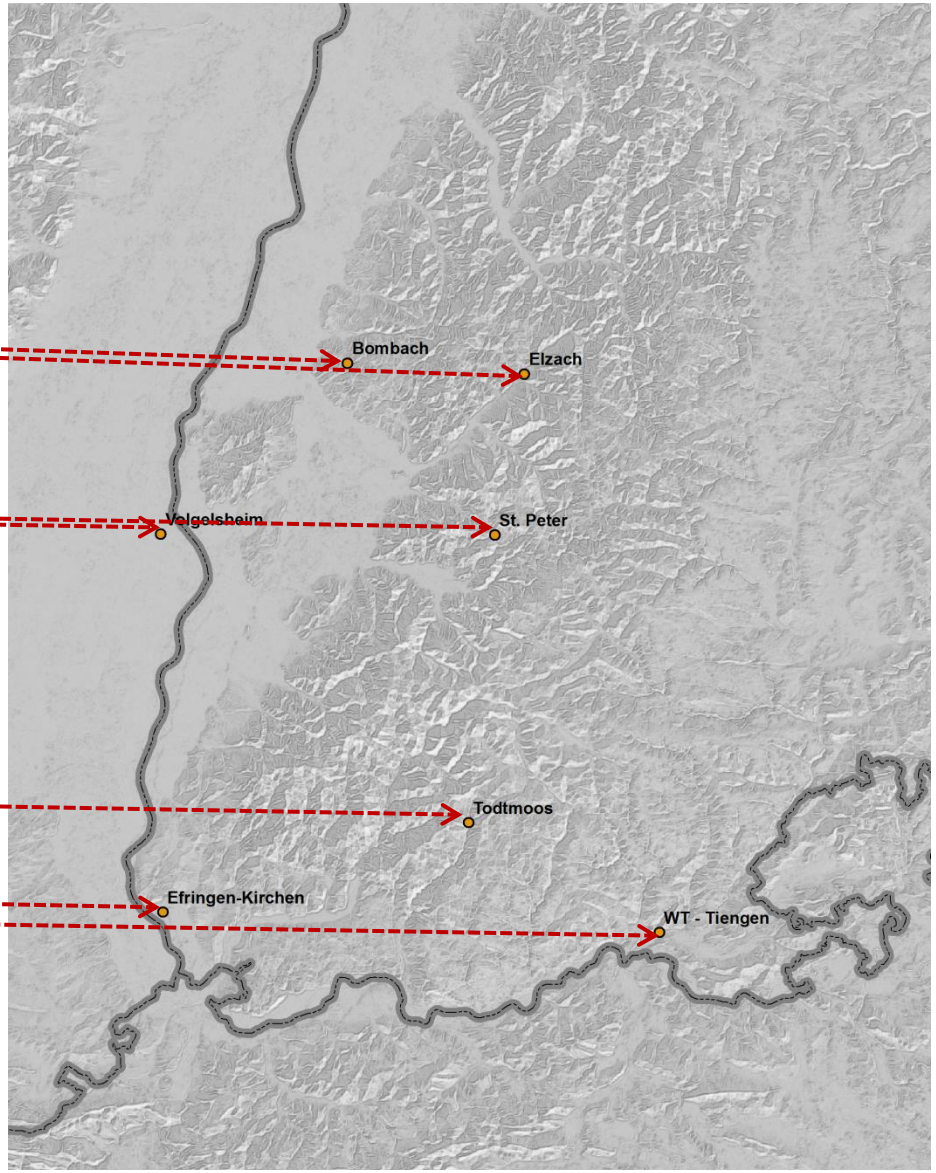
First step: georeference maps

- Scanned maps normally don't contain spatial reference information
- In order to work properly with the maps they have to be "fitted" into the map coordinate system
- This is usually done by using "control points", i.e. points on the raster dataset for which …
  - … either the coordinates are known
  - … or there are correspondent points or features (e.g. cities, rivers, borders, …) in the already existing map

→ Points on the raster dataset can be associated with coordinates or points on map

Case Study 1: Perceptual Dialectology





Case Study 1: Perceptual Dialectology

First step: georeference maps → in ArcGIS

- Add map to ArcGIS project (in ArcMap)
- In the *Georeferencing* toolbar select raster dataset (here: Staufen_JWK_klein)
- Click “Fit To Display”
- Associate points on raster dataset with points on map using the “Add Control Points” tool
- Click “Update Georeferencing”

For a demonstration video see:

http://resources.arcgis.com/de/gallery/video/image-management/details?entryID=BEE233D1-1422-2418-3442-F45730292D87

[July 2014]

Case Study 1: Perceptual Dialectology

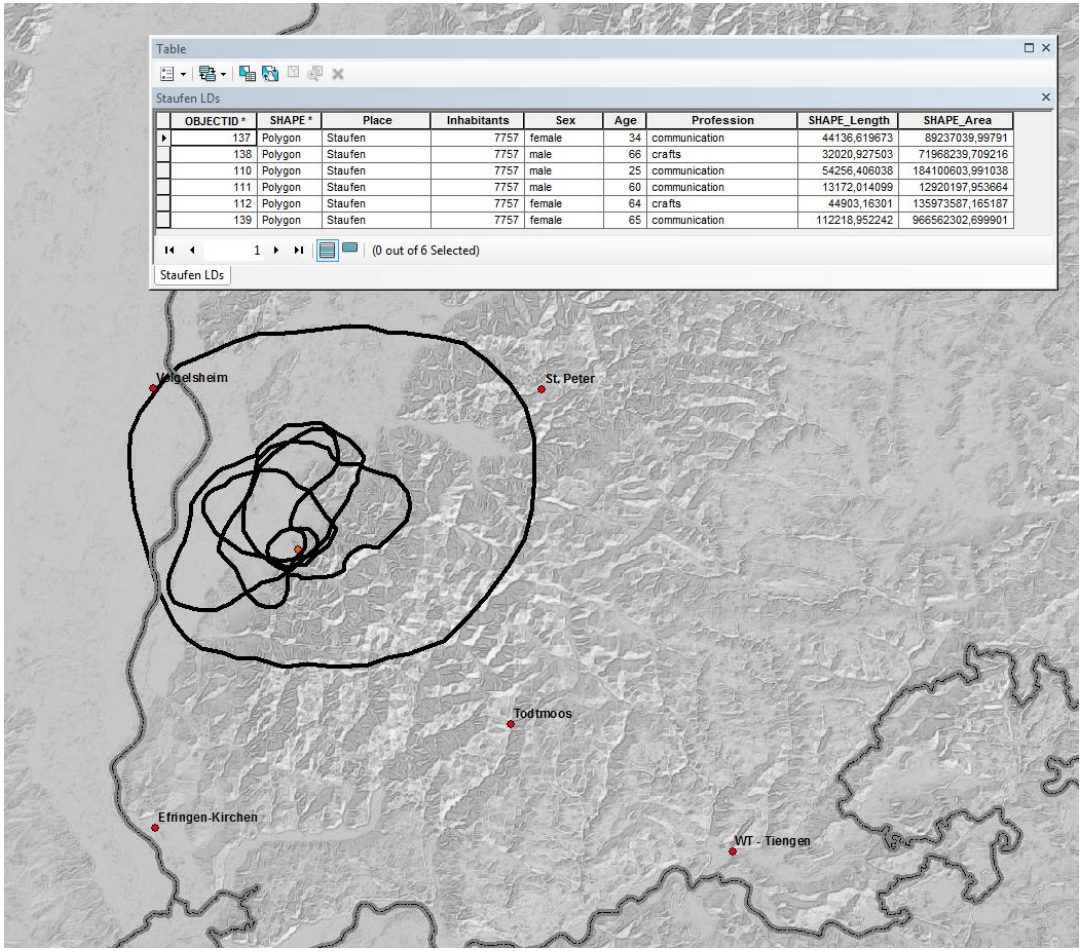
Second step: copy *mental maps* to database

- Create Geodatabase (e.g. *Mental_Maps*)
  - Create Feature Dataset (e.g. *Local_Dialects*)
    - Create (Polygon) Feature Class (e.g. *Staufen_LDs*)
- Add Feature Class to map project
- In Editor click “Start Editing”
- Select *Staufen Local Dialects*
- Copy hand-drawn map to Feature Class
- Open Attribute Table and add attributes
- Click “Save Edits” and “Stop Editing”

→ Repeat steps 1 and 2 until all mental maps are stored in Feature Class

Case Study 1: Perceptual Dialectology

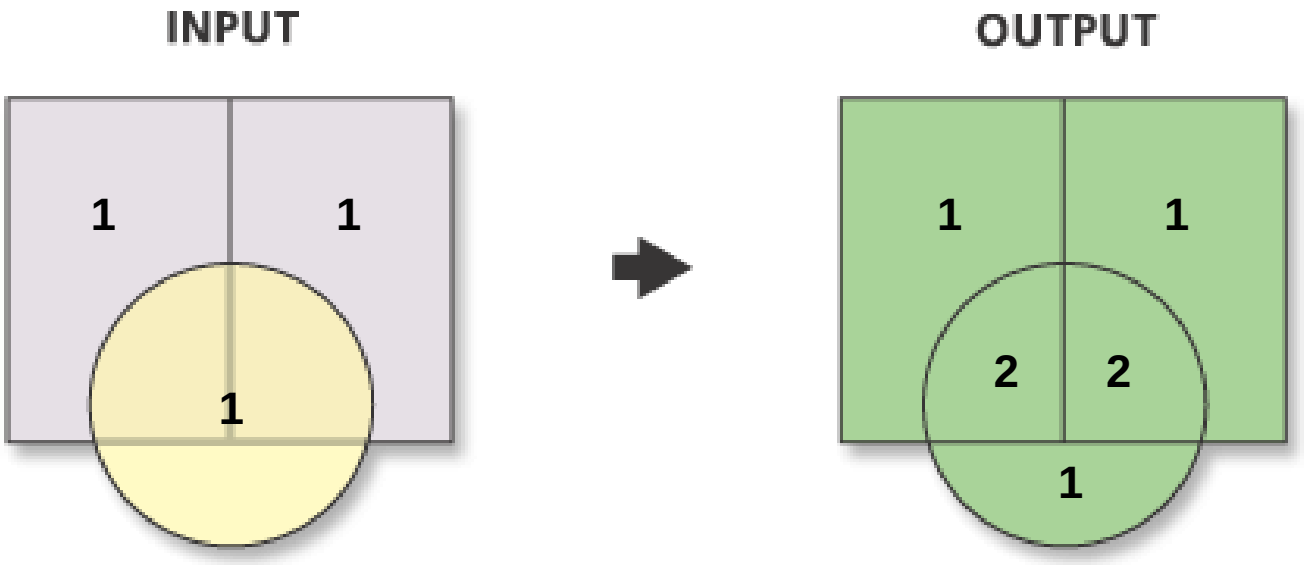
Second step: copy *mental maps* to database



Case Study 1: Perceptual Dialectology

Third step: aggregate *mental maps*

- For vector data this can be performed by using the “Union” tool



Case Study 1: Perceptual Dialectology

Third step: aggregate *mental maps*

Union

- In the ArcToolbox select “Analysis Tools” → “Overlay” → “Union”
- Select *Staufen LDs* as Input Features
- As Output Feature Class create *Staufen_LDs_SelfUnion* in *Local Dialects*

Frequency

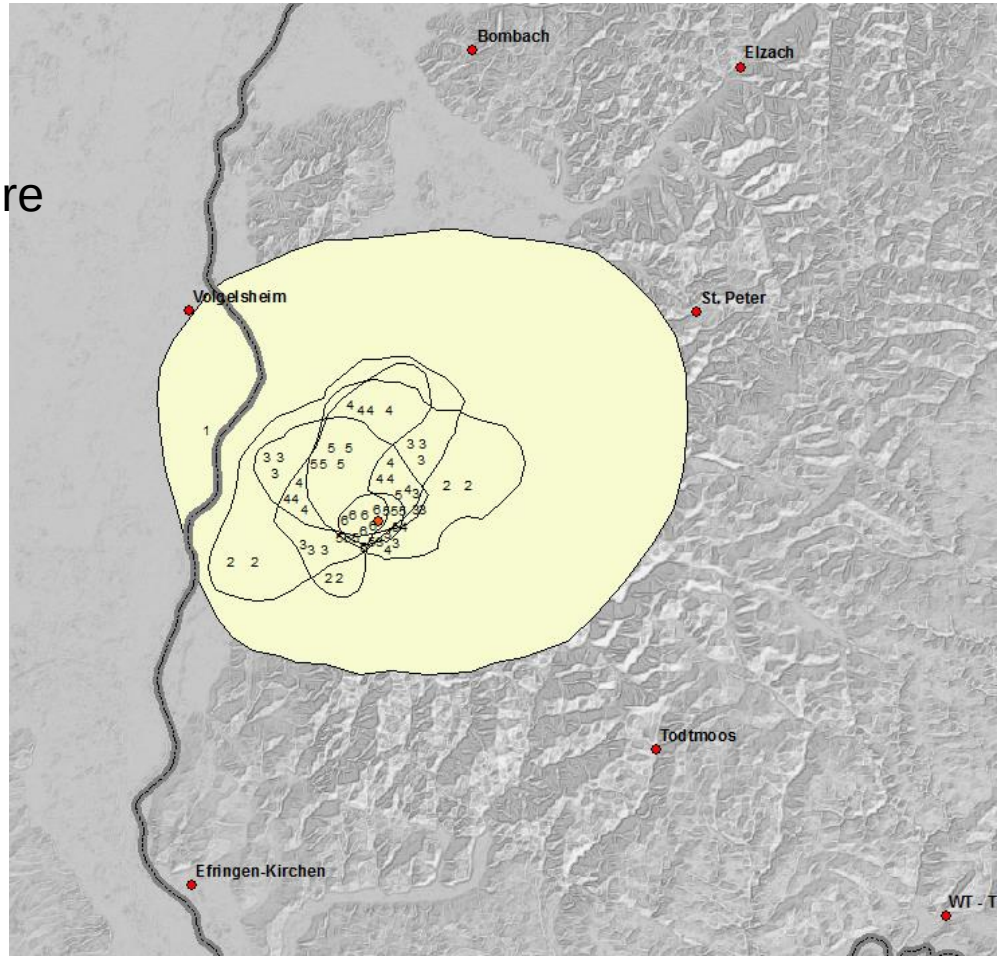
- For Frequency count open Table
- Right-click on Field *SHAPE_Length*
- Select “Summarize”
- Specify output table (e.g. as *Staufen_LDs_Freq_Shape_Length*)

Case Study 1: Perceptual Dialectology

Third step: aggregate *mental maps*

Join

- Join Frequency Table to Feature Dataset based on the field *SHAPE_Length*

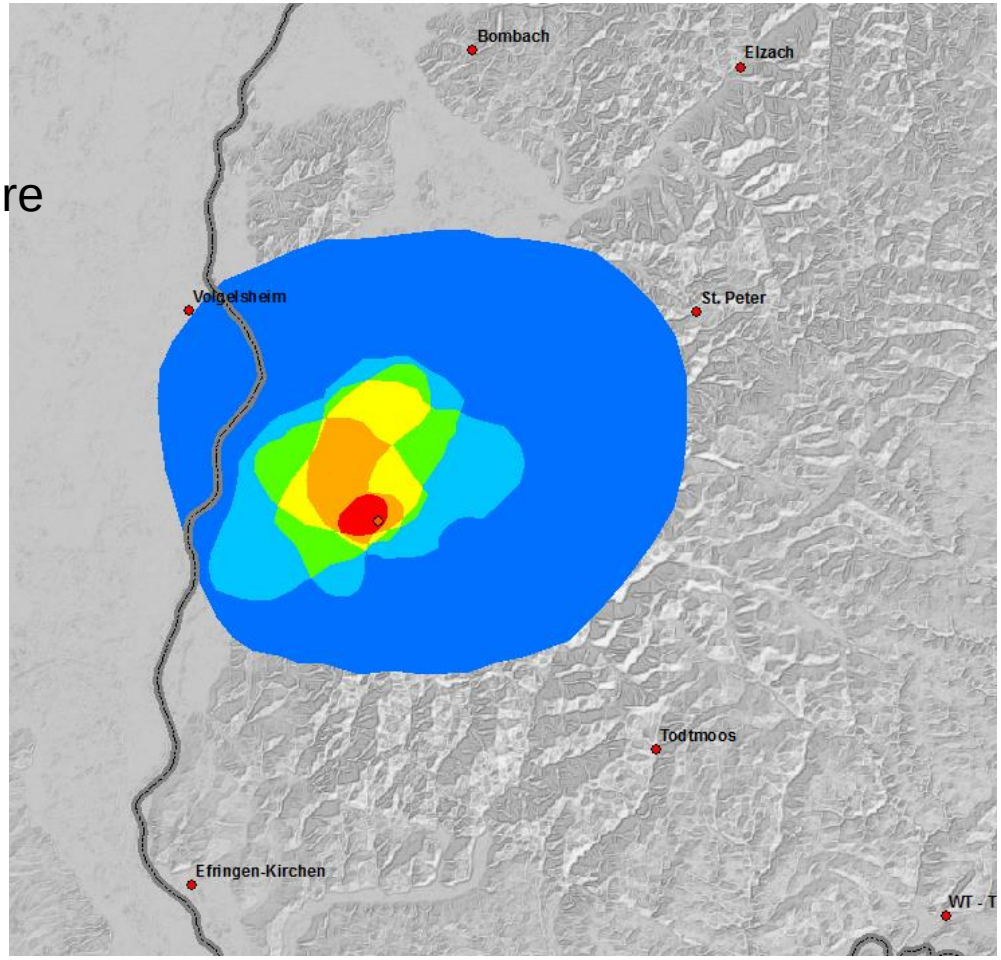


Case Study 1: Perceptual Dialectology

Third step: aggregate *mental maps*

Join

- Join Frequency Table to Feature Dataset based on the field *SHAPE_Length*

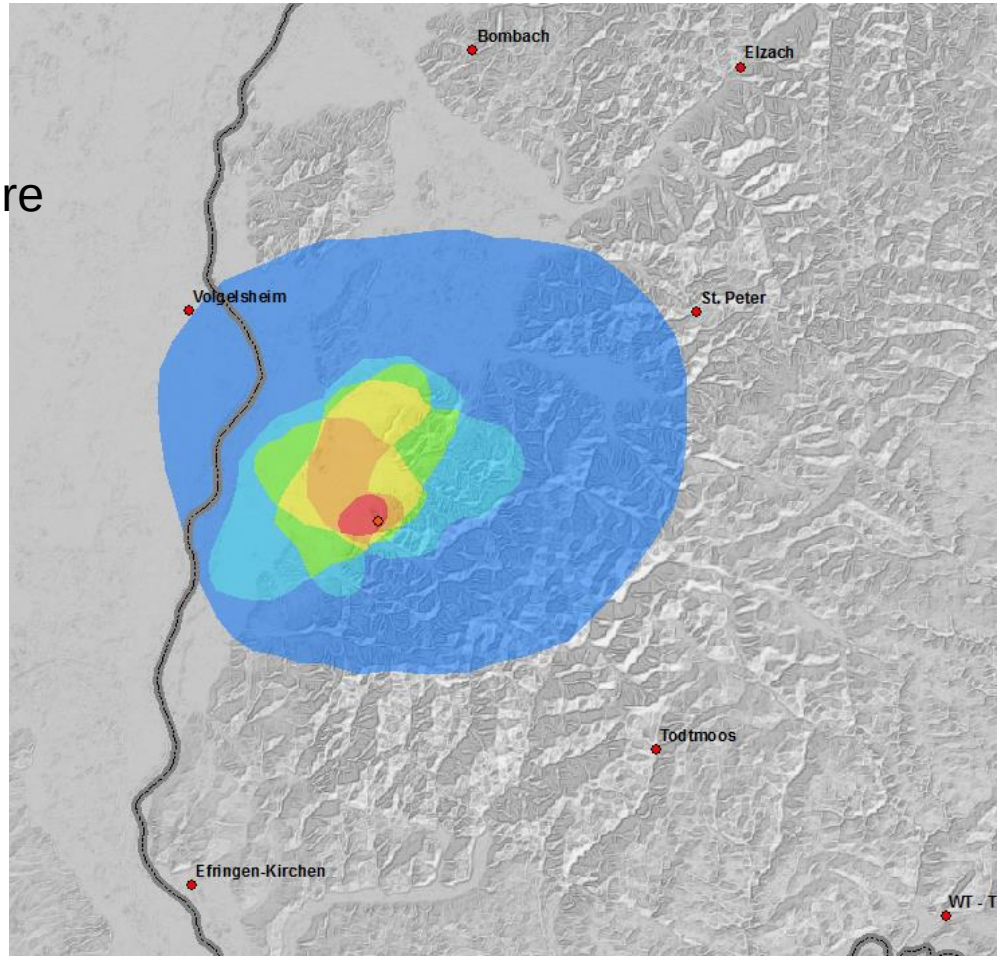


Case Study 1: Perceptual Dialectology

Third step: aggregate *mental maps*

Join

- Join Frequency Table to Feature Dataset based on the field *SHAPE_Length*



Case Study 1: Perceptual Dialectology

Further survey questions:

- Which are the most salient dialect areas?
- Which areas do speakers characterize as most pleasant, dialectal, different, …?

→ Large numbers of hand-drawn maps

→ Query data using values from the attribute tables

Case Study 1: Perceptual Dialectology

Most salient dialect areas

By denomination

- Query attribute data for most frequently occurring denominations of dialect areas
- Create new datasets (subsets defined by certain attributes)
- Aggregate “new” data (see step three)

By region

- Visualization of aggregated hand-drawn maps will help to determine most salient dialect areas

→ For large numbers of hand-drawn maps: convert vector datasets to raster datasets

Case Study 1: Perceptual Dialectology

Step four: query data using values from attribute table

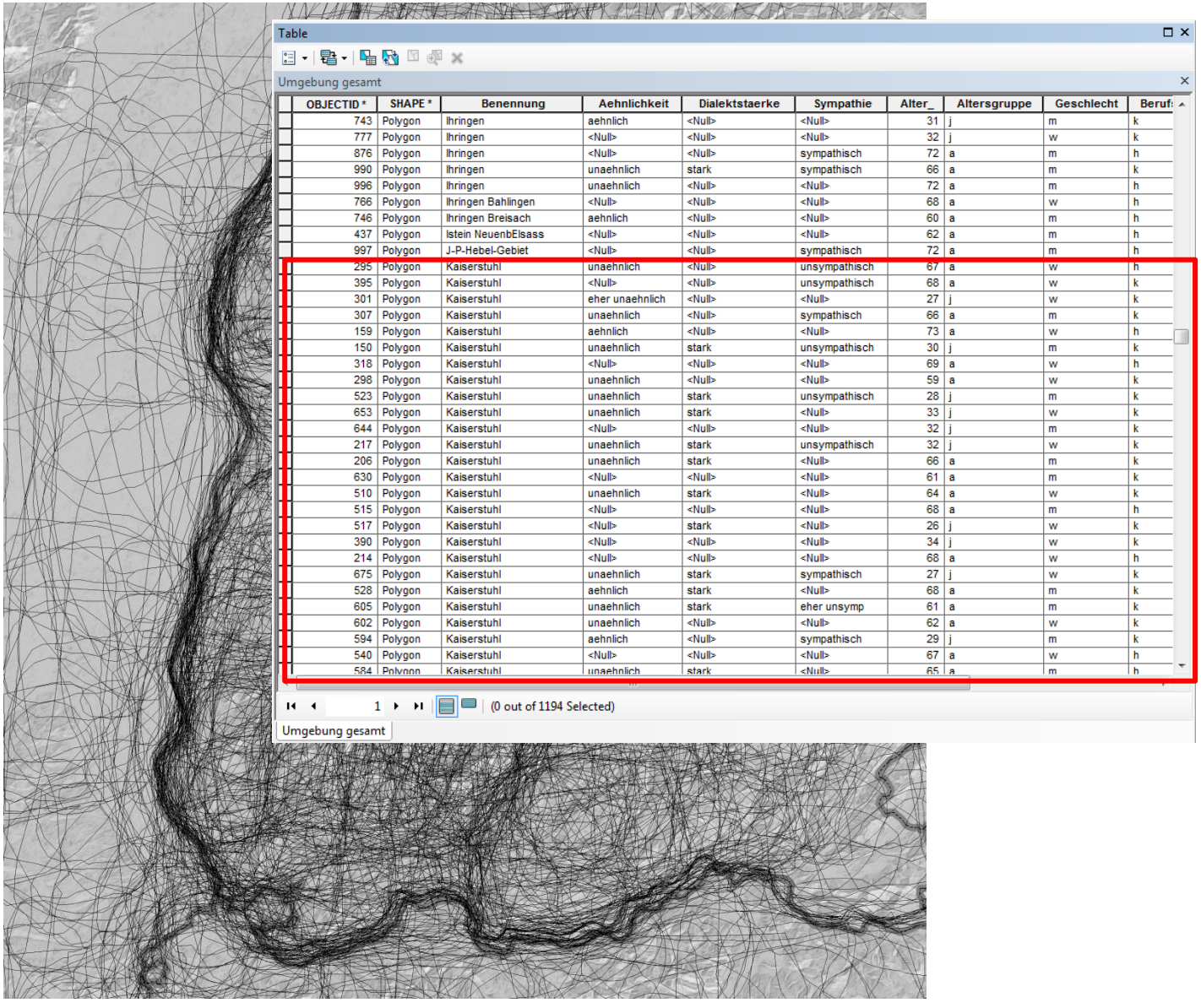
Version 1:

- Copy dataset (within ArcCatalog, not in the working environment in ArcMap!)
- Rename dataset according to specification (i.e. attribute values defining the new dataset, e.g. “Kaiserstuhl”, “young_informants”, …)
- Open new dataset in ArcMap
- Delete all cases which are not in accordance with specification (e.g. all “older” informants)
- Repeat step three

Version 2:

- In ArcToolbox select “Analysis Tools” → “Extract” → “Select”
- Use SQL expression to select subset (e.g. “[Age] < 35”)

Case Study 1: Perceptual Dialectology



Table

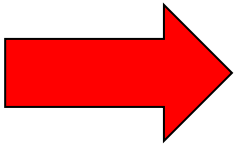
Umgebung gesamt

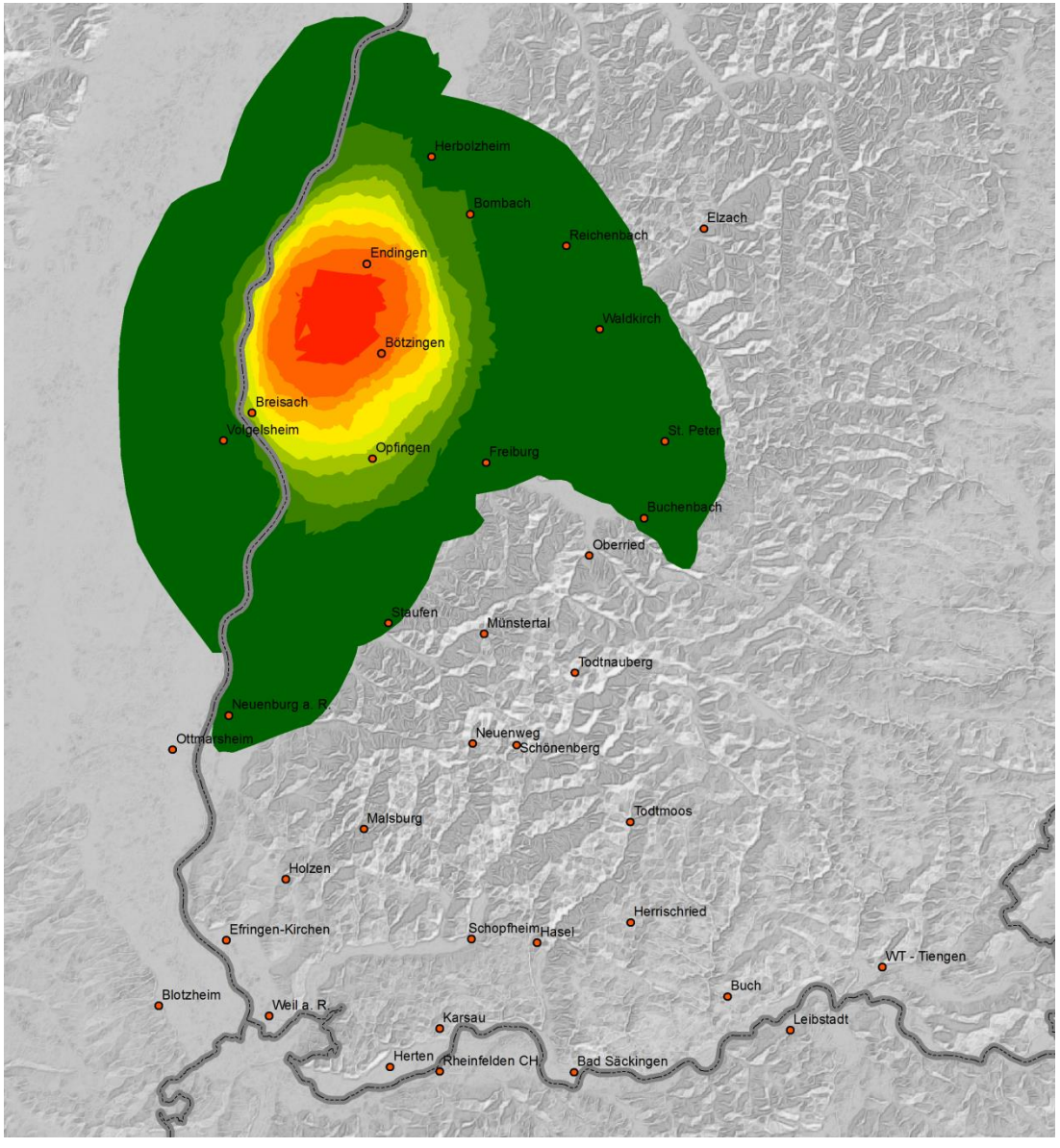
OBJECTID *	SHAPE *	Benennung	Aehnlichkeit	Dialektstaerke	Sympathie	Alter_	Altersgruppe	Geschlecht	Berufs
743	Polygon	Ihringen	aehnlich	<Null>	<Null>	31	j	m	k
777	Polygon	Ihringen	<Null>	<Null>	<Null>	32	j	w	k
876	Polygon	Ihringen	<Null>	<Null>	sympathisch	72	a	m	h
990	Polygon	Ihringen	unaehnlich	stark	sympathisch	66	a	m	k
996	Polygon	Ihringen	unaehnlich	<Null>	<Null>	72	a	m	h
766	Polygon	Ihringen Bahlingen	<Null>	<Null>	<Null>	68	a	w	h
746	Polygon	Ihringen Breisach	aehnlich	<Null>	<Null>	60	a	m	h
437	Polygon	Istein NeuenbElsass	<Null>	<Null>	<Null>	62	a	m	h
997	Polygon	J-P-Hebel-Gebiet	<Null>	<Null>	sympathisch	72	a	m	h
295	Polygon	Kaiserstuhl	unaehnlich	<Null>	unsympathisch	67	a	w	h
395	Polygon	Kaiserstuhl	<Null>	<Null>	unsympathisch	68	a	w	k
301	Polygon	Kaiserstuhl	eher unaehnlich	<Null>	<Null>	27	j	w	k
307	Polygon	Kaiserstuhl	unaehnlich	<Null>	sympathisch	66	a	m	k
159	Polygon	Kaiserstuhl	aehnlich	<Null>	<Null>	73	a	w	h
150	Polygon	Kaiserstuhl	unaehnlich	stark	unsympathisch	30	j	m	k
318	Polygon	Kaiserstuhl	<Null>	<Null>	<Null>	69	a	w	h
298	Polygon	Kaiserstuhl	unaehnlich	<Null>	<Null>	59	a	w	k
523	Polygon	Kaiserstuhl	unaehnlich	stark	unsympathisch	28	j	m	k
653	Polygon	Kaiserstuhl	unaehnlich	stark	<Null>	33	j	w	k
644	Polygon	Kaiserstuhl	<Null>	<Null>	<Null>	32	j	m	k
217	Polygon	Kaiserstuhl	unaehnlich	stark	unsympathisch	32	j	w	k
206	Polygon	Kaiserstuhl	unaehnlich	stark	<Null>	66	a	m	k
630	Polygon	Kaiserstuhl	<Null>	<Null>	<Null>	61	a	m	k
510	Polygon	Kaiserstuhl	unaehnlich	stark	<Null>	64	a	w	k
515	Polygon	Kaiserstuhl	<Null>	<Null>	<Null>	68	a	m	h
517	Polygon	Kaiserstuhl	<Null>	stark	<Null>	26	j	w	k
390	Polygon	Kaiserstuhl	<Null>	<Null>	<Null>	34	j	w	k
214	Polygon	Kaiserstuhl	<Null>	<Null>	<Null>	68	a	w	h
675	Polygon	Kaiserstuhl	unaehnlich	stark	sympathisch	27	j	w	k
528	Polygon	Kaiserstuhl	aehnlich	stark	<Null>	68	a	m	k
605	Polygon	Kaiserstuhl	unaehnlich	stark	eher unsymp	61	a	m	k
602	Polygon	Kaiserstuhl	unaehnlich	<Null>	<Null>	62	a	w	k
594	Polygon	Kaiserstuhl	aehnlich	<Null>	sympathisch	29	j	m	k
540	Polygon	Kaiserstuhl	<Null>	<Null>	<Null>	67	a	w	h
584	Polygon	Kaiserstuhl	unaehnlich	stark	<Null>	65	a	m	h

1 (0 out of 1194 Selected)

Umgebung gesamt

Case Study 1: Perceptual Dialectology





Case Study 1: Perceptual Dialectology

Step five: convert data from feature to raster

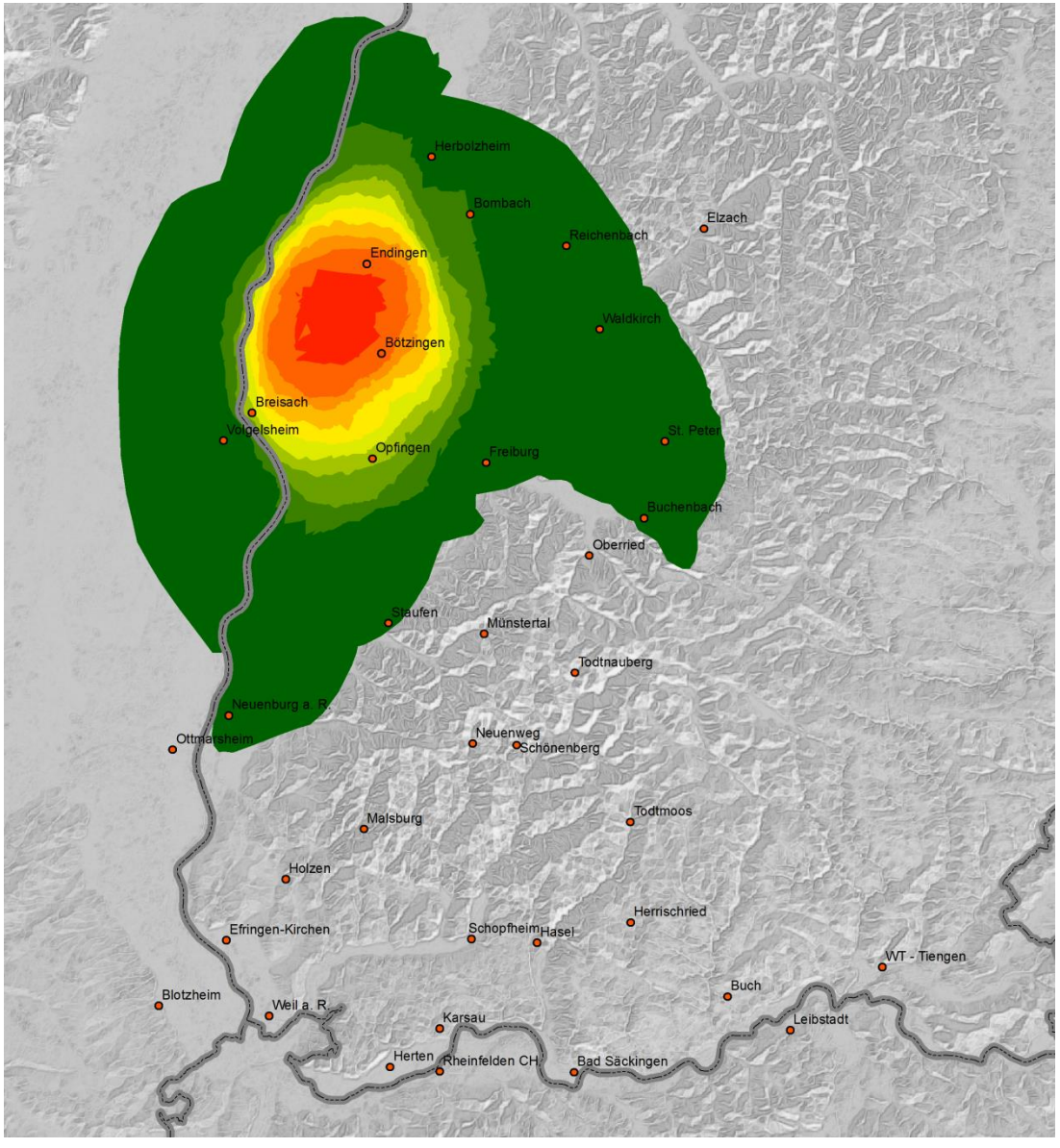
Problem:

- Although generally "lighter" than raster data, feature datasets require a lot of storage and processing capacity when containing large amounts of hand-drawn maps

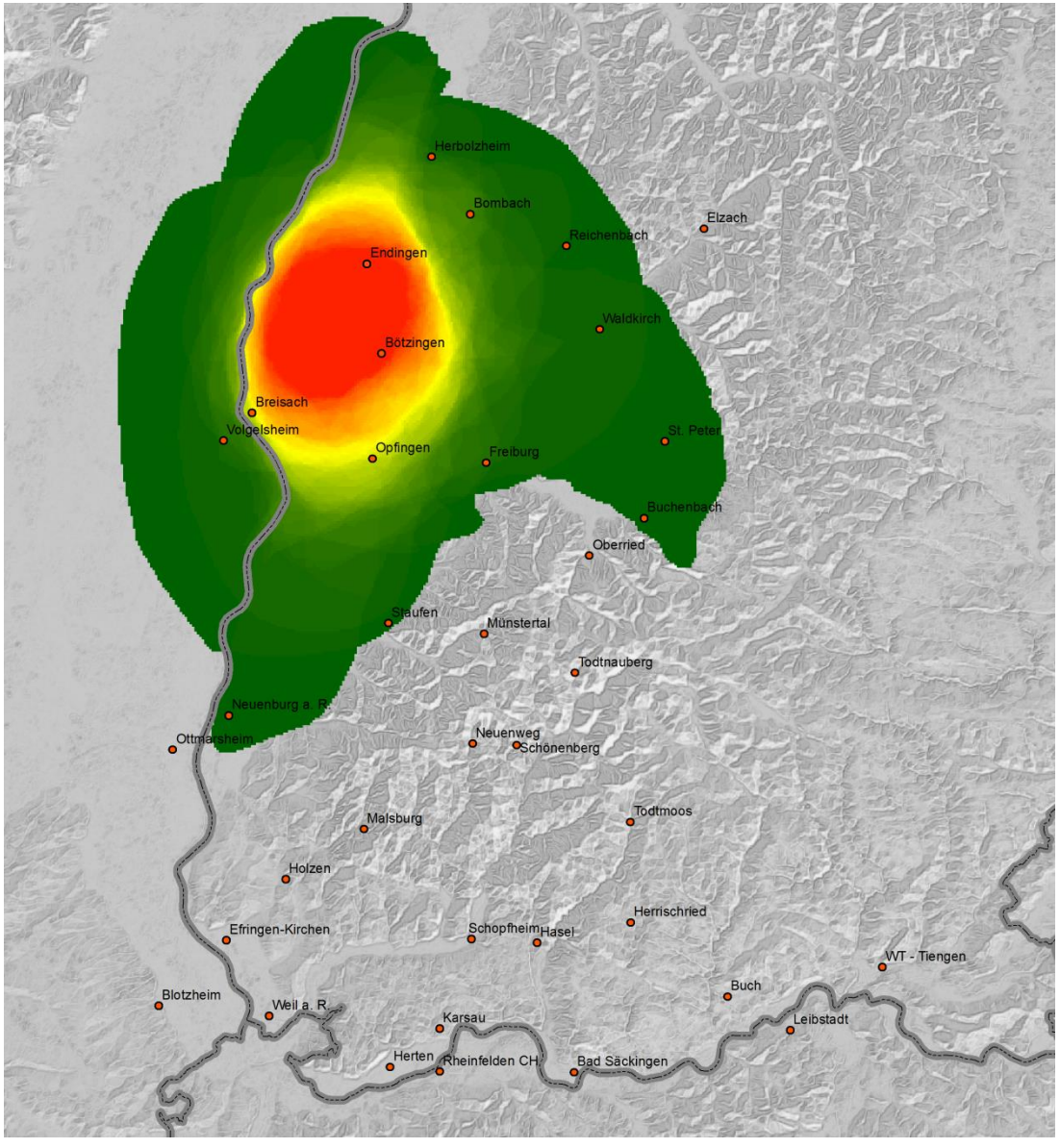
Conversion:

- In ArcToolbox select "Conversion Tools" → "To Raster" → "Polygon to Raster"
- Select Feature Dataset (e.g. *Umgebung_Kaiserstuhl_Union*) as Input Features
- Select *Cnt_SHAPE_Length* as Value Field!
- Define Output Raster Dataset (e.g. *kaiser_union*)

Case Study 1: Perceptual Dialectology



Case Study 1: Perceptual Dialectology



Case Study 1: Perceptual Dialectology

Step six: create smooth surface

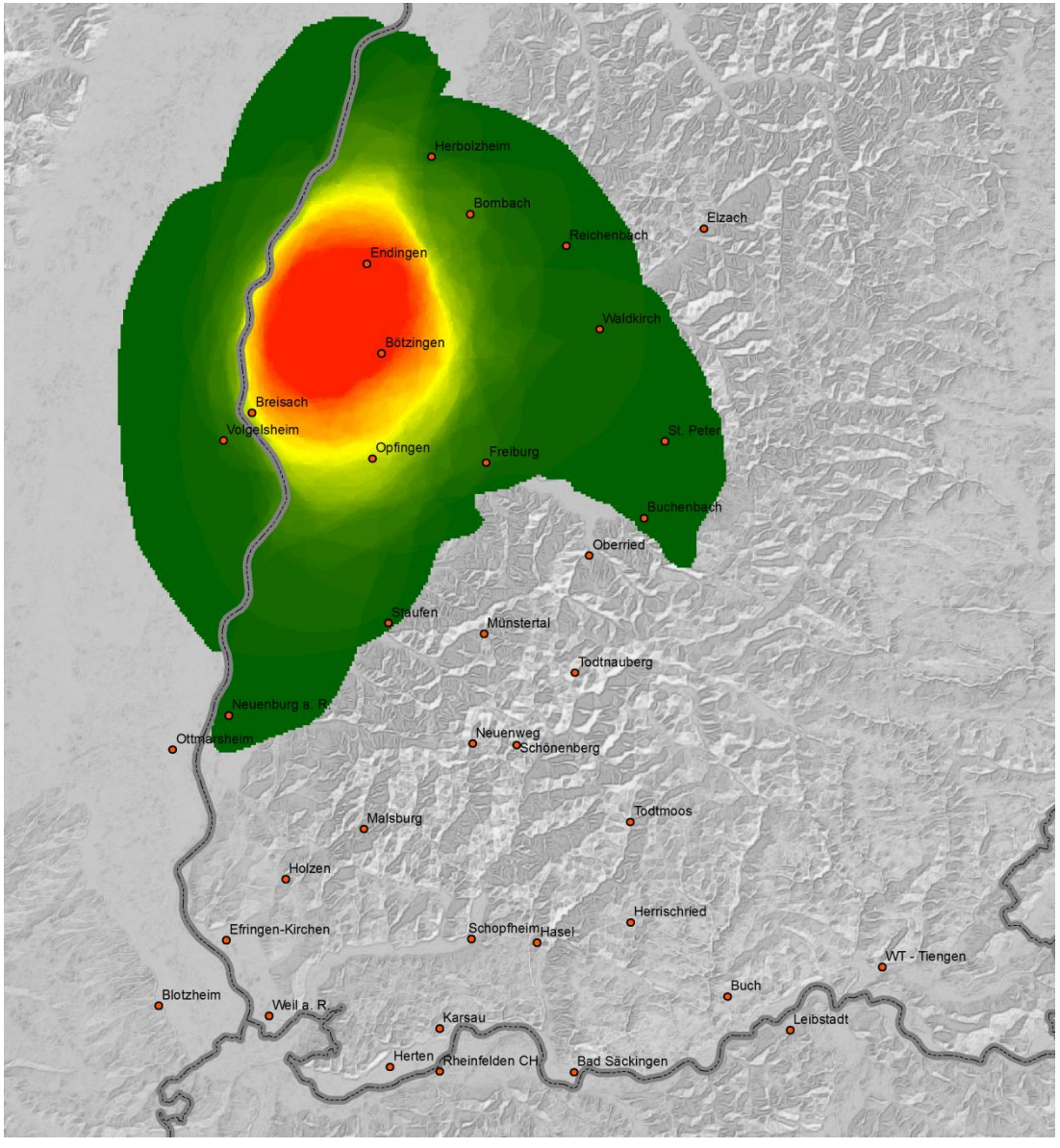
Smoothing surface:

- In ArcToolbox select “Spatial Analyst Tools” → “Neighborhood” → “Focal Statistics”
- Select raster dataset (e.g. *kaiser_union*) as input raster
- Define output raster (e.g. *kaiser_smooth*)
- Adjust neighborhood settings (here: rectangle, height=5, width=5, units=cell)
- Set statistics type to “mean”

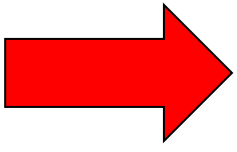
Adding contours:

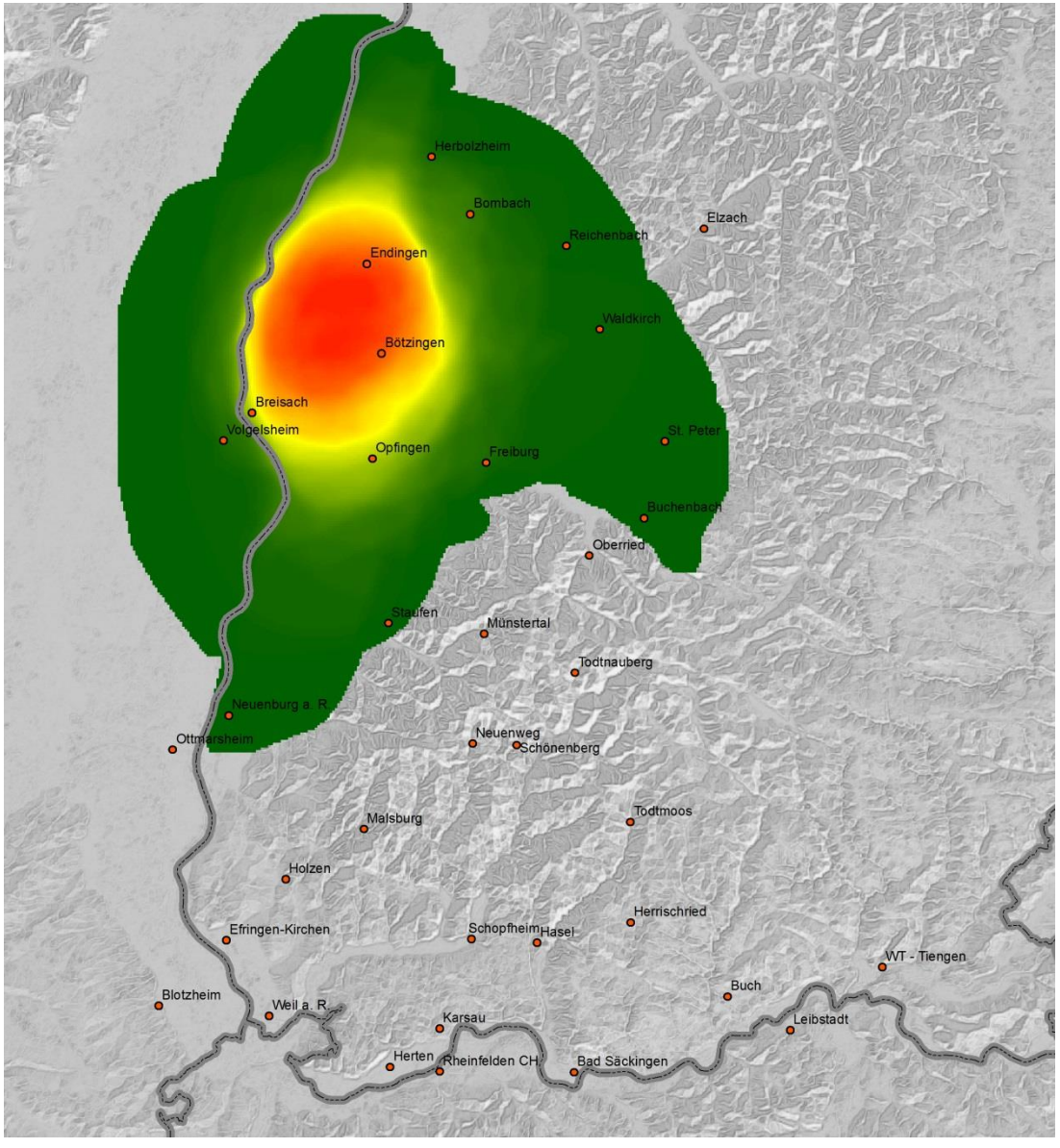
- In ArcToolbox select “Spatial Analyst Tools” → “Surface” → “Contour”
- Select raster dataset (e.g. *kaiser_smooth*) as input raster
- Define output polyline features (e.g. *kaiserstuhl_contour5*)
- Adjust contour interval (depending on scale and number of cases)

Case Study 1: Perceptual Dialectology

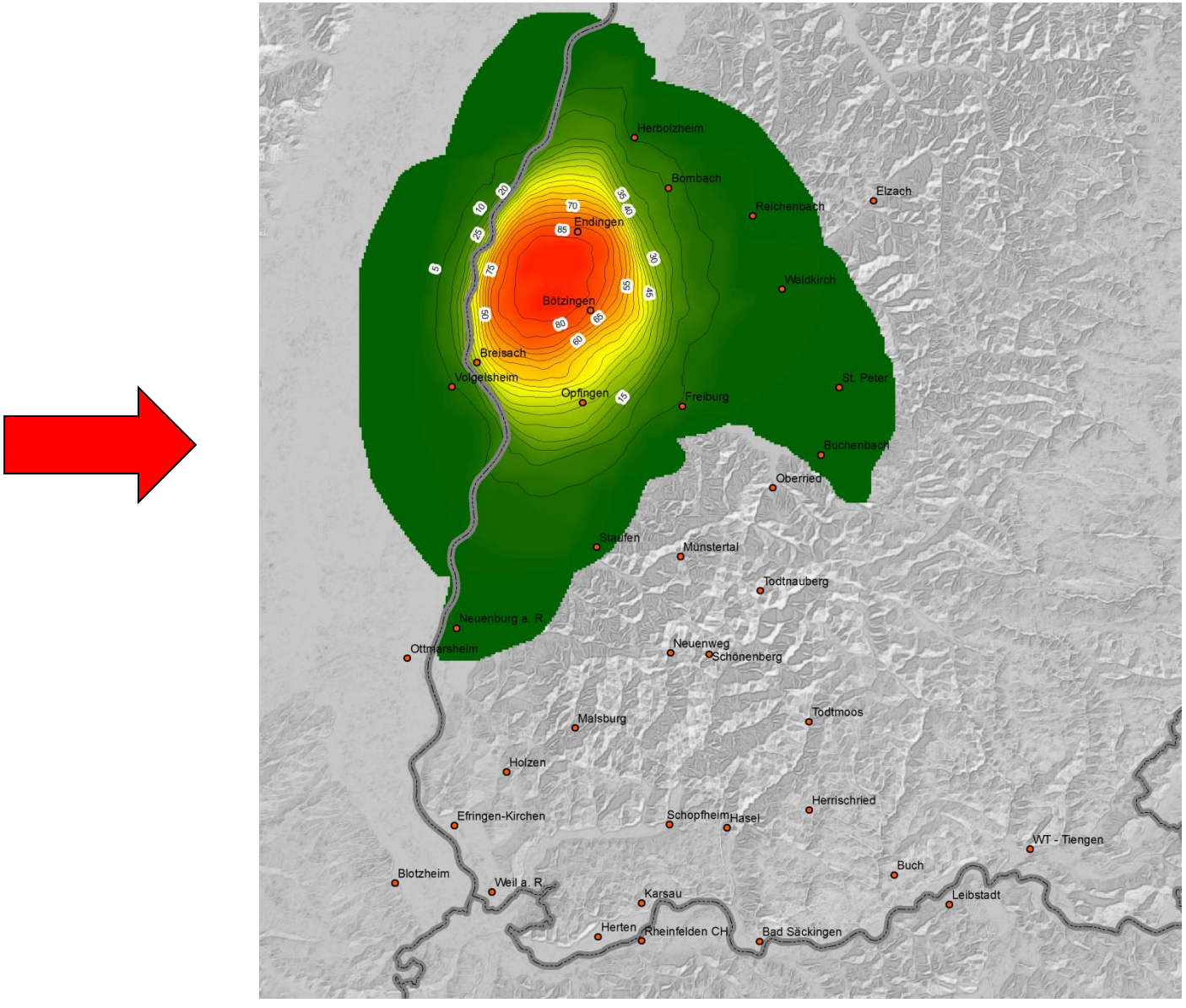


Case Study 1: Perceptual Dialectology

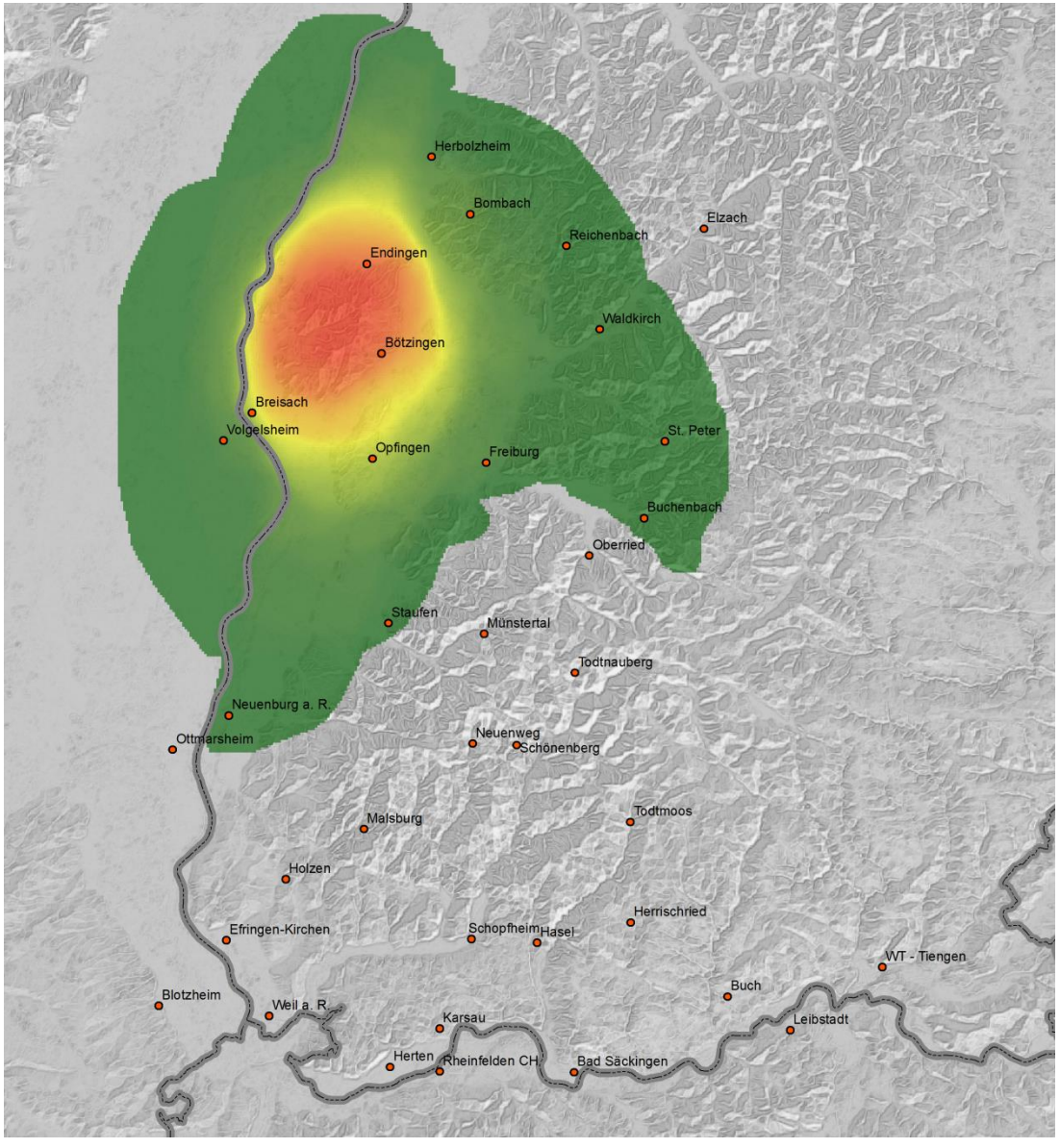




Case Study 1: Perceptual Dialectology



Case Study 1: Perceptual Dialectology



Case Study 1: Perceptual Dialectology

Alternative: aggregate raster data

Problem:

Vector datasets including large numbers of hand-drawn maps are too “heavy” to process

Alternative:

First convert polygons to rasters, then aggregate rasters

Case Study 1: Perceptual Dialectology

Alternative: aggregate raster data

Convert:

- Convert feature datasets (containing no aggregated data) to raster data (cf. step five) (using *OBJECTID* as Value Field)

Reclassify:

- In ArcToolbox select “Spatial Analyst Tools” → “Reclass” → “Reclassify”
- Select *mental maps* from single informant as input raster (e.g. *st_jwk_umg*)
- Select VALUE as reclass field
- For reclassification reclassify all numerical values as “1”. Reclassify NoData as “0” (important!)
- Define Output raster (e.g. *st_jwk_rec*)
- In “Environments” set *Analysis Mask* as Processing Extent and as Mask for Raster Analysis

Case Study 1: Perceptual Dialectology

Alternative: aggregate raster data

Aggregate:

- In ArcToolbox select “Spatial Analyst” → “Local” → “Cell Statistics”
- Select all rasters you want to aggregate as input rasters
- Define output raster
- Select “Sum” as overlay statistic

Case Study 1: Perceptual Dialectology

Questions?

Case Study 2: Swiss-German Dialect Syntax

“Syntactic Atlas of German-speaking Switzerland”
(Syntaktischer Atlas der deutschen Schweiz, *SADS*)

- Project funded by the SNF 2000-2008
- 4 questionnaires including different syntactic phenomena
- 3187 informants at 383 places (between 3 and 26 informants at each place)
- Different questioning techniques:
  - Translation
  - Completion
  - Multiple choice (acceptance and preference)
  - Judgment
- Data stored in a FileMaker database

http://www.ds.uzh.ch/dialektsyntax/

Case Study 2: Swiss-German Dialect Syntax

Example

Translation:

I.1 Entschuldigung, ich habe zu wenig Kleingeld, *um* ein Billet *zu* lösen.

(*Excuse me, I don't have enough change to buy a ticket*.)

→ Most frequent answers:

- … *für* ein Billet (*zu*) lösen
- … *zum* ein Billet (*zu*) lösen
- … *um* ein Billet *zu* lösen
- …

Case Study 2: Swiss-German Dialect Syntax

Table

I1_Finalanschluss

OID	NAME	BFS_NR	I1_FUER_ZU	I1_0_ZU	I1_ZUM_ZU	I1_UM_ZU	I1_FZZ	I1_DASS	I1_PP	N_GPS	AN_I1_FZ	AN_I1_Z	AN_I1_ZZ	AN_I1_UZ	AN_I1_FZZ	AN_I1_DASS	AN_I1_PP	MDT
221	Aarau	4001_1	2	0	6	1	0	0	2	10	0,2	0	0,6	0,1	0	0	0,2	
59	Aarberg	361_1	7	0	0	0	0	0	1	8	0,88	0	0	0	0	0	0,13	
236	Aarburg	4271_1	4	0	1	2	0	0	0	7	0,57	0	0,14	0,29	0	0	0	
17	Adelboden	561_1	10	0	0	0	0	0	0	10	1	0	0	0	0	0	0	
369	Aedermannsdorf	2421_1	2	0	1	1	0	1	1	6	0,33	0	0,17	0,17	0	0,17	0,17	
350	Aesch (BL)	2761_1	2	0	2	3	0	0	1	8	0,25	0	0,25	0,38	0	0	0,13	
378	Aesch (LU)	1021_1	2	0	1	2	0	0	3	8	0,25	0	0,13	0,25	0	0	0,38	
123	Aeschi (SO)	2511_1	7	0	0	2	0	0	0	9	0,78	0	0	0,22	0	0	0	
118	Agarn	6101_1	8	0	0	0	0	0	2	10	0,8	0	0	0	0	0	0,2	
258	Alpnach	1401_1	5	0	1	2	0	1	0	9	0,56	0	0,11	0,22	0	0,11	0	
363	Alpthal	1361_1	1	0	0	1	0	0	1	3	0,33	0	0	0,33	0	0	0,33	
276	Altdorf (UR)	1201_1	3	0	0	2	0	0	1	6	0,5	0	0	0,33	0	0	0,17	
87	Altstaetten	3251_1	0	0	5	0	0	1	0	6	0	0	0,83	0	0	0,17	0	
310	Amden	3311_1	0	0	2	3	0	0	2	7	0	0	0,29	0,43	0	0	0,29	
4	Amriswil	4461_1	0	0	3	0	0	0	0	3	0	0	1	0	0	0	0	
296	Andelfingen	30_1	1	0	4	1	0	0	3	8	0,13	0	0,5	0,13	0	0	0,38	
150	Andermatt	1202_1	5	0	0	2	0	0	0	7	0,71	0	0	0,29	0	0	0	
234	Andwil (SG)	3441_1	0	0	4	3	0	0	0	7	0	0	0,57	0,43	0	0	0	
125	Appenzell	3101_1	0	0	7	1	0	0	1	9	0	0	0,78	0,11	0	0	0,11	
155	Arosa	3921_1	1	0	5	1	0	0	0	7	0,14	0	0,71	0,14	0	0	0	
96	Ausserberg	6191_1	5	0	0	0	0	0	1	6	0,83	0	0	0	0	0	0,17	
217	Avers	3681_1	0	0	3	1	0	0	1	5	0	0	0,6	0,2	0	0	0,2	
166	Baeretswil	111_1	0	0	7	0	0	0	3	10	0	0	0,7	0	0	0	0,3	
170	Baldingen	4301_1	1	0	1	4	0	0	0	6	0,17	0	0,17	0,67	0	0	0	
5	Basadingen-Schlattingen	4536_1	0	0	4	0	0	0	0	4	0	0	1	0	0	0	0	
213	Basel	2701_2	1	0	3	1	0	0	0	5	0,2	0	0,6	0,2	0	0	0	
104	Bassersdorf	52_1	1	0	12	1	0	0	1	15	0,07	0	0,8	0,07	0	0	0,07	
133	Bauma	171_1	0	0	6	2	0	0	0	8	0	0	0,75	0,25	0	0	0	
53	Belp	861_1	7	0	0	1	0	0	0	8	0,88	0	0	0,13	0	0	0	
349	Benken (SG)	3312_1	0	0	3	3	0	1	1	8	0	0	0,38	0,38	0	0,13	0,13	
192	Bern	351_1	12	0	0	1	0	0	6	19	0,63	0	0	0,05	0	0	0,32	
67	Berneck	3233_1	0	0	6	1	0	0	0	7	0	0	0,86	0,14	0	0	0	
116	Betten	6171_1	4	0	0	0	0	0	1	5	0,8	0	0	0	0	0	0,2	
248	Bettingen	2702_1	0	0	4	1	0	0	3	7	0	0	0,57	0,14	0	0	0,43	
211	Bettlach	2543_1	6	0	1	3	0	0	0	10	0,6	0	0,1	0,3	0	0	0	
233	Bibern (SH)	2913_1	0	0	4	3	0	0	0	7	0	0	0,57	0,43	0	0	0	
42	Bibern (SO)	2444_1	8	0	0	1	0	0	0	9	0,89	0	0	0,11	0	0	0	
20	Binn	6054_1	3	0	0	0	0	0	0	3	1	0	0	0	0	0	0	

0 (0 out of 383 Selected)

I1_Finalanschluss

Case Study 2: Swiss-German Dialect Syntax

Objectives

- Attach data to geographic locations (→ “Join” function)
- Add new columns (→ “Add field”, “Field calculator”)
- Apply and compare different visualization methods
  - Point symbols
    - Simple points for single variants
    - Pie charts for multiple variants
  - Voronoi diagram / Thiessen polygons
- Create map layout
- Perform geostatistic analyses

Case Study 2: Swiss-German Dialect Syntax

Step A: Create base map

Version 1:

- Sometimes geodata are available from “official” providers (such as the Federal Statistical Office in CH)

→ Ask at your geography department!

Version 2:

- Create point (e.g. for locations) or line/polygon (e.g. for boundaries) features (cf. step 2 in case study 1)
- Use scanned and georeferenced map (cf. step 1 in case study 1) as background
- Move points using the “Editor” tool if necessary

Case Study 2: Swiss-German Dialect Syntax

Step B: Attach data to geographic locations

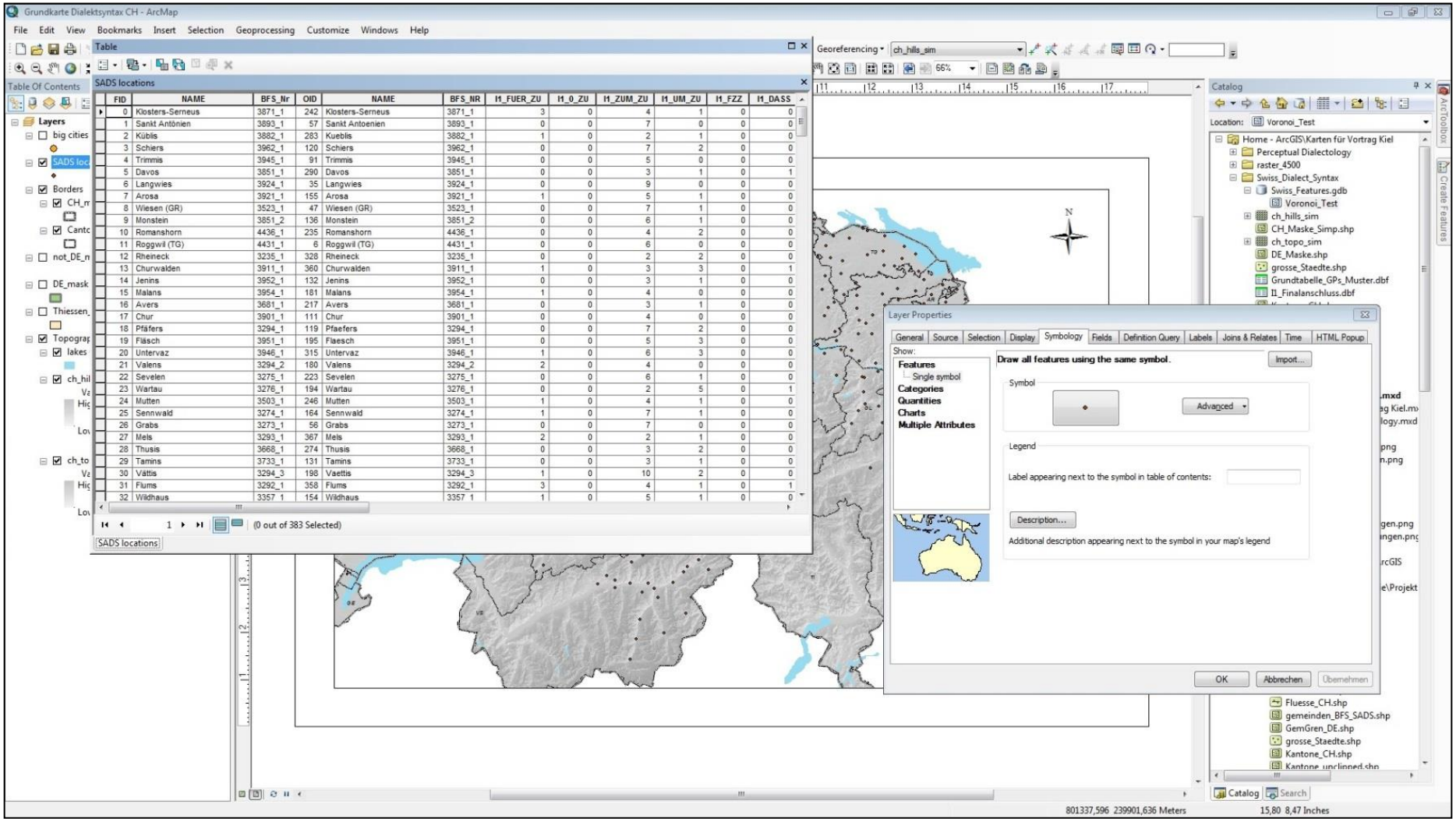
- Right-click on layer you want your data attach to (locations, Voronoi diagram)
- Click “Joins and Relates” → “Join…”
- Choose your data as table to join to this layer
- Choose ID field (here: BFS_Nr) as the field the join will be based on (1) AND as the field in the table to base the join on (3)

- Right-click on layer you attached your data to (locations, Voronoi diagram)
- Click “Open Attribute Table” (to view/modify your data)
- Click “Properties” (tab “Symbology” to visualize your data; tab “Display” for transparency)
- Try different visualization methods

Universität Zürich[UZH]

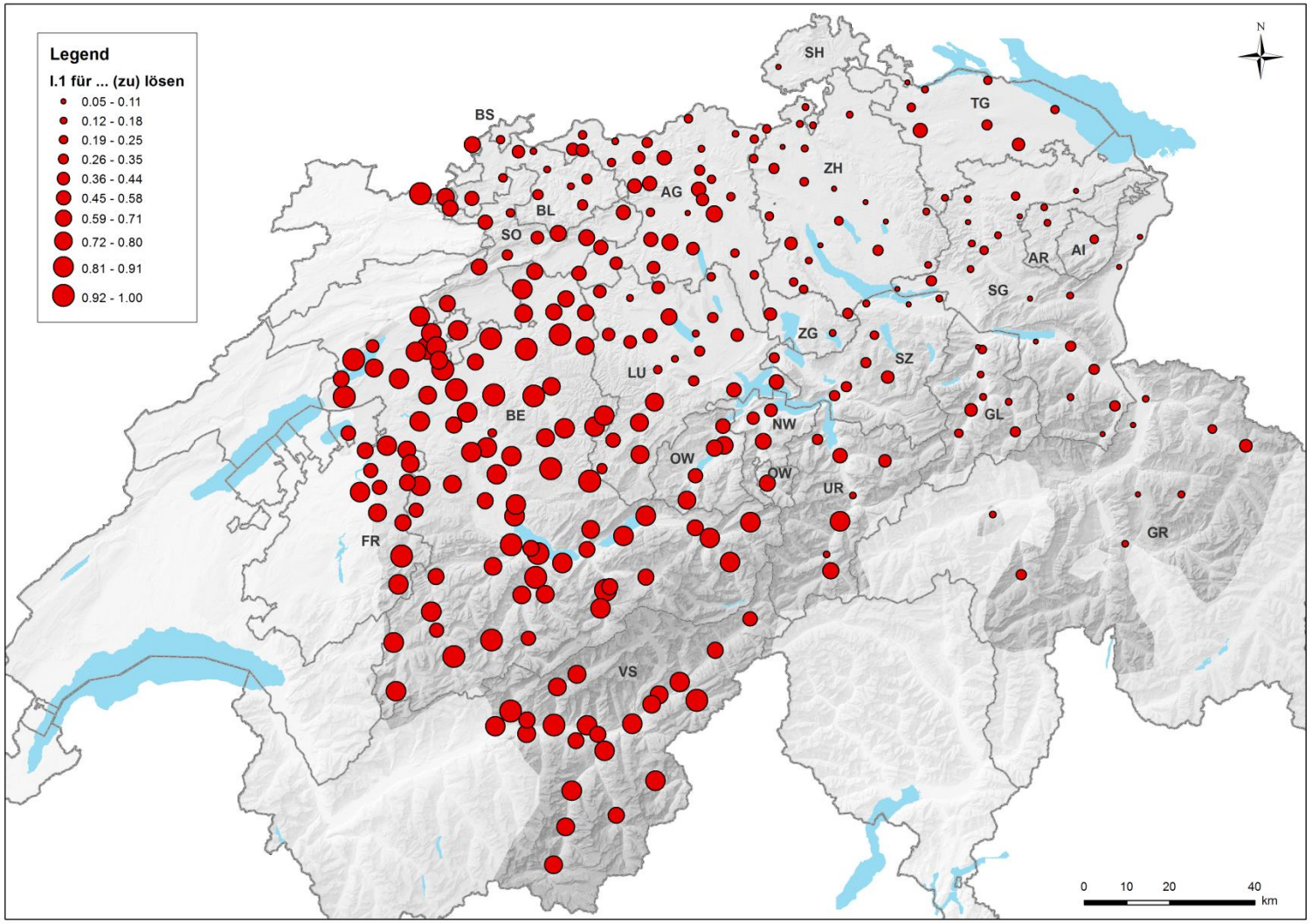
Case Study 2: Swiss-German Dialect Syntax

Deutsches Seminar



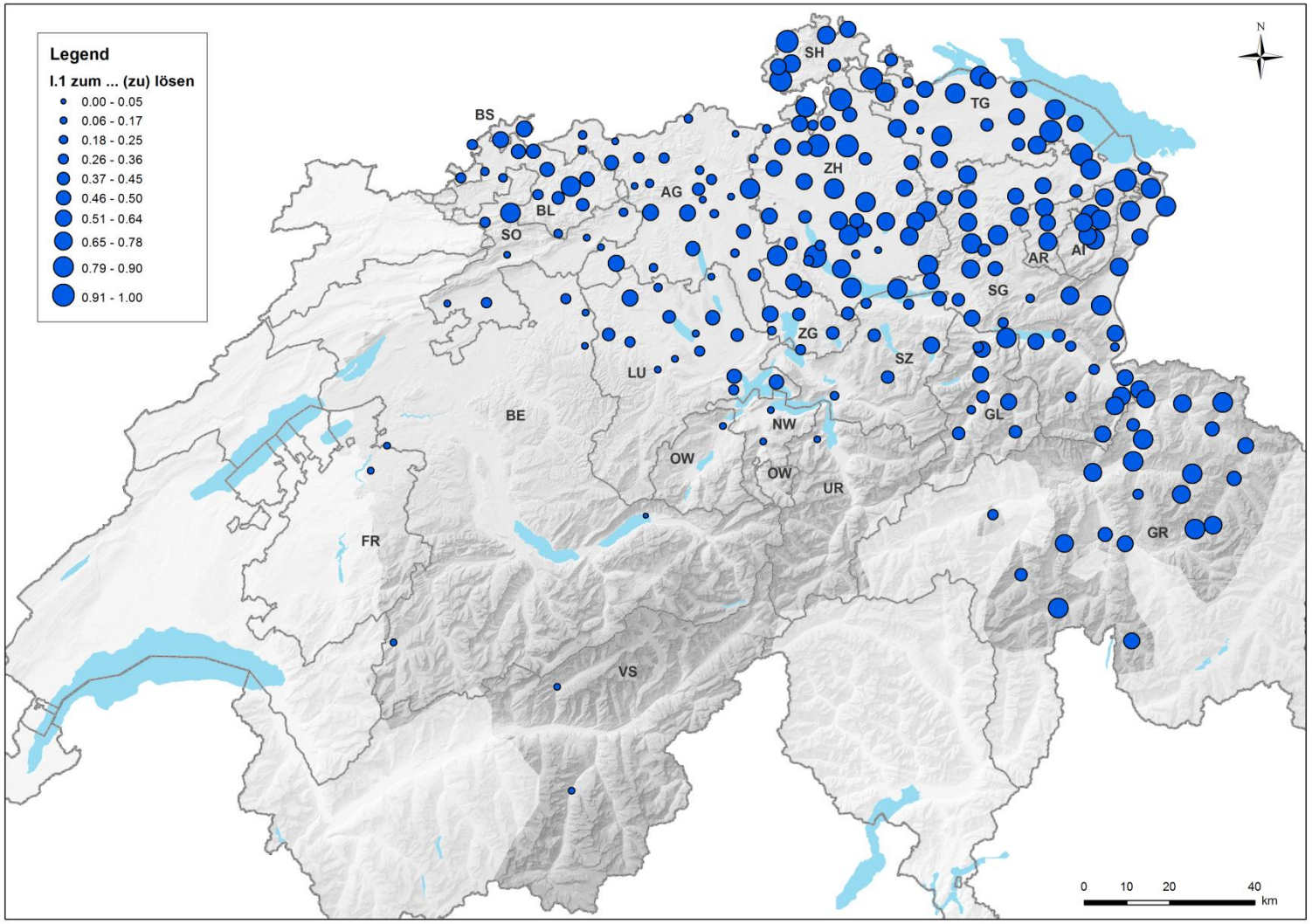
Case Study 2: Swiss-German Dialect Syntax

Distribution of variant «für ein Billet (zu) lösen»



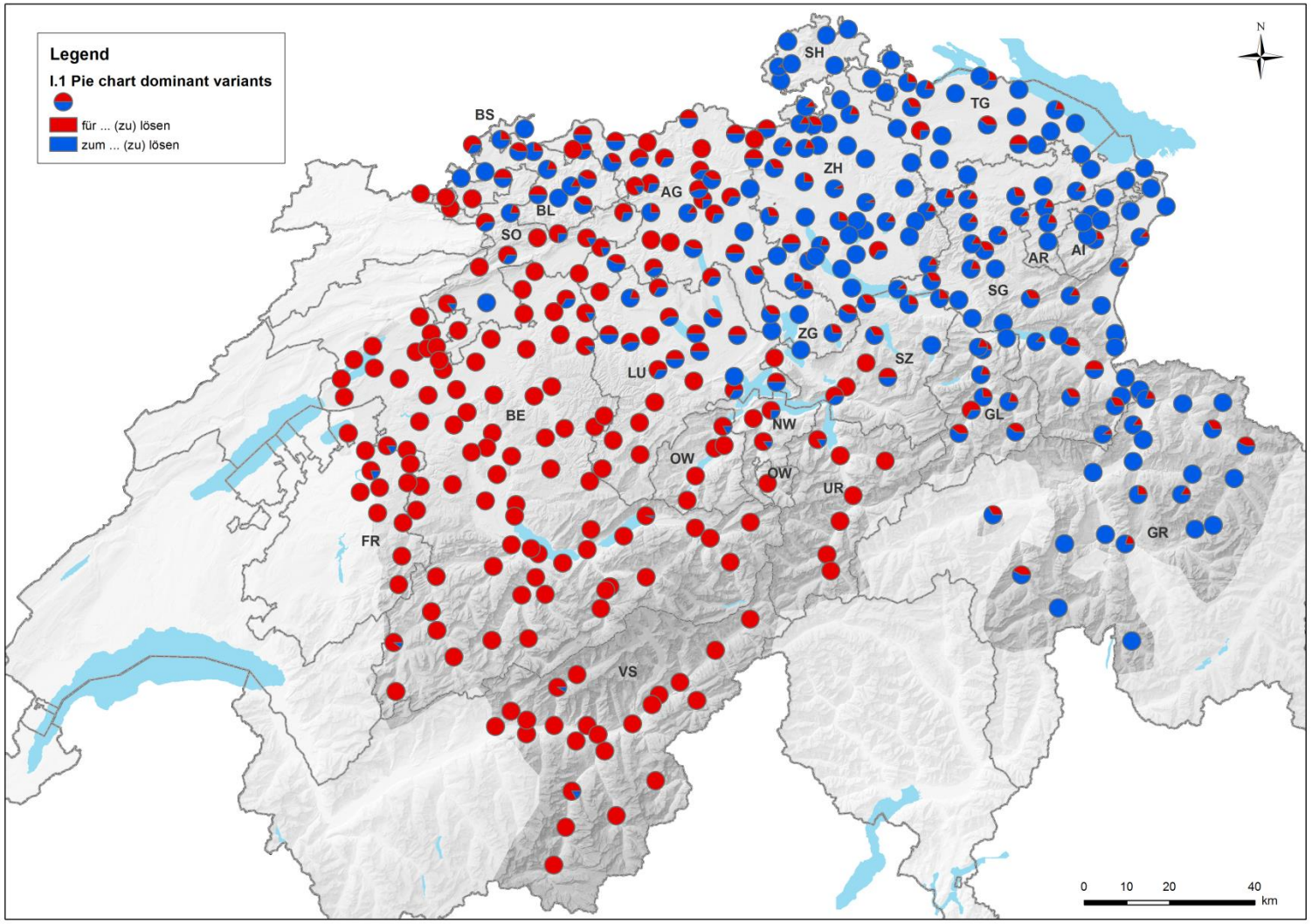
Case Study 2: Swiss-German Dialect Syntax

Distribution of variant «zum ein Billet (zu) lösen»



Case Study 2: Swiss-German Dialect Syntax

Pie chart of most frequent variants



Case Study 2: Swiss-German Dialect Syntax

Step C: Create Voronoi diagram / Thiessen polygons

Create Thiessen Polygons

- In ArcToolbox select “Analysis Tools” → “Proximity” → “Create Thiessen Polygons”
- Select point features (locations) as Input Features
- Choose name and location (in geodatabase!) as Output Feature Class

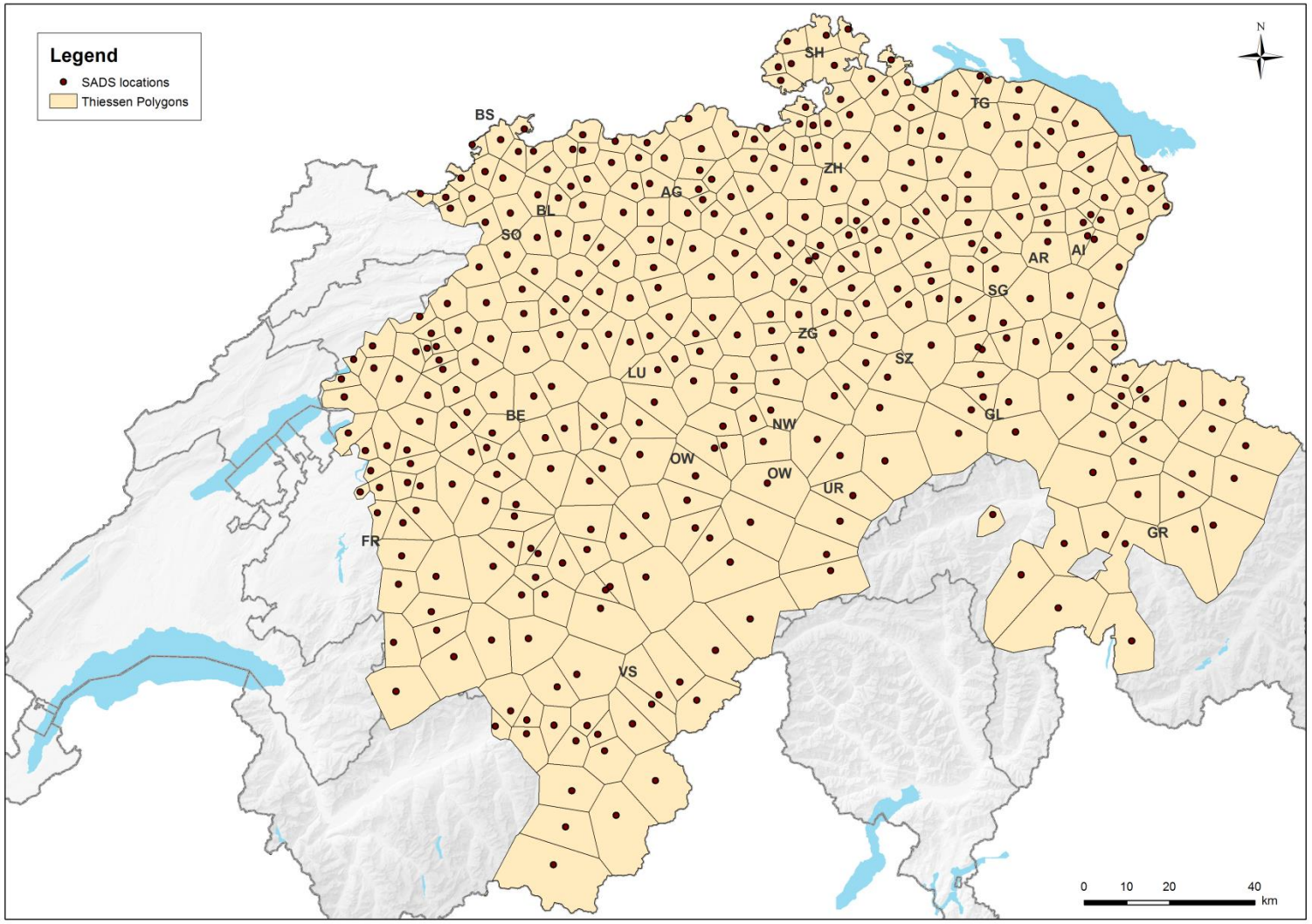
Clip Thiessen Polygons

- In ArcToolbox select “Analysis Tools” → “Extract” → “Clip”
- Select Thiessen polygons as Input Features
- Select mask with outer boundaries of your research area (here: German-speaking area in Switzerland) as Clip Features
- Choose name and location (in geodatabase!) as Output Feature Class

→ Repeat step B with Thiessen polygons

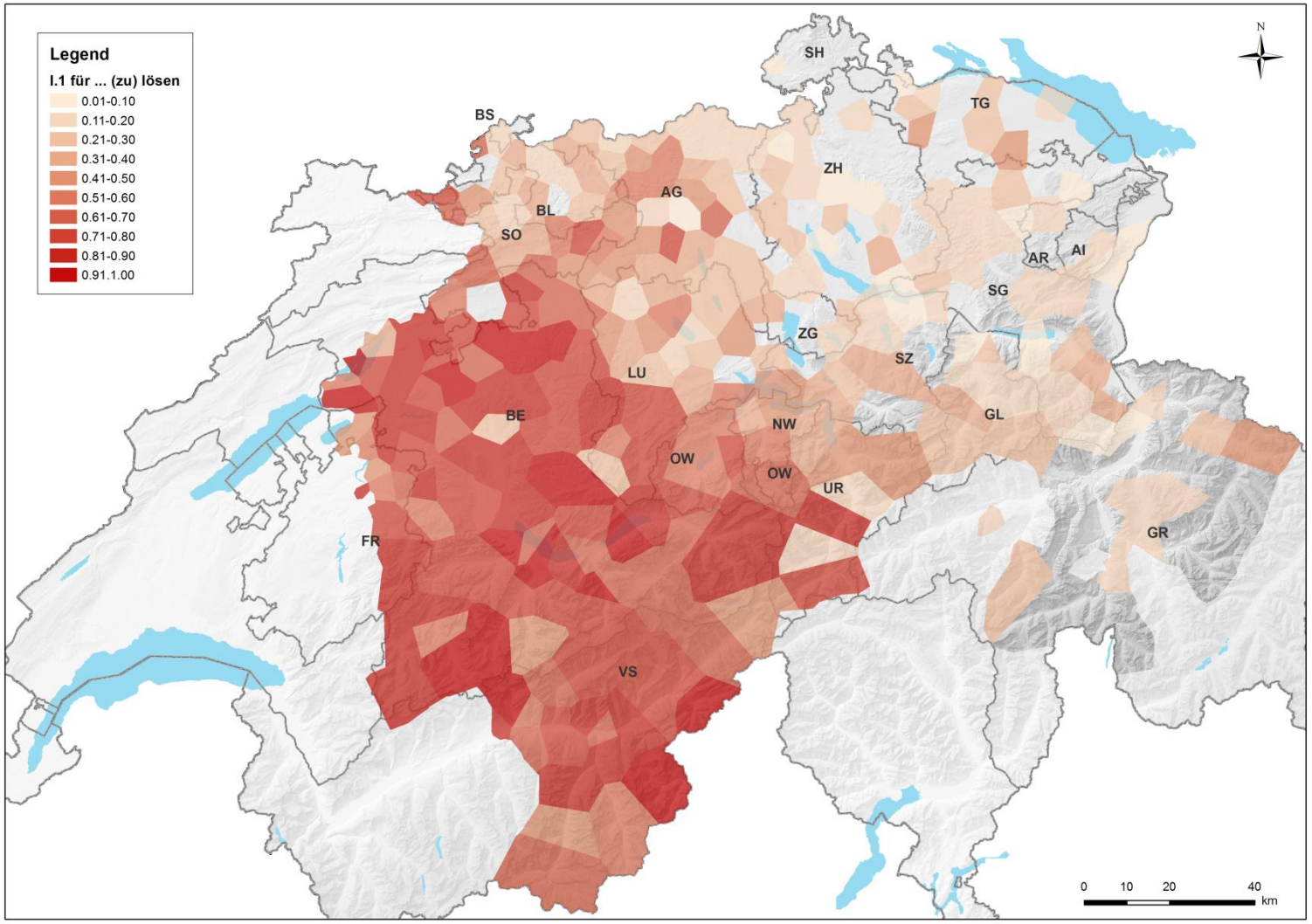
Case Study 2: Swiss-German Dialect Syntax

Thiessen polygons



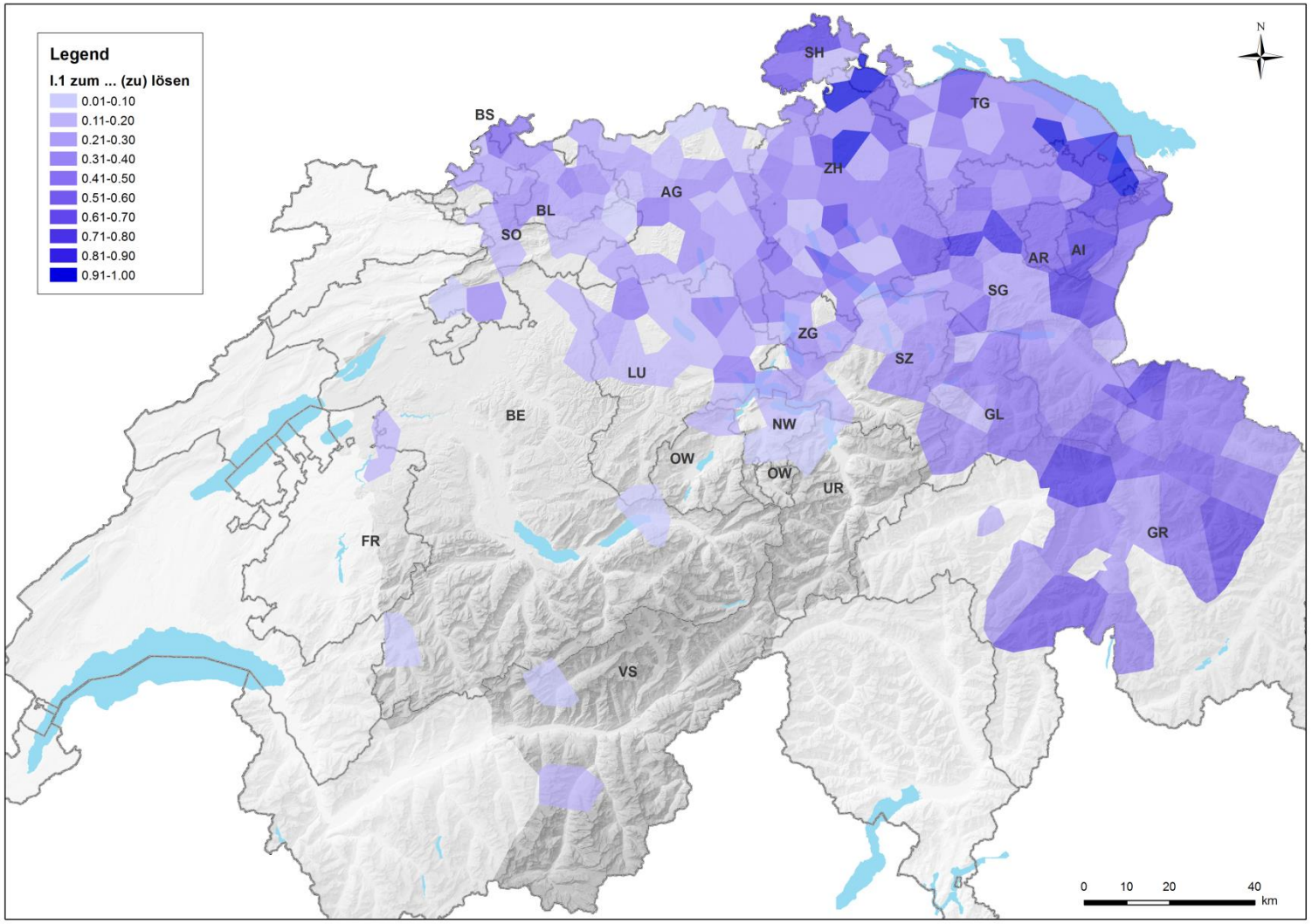
Case Study 2: Swiss-German Dialect Syntax

Distribution of variant «für ein Billet (zu) lösen»



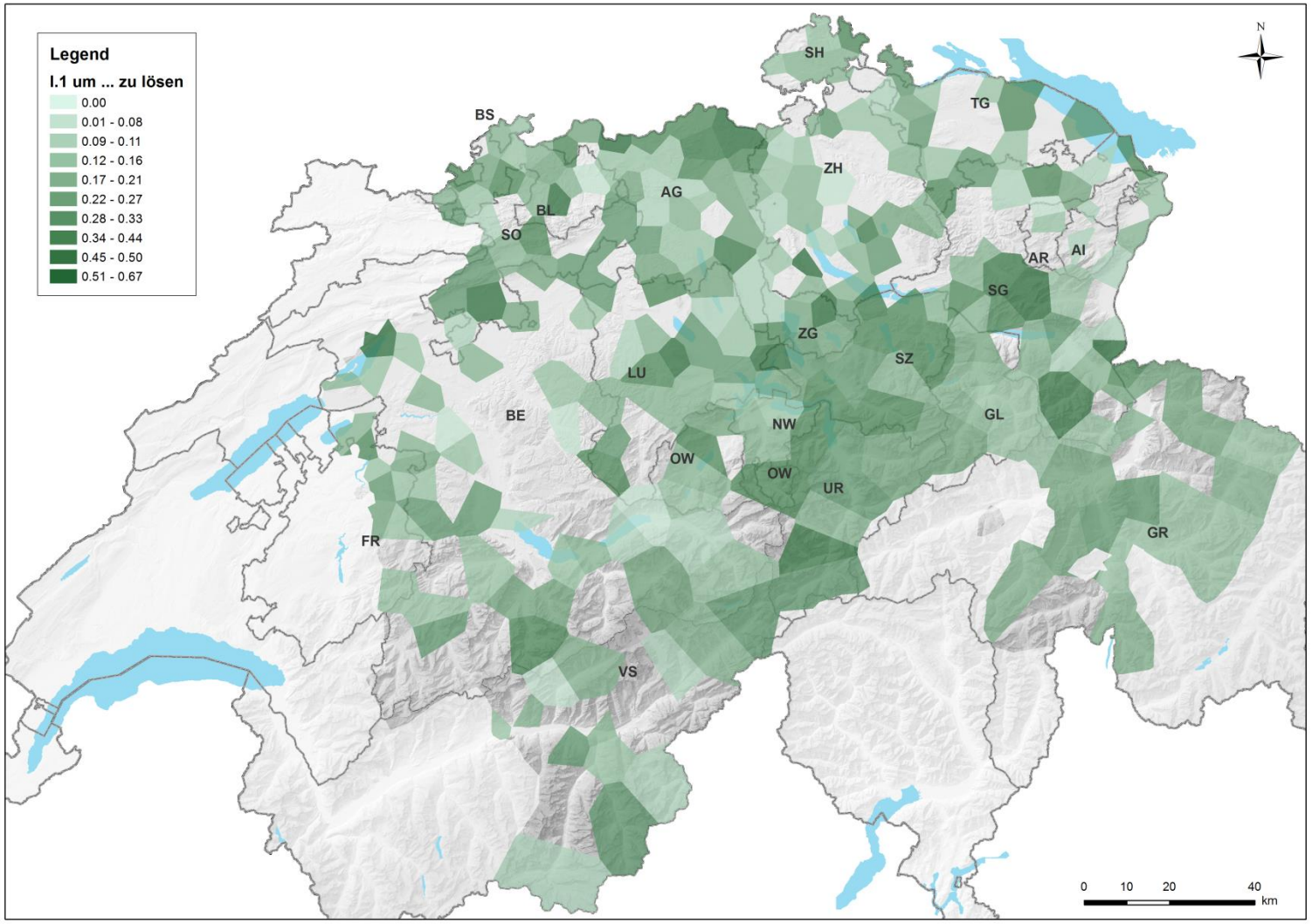
Case Study 2: Swiss-German Dialect Syntax

Distribution of variant «zum ein Billet (zu) lösen»



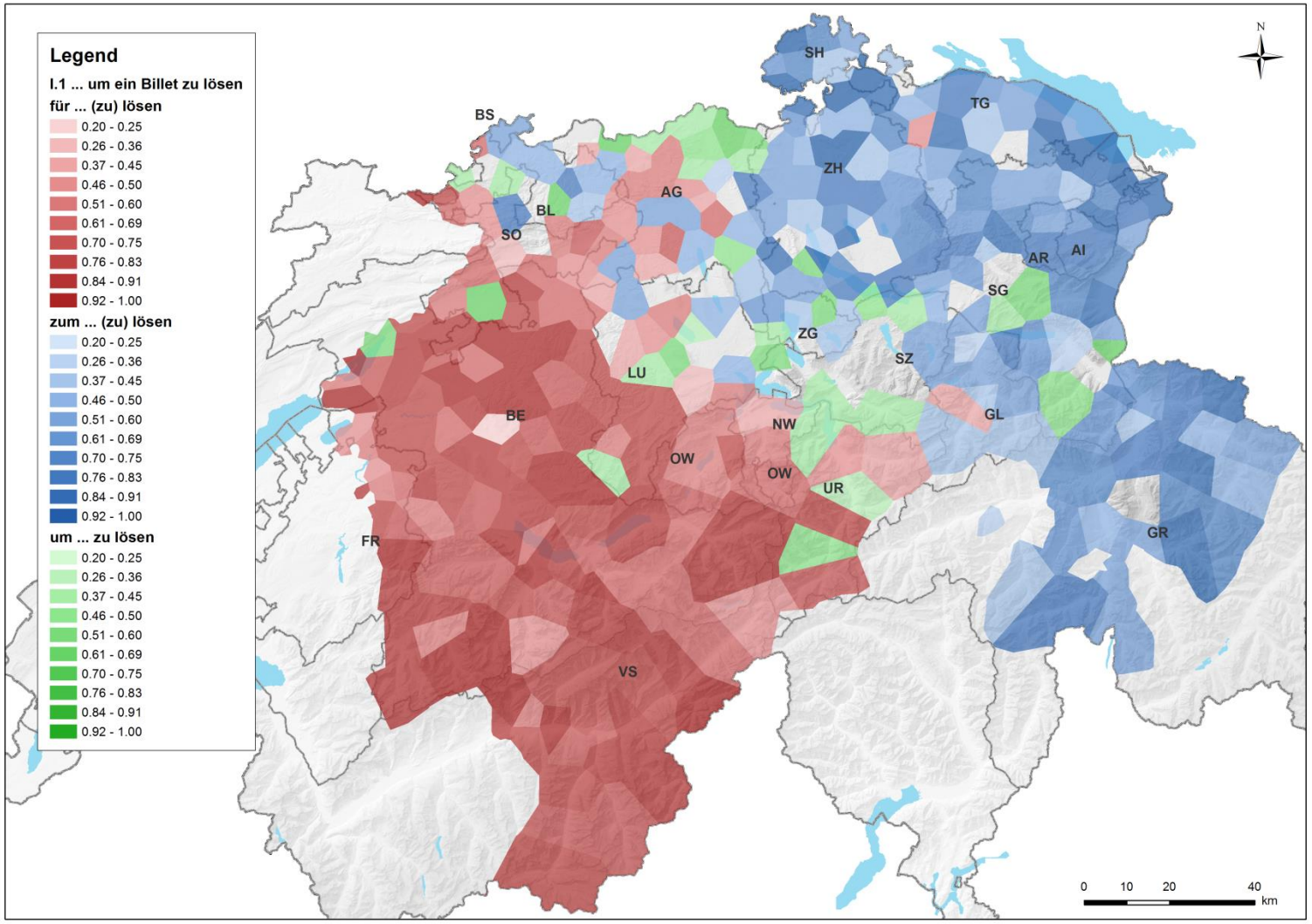
Case Study 2: Swiss-German Dialect Syntax

Distribution of variant «um ein Billet zu lösen»



Case Study 2: Swiss-German Dialect Syntax

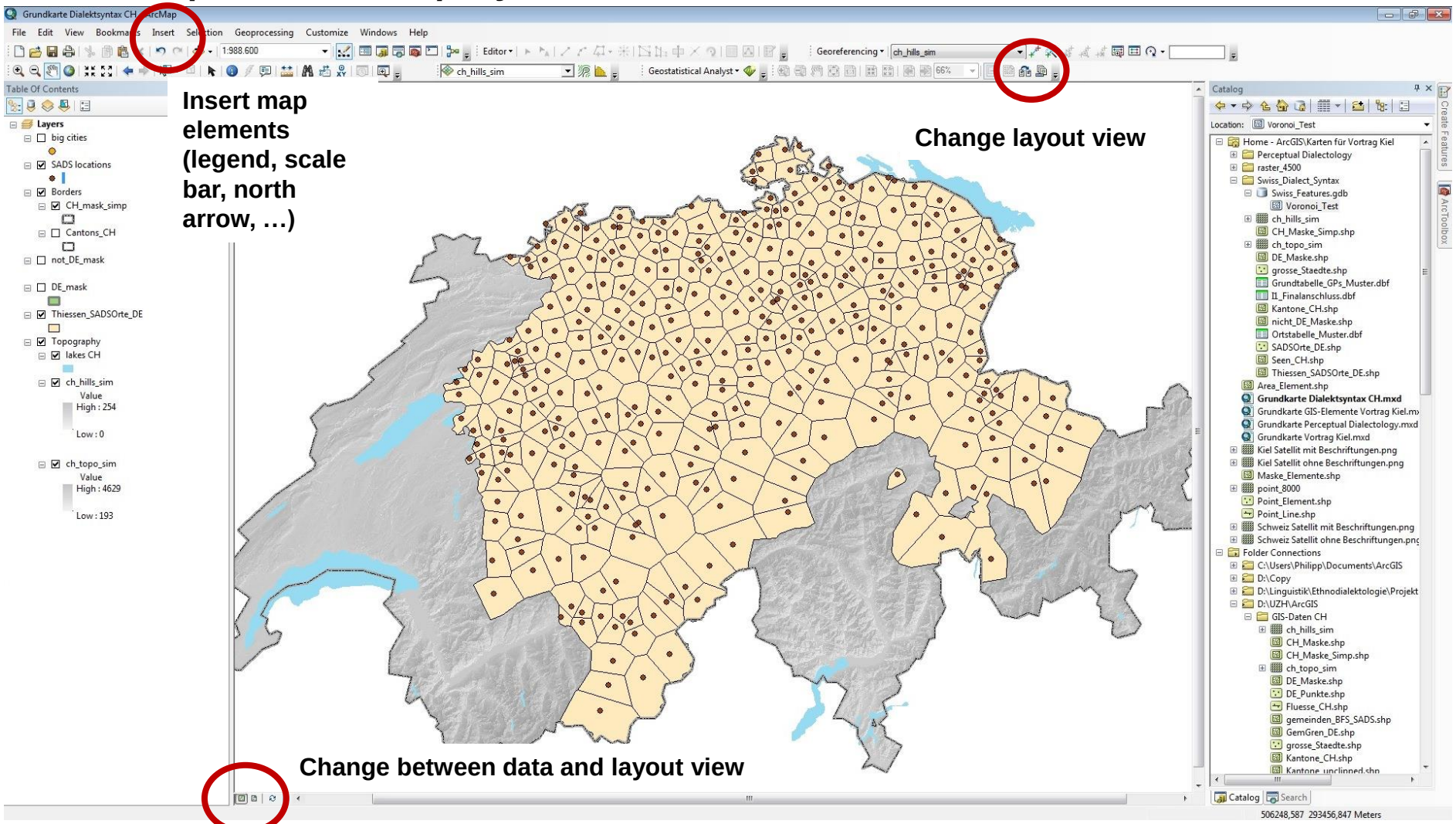
Combined map displaying the dominant variant at each place[1]



[1] At «empty» polygons there is no single dominant variant.

Case Study 2: Swiss-German Dialect Syntax

Step D: Create map layout



Case Study 2: Swiss-German Dialect Syntax

Outlook: Perform geostatistic analyses

"*Fundamental Dialectological Postulate*: Geographically proximate varieties tend to be more similar than distant ones." (Nerbonne & Kleiweg 2007: 154)

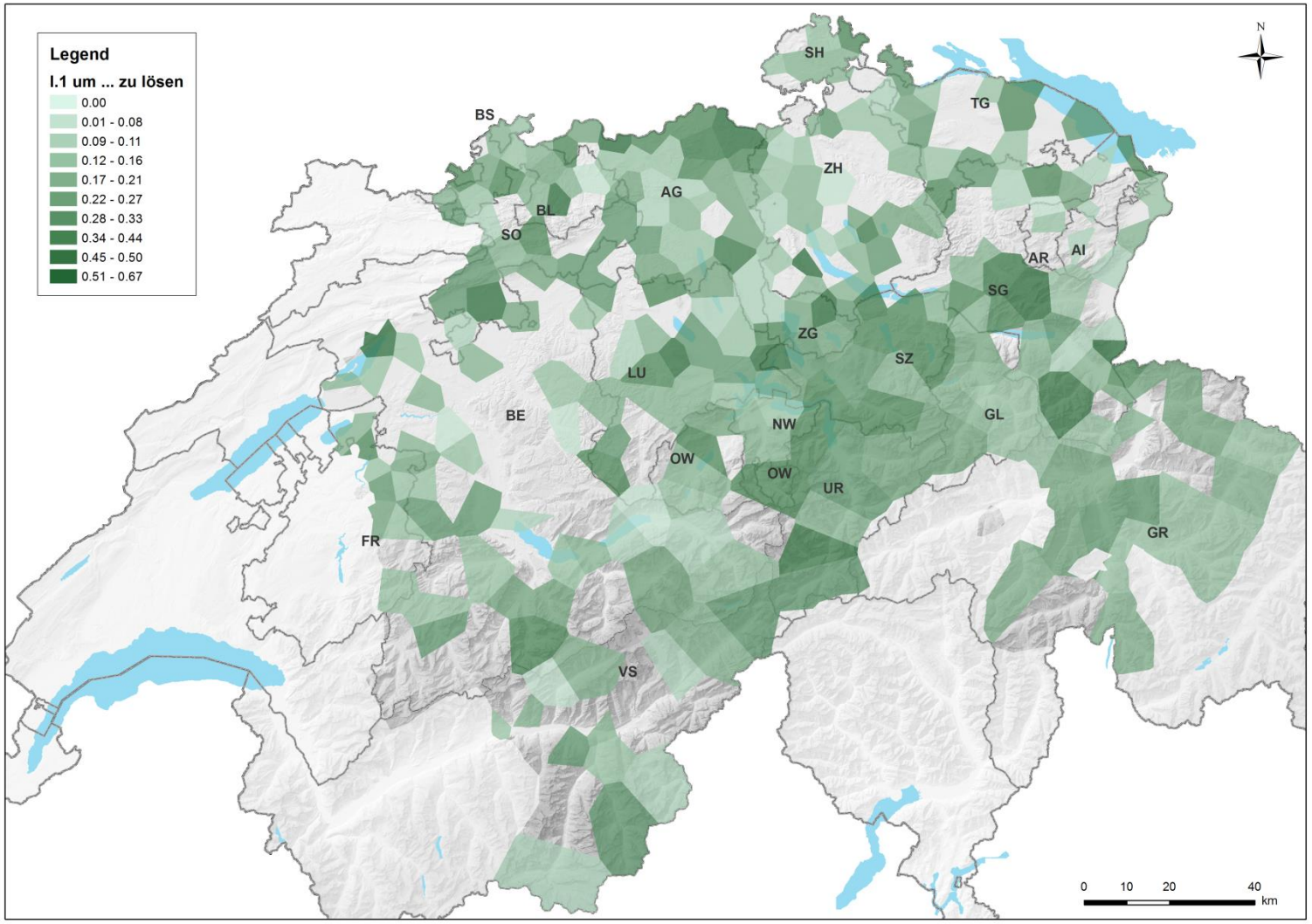
→ Hot Spot or Cluster and Outlier Analyses (in ArcToolbox → "Spatial Statistics Tools" → "Mapping Clusters")

Linguistic data can be regarded as a statistical sample of the "linguistic reality"

→ Interpolation (different methods in the ArcToolboxes "3D Analyst Tools", "Geostatistical Analyst Tools", "Spatial Analyst Tools")

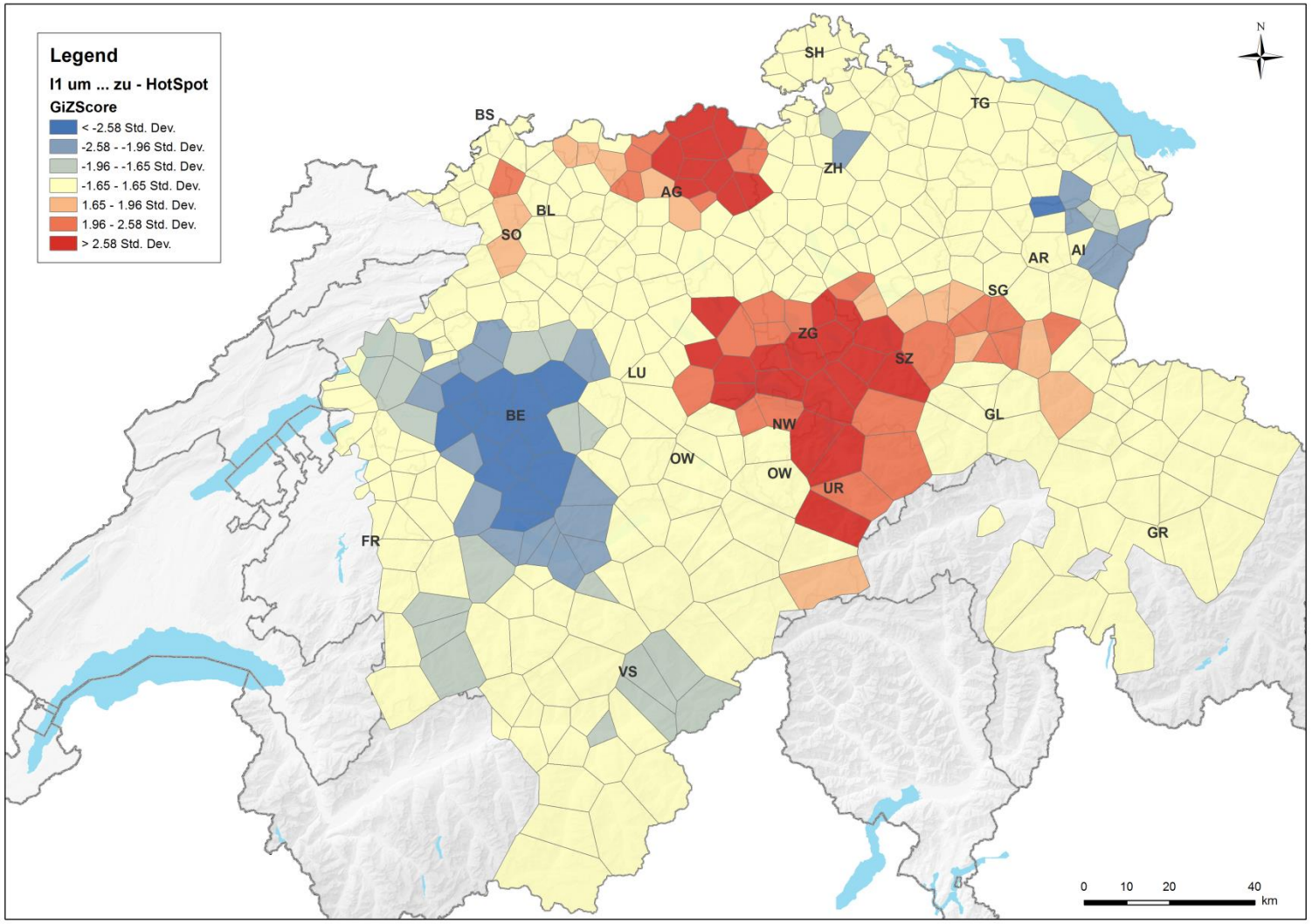
Case Study 2: Swiss-German Dialect Syntax

Distribution of variant «um ein Billet zu lösen»



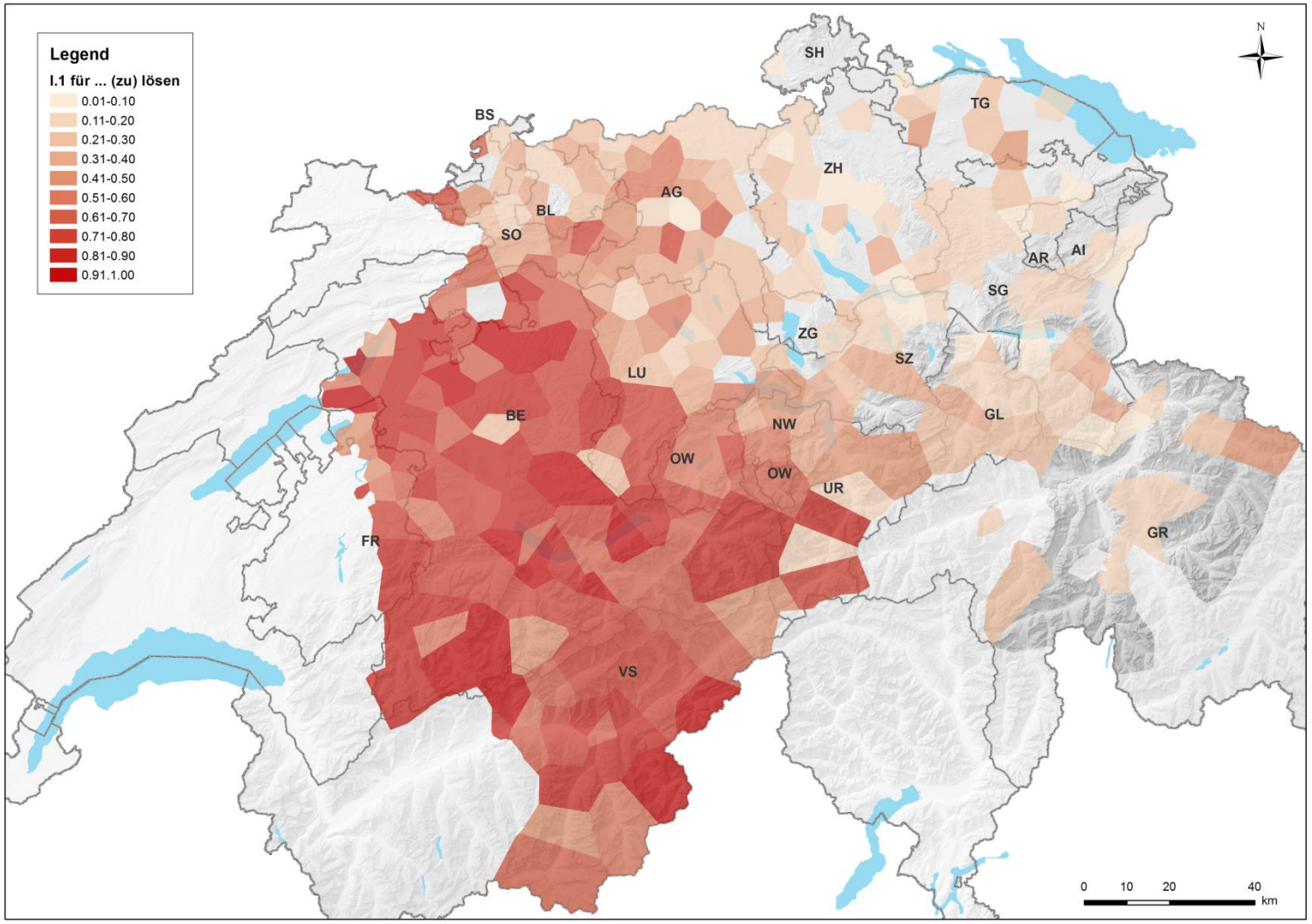
Case Study 2: Swiss-German Dialect Syntax

Hot Spot Analysis (Getis-Ord Gi*) of variant «um ein Billet zu lösen»



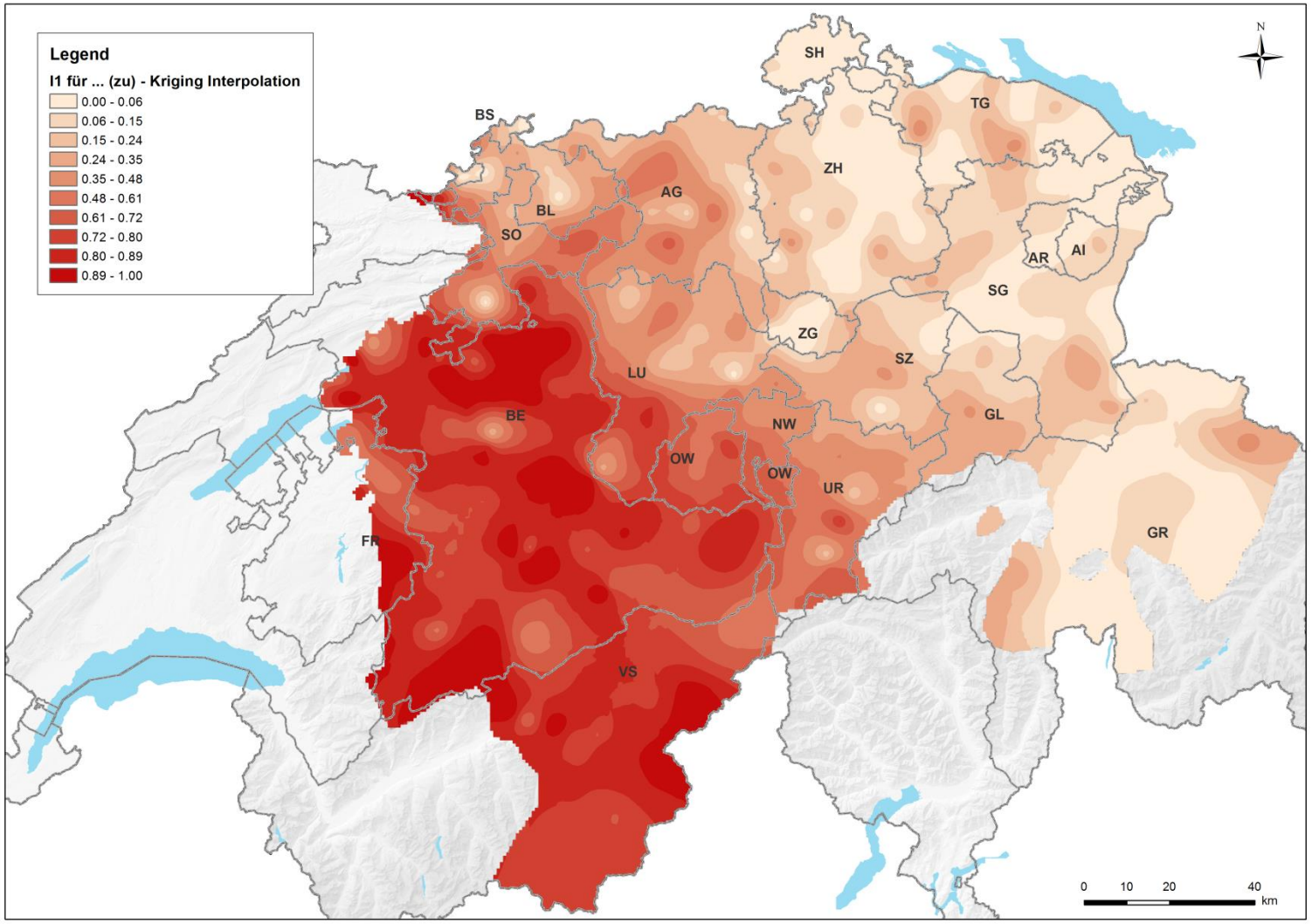
Case Study 2: Swiss-German Dialect Syntax

Distribution of variant «für ein Billet (zu) lösen»



Case Study 2: Swiss-German Dialect Syntax

Kriging interpolation of variant «für ein Billet (zu) lösen»



Questions?

References

Online-References (all accessed July 2014)

ESRI 2014a: ArcGIS Resources. Introduction to GIS. http://resources.arcgis.com/en/help/ getting-started/articles/026n0000000t000000.htm

ESRI 2014b: ArcGIS Resources. ArcGIS Help. http://resources.arcgis.com/en/help/main/10.2/

GRASS GIS: http://grass.osgeo.org/

QGIS: http://www.qgis.org/en/site/

References

Anders, Christina A. (2010): Wahrnehmungsdialektologie. Das Obersächsische im Alltagsverständnis von Laien. Berlin; New York: de Gruyter.

Bartelme, Norbert (2005): Geoinformatik. Modelle, Strukturen, Funktionen. 4., volls. überarb. Auflage. Berlin; Heidelberg: Springer

Bill, Ralf (2010): Grundlagen der Geo-Informationssysteme. 5th edition. Berlin; Offenbach: Wichmann.

Bucheli, Claudia & Elvira Glaser (2002): "The Syntactic Atlas of Swiss German Dialects: empirical and methodological problems". In: Sjef Barbiers, Leonie Cornips & Susanne van der Kleij (eds.): *Syntactic Microvariation*. Amsterdam: Meertens Instituut, 41-74.

Christen, Helen, Elvira Glaser & Matthias Friedli eds. (2012): Kleiner Sprachatlas der deutschen Schweiz. 4th edition. Frauenfeld et al.: Huber.

Girnth, Heiko (2011): "Mapping language data". In: Lameli et al. eds., 98-121.

Heywood, Ian, Sarah Cornelius & Steve Carver (2006): *An introduction to geographical information systems*. 3rd edition. Harlow; Munich et al.: Pearson Prentice Hall.

Hotzenköcherle, Rudolf ed. (1962-1997): *Sprachatlas der deutschen Schweiz*. Bern; Basel: Francke.

Kehrein, Roland, Alfred Lameli & Stefan Rabanus (2011): "Introduction". In: Lameli et al. eds., xi-xxii.

References

Lameli, Alfred, Roland Kehrein & Stefan Rabanus eds. (2011): *Language and Space. Vol. 2: Language Mapping*. Berlin; New York: de Gruyter.

Lameli, Alfred, Christoph Purschke & Roland Kehrein (2008): “Stimulus und Kognition. Zur Aktivierung mentaler Raumbilder”. In: Linguistik online 35.3, 55-86.

Montgomery, Chris (2006): *Northern English Dialects. A Perceptual Approach*. Diss. University of Sheffield.

Montgomery, Chris & Philipp Stoeckle (2013): “Geographic information systems and perceptual dialectology: a method for processing draw-a-map data”. In: *Journal of Linguistic Geography* 1, 52-85.

Nerbonne, John & Peter Kleiweg (2007): “Toward a Dialectological Yardstick”. In: Journal of Quantitative Linguistics 14.2-3, 148-166.

Preston, Dennis R. (1982): “Perceptual Dialectology. Mental maps of United State dialects from a Hawaiian perspective”. In: *Working Papers in Linguistics* 14.2, 5-49.

Preston, Dennis R. (1993): “Folk Dialect Maps”. In : A. Wayne Glowka & Donald M. Lance eds.: *Language Variation in North American English. Research and Teaching*. New York: Modern Language Association of America, 105-118.

Purschke, Christoph (2011): *Regionalsprache und Hörerurteil. Grundzüge einer perzeptiven Variationslinguistik*. Stuttgart: Steiner.

Stoeckle, Philipp (forthc.): *Subjektive Dialekträume im alemannischen Dreiländereck*. Hildesheim et al.: Olms.