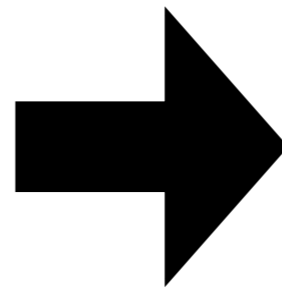


# Prostorska in krajinska arheologija-Vaje 2

Dimitrij Mlekuž

# Modelling

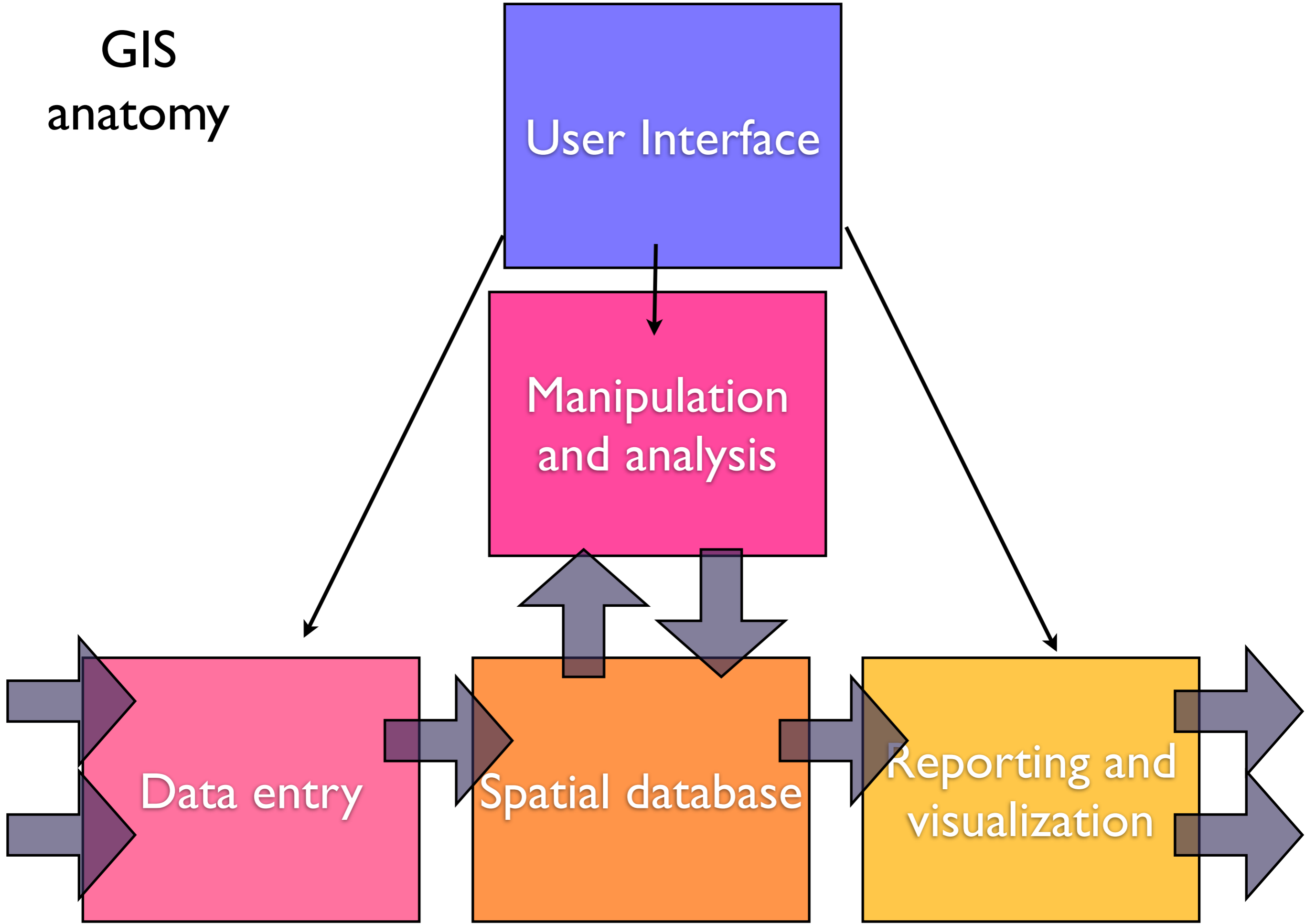
Phenomenon



Model

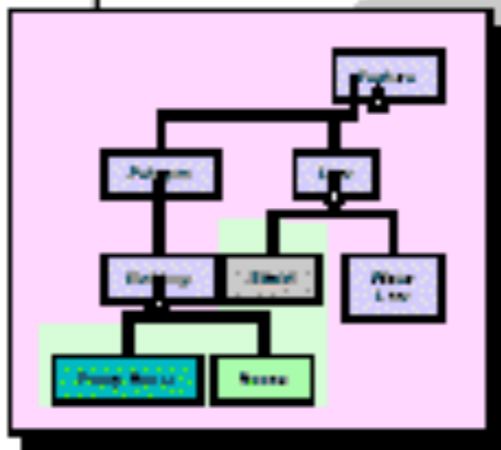


# GIS anatomy



# GIS Data Model

Description and Representation



**Operational GIS**  
Analysis and  
Presentation

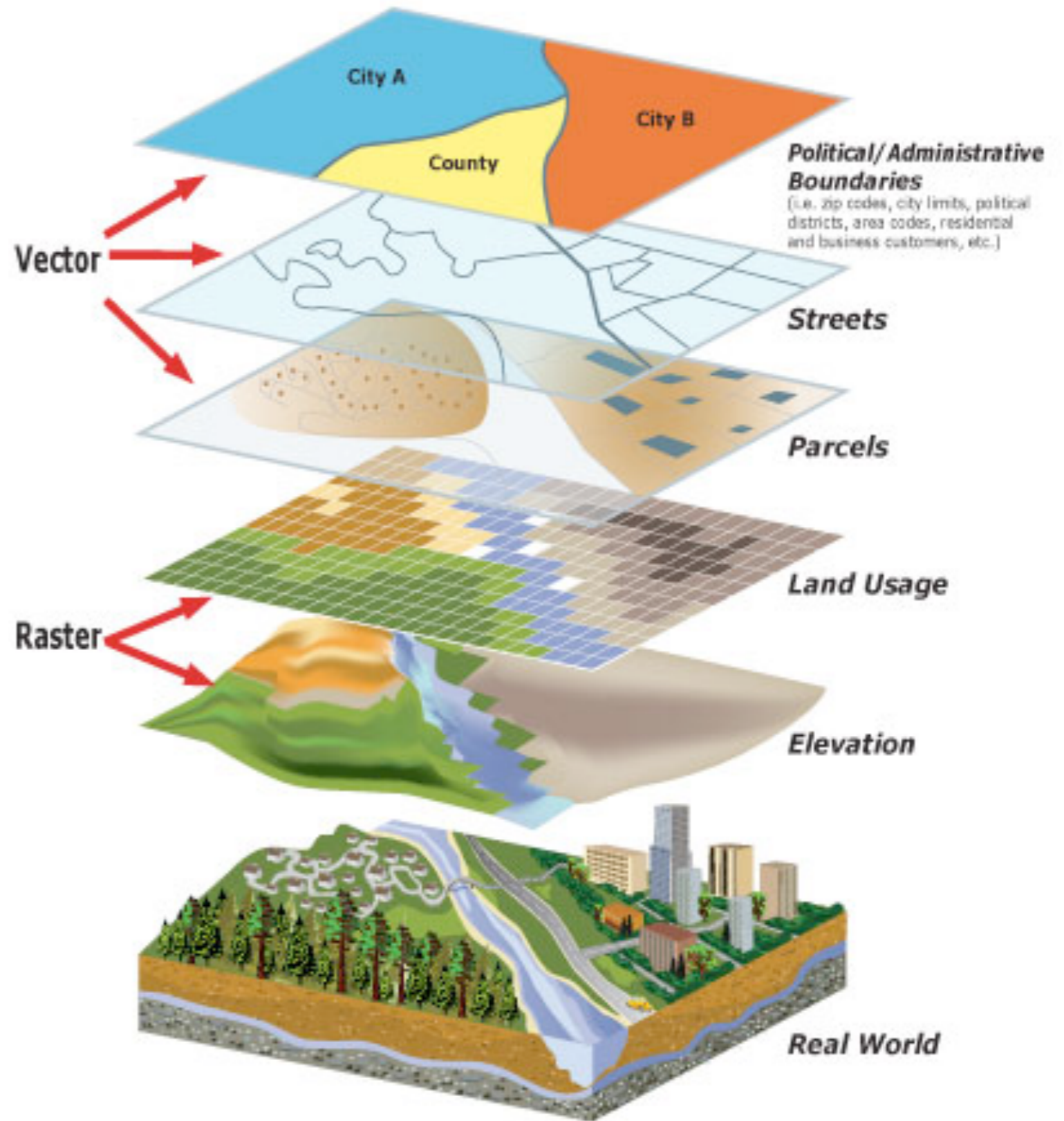


**Real World**

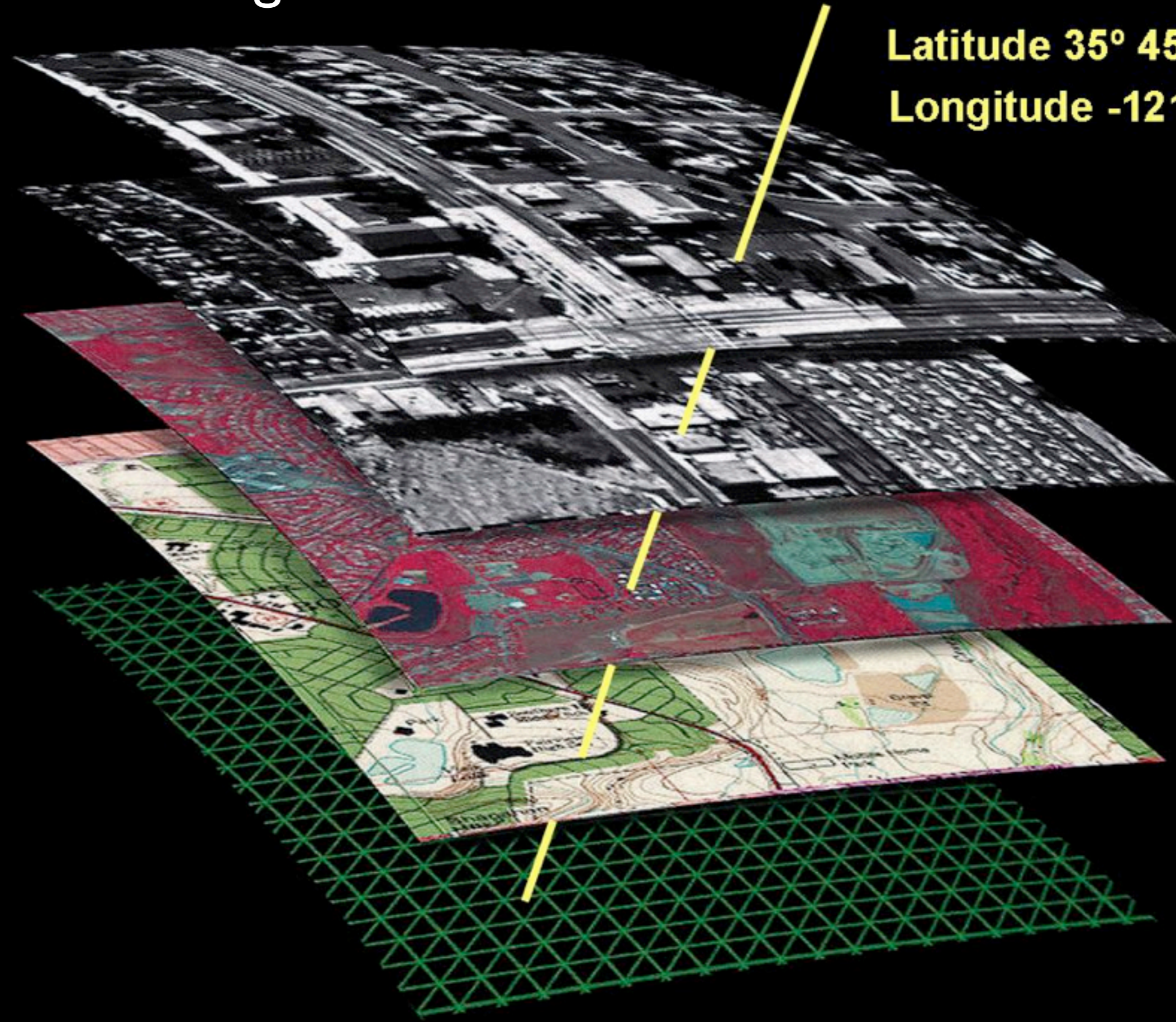


**People**  
Interpretation and  
Explanation

# Model of spatial phenomena

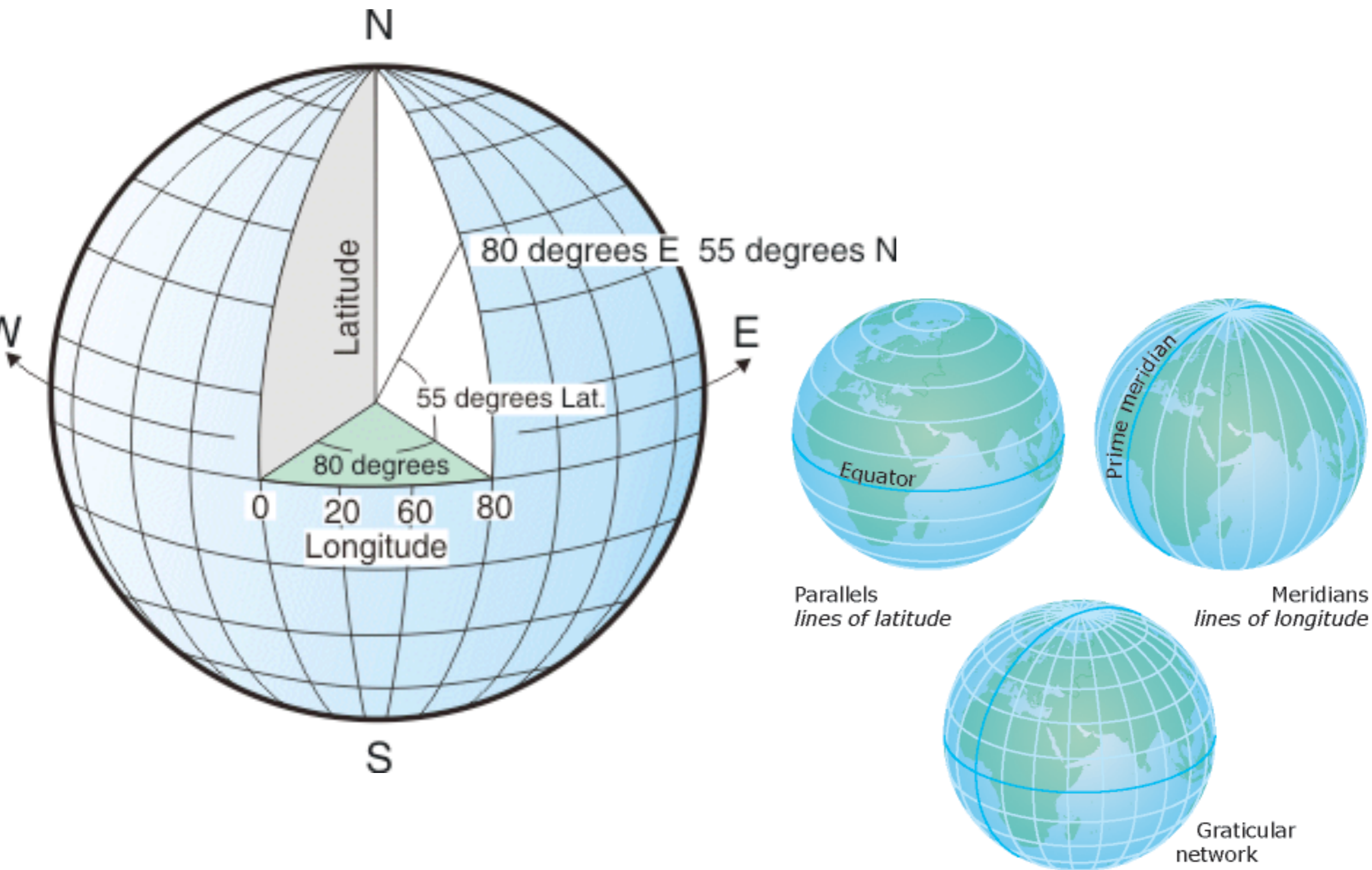


# Georeferencing

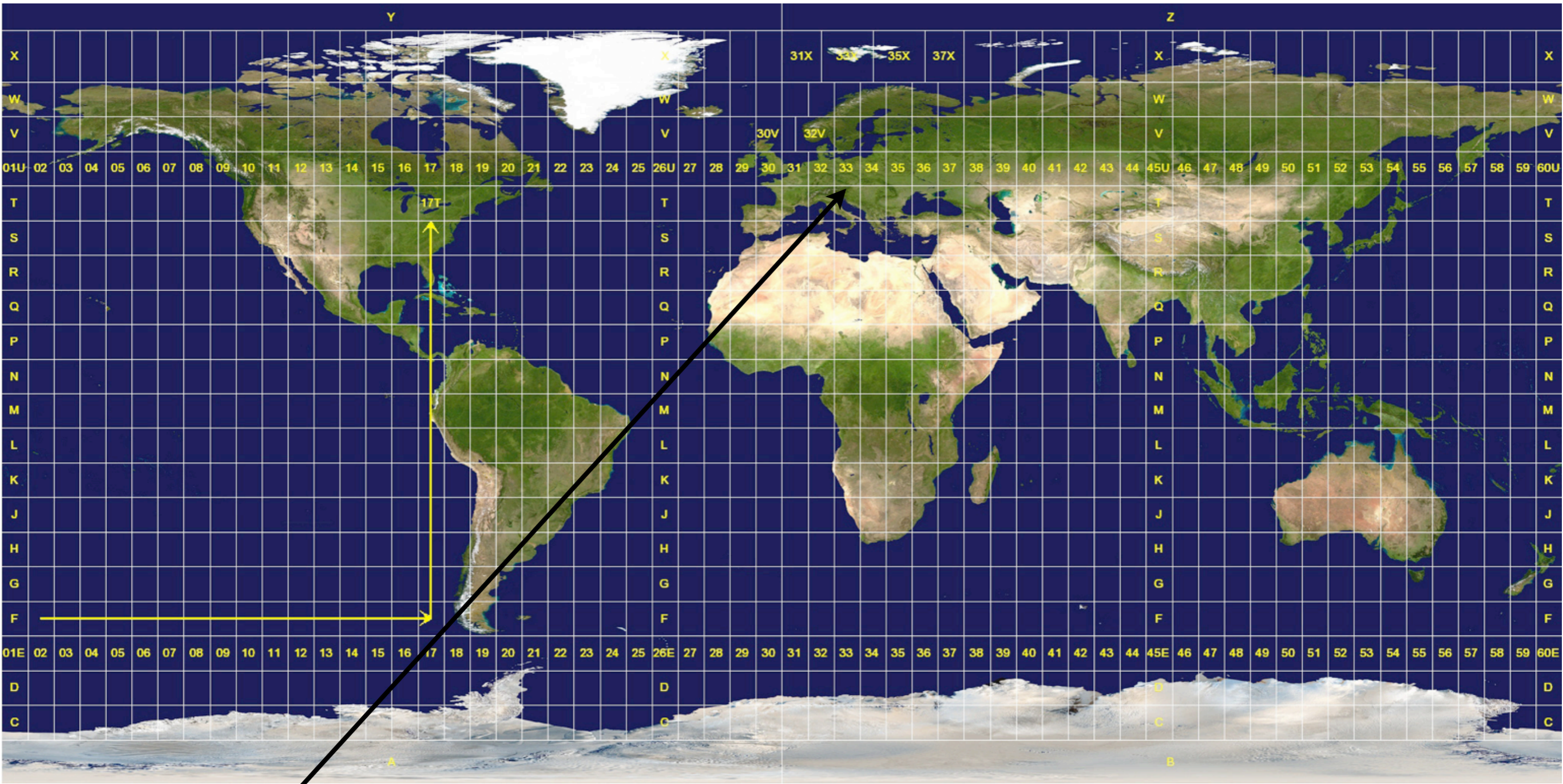


Latitude  $35^{\circ} 45' 20''$   
Longitude  $-121^{\circ} 28' 52''$

# Geographic coordinate system



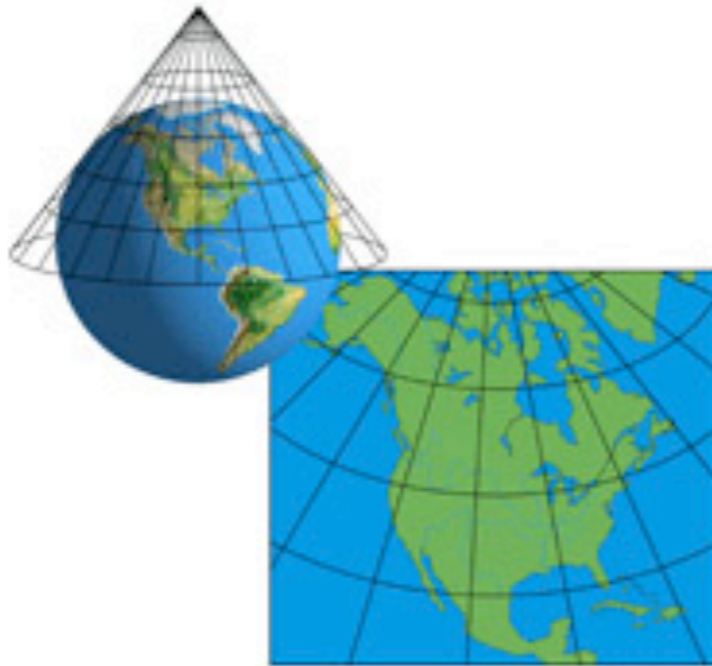
# UTM (Universal Transverse Mercator)



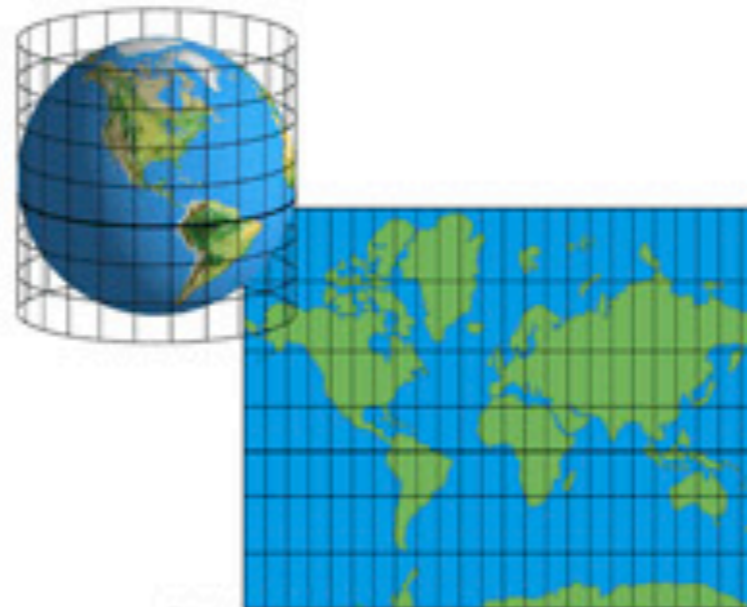
Slovenija: 33T



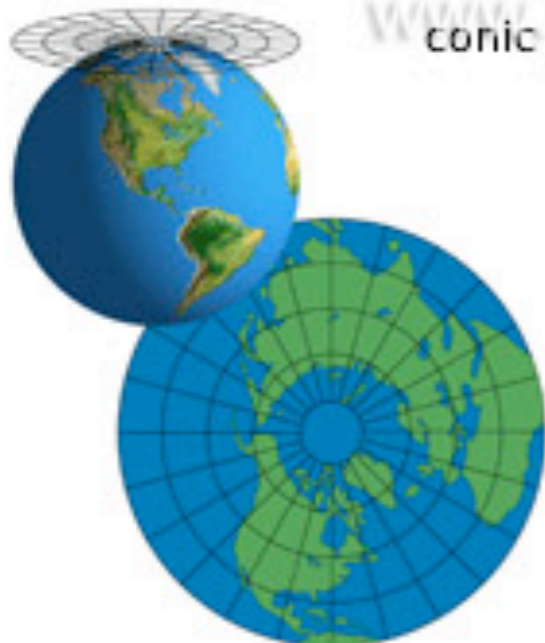
# Prehod iz ukrivljene referenčne ploskve na ravnino



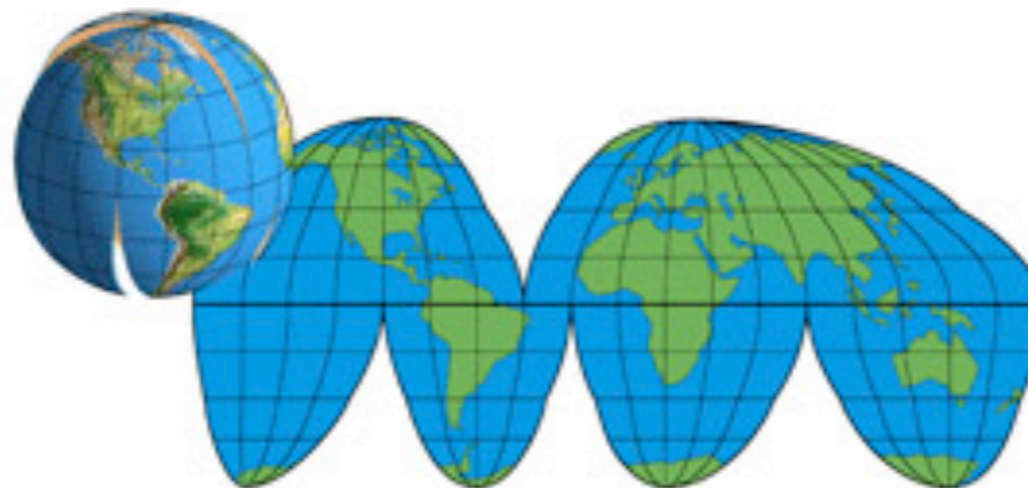
conic projection



cylindrical projection



plane projection

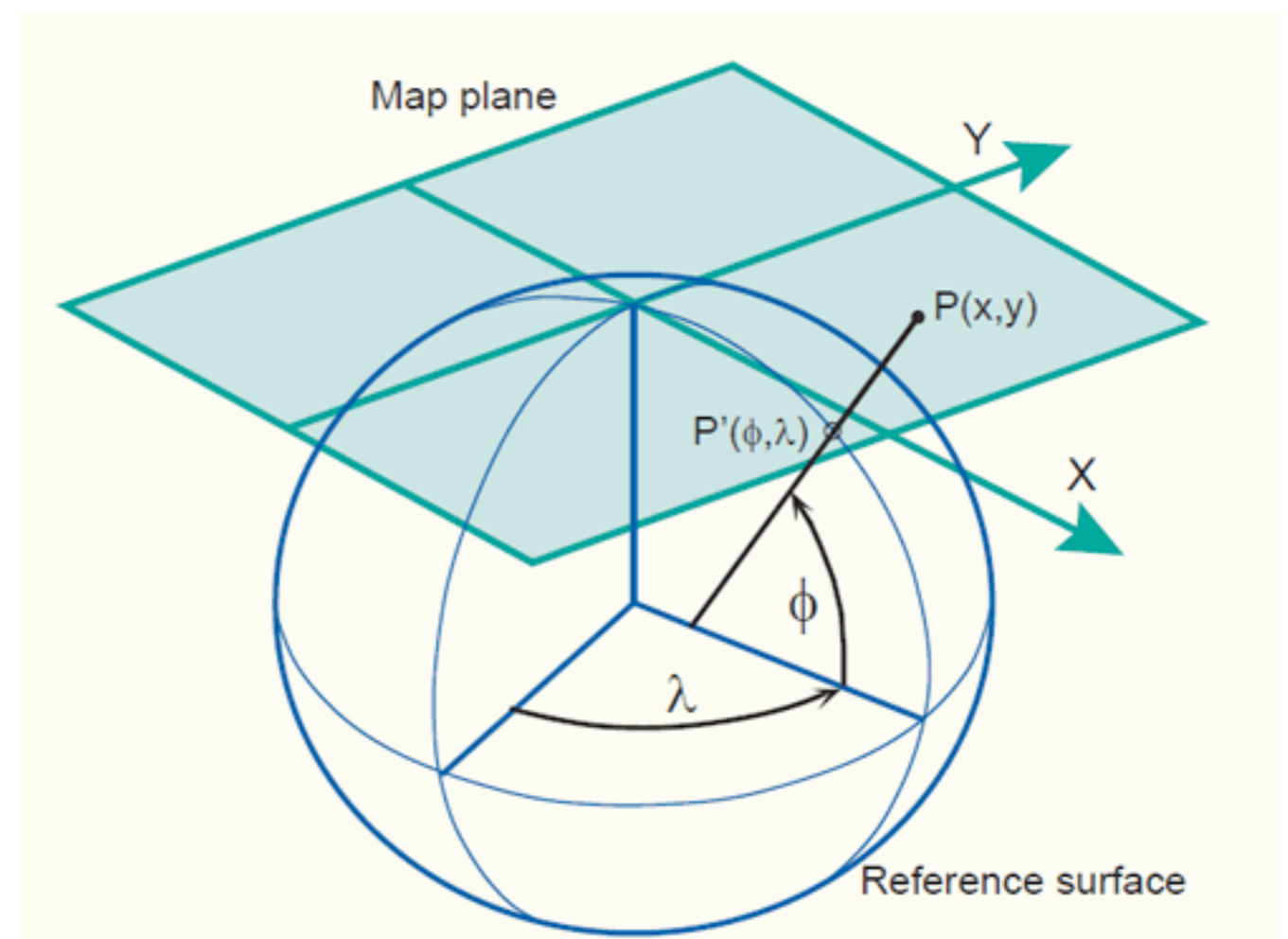


interrupted projection

www.visualdictionaryonline.com

Kartografska projekcija obravnava preslikavao elipsoida v ravnino. Je analitična preslikava prostorskih (3D) točk z elipsoida (krogle) na ravnino (2D karto).

Definirana je z matematično zvezo med koordinatami točk na referenčni ploskvi in koordinatami identičnih točk, prikazanih na projekcijski ravnini.



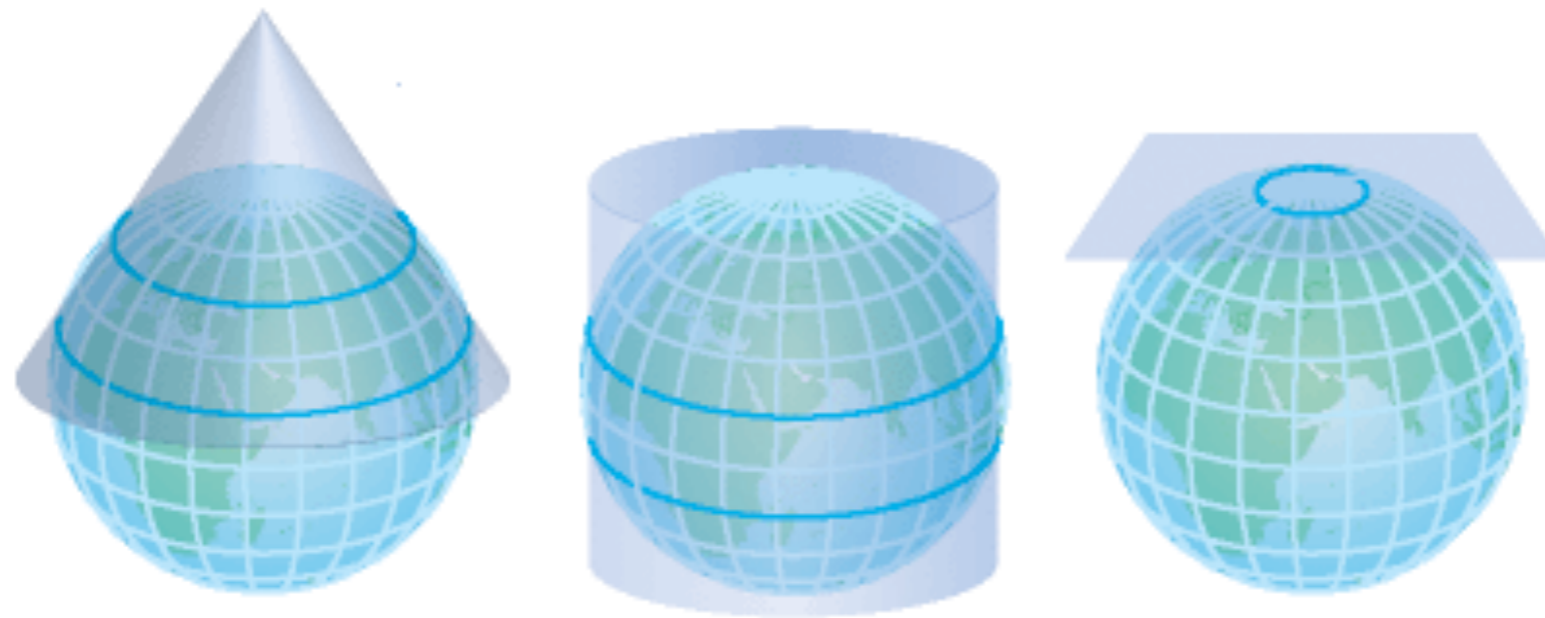
Posledice preslikave so deformacije dolžin, površin, kotov

namen kartografske projekcije je odpraviti eno vrsto deformacij in minimizirati drugi dve

konformne (brez deformacij kotov)

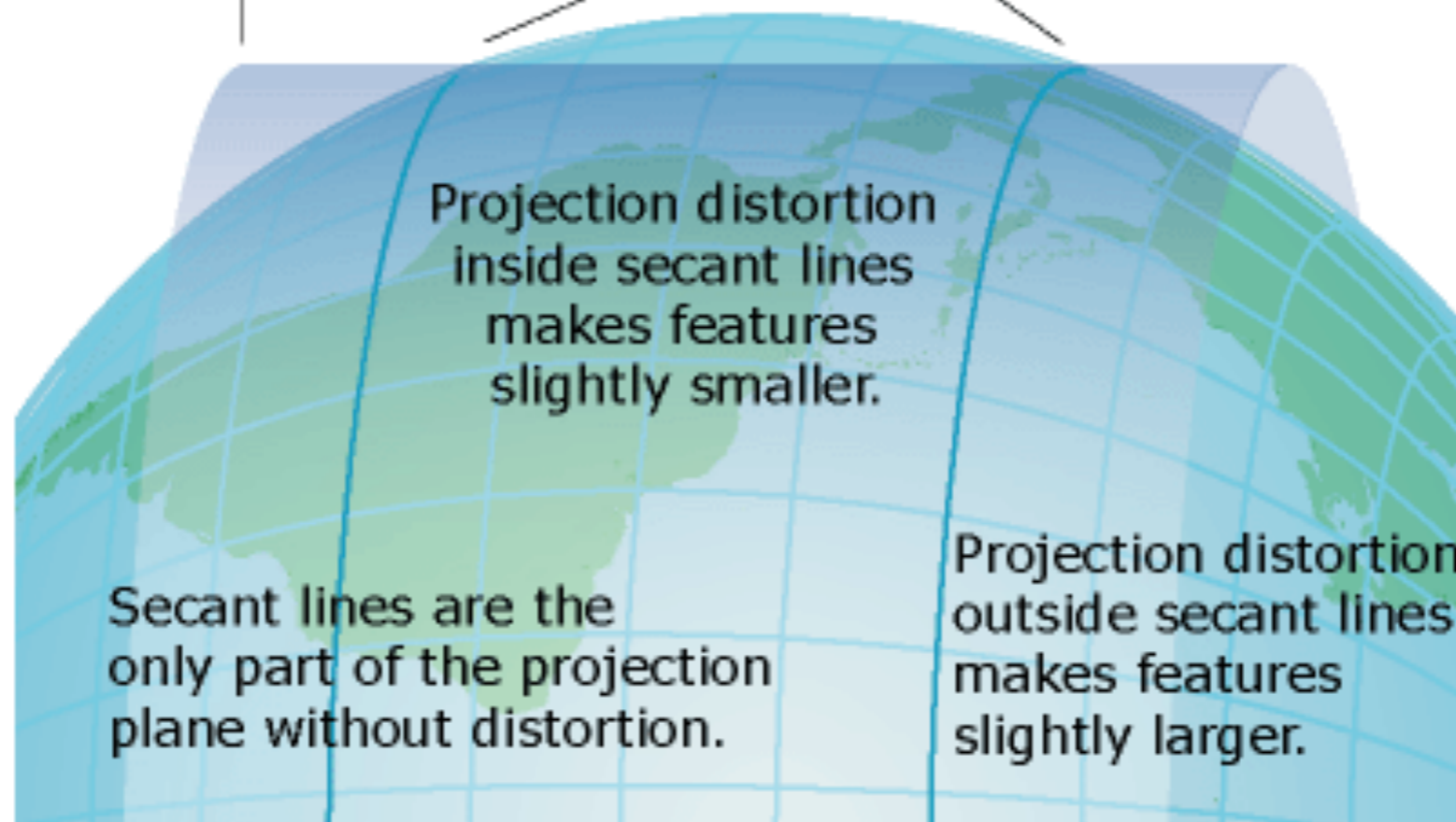
ekvivalentne (brez deformacij površin)

ekvidistantne (brez deformacij dolžin v izbrani smeri)



Projection plane

Secant lines

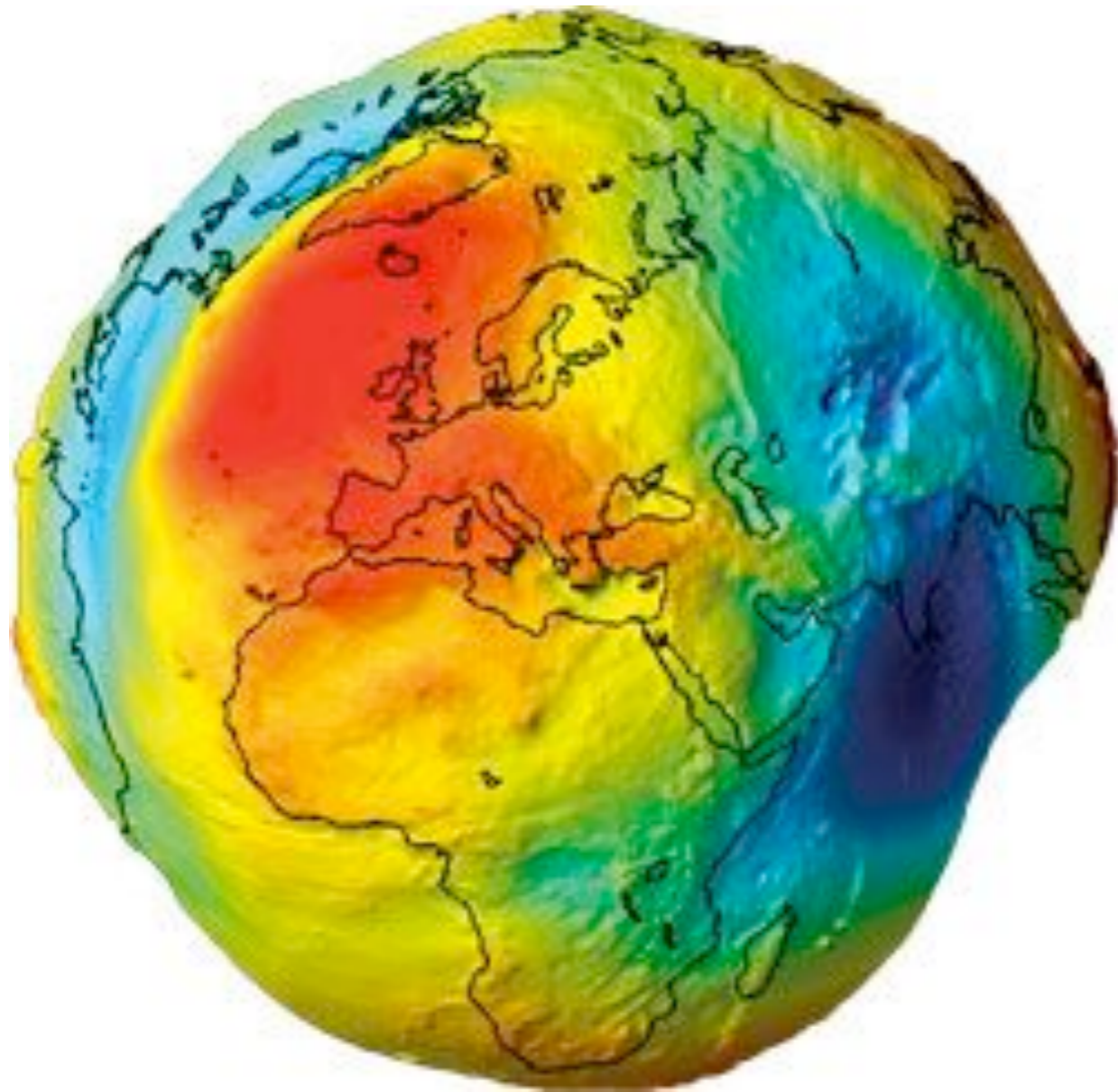


Projection distortion  
inside secant lines  
makes features  
slightly smaller.

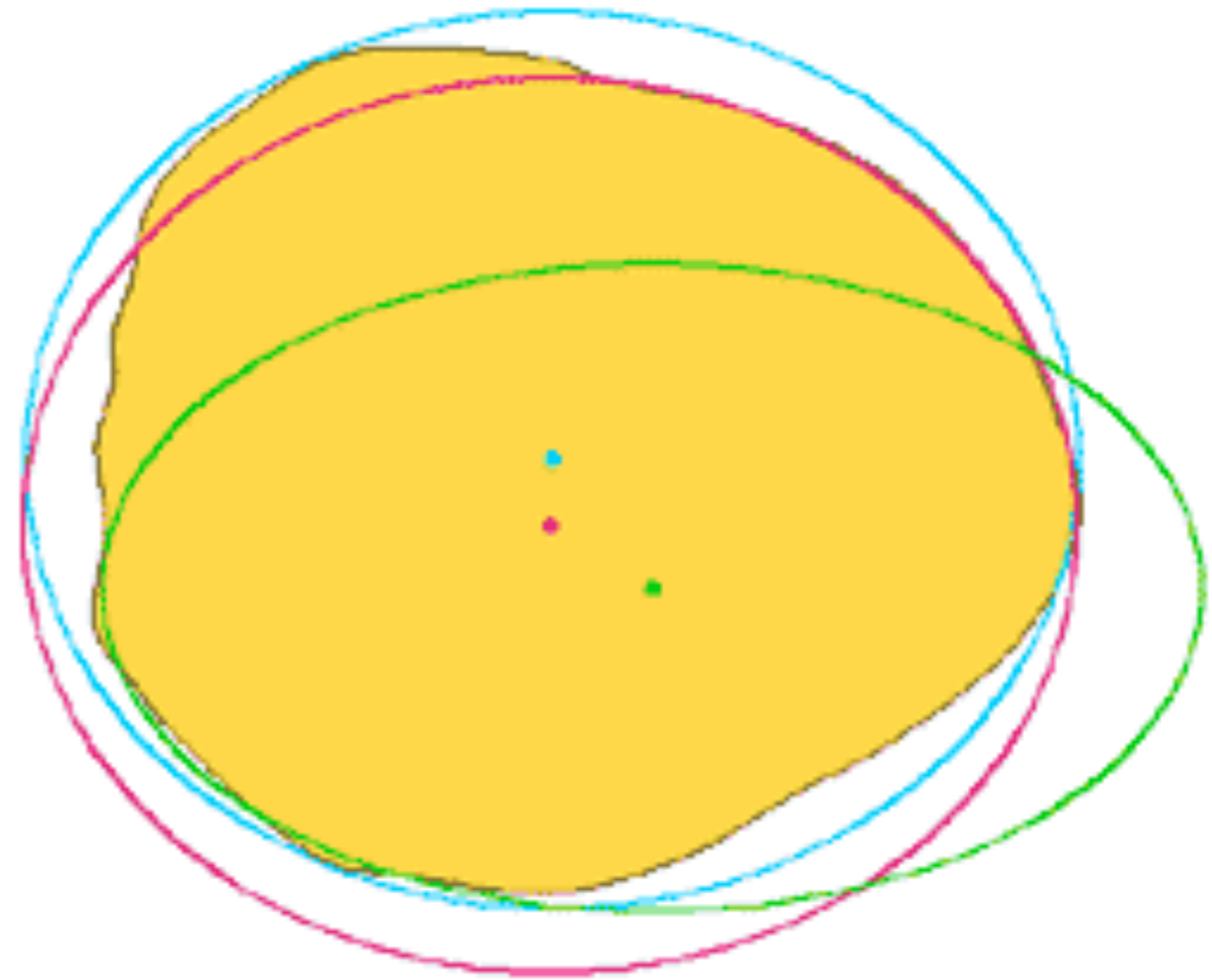
Secant lines are the  
only part of the projection  
plane without distortion.

Projection distortion  
outside secant lines  
makes features  
slightly larger.

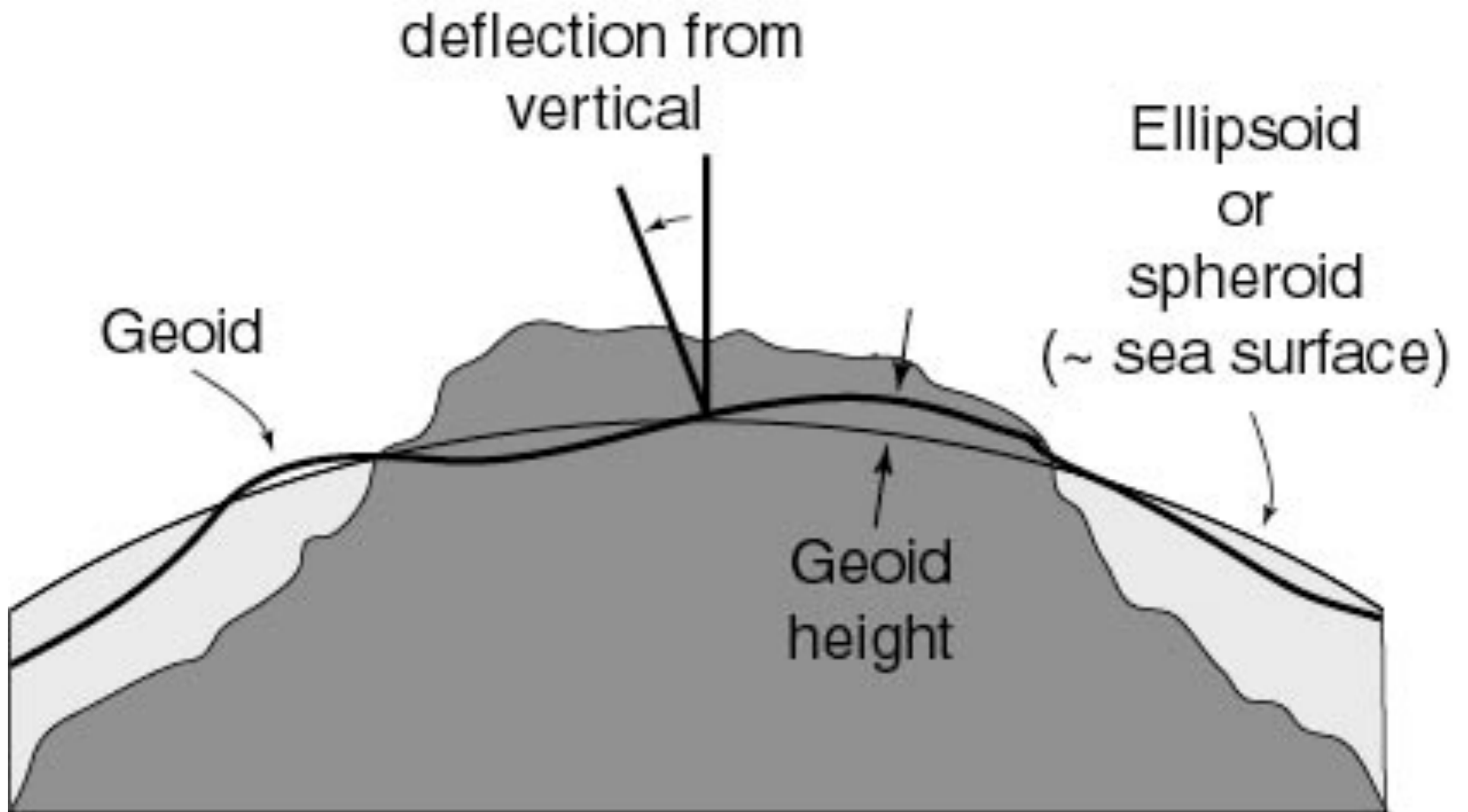
**Geoid**



**Elipsoid**



**Bessel 1841, WGS84 ...**



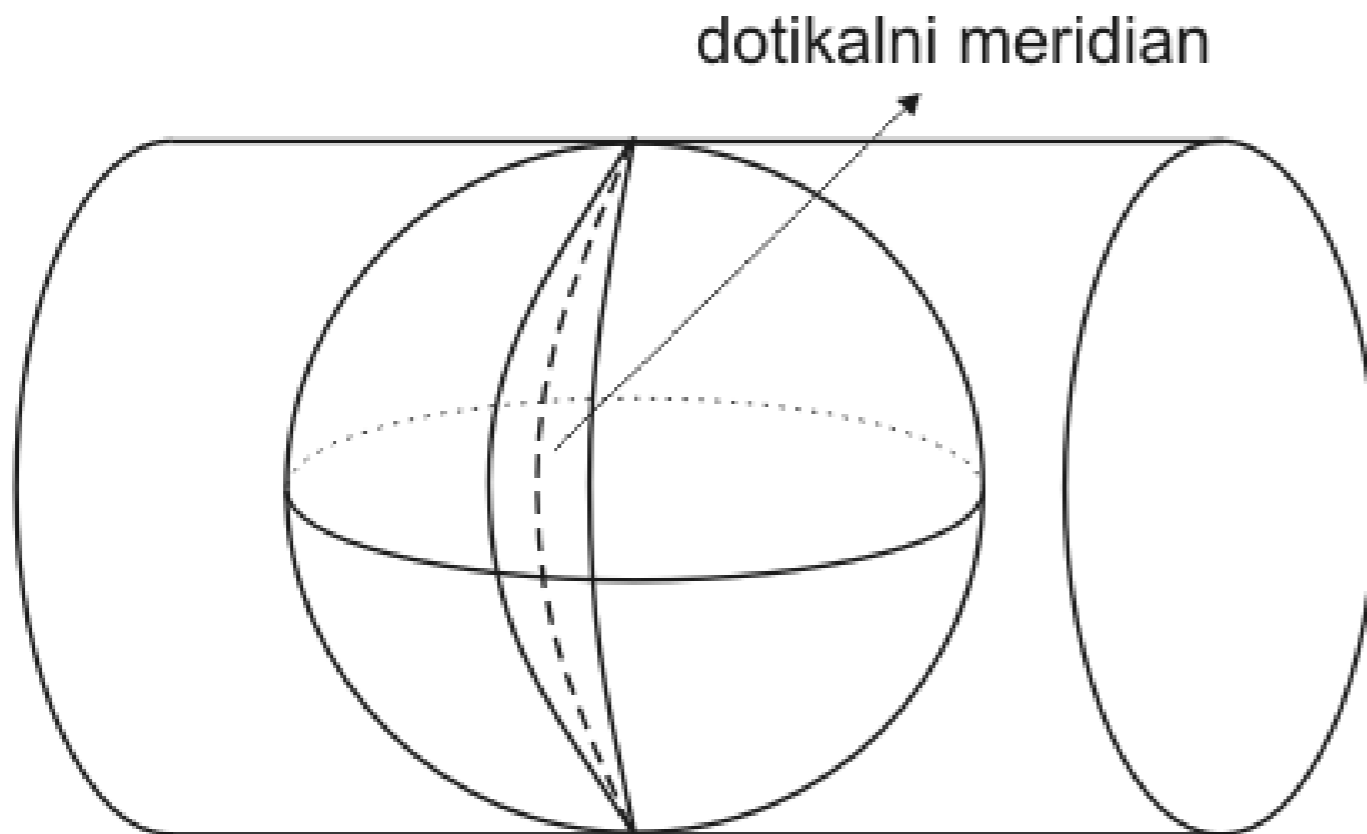
# Državni koordinatni sistemi v Sloveniji

## Stari: GK, D48/GK

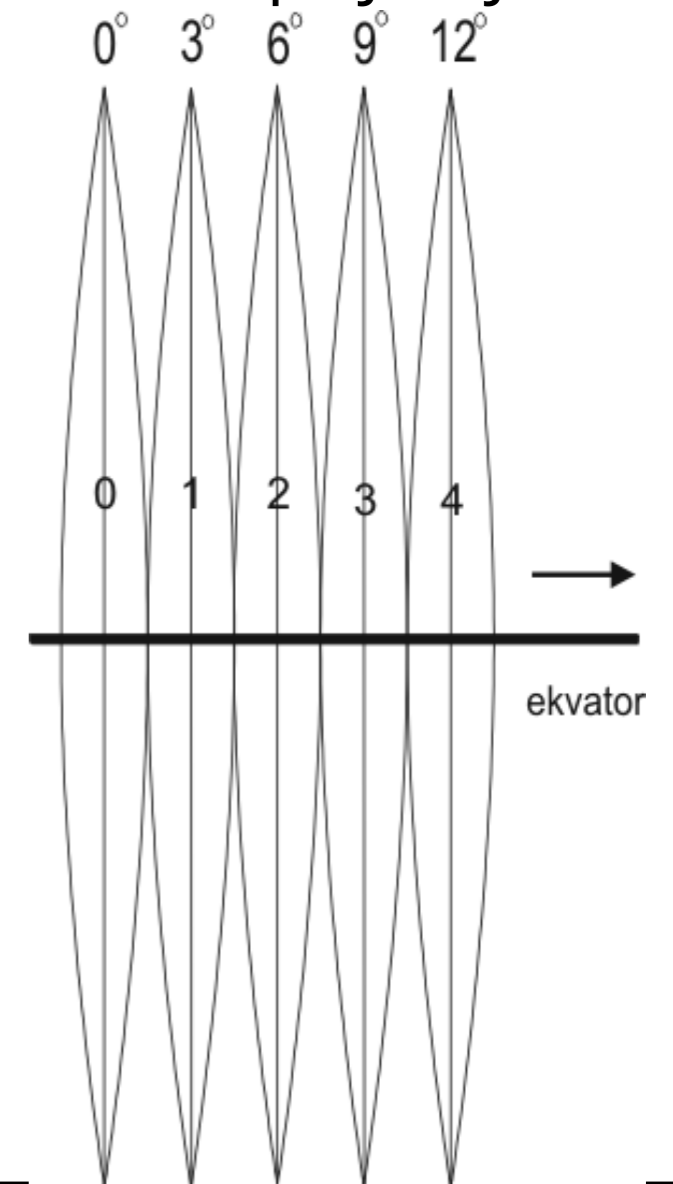
- Oznaka kartografske projekcije: GK – Gauß-Krügerjeva projekcija
- Oznaka koordinatnega sistema: D48/GK
- Referenčna ploskev: elipsoid Bessel 1841
- Številka cone: = 5 (vendar je ne označujemo)
- Širina cone: =  $3^{\circ} 15'$
- Geografska dolžina srednjega meridiana cone: =  $15^{\circ}$
- Geografska širina izhodiščne paralele: =  $0^{\circ}$
- Linijsko merilo na srednjem meridianu: = 0,9999
- Navidezni pomik proti severu: = -5.000.000 m
- Navidezni pomik proti vzhodu: = 500.000 m

## Lastnosti:

- konformna - ohranja kote, ostale deformacije naraščajo z oddaljenostjo od dotikalnega (srednjega) meridiana.
- Širina cone (velikost območja) preslikave je odvisna od merila na srednjem meridianu, zahtevana natančnost projekcije in geografske lege območja.
- Za geodetska računanja, katastrsko in topografsko izmero je standard projekcijske natančnosti v večini držav 1 : 10 000 (1 dm/km).



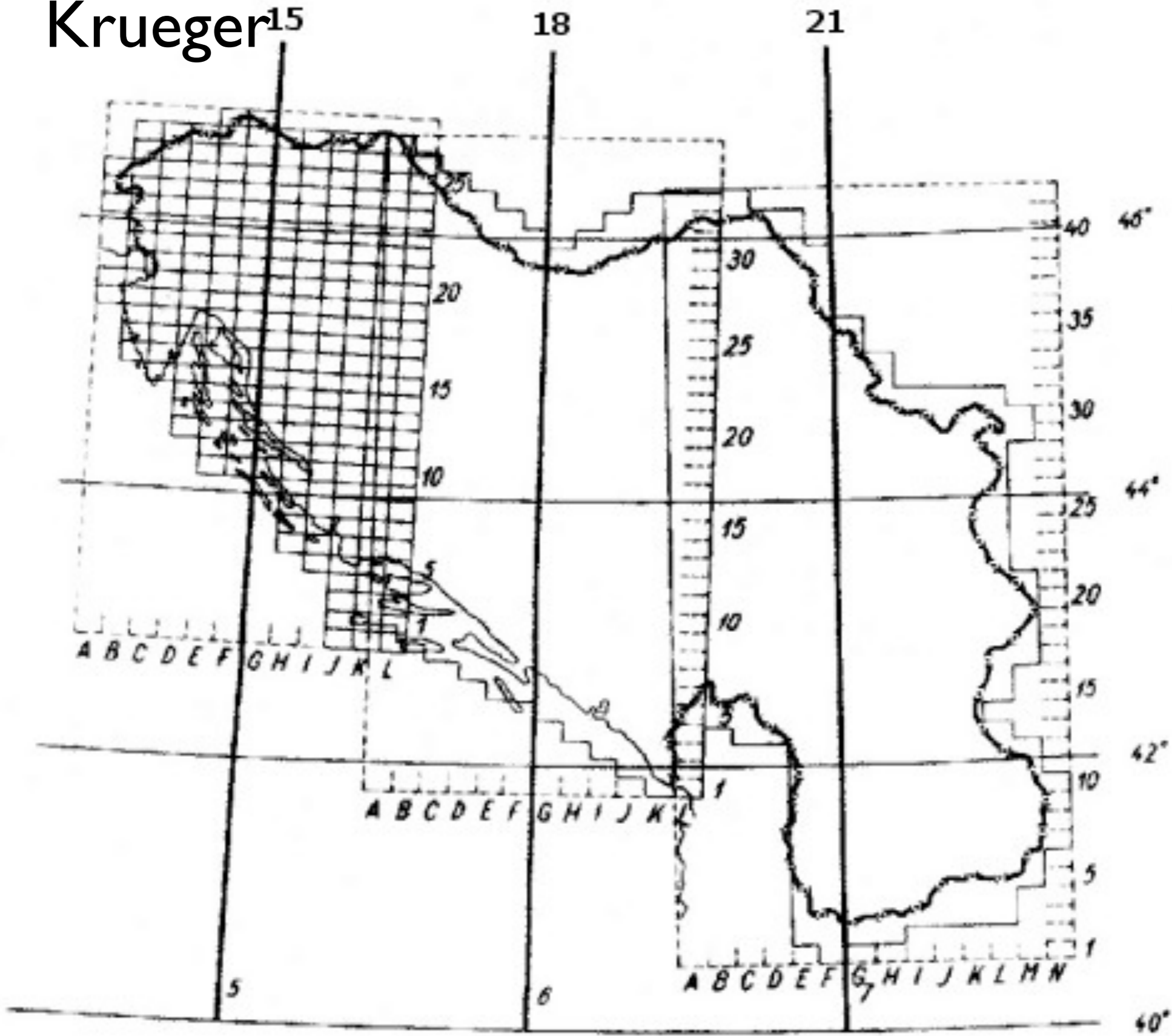
Širina meridianske cone =  $3^\circ \Rightarrow$   
333 km  $\phi = 0^\circ$  , 254 km  $\phi = 46^\circ$





# Gauss

# Krueger



Transverse  
Mercator

Bessel 1841

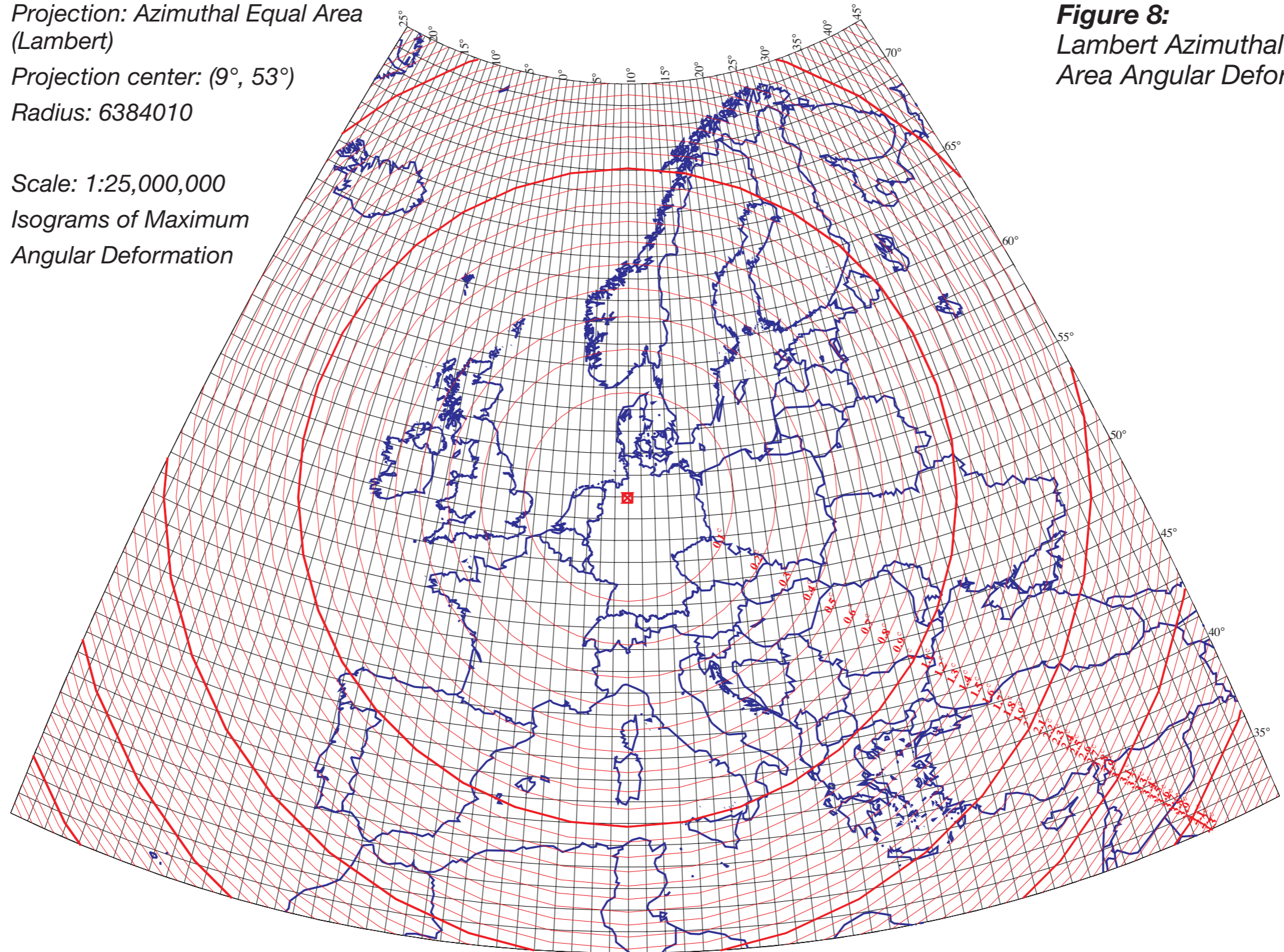
# Novi koordinati sistem D96/TM

- Oznaka kartografske projekcije: TM – prečna Mercatorjeva projekcija
  - Oznaka koordinatnega sistema: D96/TM
  - Referenčna ploskev: elipsoid GRS80
  - Številka cone: = 5 (vendar je ne označujemo)
  - Širina cone: =  $3^{\circ} 15'$
  - Geografska dolžina srednjega meridiana cone: =  $15^{\circ}$
  - Geografska širina izhodiščne paralele: =  $0^{\circ}$
  - Linijsko merilo na srednjem meridianu: = 0,9999
  - Navidezni pomik proti severu: = -5.000.000 m
  - Navidezni pomik proti vzhodu: = 500.000 m
- 
- Novi slovenski horizontalni koord. sistem temelji na skupnem evropskem koord. sistemu ETRS89.

# EUROPEAN TERRESTRIAL REFERENCE SYSTEM 89 (ETRS89)

Projection: Azimuthal Equal Area  
(Lambert)  
Projection center: (9°, 53°)  
Radius: 6384010

Scale: 1:25,000,000  
Isograms of Maximum  
Angular Deformation

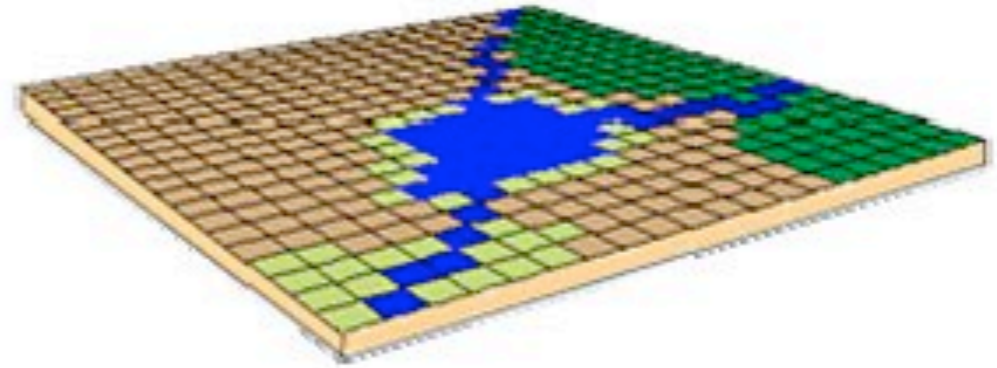


**Figure 8:**  
Lambert Azimuthal Equal  
Area Angular Deformation.



Figure 2. ETRF2000 horizontal velocities of EPN stations.

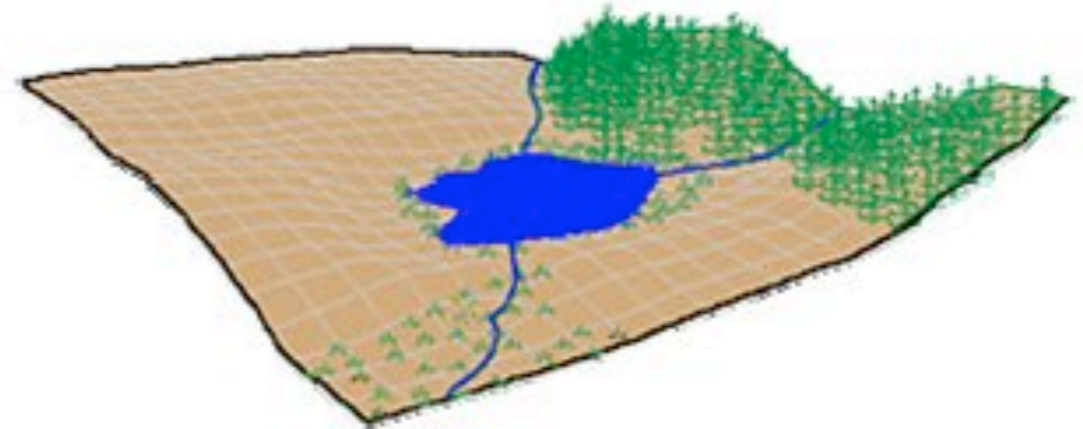
- RASTER



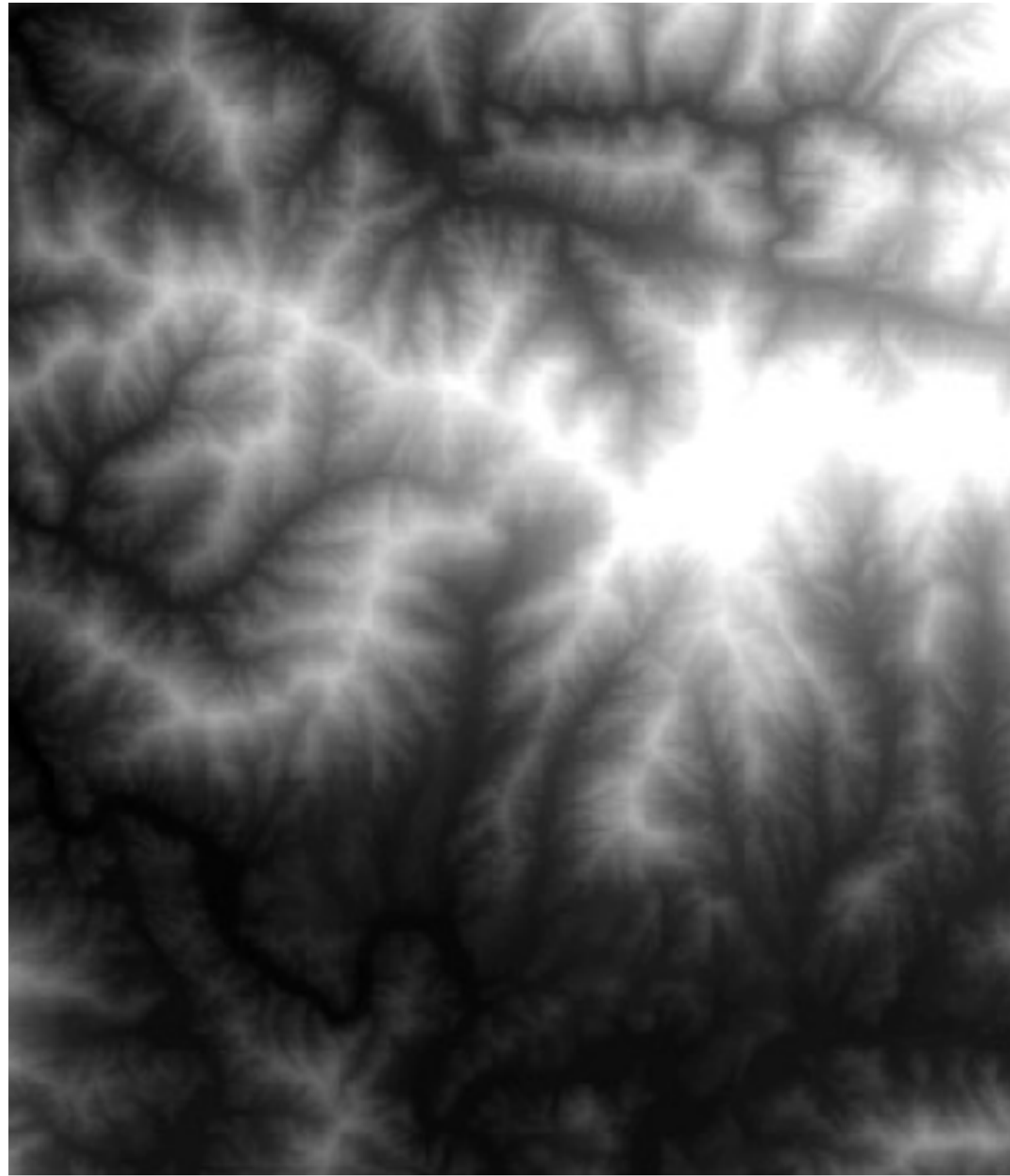
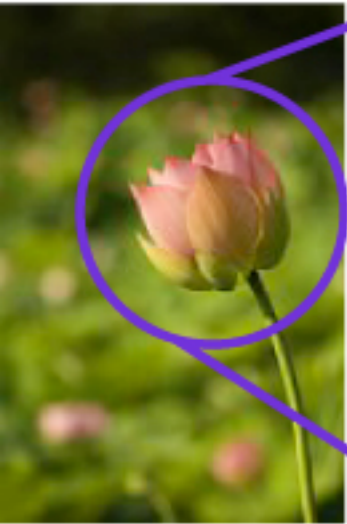
- VECTOR



- Real World



# Rasters



# Resolution

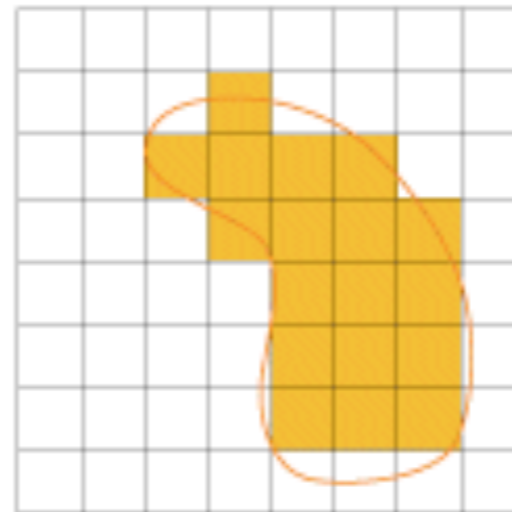
71 m<sup>2</sup>  
polygon



73 m<sup>2</sup>  
1 m cell  
16 x 16 cells



72 m<sup>2</sup>  
2 m cell  
8 x 8 cells



80 m<sup>2</sup>  
4 m cell  
4 x 4 cells



- Smaller cell size
- Higher resolution
- Higher feature spatial accuracy
- Slower display
- Slower processing
- Larger file size

- Larger cell size
- Lower resolution
- Lower feature spatial accuracy
- Faster display
- Faster processing
- Smaller file size



# The “Paper Map World” *(analog)*

## **POINTS**



*Dot of ink*

## **LINES**



*Dragged flow of ink*

## **AREAS**



*Dragged and filled  
flow of ink*

# The “GIS Map World” *(digital)*

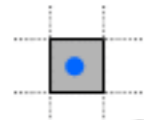
*X, Y coordinates*



(Vector)

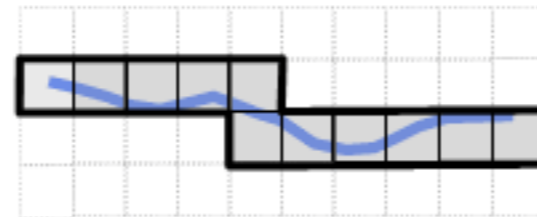


(Vector)

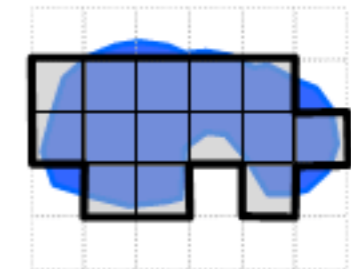


*Cell Col, Row*

(Raster)



(Raster)

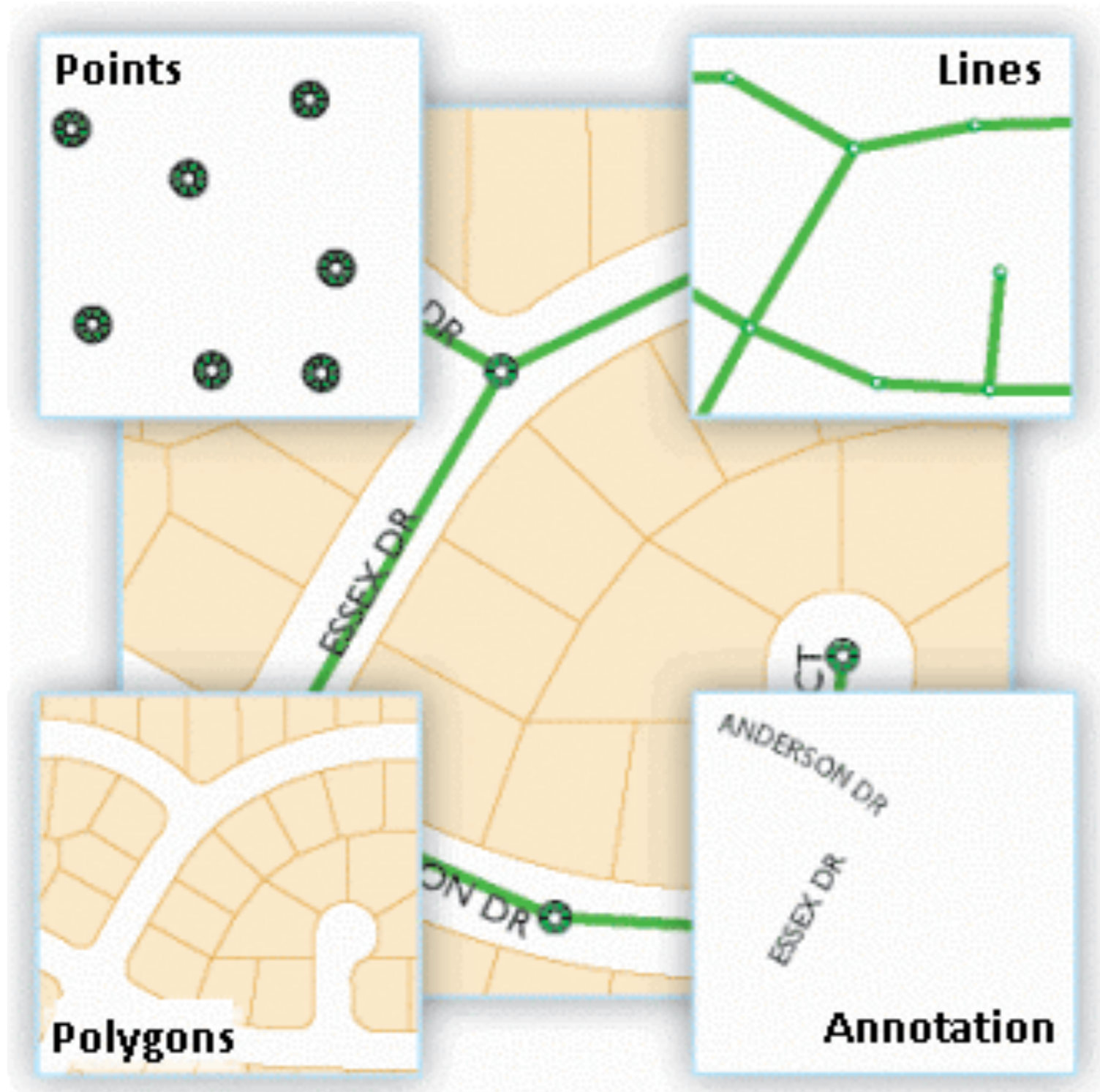


**POINTS** are stored as individual X, Y coordinates (Vector) or as individual Column, Row cell entries in a grid (Raster)

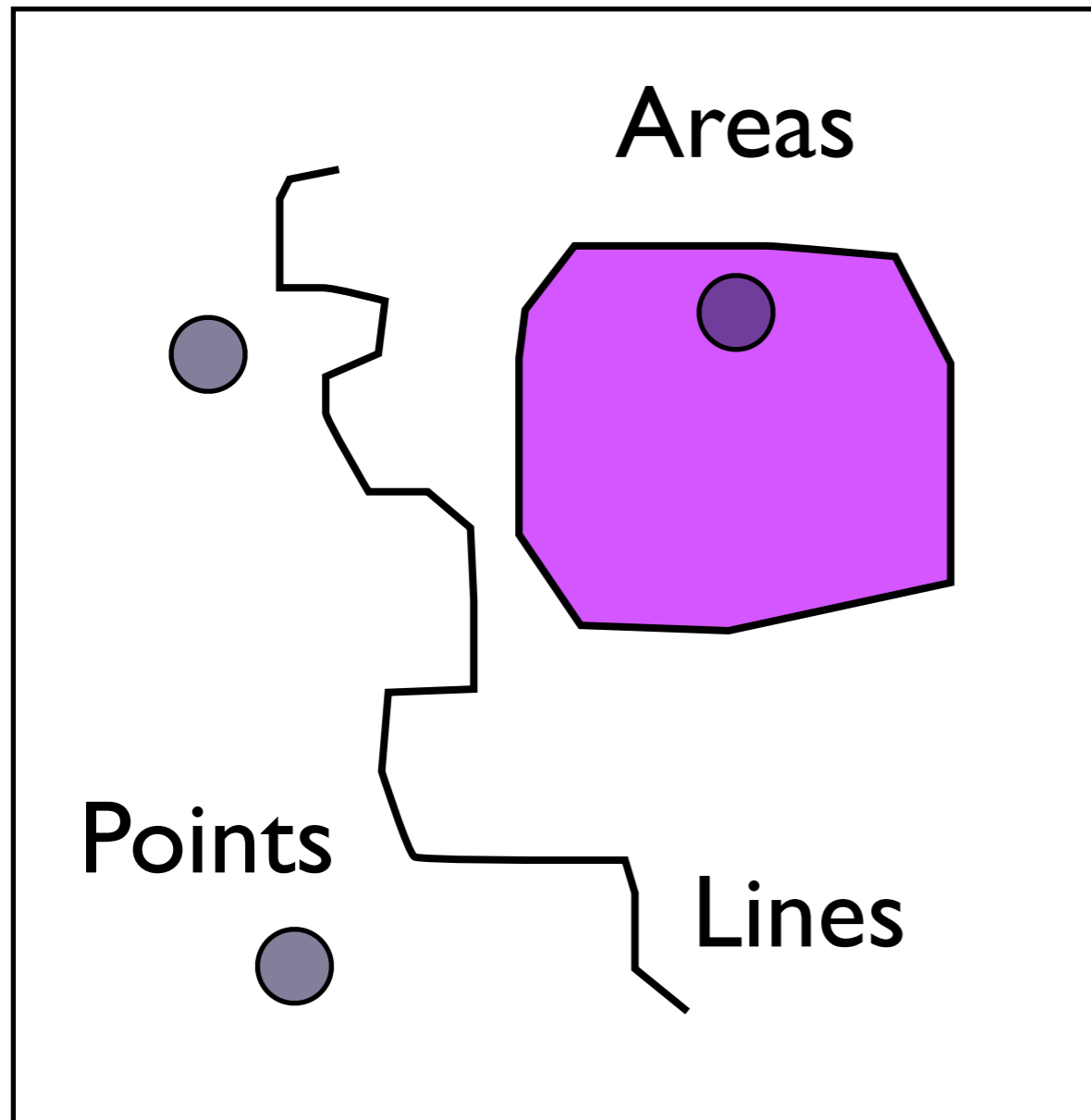
**LINES** are stored as a set of mathematically connected X, Y coordinates (Vector) or as a set of connected grid cells (Raster)

**AREAS** are stored as a set of mathematically connected X, Y coordinates defining the boundary (Vector) or as a set of contiguous cells defining the interior (Raster)





# Vectors



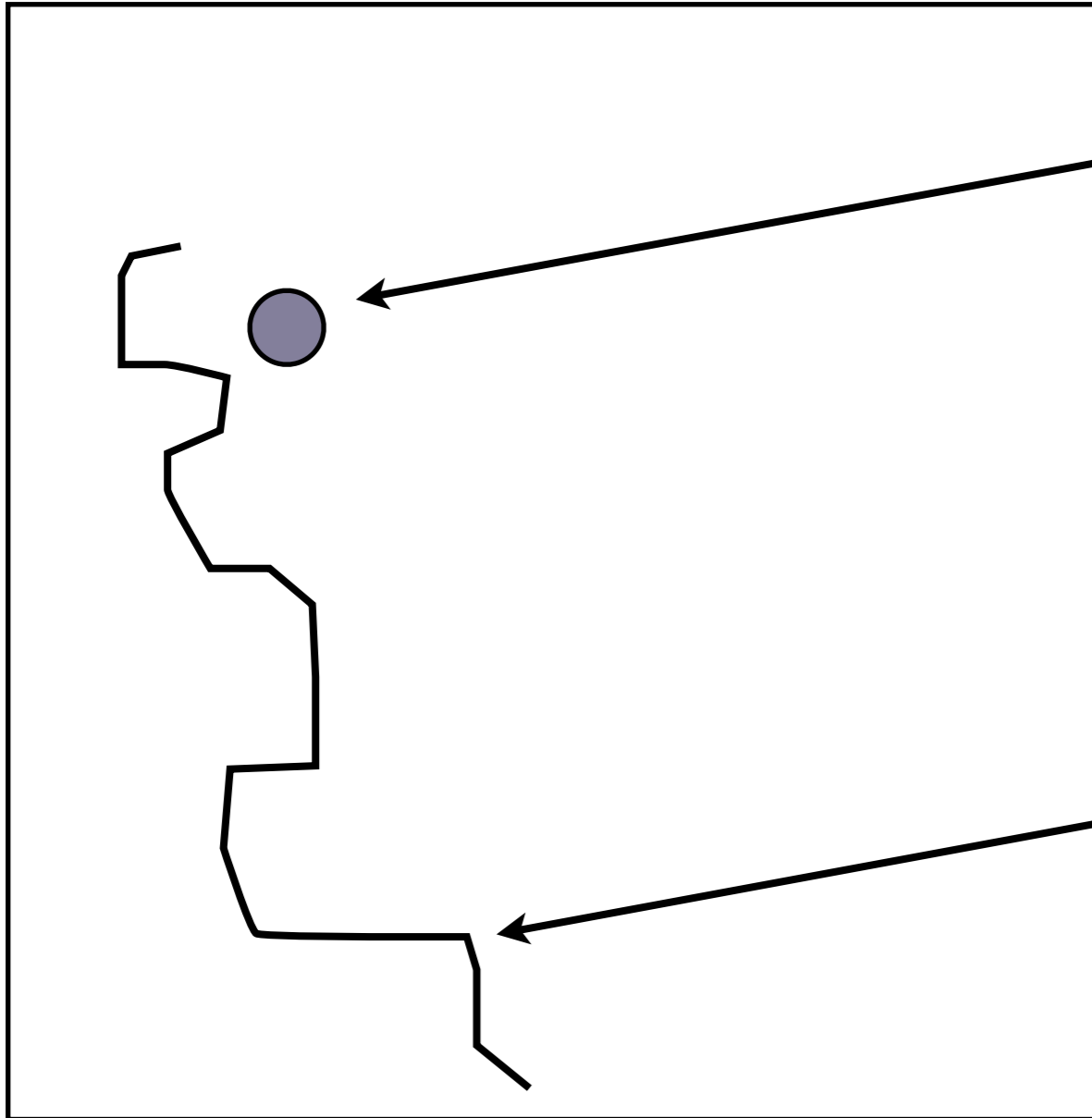
Locational component

Topological component

Attribute component

Metadata component

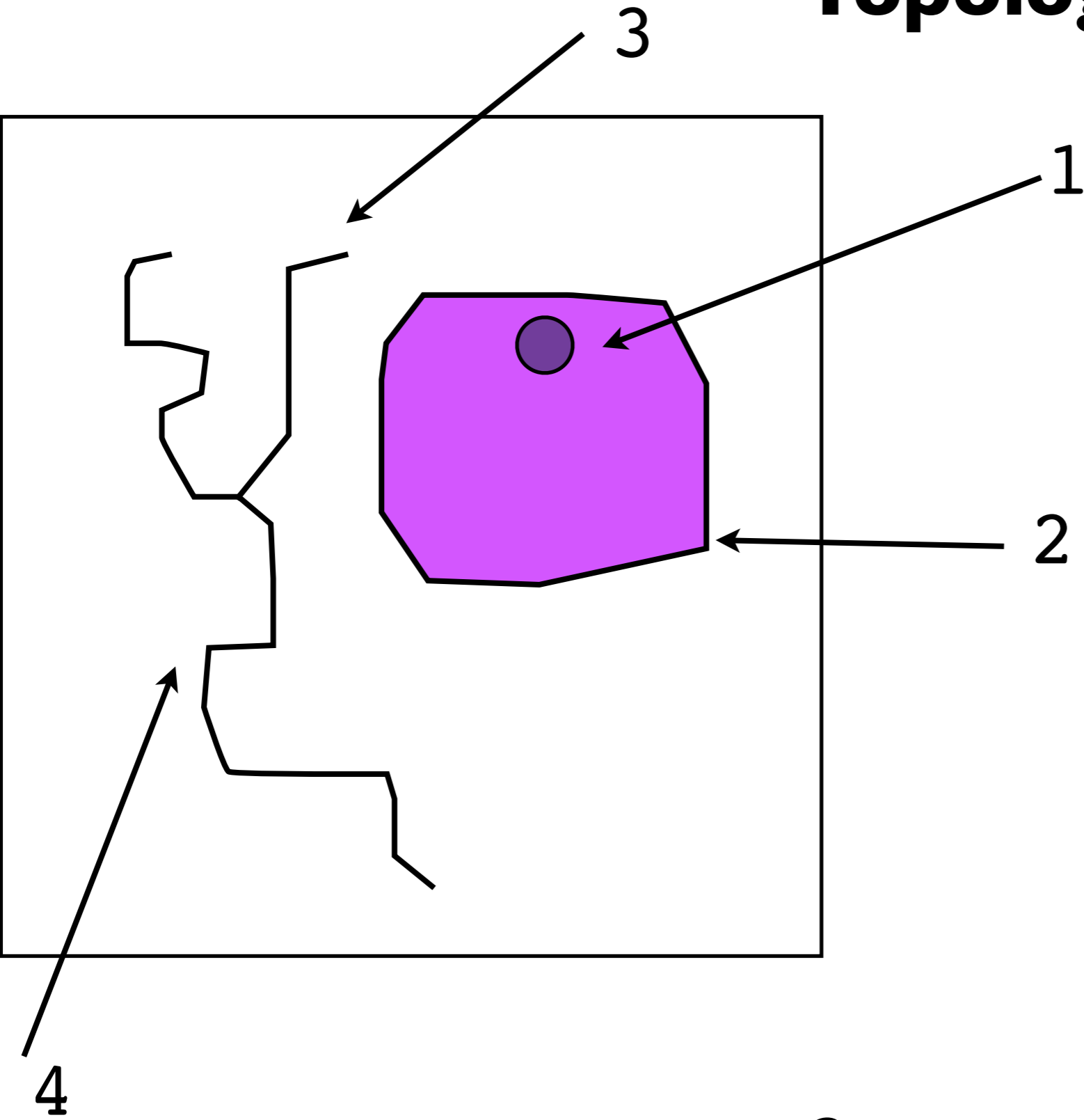
# Locational component



Point, 1201, 6234

Line,  
1134, 6240,  
1221, 6220,  
1211, 6212  
.....

# Topological component



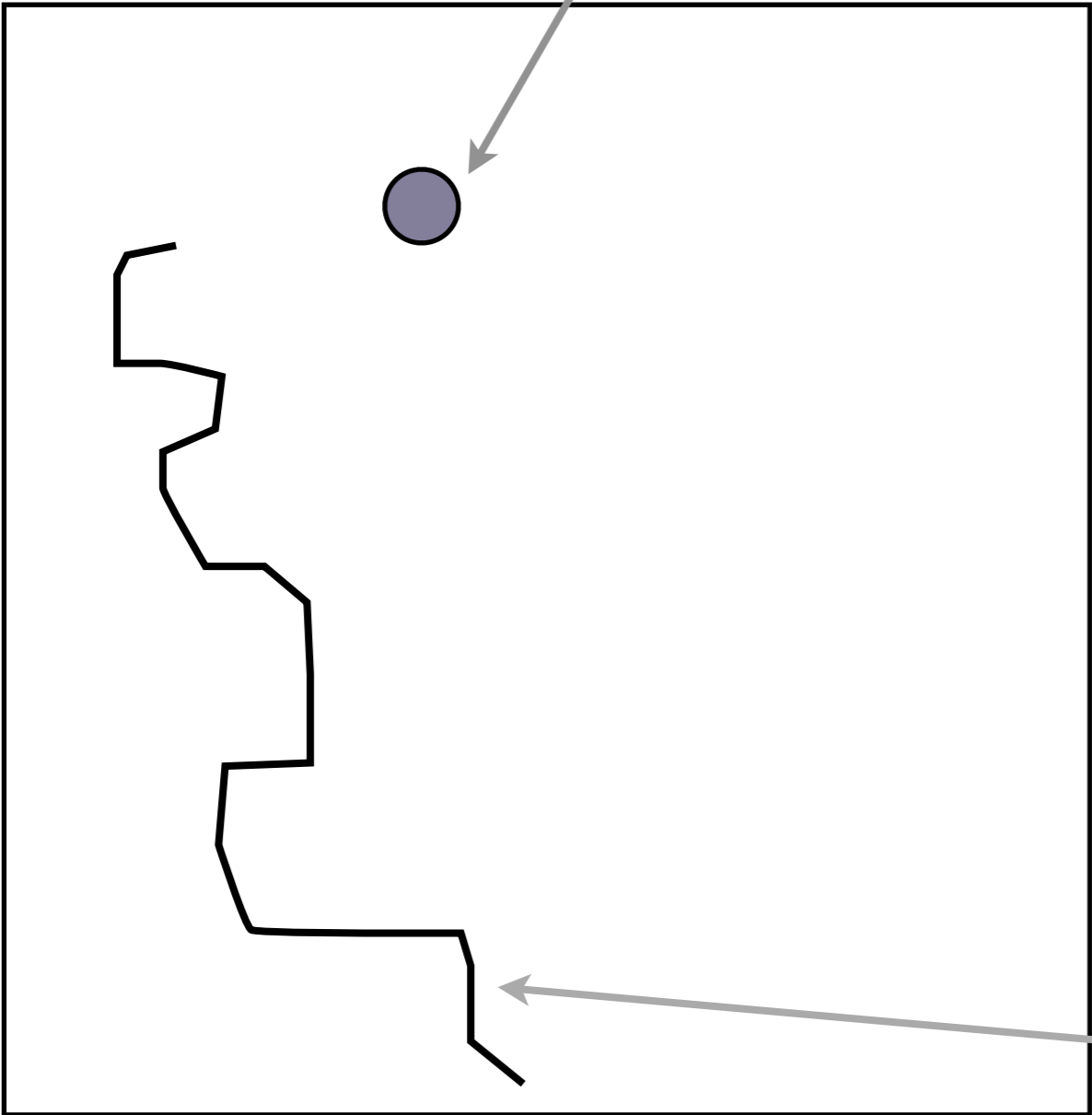
1 is inside 2

3 is connected to 4

# Attribute component

*id, type, date, name*

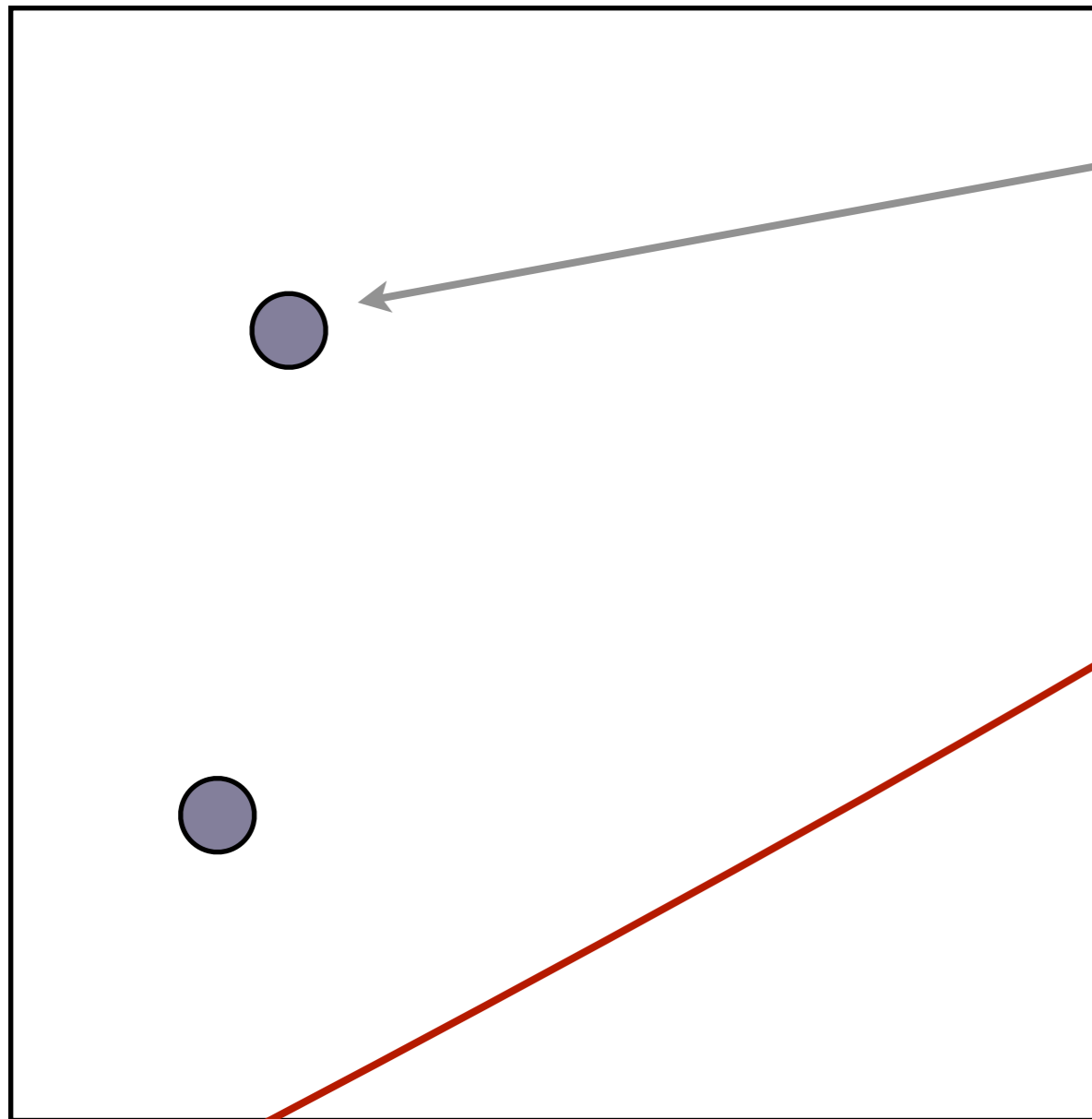
1, archaeological site, Roman, Ammaia



*id, type, name*

2, river, Rio Sever

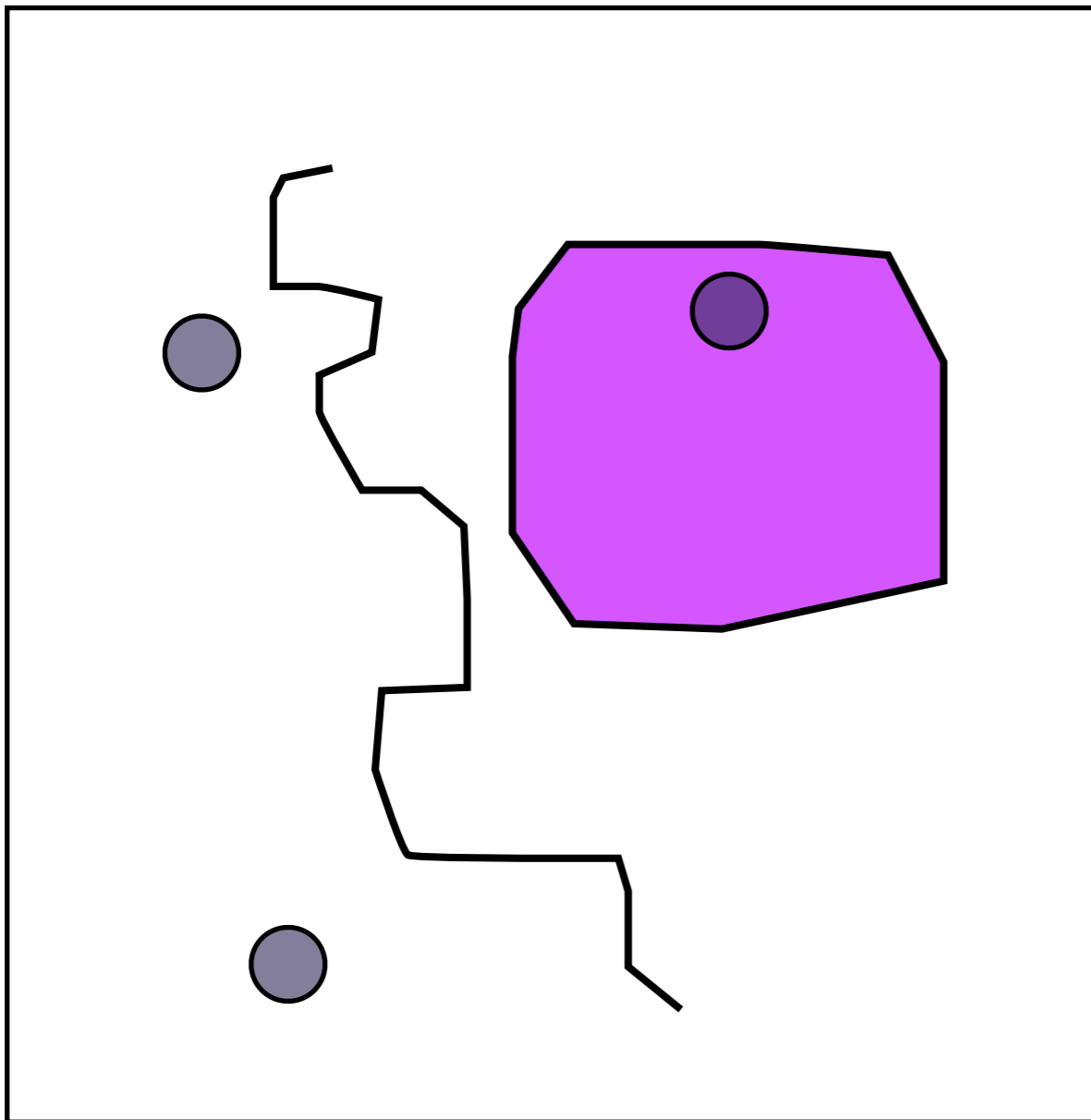
# Linking with external databases



id  
1

id, name, type, no\_amphorae, no\_coarseware  
1, Ammaia, 1256, 7654

# Metadata



Projection

Source

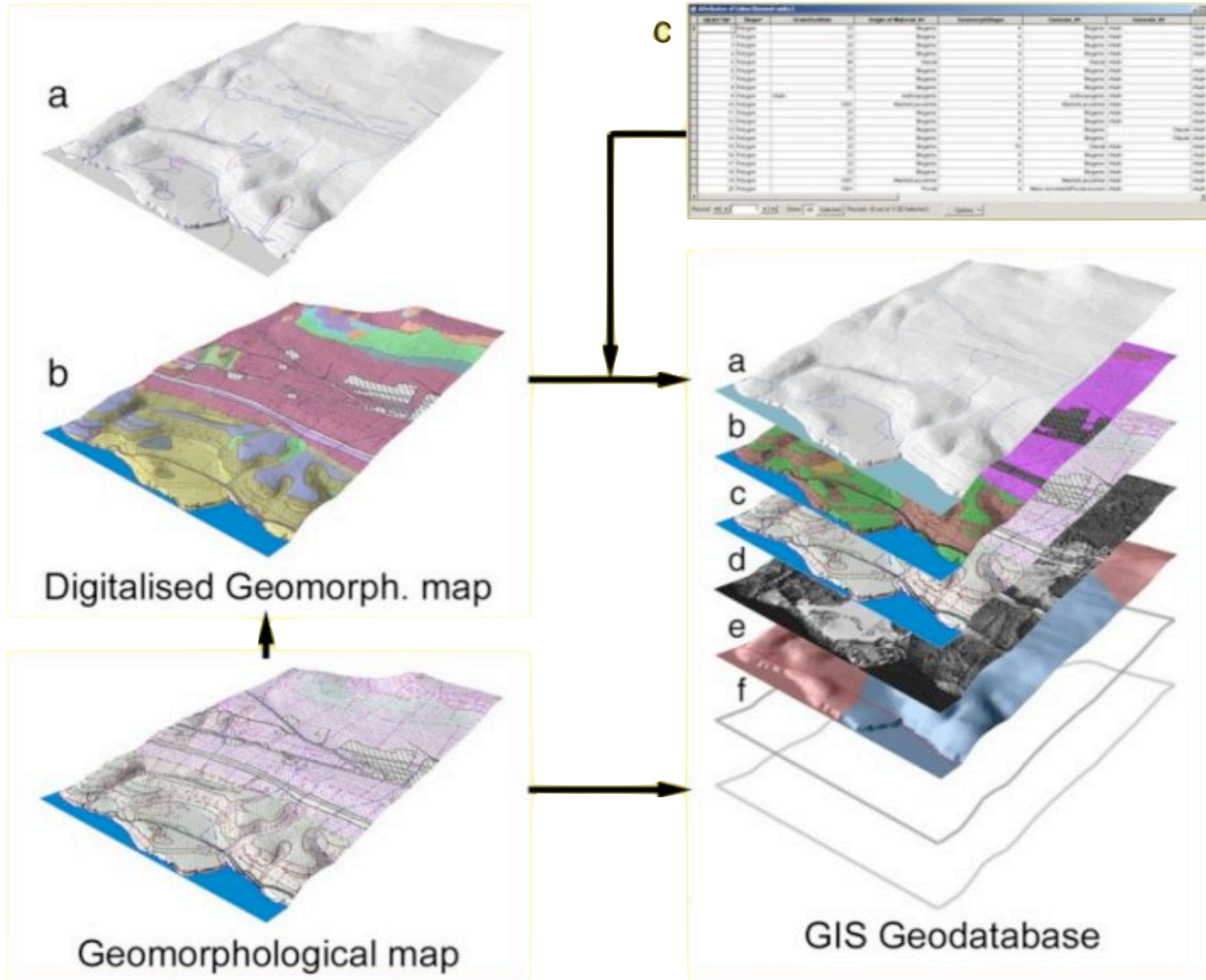
Legend

Errors

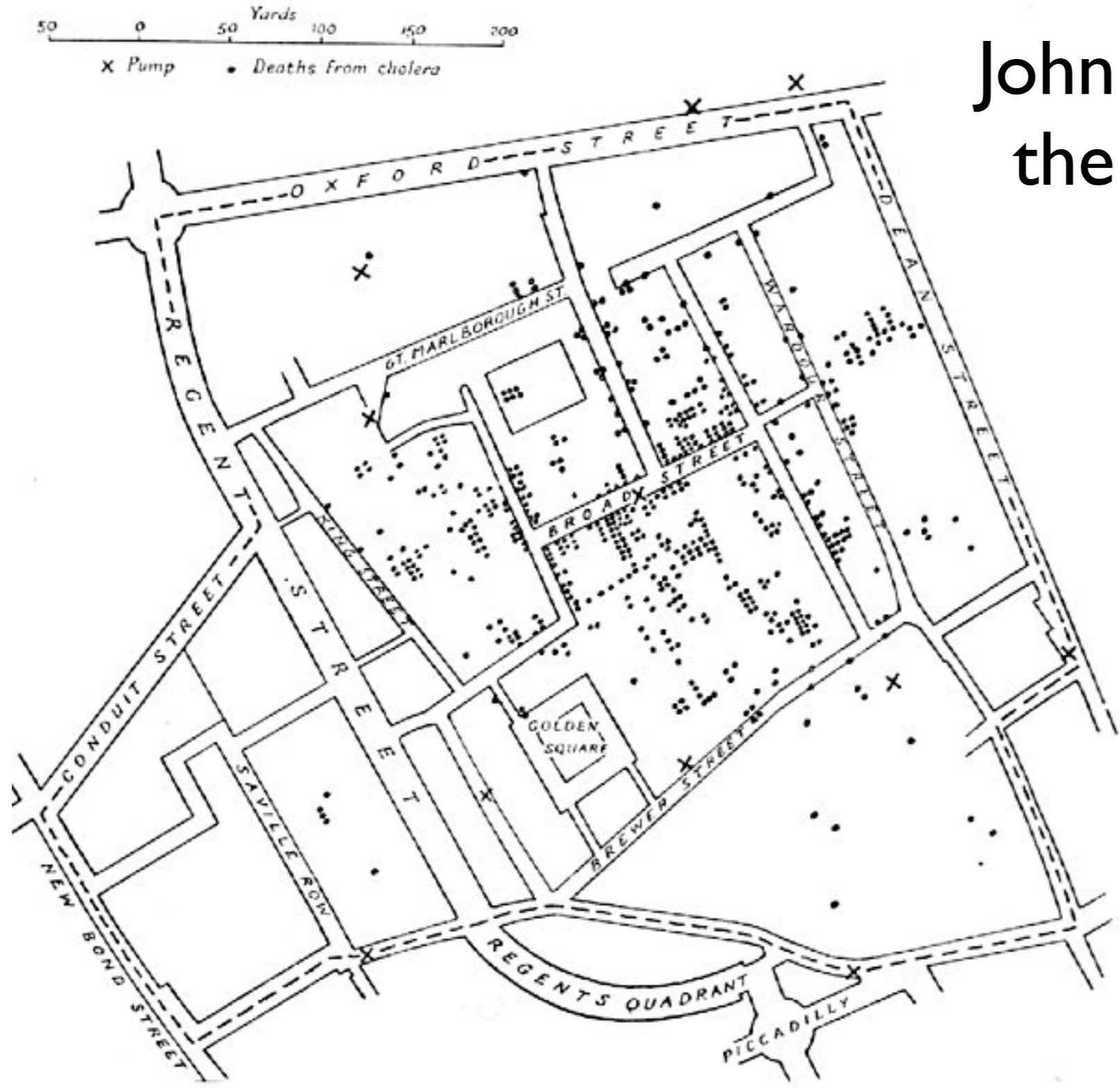
Copyright

...

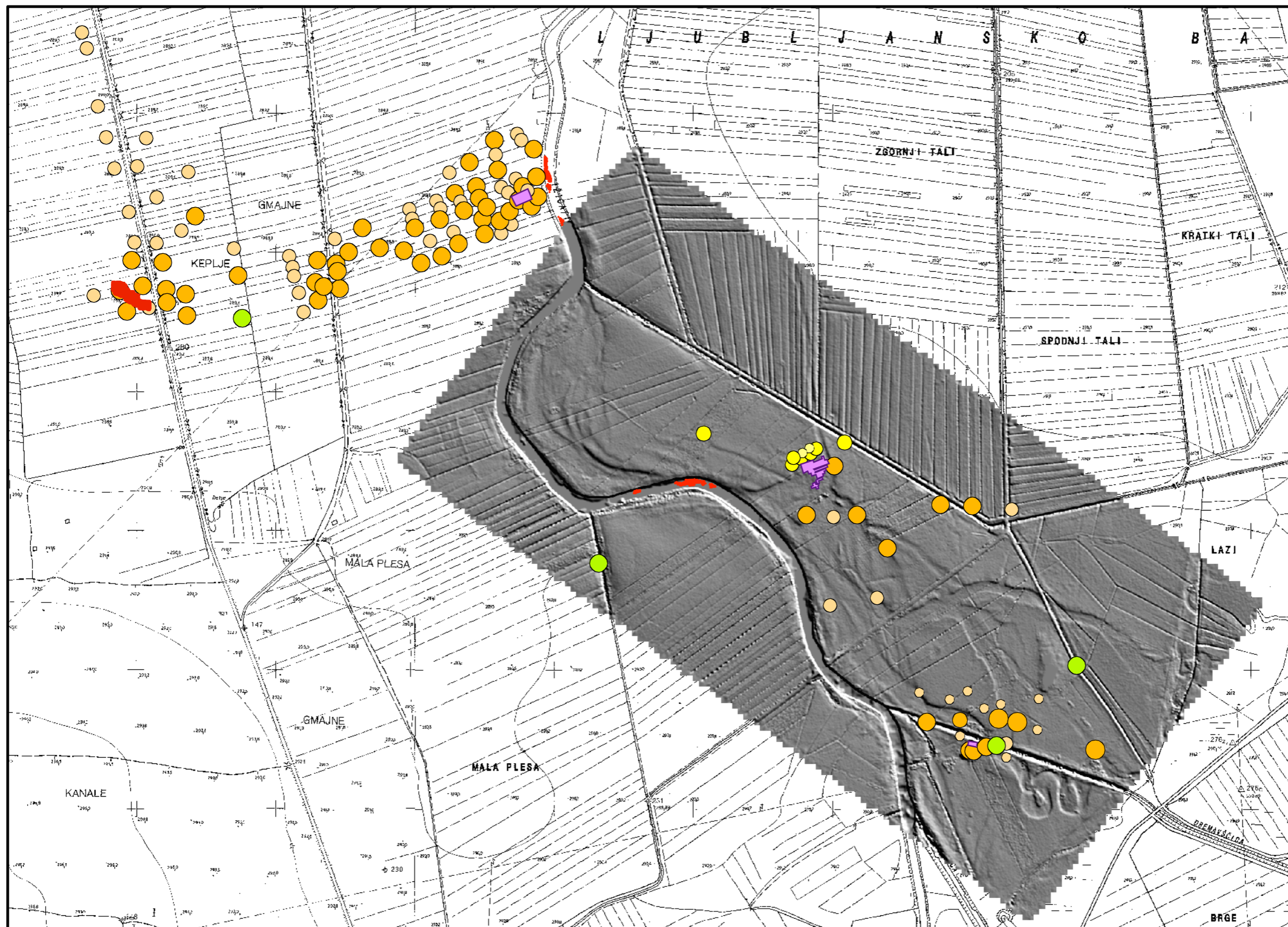
# Geodatabase

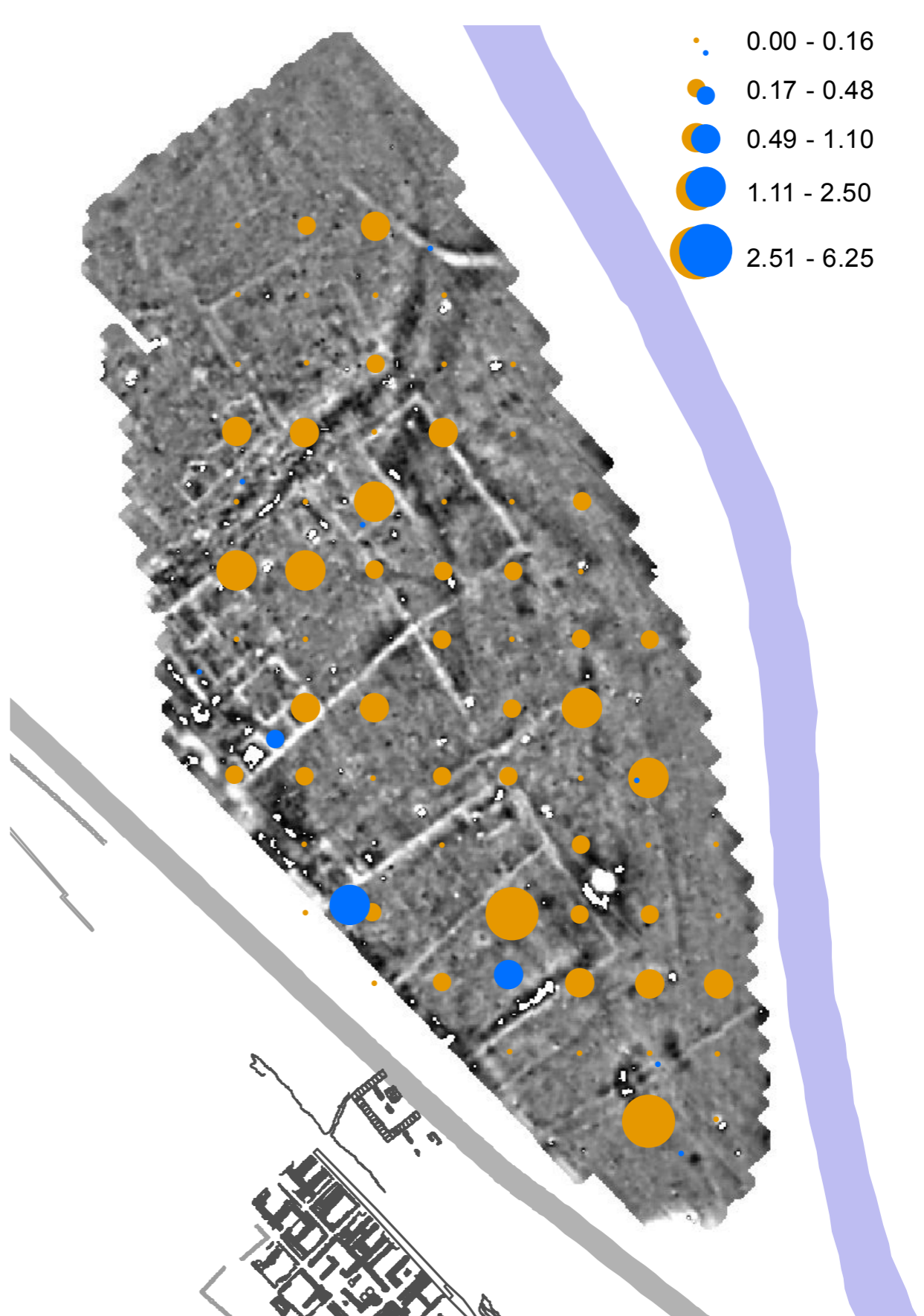




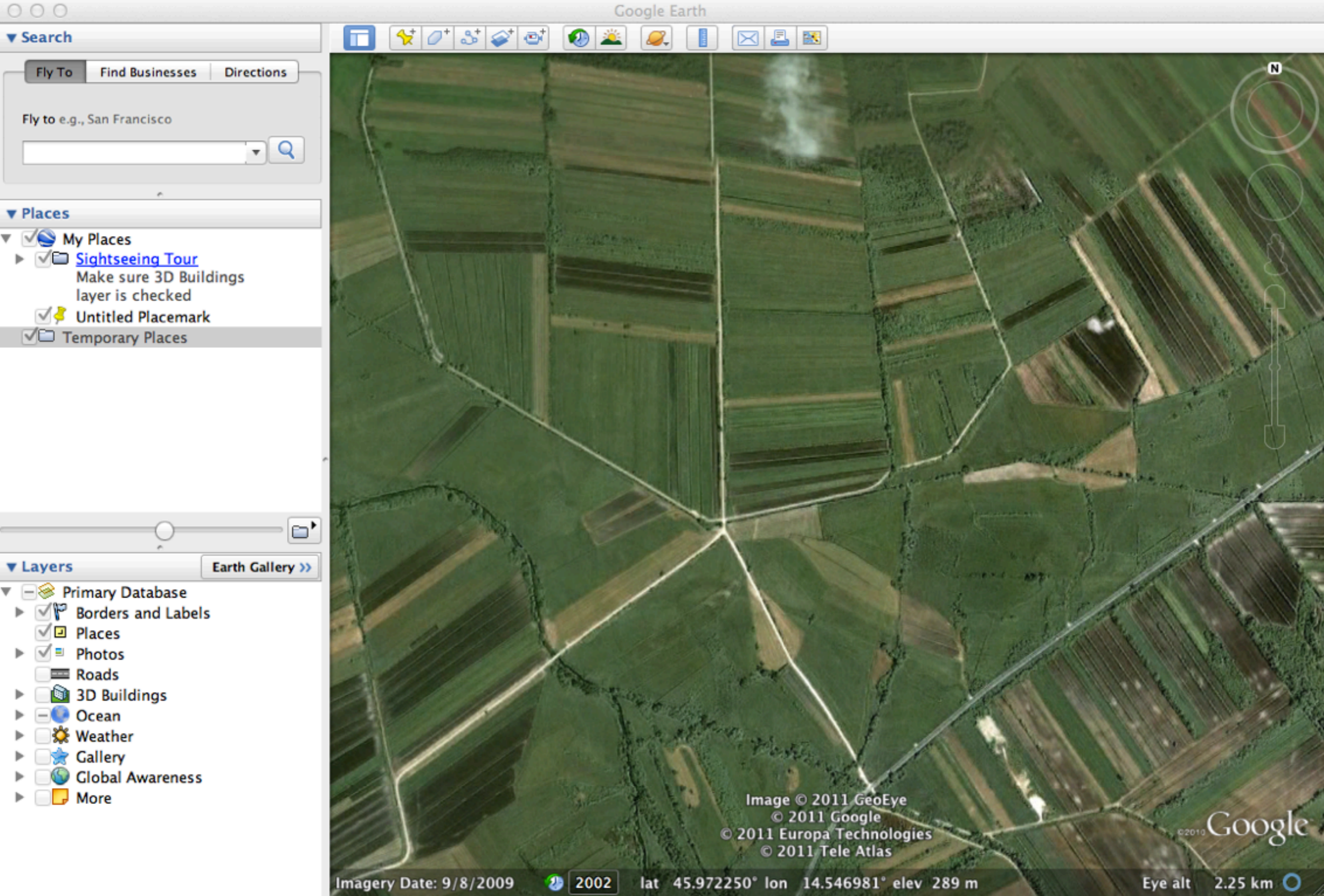


John Snow's map of the Soho cholera outbreak





# Google Earth



Geopedia - interaktivni spletni atlas in zemljevid Slovenije

Geopedia

Geopedia.si Lite

Geopedia Pro in nove vsebine 22. 09. 11

INFO VSEBINA


Uporabne informacije

Katero področje vas zanima?

Kliknite na eno od povezav spodaj, ali pa odprite zavihek "Vsebina" in izberite posamezne sloje.

- [Avtobusni promet LPP](#)
- [Dogodki - 7 dni](#)
- [Kolesarstvo](#)
- [Kultura in užitki](#)
- [Pohodništvo](#)
- [Slovenija v fotografijah](#)
- [Študenti](#)
- [Turizem](#)
- [Vreme](#)
- [Zdravje](#)
- [Ostale zanimive vsebine ...](#)

Če želite najti pot med kraji, kliknite na avto na dnu zavihka oz. na zavihek Pot (Geopedia V1).



©2011 Sinergise d.o.o. | Podatki: Geodetski inštitut Slovenije Y X: 519840 124320 46°15'45,76" N 15°15'9,27" E

The screenshot displays the GISKD web application interface. At the top, the browser address bar shows the URL <http://giskds.situla.org/giskd/>. The page header includes the text "Register nepremične kulturne dediščine" and the logo of the "Ministrstvo za kulturo" (Ministry of Culture) of the Republic of Slovenia. The main content area features a map of the Ober-Vellach region, with a red outline indicating the area of interest. The map is overlaid with various colored markers (yellow, pink, blue, green) representing cultural heritage sites. A legend on the left side of the map lists the following layers: Časovnica (checked), Dediščina (checked), Podlage (unchecked), and Franciscejski kataster (checked). Below the legend, there is a disclaimer: "Spletna verzija GiskD je informativne narave. Podatki nimajo uradnega značaja." (The web version of GiskD is for informational purposes. The data does not have an official status.) and a list of data sources: "Ministrstvo za kulturo Republike Slovenije", "Arhiv Republike Slovenije", and "Ministrstvo za okolje in prostor Republike Slovenije". A scale bar at the bottom of the map indicates distances up to 240 meters. The page number "454395.944, 128334.504" is visible at the bottom left.

<http://giskds.situla.org/giskd/>

# GERK

RKG-GERK

http://rkg.gov.si/GERK/viewer.jsp

REPUBLICA SLOVENIJA  
MINISTRSTVO ZA KMETIJSTVO,  
GOZDARSTVO IN PREHRANO

RKG Domov  
eRKG Kazalo  
KataKoma Kontakt  
KatMeSiNa English

KMG MID:  Potrdi

Aktivna plast: GERK

Plast	Vključi	Tekst	?
Orto-foto	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Orto-foto-stanje pred 2006	<input type="checkbox"/>	<input type="checkbox"/>	
DTK50	<input type="checkbox"/>	<input type="checkbox"/>	
TK25	<input type="checkbox"/>	<input type="checkbox"/>	
TTN5	<input type="checkbox"/>	<input type="checkbox"/>	
Zemljepisna imena	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Raba	<input type="checkbox"/>	<input type="checkbox"/>	
GERK	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
GERK_31.12.2009	<input type="checkbox"/>	<input type="checkbox"/>	
GERK prekrivanja	<input type="checkbox"/>	<input type="checkbox"/>	
GERK Neskladja RABA MKGP	<input type="checkbox"/>	<input type="checkbox"/>	
▶ RPE, Kataster, DMR			
▶ Vinogradništvo			
▶ Kontrolni sloji 2011			
▶ Kontrolni sloji 2010			
▶ Kontrolni sloji 2009			
▶ Kontrolni sloji 2008			

V mirovanju. 500063.60, 100826.82

# Atlas okolja

ATLAS OKOLJA

http://gis.arso.gov.si/atlasokolja/profile.aspx?id=Atlas\_Okolja\_AXL@Arso

naraoslovni atals slovenije

REPUBLICA SLOVENIJA  
MINISTRSTVO ZA OKOLJE IN PROSTOR  
AGENCIJA REPUBLIKE SLOVENIJE ZA OKOLJE

ATLAS OKOLJA

0 km 20 km 40 km 60 km 80 km 100 km 120 km 140 km 160 km 180 km 200 km 220 km 240 km

0 km 20 km 40 km 60 km 80 km 100 km 120 km 140 km 160 km 180 km 200 km 220 km

0 km 20 km 40 km 60 km 80 km 100 km 120 km 140 km 160 km 180 km 200 km 220 km

0 km 20 km 40 km 60 km 80 km 100 km 120 km 140 km 160 km 180 km 200 km 220 km

sloji iskanje info nast. legenda

**Trenutno vidni sloji:**

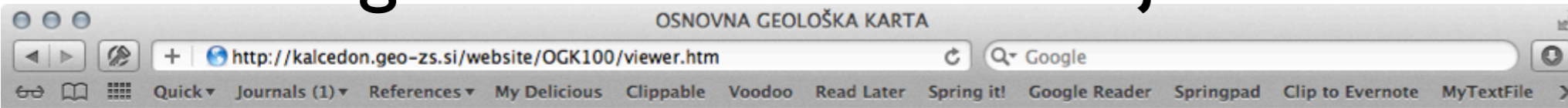
- Začasni sloj
- Prostorske enote**
  - Državna meja
  - Upravne enote
- Merilna mesta**
  - Državna mreža potresnih opazovalnic
  - Kakovost površinskih voda
  - Monitoring kakovosti morja
  - Hidrološki monitoring podzemnih voda
  - Kakovost podzemne vode
  - Kakovost jezer
  - Hidrološke meritve na površinskih vodah
  - Kakovost zunanjega zraka
  - Mobilne meritve zraka
  - Kopalne vode
  - Meteorološke postaje
- Okolje**
- Podnebje**
- Infrastruktura**
- Vode**
- Narava**
  - Naravne vrednote (točke)
  - Naravne vrednote (jame)
  - Ekološko pomembna območja (jame)
  - Državna zavarovana območja (točke)
  - Lokalna zavarovana območja (točke - inf)

GKY: 590518 GKX: 114785 Merilo 1: 1457653

Copyright 2007 Agencija RS za okolje, LUZ d.d. [GIS-HELP.ARSO@GOV.SI](mailto:GIS-HELP.ARSO@GOV.SI)



# Osnovna geološka karta Slovenije



Geološki zavod Slovenije



List OGK

Postojna

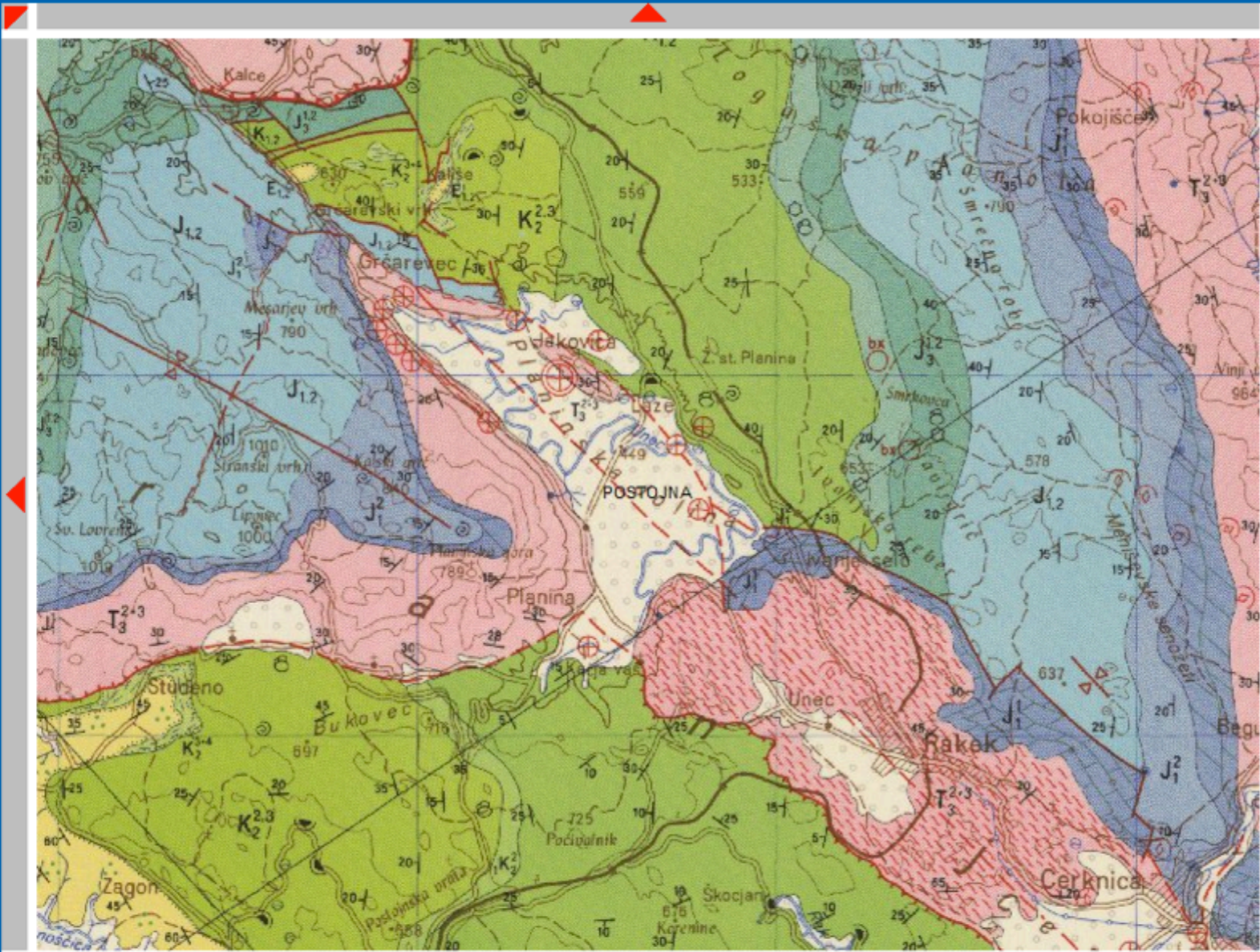
Dodatni sloji

Občine

Trenutno merilo

1 : NaN

OK



- Povečava
- Pomanjšava
- Celotno območje
- Premik
- Polzvedba-točka
- Polzvedba-območje
- Povpraševanje
- Počisti izbrlo
- Tiskanje
- Legenda
- Pomoč
- Prijavi napako

Copyright © 2006, Geo ZS

Profil Stolpec Legenda kartiranih enot Legenda standardnih oznak Tolmač Metaopis

Map: 446757.96 , 83168.46 -- Image: 560 , 71 -- ScaleFactor: 21.586128253983503

<http://kalcedon.geo-zs.si/>

# World coordinate converter

<http://twcc.free.fr/>

The screenshot shows the website 'The World Coordinate Converter' in a browser window. The address bar shows 'http://twcc.free.fr/'. The search bar contains 'gauss krueger yugoslavia'. The page has a navigation menu with 'About TWCC', 'Contact us', 'Donate', and 'English'. Below the navigation, there are tabs for 'Manual' and 'CSV'. The main content area features a map of Slovenia with a location marker at '409, 6215 Divača, Slovenia'. A 'Drag me!' dialog box is open over the map, showing the coordinates '45.6685517°N 13.9704895°E' and an elevation of '450m'. To the right of the map, there are two conversion panels. The first panel is for '\*GPS (WGS84) (deg) [?]' with 'Lat = 45.6685517188248 °N' and 'Lng = 13.97048950195312 °E'. The second panel is for 'ETRS89 (LCC) [?]' with 'X = 4299793.26 m' and 'Y = 2127422.13 m'. The bottom of the page includes a 'CREDIT:' section with links to 'Free', 'Spatial Reference', 'Proj4js', 'jQuery UI', 'GrottoCenter.org', 'Google', and 'OpenStreetMap'. The footer also includes '© 2010 Clément Ronzon' and a Creative Commons BY-NC license.

<https://ge.tt/6xH96VWP?c>

Kaj je na lokaciji, zapisani v datoteki Točka.kml?

Kaj je zapisno v datoteki track-2007- ...kml?

Georeferenciraj EmonaMap.jpg?

Dodaj lidar posnetek gomil Pošte v Google  
Earth in digitaliziraj gomile.



north: 153778.440406  
south: 153274.440406  
west: 548085.5  
east: 548844.5

gom2.jpg

Kaj je na parceli 873 KO Divača?

Digitaliziraj enoto  
dediščine v bližini in  
jo položi na Google  
Earth.

# Domača naloga

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## New Developments in the Use of Spatial Technology in Archaeology

Mark D. McCoy · Thegn N. Ladefoged

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**Abstract** Spatial technology is integral to how archaeologists collect, store, analyze, and represent information in digital data sets. Recent advances have improved our ability to look for and identify archaeological remains and have increased the size and complexity of our data sets. In this review we outline trends in visualization, data management, archaeological prospecting, modeling, and spatial analysis, as well as key advances in hardware and software. Due to developments in education, information technology, and landscape archaeology, the implementation of spatial technology has begun to move beyond superficial applications and is no longer limited to environmental deterministic approaches. In the future, spatial technology will increasingly change archaeology in ways that will enable us to become better practitioners, scholars, and stewards.

**Keywords** Geographic information systems · Laser mapping · Remote sensing · Geophysical survey

### Introduction

A common thread that links classic methodological innovations in field archaeology, such as the pioneering use of aerial photography by Gordon Willey or grid-based excavations by Sir Mortimer Wheeler, is how these methods have enhanced our ability to find and record the locations of archaeological remains at a level of precision necessary to interpret them. Today we use a wide variety of “spatial

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