

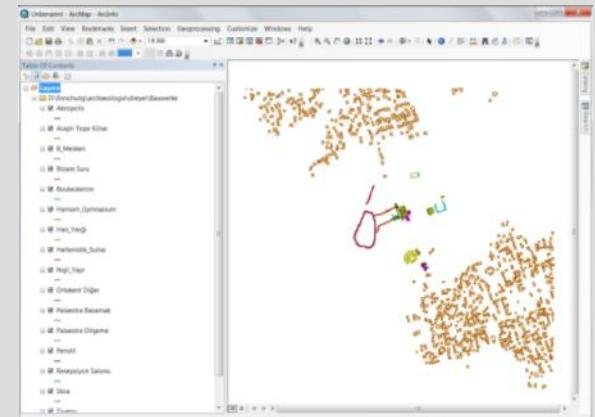
GIS and Geomatics in Ancient History

Geomatic Methods Supporting The Investigation Of Ancient History

Mark Vetter, Boris Dreyer

Agenda

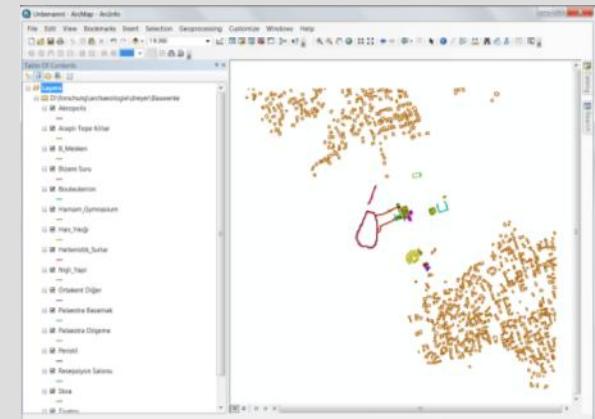
- 1.) Why geomatics in ancient history
sciene?
- 2.) Aims of the Metropolis project
- 3.) Aims of the VARUS battle reconstruction
- 4.) Results VARUS research
- 5.) Outlook and desiderata



1.) Introduction - Background

Why geomatics in ancient history?

- Geomatics – the complete process from survey, mapping, manipulation, analysis and presentation of geodata.
- Why using a GIS as a database for historic documents? Because in most cases this data is spatial related
- GIS: a powerful tool for documentation, but as well as analysis of (paleo-) spatial related questions



2.) Aims of Metropolis project

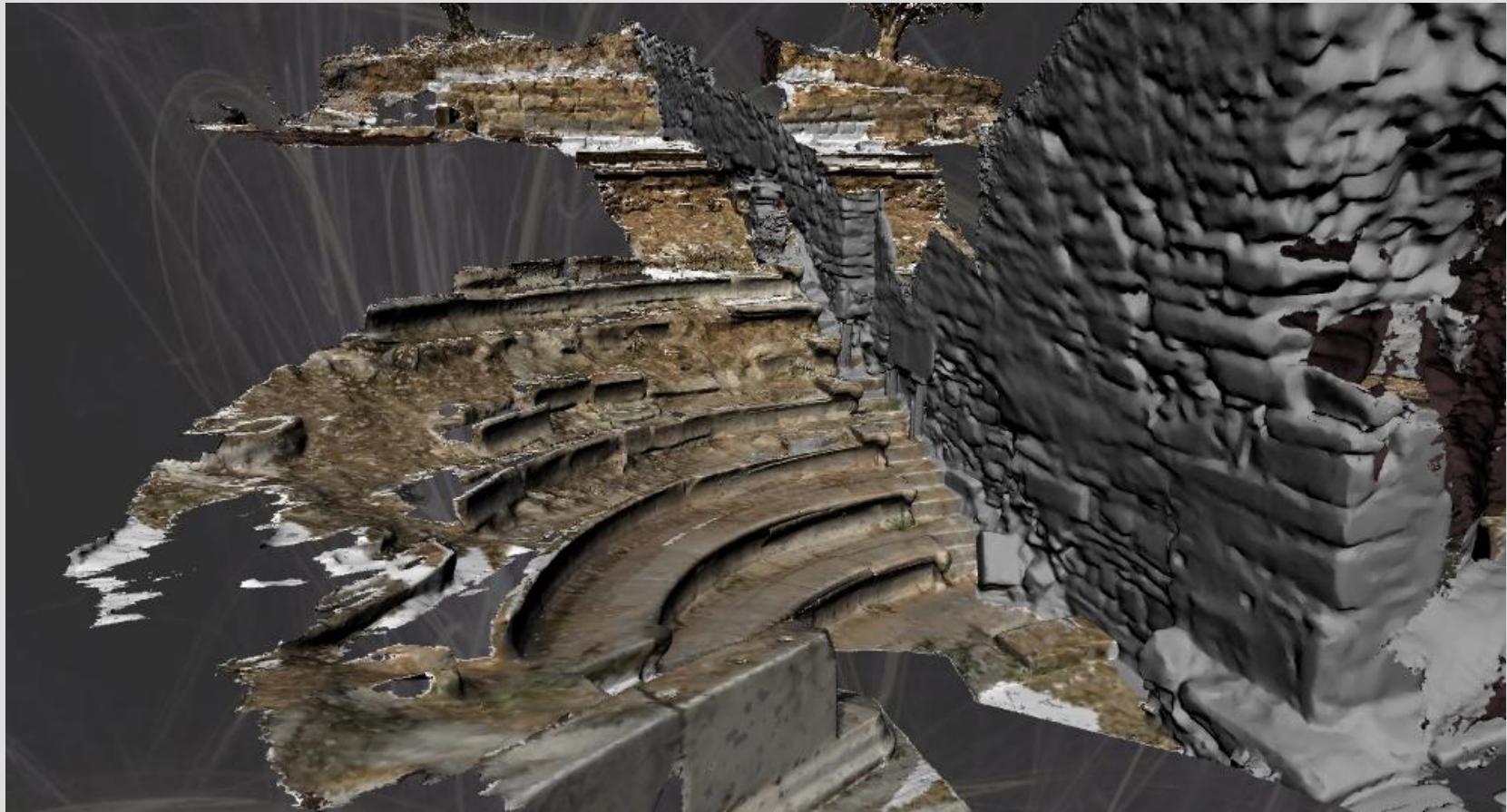
- Survey of already existing 3D-spatial structures
- Bringing these structures in a location based, geodetic projection with a GIS
- Thematical categorisation of geodata according time period/importance
- 2D maps of building structures of Metropolis
- Reconstruction and 3D presentation of buildings
- Basics for geoprocessing with the aim of acquisition of scientific knowledge for archeological purposes in order to understand historical structures and connectivities



2.) Study area Metropolis / Ionia

- Foundation of city in 725 BD
- Prosperity time in hellenistic epoch in 3th century BD
- Higher level of construction activities in roman time (Stoa, Bath) round Augustus
- Earthquake in 17th century AD which caused enormous damages
- In byzantine epoch in 14th century AD constructions of fortification walls

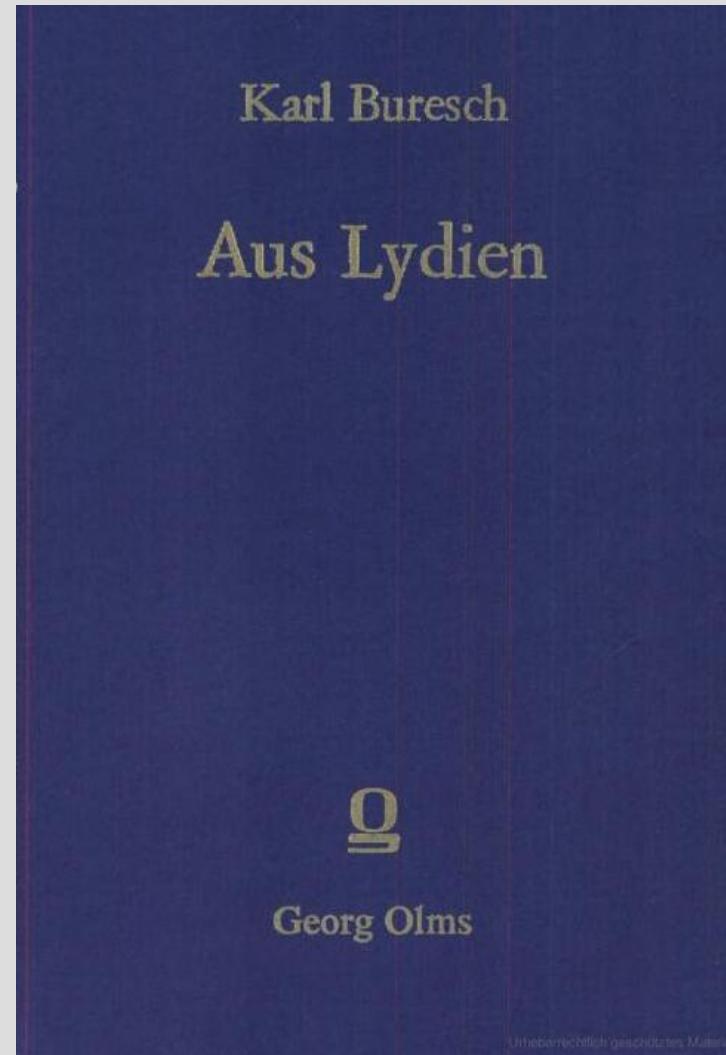




„Low-cost approach for a 3D-visualization of historical structures in Metropolis“
Presentation of Sebastian Lemstra on **Thursday 11.00 – 11:15**



- Unifying different sources of material documents and ancient and recent geodata in a GIS
- KARL BURESCH: Aus Lydien, 1898

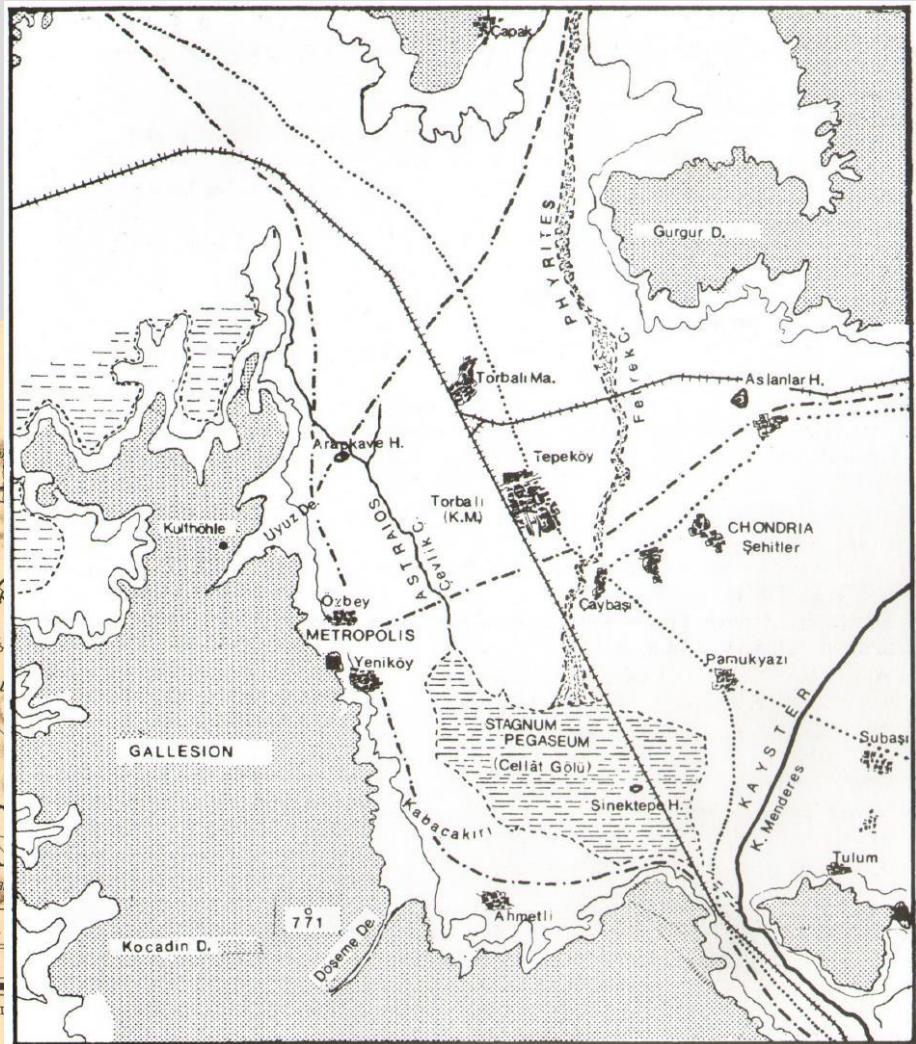
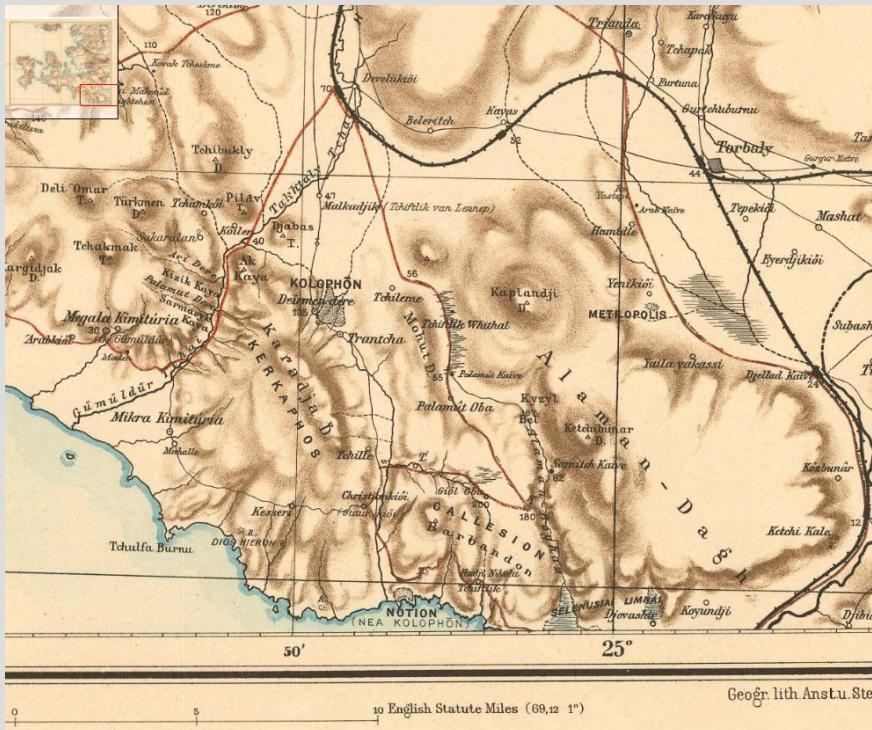




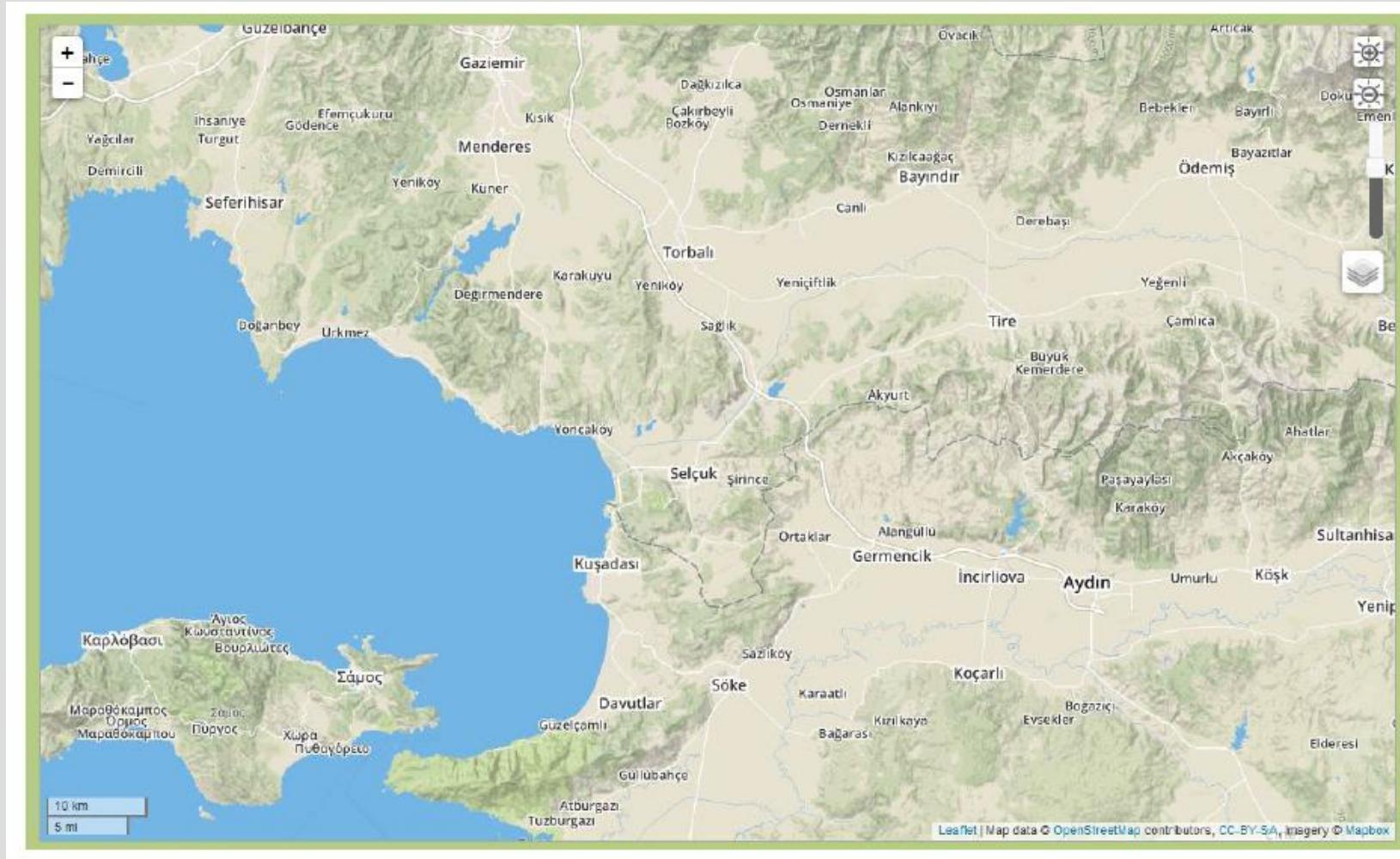
- KARL BURESCH: Aus Lydien, 1898

Von hier aus wandte ich mich NNW gegen die oben erwähnte Hügelkette, nach deren Übersteigung ich mich mühsam durch den noch fast überall versumpften westlichen Teil der Kaÿstros-Ebene zu winden hatte. Bei Subaschi, wo der Verwalter der großherrlichen Güter seinen Sitz hat, traf ich auf ein großes, fast fertiges Stück der oben erwähnten neuen Chaussee, welches auf Tepekjöi (großherrliches Gutsdorf) und Turbaly zustrebte. Erst am N-Rande von Maschat, wo ich die in einer *Mosseïov* 1878 S. 97 n. σεξ' ungenügend mitgeteilten Grabinschrift **) genannte Ortschaft **Chondria** (*Χονδριανῶν κώμη*) feststellte, bekam ich wieder festen Boden unter die Füsse.

- Map of KIEPERT (1880)
- Map of MERIC (1985)

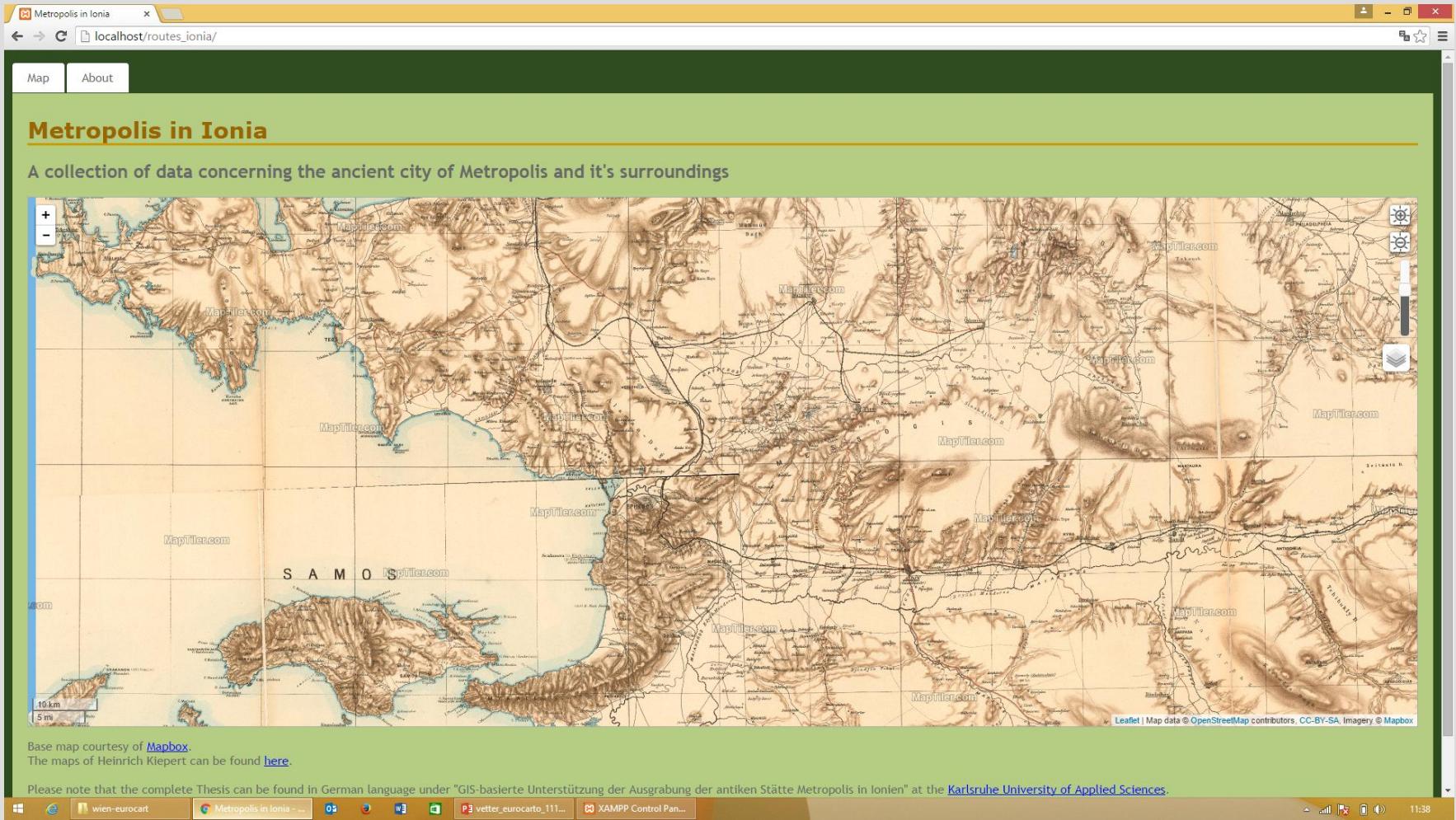


First prototype: Open source ancient history Webmaps/GIS of Ionia



Leaflet realisation based on OSM and Mapbox, coded by MARIUS OSTER

First prototype: Open source ancient history Webmaps/GIS of Ionia



The screenshot shows a web-based Geographic Information System (GIS) application titled "Metropolis in Ionia". The main interface features a large, detailed topographic map of the Ionian region, including the island of Samos and surrounding coastal areas. The map is overlaid with a network of roads and paths, some of which are highlighted in red or blue. Various locations are labeled with names such as "Metropolis", "Samos", "Ephesus", and "Miletus". The map includes a grid system and a scale bar indicating distances up to 10 km. At the top of the page, there is a browser header with the title "Metropolis in Ionia" and the URL "localhost/routes_ionia/". Below the header, there are two tabs: "Map" and "About". The "Map" tab is currently selected. The main content area has a green header with the title "Metropolis in Ionia" and a subtitle "A collection of data concerning the ancient city of Metropolis and its surroundings". At the bottom of the page, there is a footer with the text "Base map courtesy of Mapbox." and "The maps of Heinrich Kiepert can be found [here](#)". Below the footer, a note states: "Please note that the complete Thesis can be found in German language under \"GIS-basierte Unterstützung der Ausgrabung der antiken Stätte Metropolis in Ionen\" at the [Karlsruhe University of Applied Sciences](#)". The bottom of the screen shows a standard Windows taskbar with several open application icons.

Leaflet realisation based on OSM and Mapbox, coded by MARIUS OSTER



First prototype: Open source ancient history Webmaps/GIS of Ionia

The screenshot shows a web-based geographical information system (GIS) application titled "Metropolis in Ionia". The map displays the coastline of the Aegean Sea and the inland regions of western Anatolia. Key locations marked include Metropolis (with a blue marker), Ephesus (with a blue marker), Priene (approx. old location) (with a blue marker), and Priene (new location) (with a blue marker). A purple line traces a route from Metropolis through the interior land towards the coast near Priene. The map includes a legend, scale bar (10 km/5 mi), and various geographical features like roads, rivers, and mountains. The interface has tabs for "Map" and "About". The footer contains credits for Mapbox and Heinrich Kiepert, and a note about the complete Thesis.

Metropolis in Ionia

localhost/routes_ionia/

Map About

Metropolis in Ionia

A collection of data concerning the ancient city of Metropolis and it's surroundings

Metropolis

Ephesus

Priene, (approx.) old location

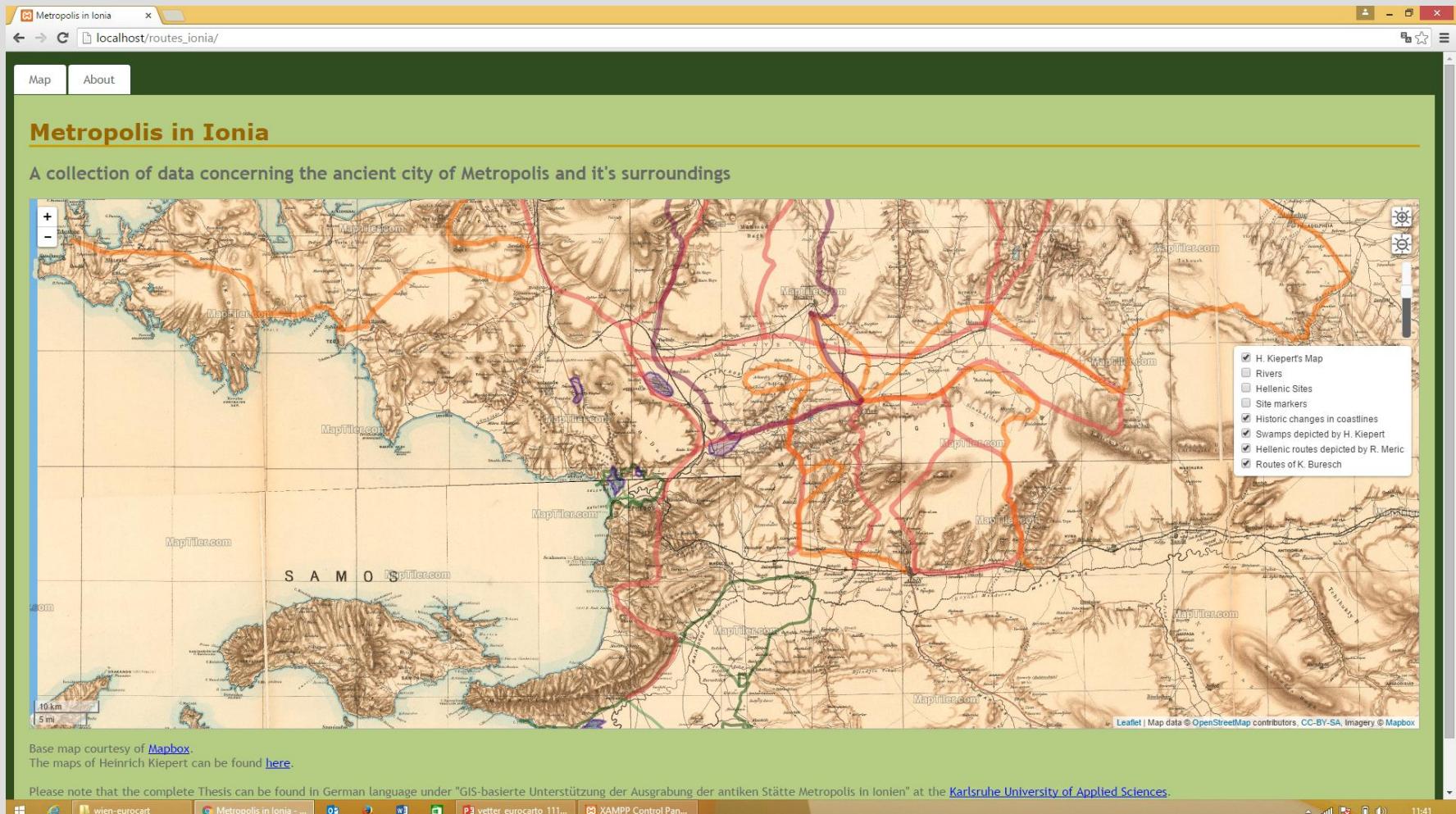
Priene, new location

Base map courtesy of [Mapbox](#).
The maps of Heinrich Kiepert can be found [here](#).

Please note that the complete Thesis can be found in German language under "GIS-basierte Unterstützung der Ausgrabung der antiken Stätte Metropolis in Ionien" at the [Karlsruhe University of Applied Sciences](#).

Leaflet | Map data © OpenStreetMap contributors, CC-BY-SA; Imagery © Mapbox

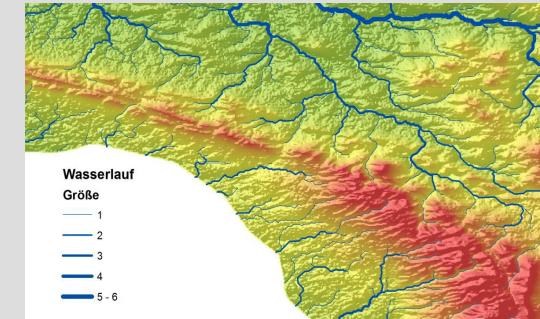
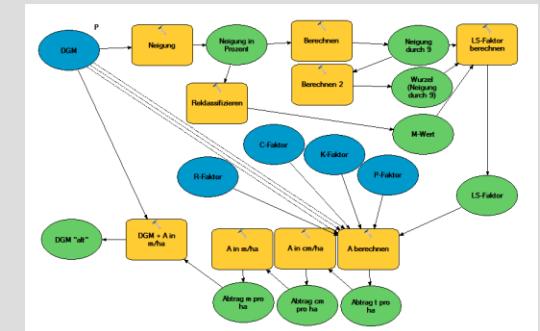
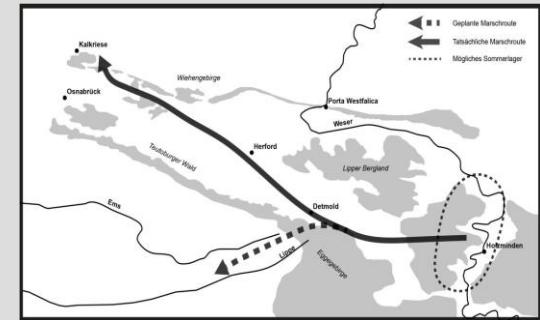
First prototype: Open source ancient history Webmaps/GIS of Ionia



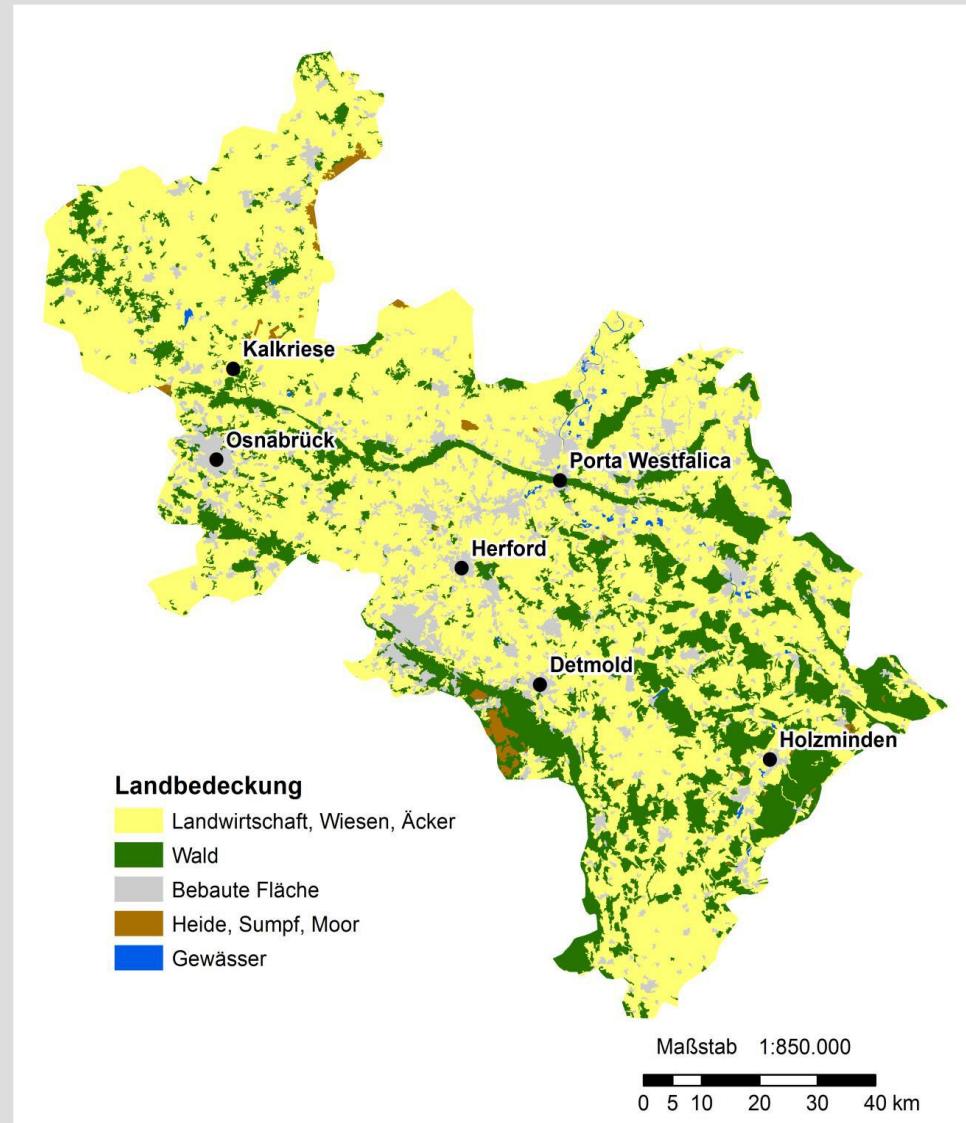
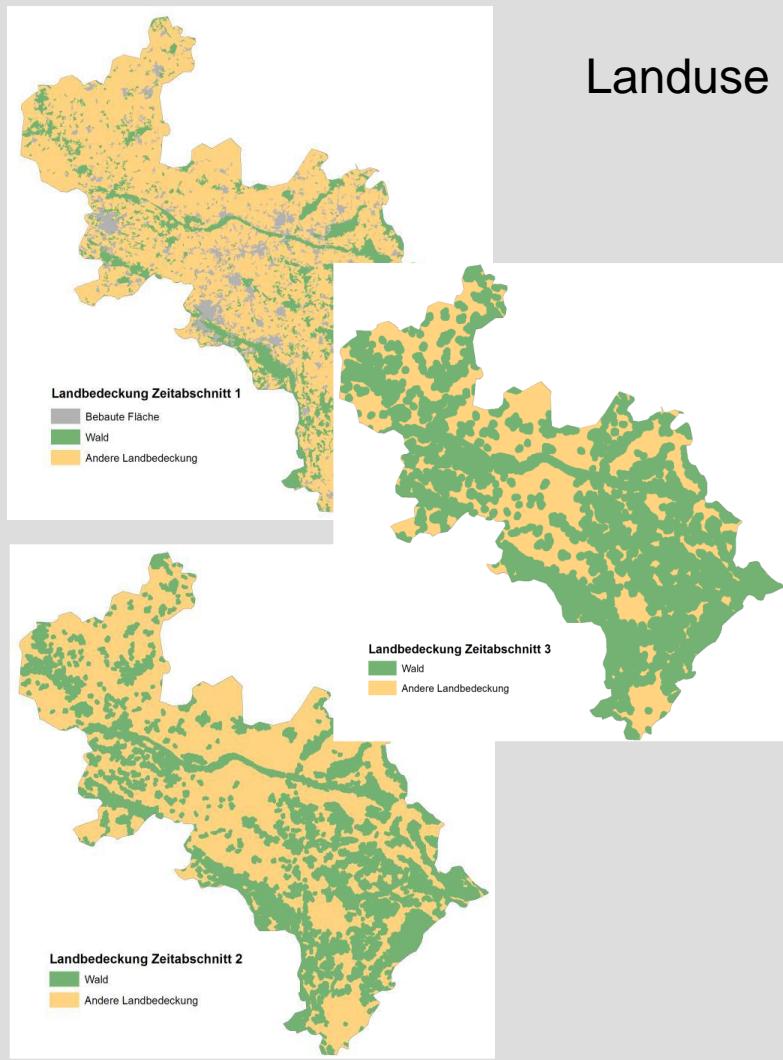
Leaflet realisation based on OSM and Mapbox, coded by MARIUS OSTER

2.) Aims of VARUS battle reconstruction project

- Development of a GIS-Work-Flows in order to clarify the development of and ancient historic event, like the VARUS battle
- What is the best probability for the route the VARUS tooked?
- Calculated possible old land surfaces in GIS in order to get knowledge about the alterations in the last 2000 years (like changes of fluvial courses, relief, changes of wetlands, etc.)
- Calculation of cost path analisis for possible movements of the VARUS with its troops 9 AD.
- Over all aim is to give the ancient historians new possible locations to search with tradtional methods for material evidences

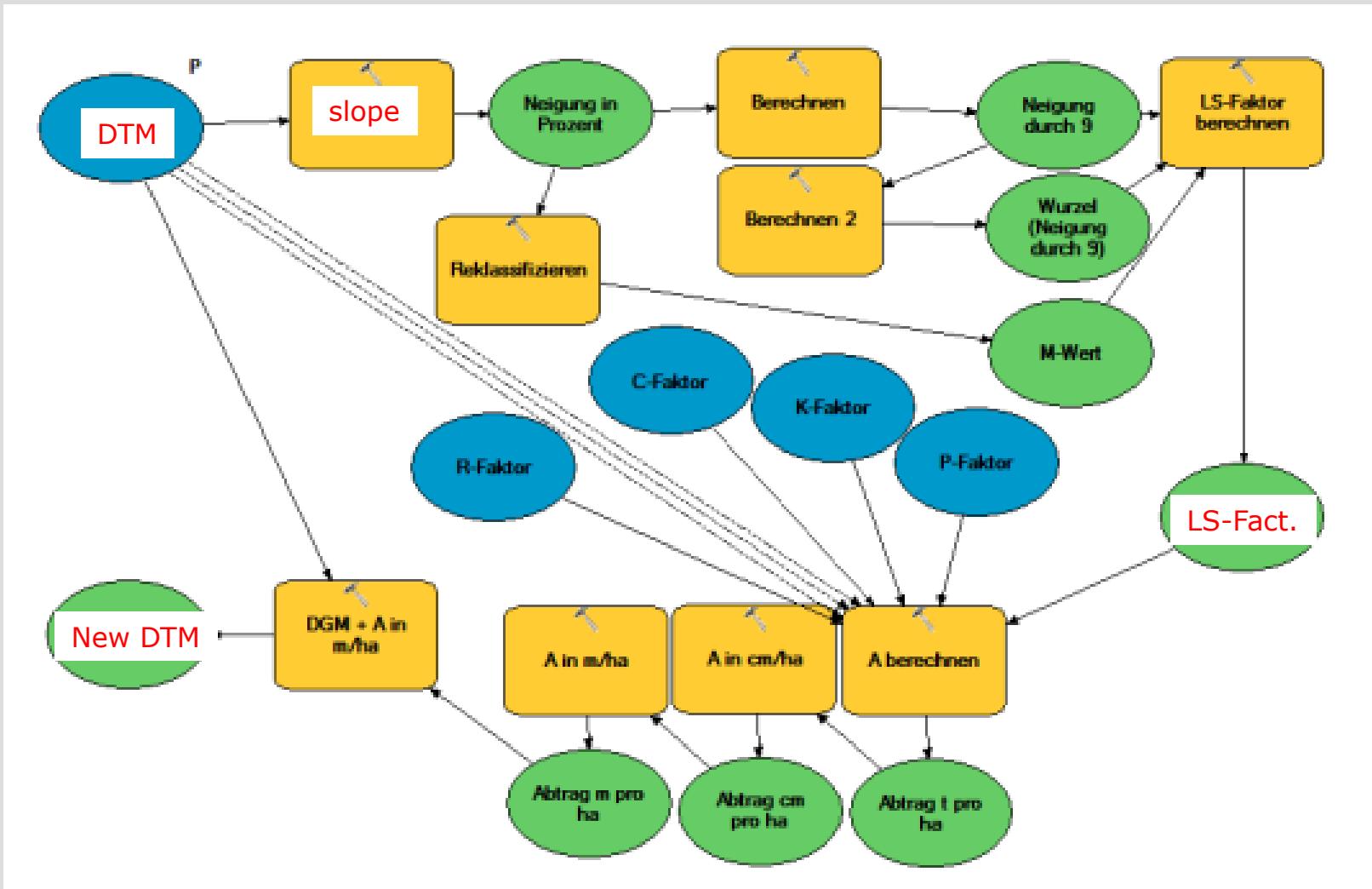


Landuse



Calculations and visualisations by LUKAS SCHABER, HSKA

GIS Work-flow

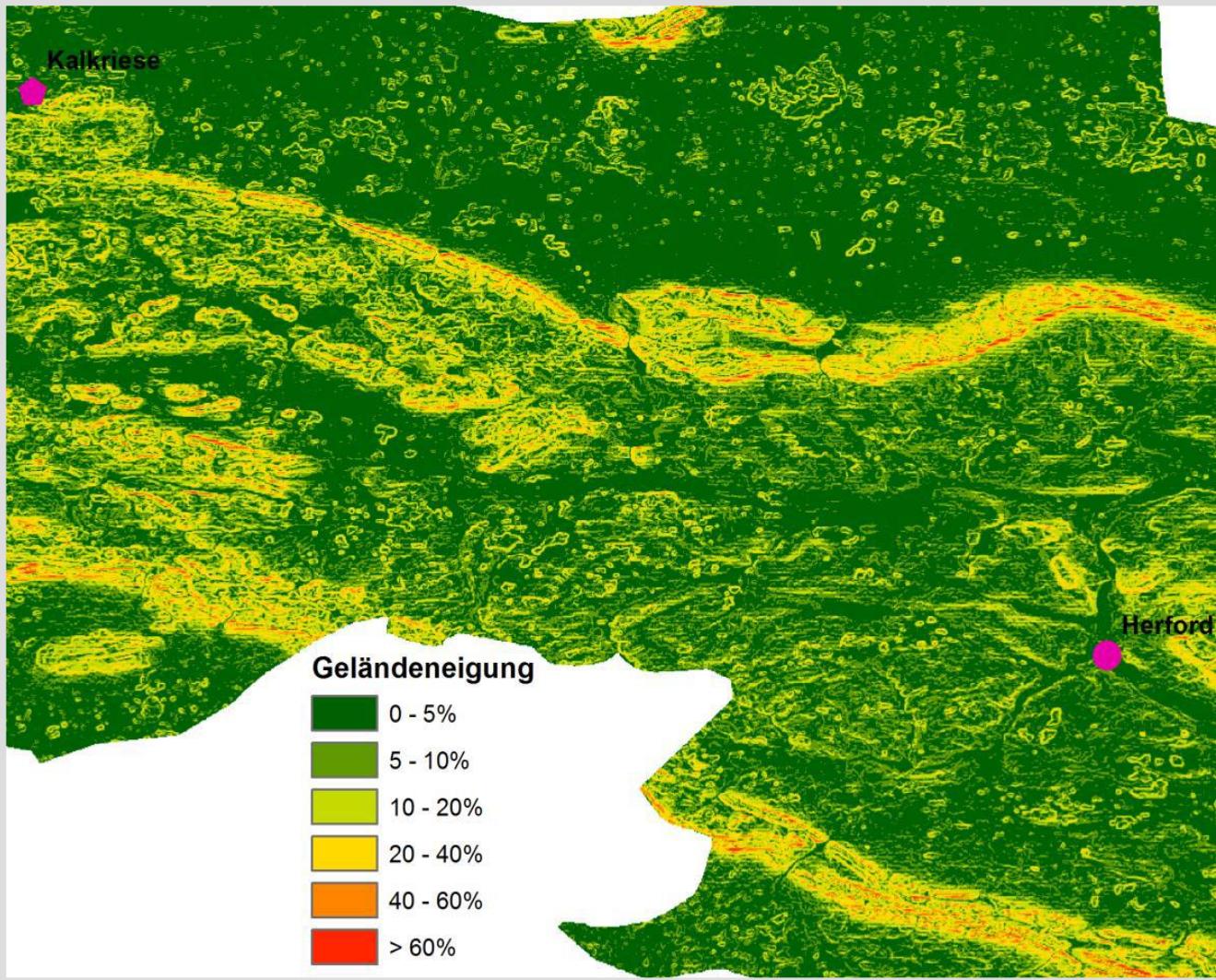


Calculations and visualisations by LUKAS SCHABER, HSKA

Slope in %	Cost unit
0-5	1
5-10	2
10-20	4
20-40	6
40-60	8
>60	10

Land- cover	Cost unit
Forest	6
Free terrain	3

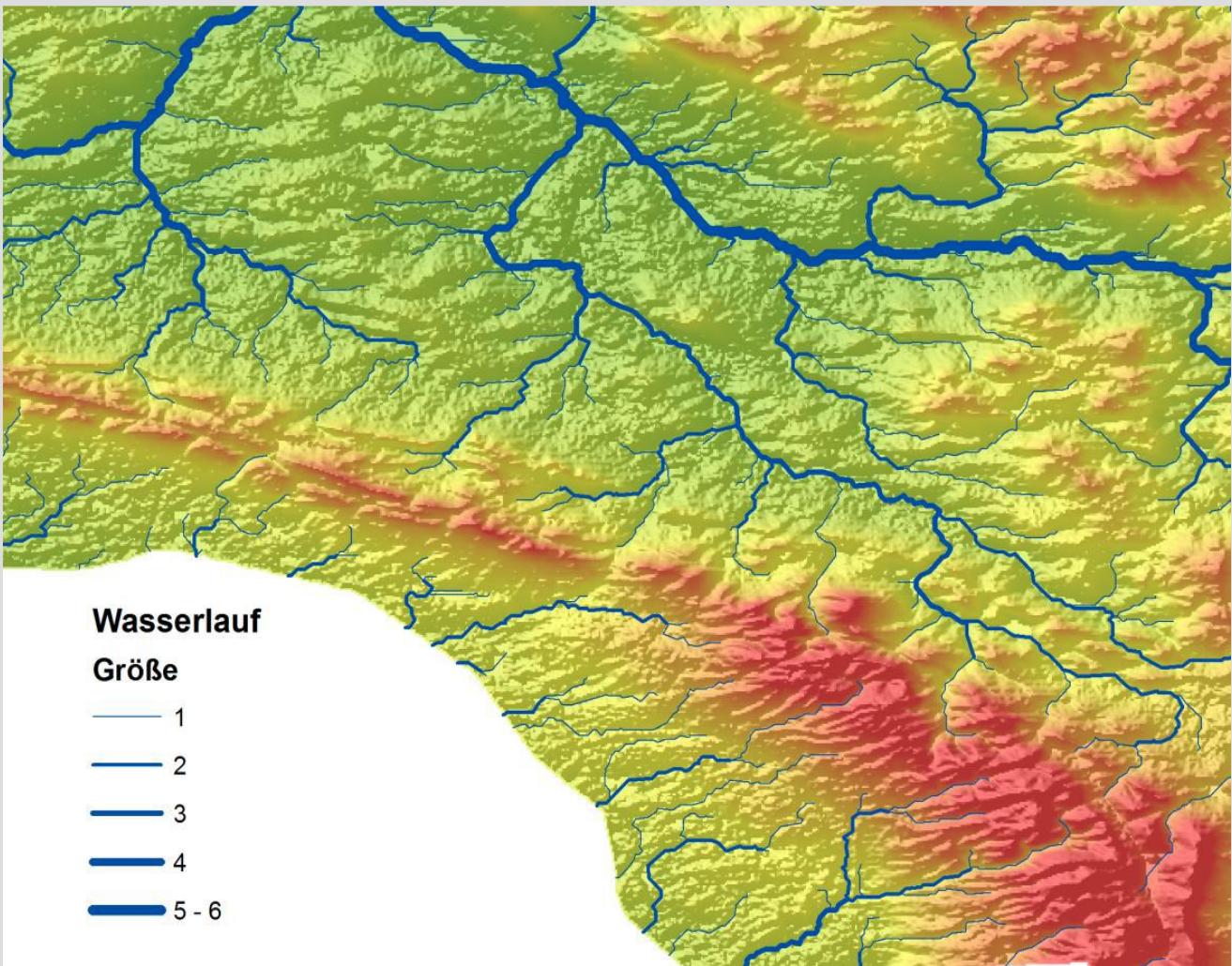
Relieve energy



Calculations and visualisations by LUKAS SCHABER, HSKA

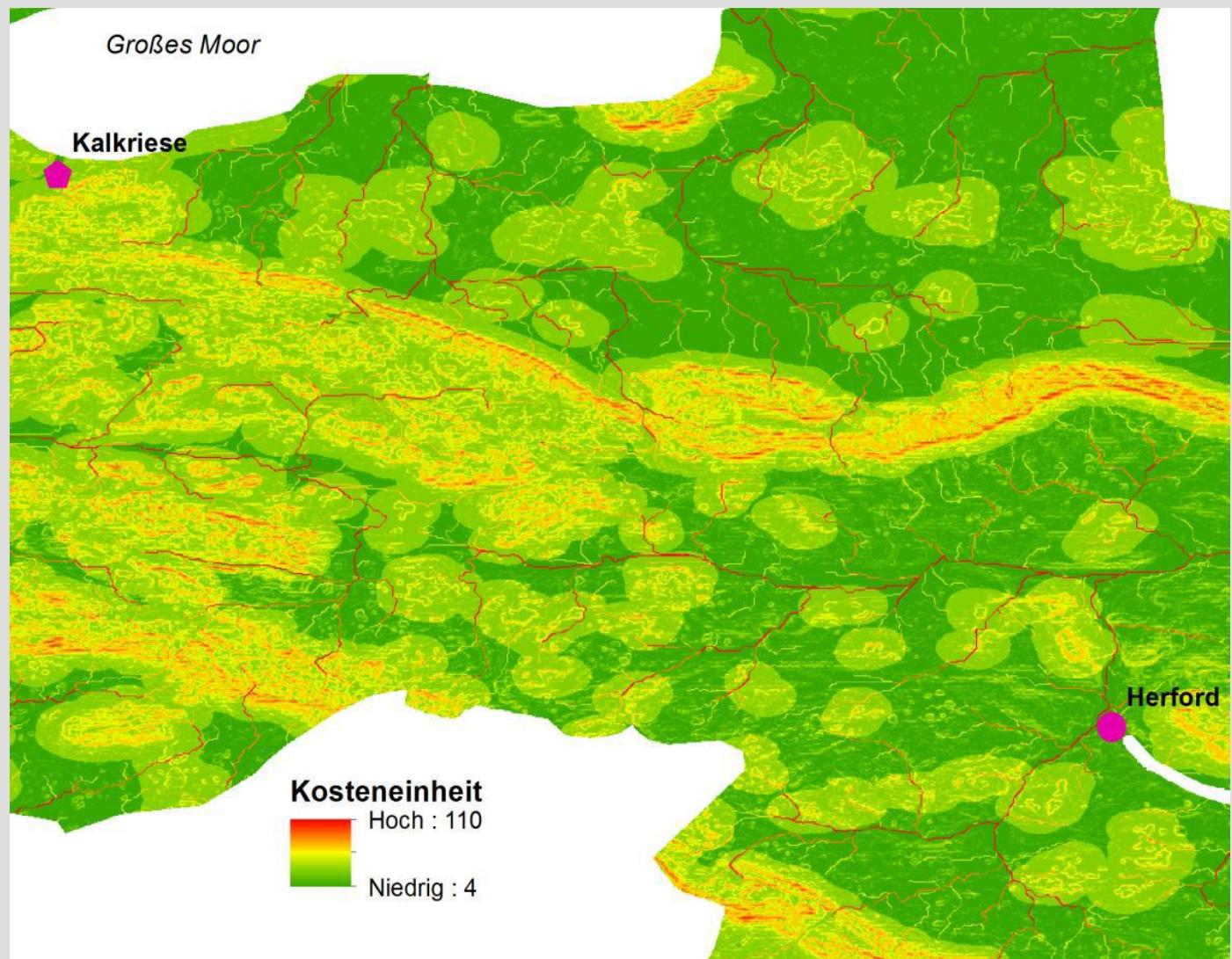
River size	Cost unit
1	5
2	10
3	15
4	25
5	50
6	100

River flows



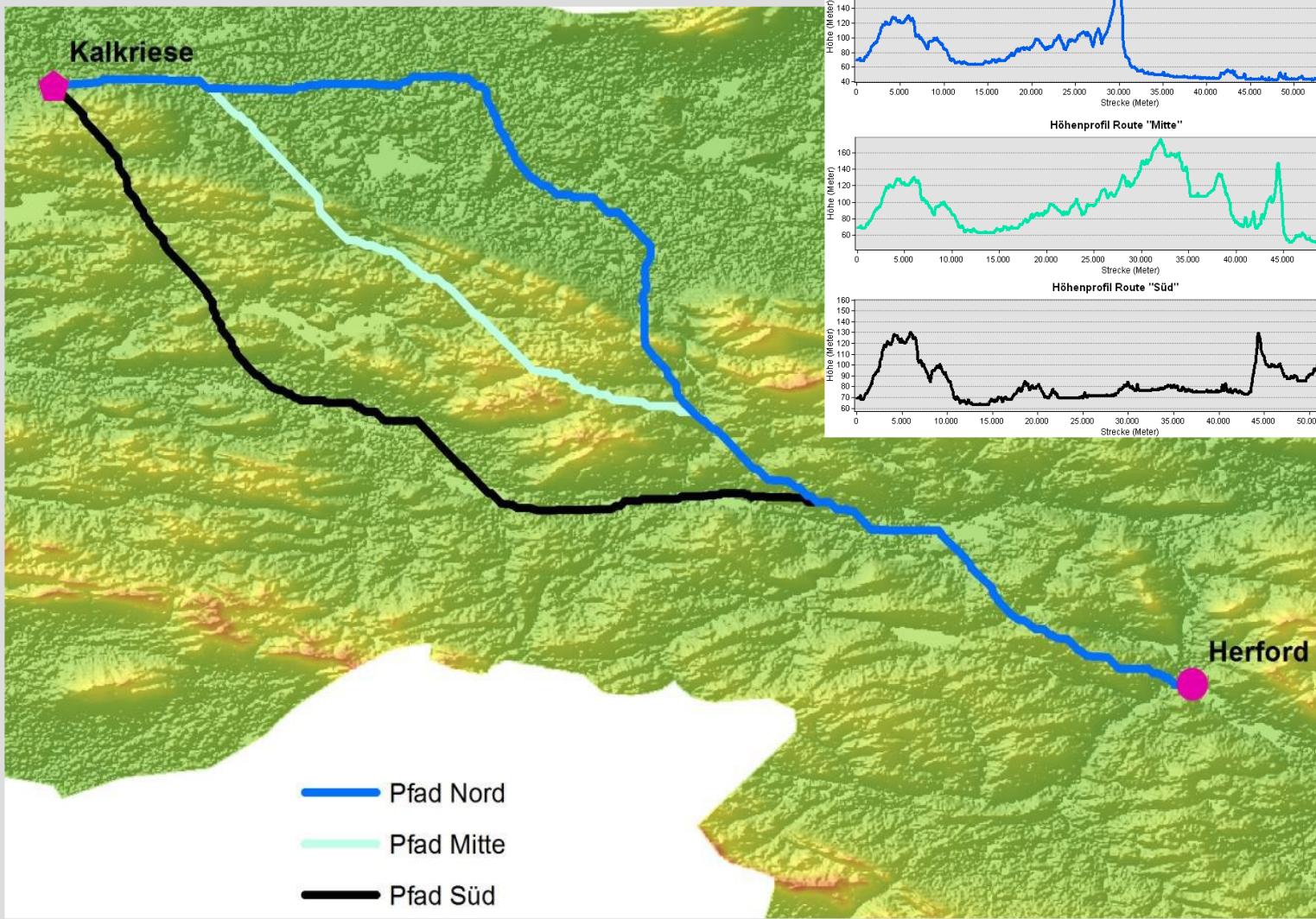
Calculations and visualisations by LUKAS SCHABER, HSKA

Results



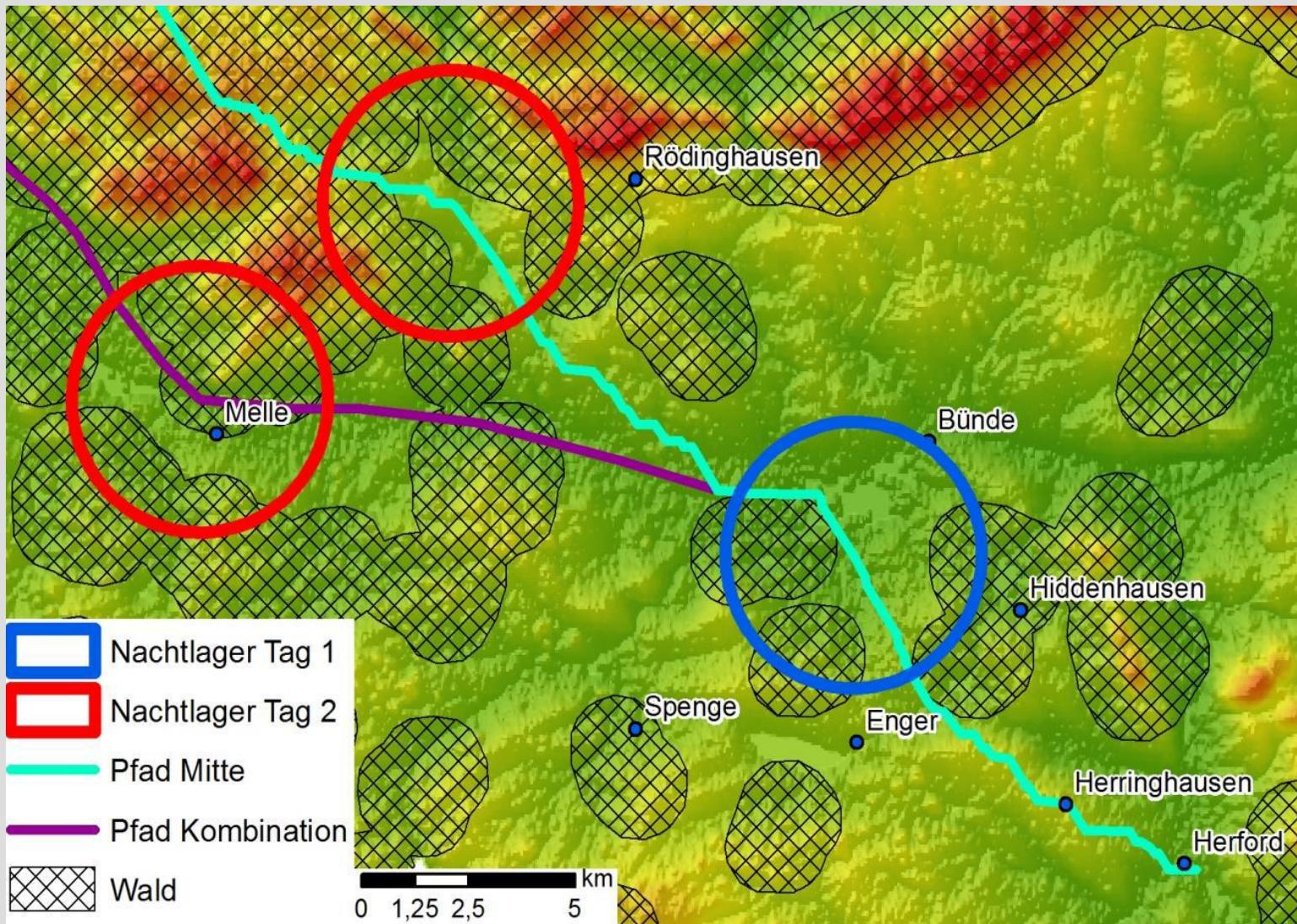
Calculations and visualisations by LUKAS SCHABER, HSKA

Results



Calculations and visualisations by LUKAS SCHABE, HSKA

Results



Calculations and visualisations by LUKAS SCHABER, HSKA

5.) Outlook and Desiderata

Completion of geodata base

- Especially more and more detailed altitude data necessary to calculate a valuable DTM

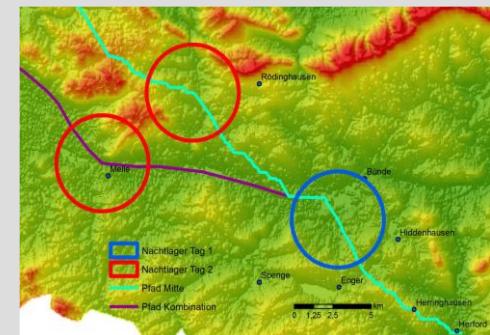
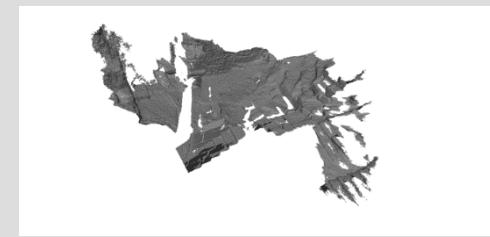
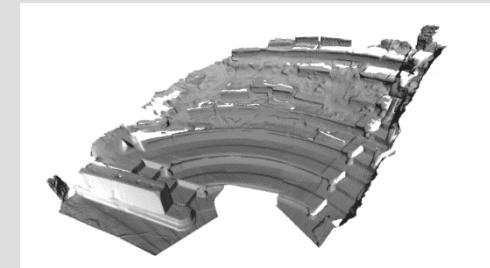
Completion/reconstruction of the city structure/3D-Data necessary

- Further Scanning of remains with Laserscanner/Kinect or other photogrammetric methods necessary
- Automatisation of the process
- Validation of geodetic instruments and methods
- Real (Geo-)visualisation (georeferenced) in a 3D-Model integrated in a GIS

More geoprocessing in ancient history with GIS

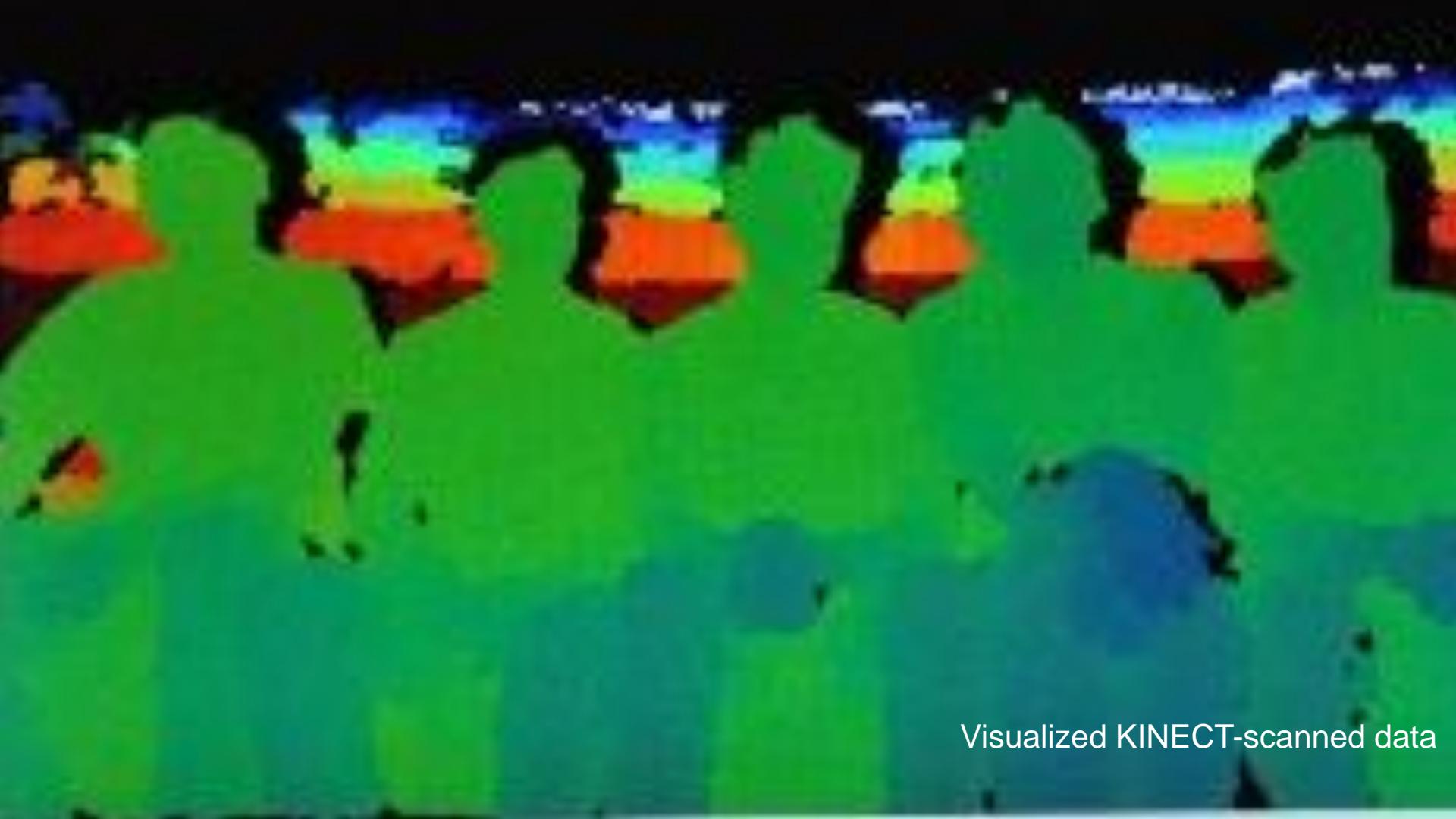
- Networking analysis, best-location, routing reachability, accessibility of construction material, water, transport and trade routes,
- All what helps to know more about former living conditions

Giving the Archeologist hints where to search (dig)



Thank you very much for your attention!

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Visualized KINECT-scanned data