

Maxim Romanov, Leipzig University

Leipzig University, Jan 16, 2017

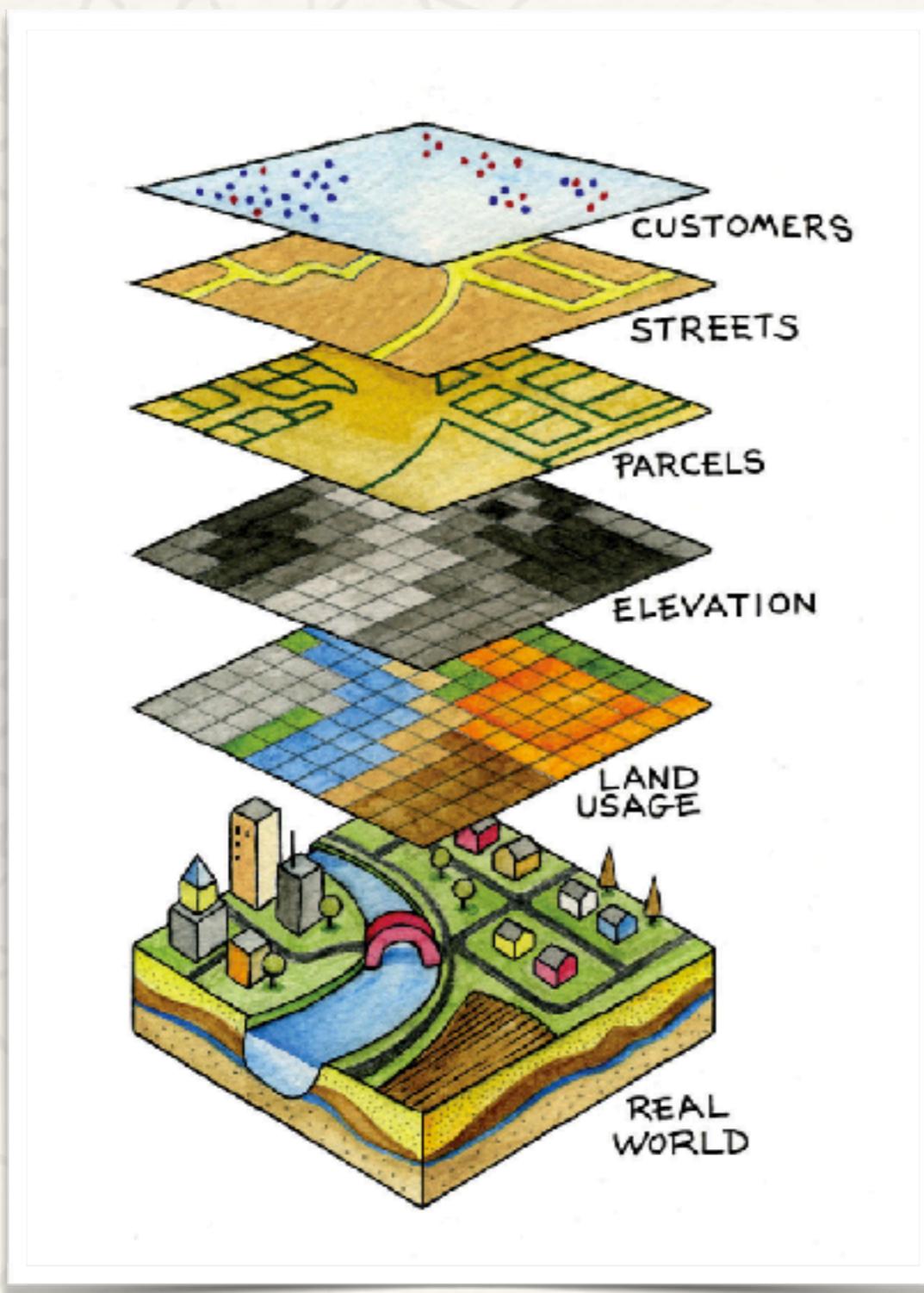
Mapping Humanities Data

Introduction to Digital Humanities
Winter 2016-2017

Why to build a “map” (cartogram)?!

- ❖ To visualize spatial distribution of a phenomenon
- ❖ To compare the distribution of different phenomena on the spatial plane
- ❖ Trace change of the distribution of various phenomena over time
- ❖ Visualize conceptualizations of space
- ❖ Model spacial entities and processes

What is a “map”? *Layers of Goodness*



- ❖ **Layers:**
 - ❖ *Analytical Layer*
 - ❖ Our Data
 - ❖ Annotation/Legend
 - ❖ *Social Geography*
 - ❖ Political Boundaries
 - ❖ Settlements, etc.
 - ❖ *Physical Geography*
 - ❖ Types of surface
 - ❖ Continents / Coastal Line
 - ❖ Elevation profile
 - ❖ Rivers, Lakes, etc.
 - ❖ *Base Layer: Graticule*

Projection Issues

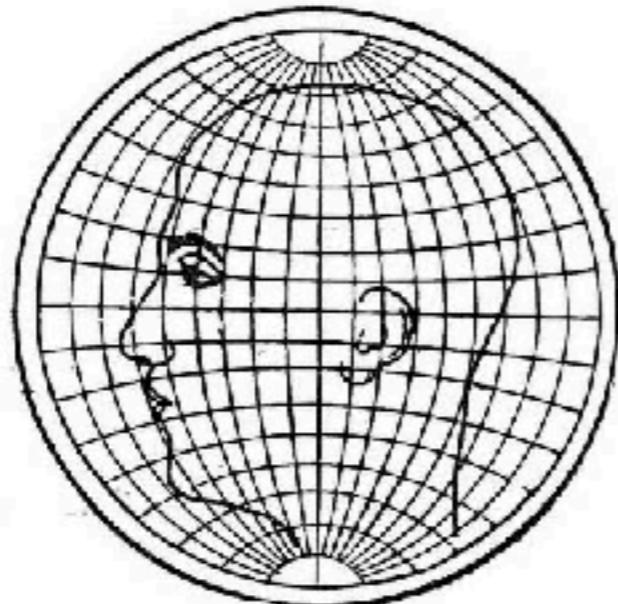


FIG. 42.—Man's head drawn on globular projection.

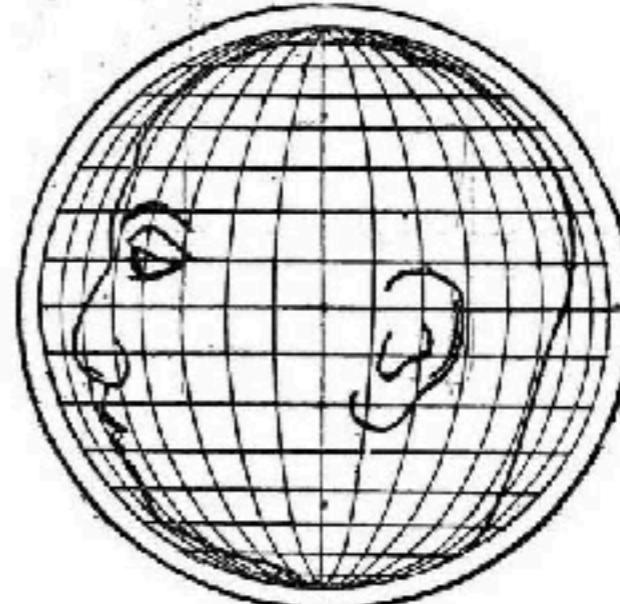


FIG. 43.—Man's head plotted on orthographic projection.

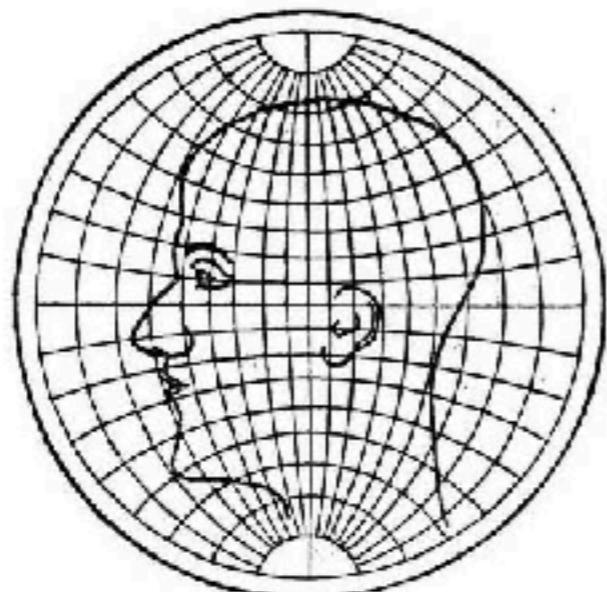


FIG. 44.—Man's head plotted on stereographic projection.

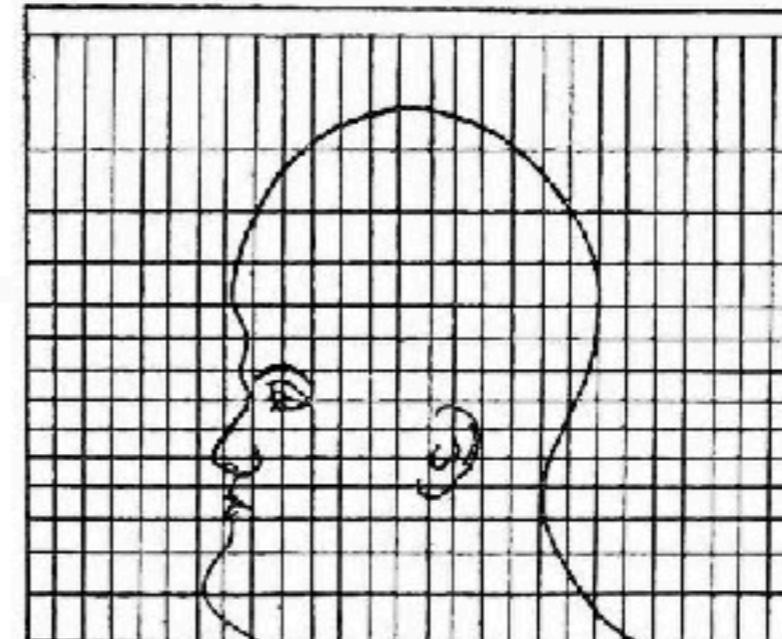
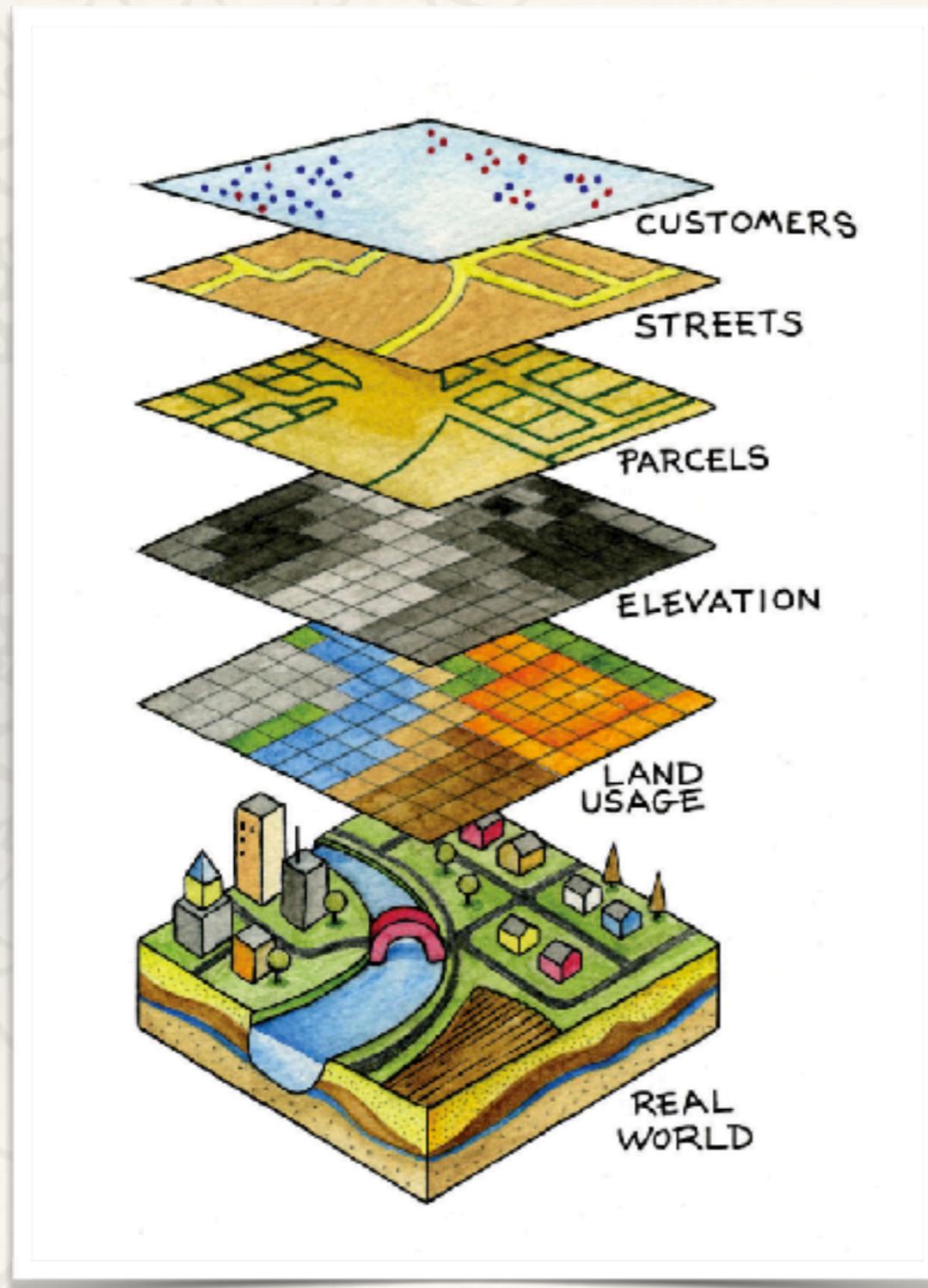


FIG. 45.—Man's head plotted on Mercator projection.

Analytical Layer: Machine-Readable Data



❖ *Analytical Layer*

❖ Our Data

❖ Points:

❖ item, x^* , $point(lat, lon)^{**}$

❖ Lines:

❖ item, x^* , $from(lat, lon)^{**}$, $to(lat, lon)^{**}$

❖ Polygons:

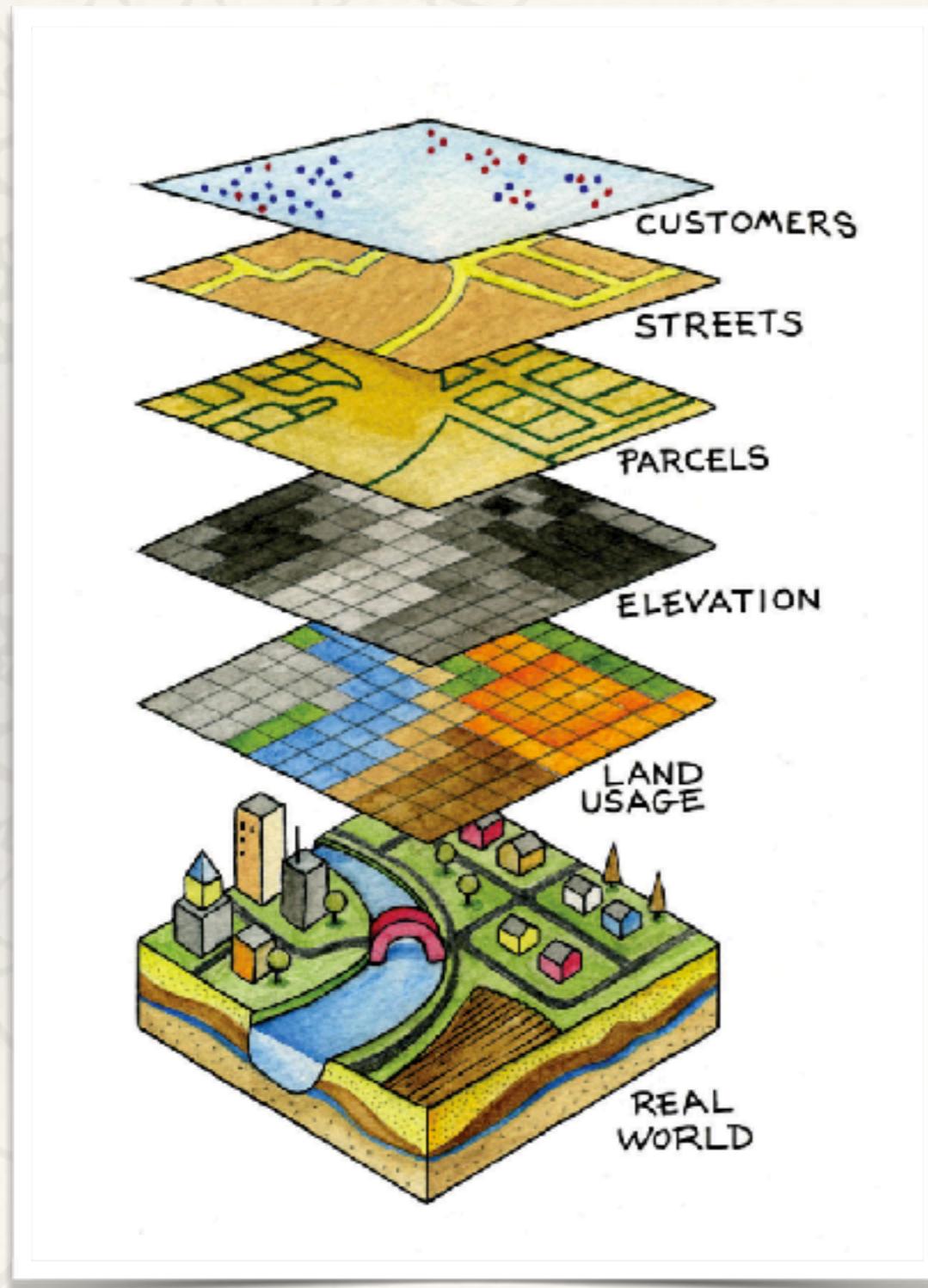
❖ item, x , $area(lat, lon; lat, lon; \dots lat, lon)^{**}$

❖ Annotation/Legend

* where x is a categorical parameter

** lat/lon : decimal coordinates (not DMS)

Analytical Layer: Machine-Readable Data



- ❖ *Analytical Layer Formats*
- ❖ CSV / TSV
- ❖ KML (Keyhole Markup Lang)
- ❖ JSON (GeoJSON; TopoJSON)

The Most Difficult Part (In Practical Terms)

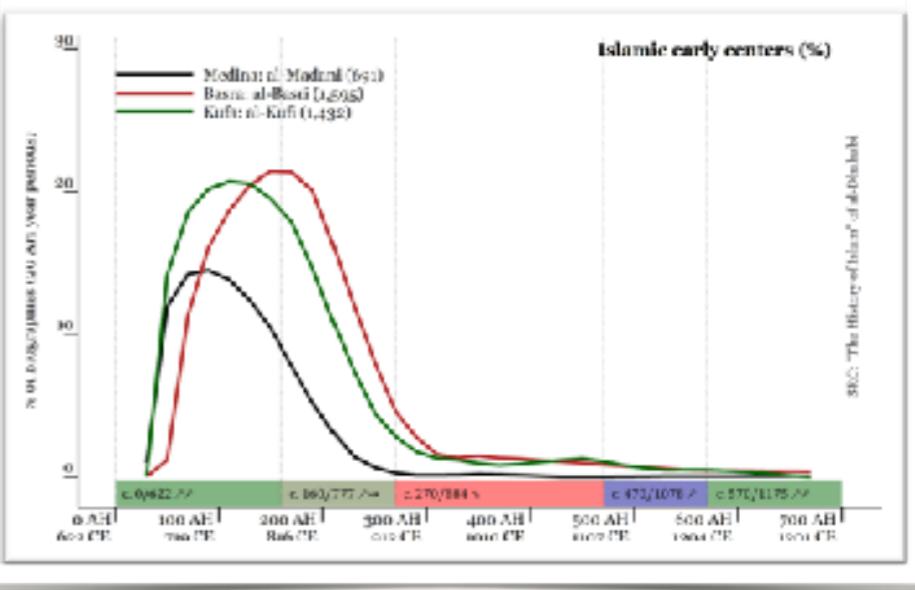
Source



Machine-
Readable
Data

Cartograms

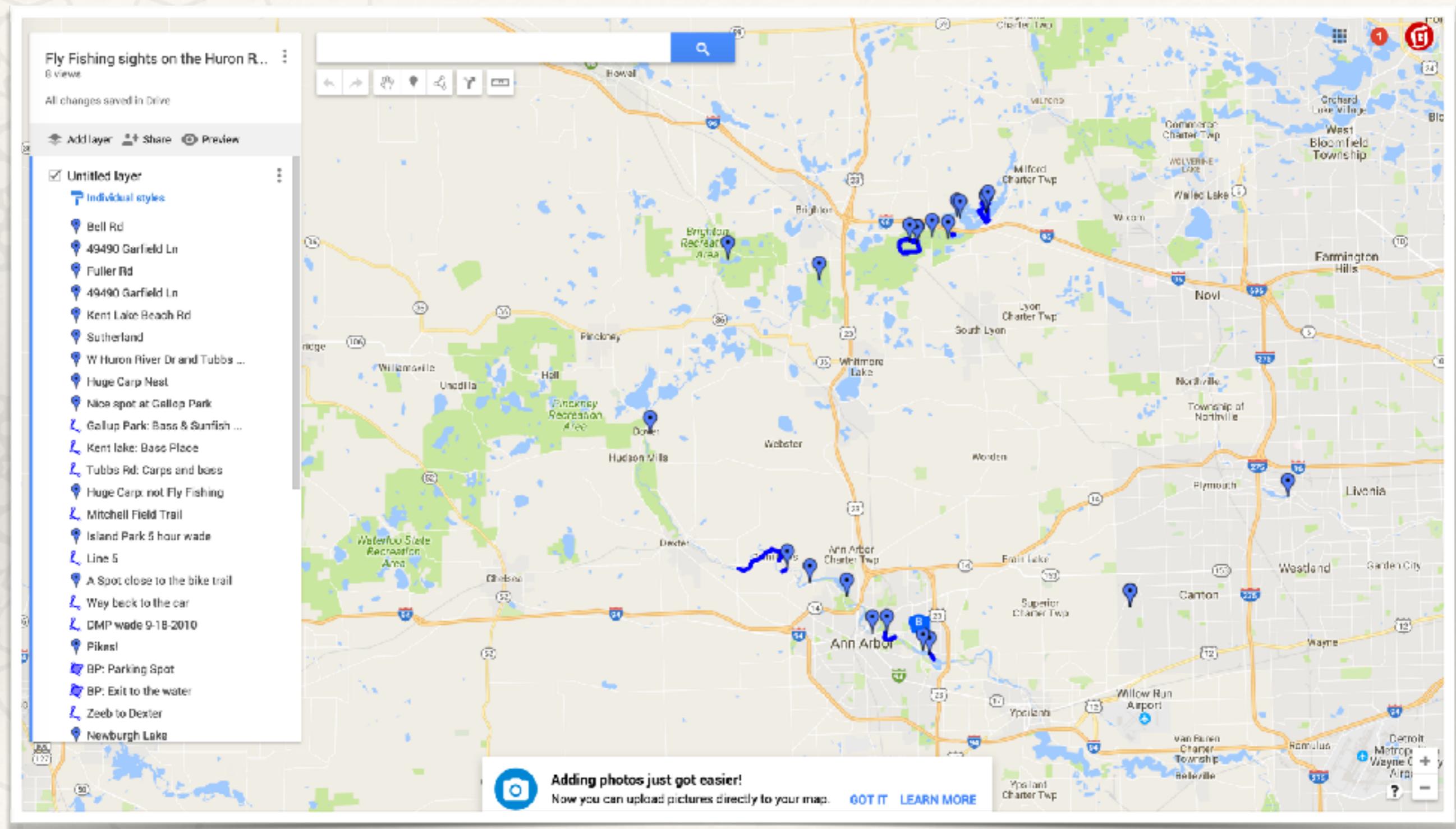
Points
Lines
Polygons



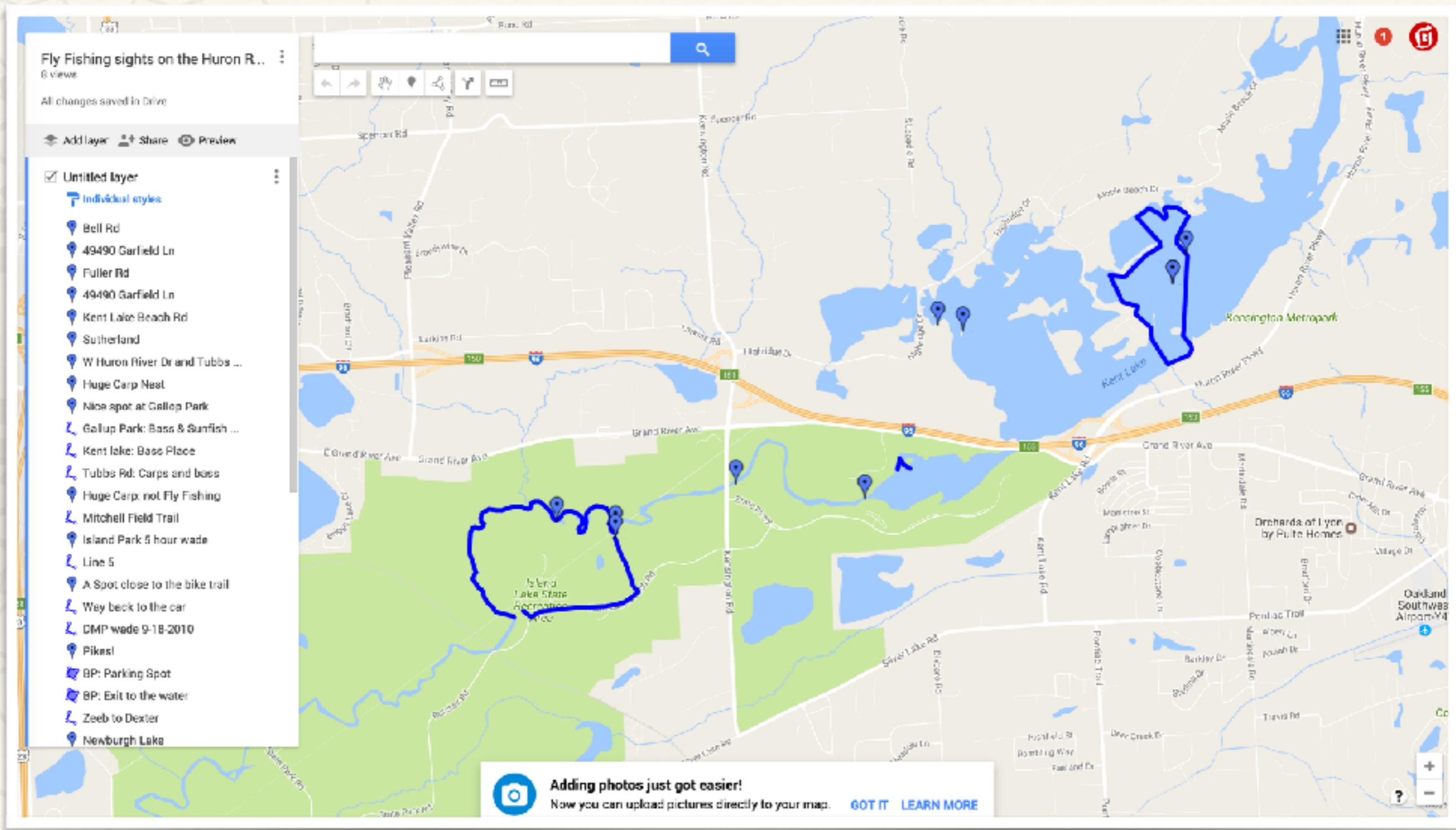
Cartograms: Geographical Information Systems (GIS)

- ❖ *Simple*
 - ❖ Google Maps
 - ❖ Carto(DB)
 - ❖ ... and many others
- ❖ *Complex*
 - ❖ ArcGIS (commercial)
 - ❖ QGIS (open source)
 - ❖ R (open source)

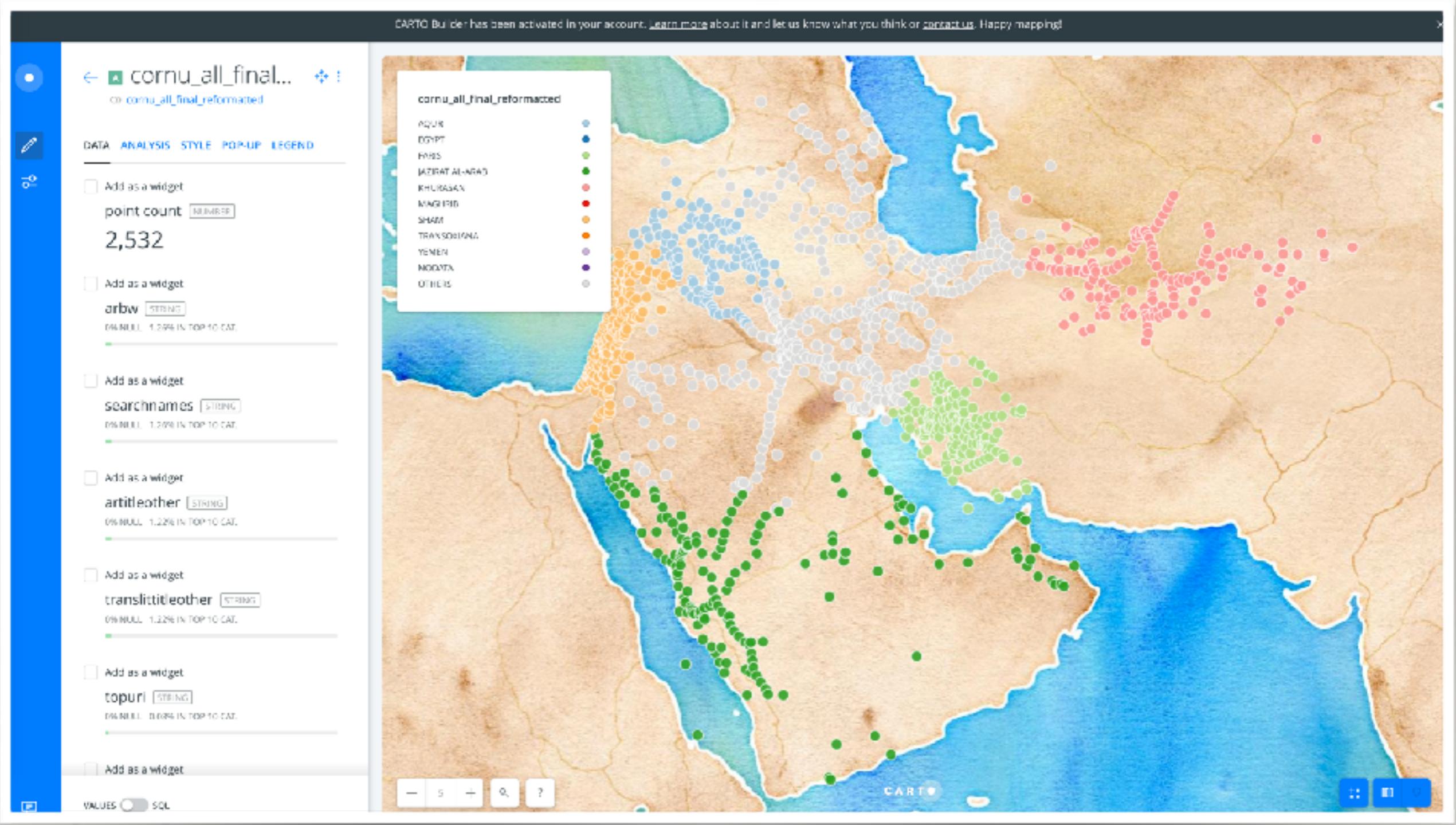
Simple: Google Maps (Google Earth)



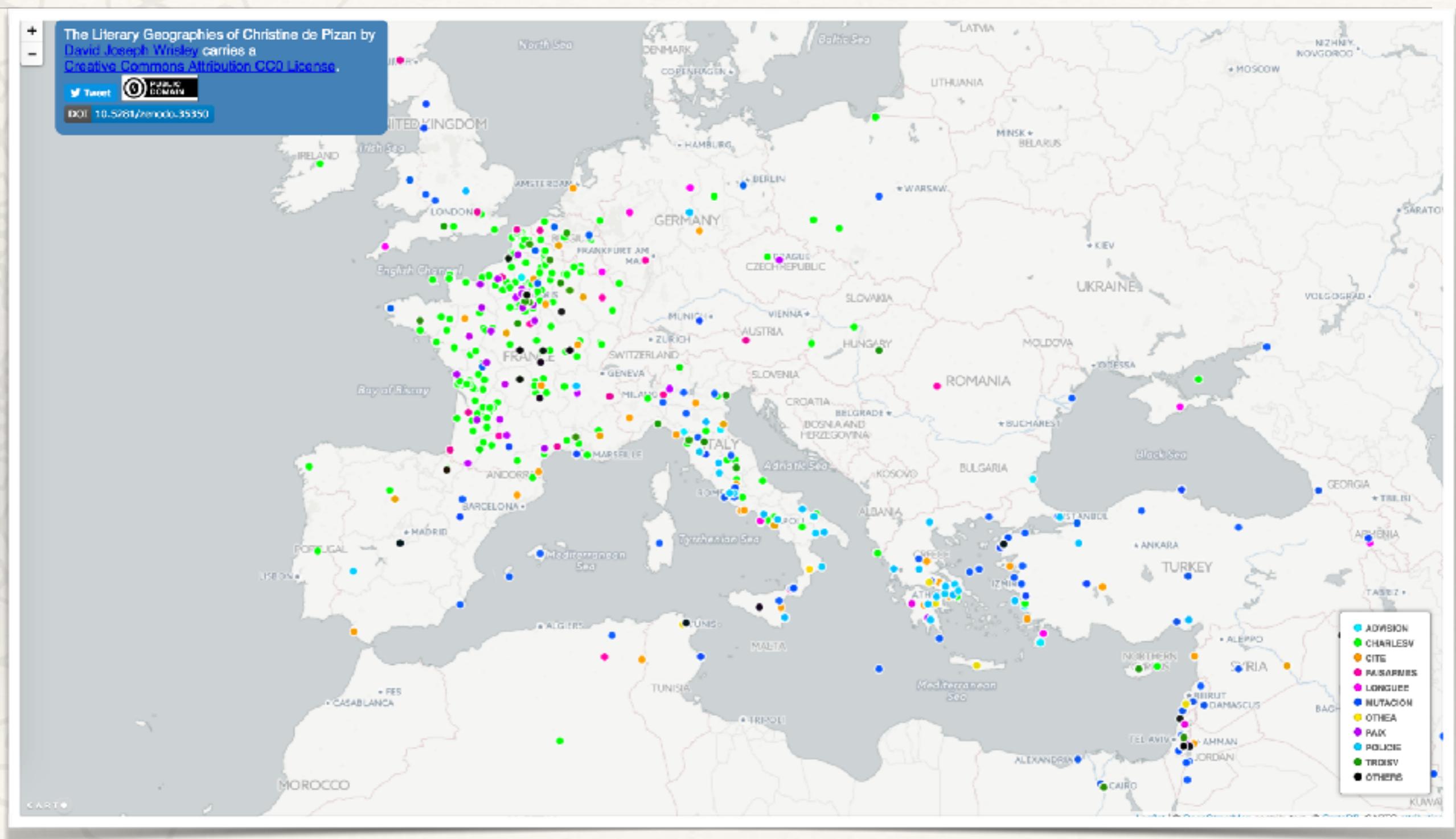
Simple: Google Maps (Google Earth)



More Complex: Carto[DB]



More Complex: Carto[DB]



Complex: ArcGIS, QGIS, R

The screenshot shows the ArcGIS website homepage. At the top, there is a navigation bar with links for "About ArcGIS", "Overview", and "What's New". Below the navigation bar, a large banner features the text "Work Smarter With ArcGIS" and "The Mapping & Analytics Platform". A vertical line of text describes the platform's capabilities: "ArcGIS provides contextual tools for mapping and spatial reasoning so you can explore data and share location-based insights. ArcGIS creates deeper understanding, allowing you to quickly see where things are happening and how information is connected." To the right of the banner, there is a map of Europe titled "Railway Access - Density" showing railway station density across various countries. Below the map is a histogram titled "Census" showing the distribution of a specific metric. The overall background of the page has a blue and purple gradient with contour lines.

Complex: ArcGIS, QGIS, R



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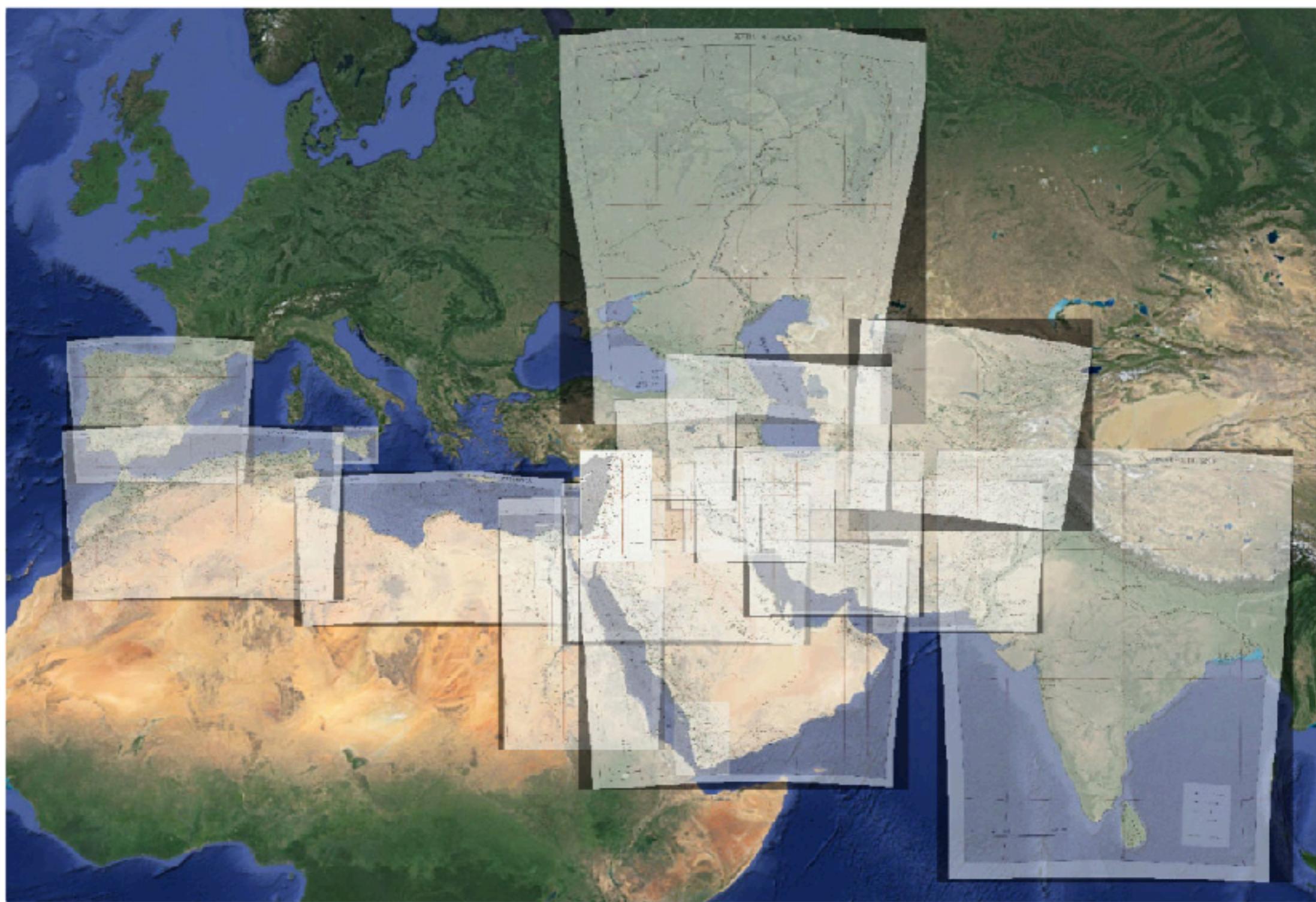
Version 2.18.2
LTR Version 2.14.10

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Complex: ArcGIS, QGIS, R

Georeferencing



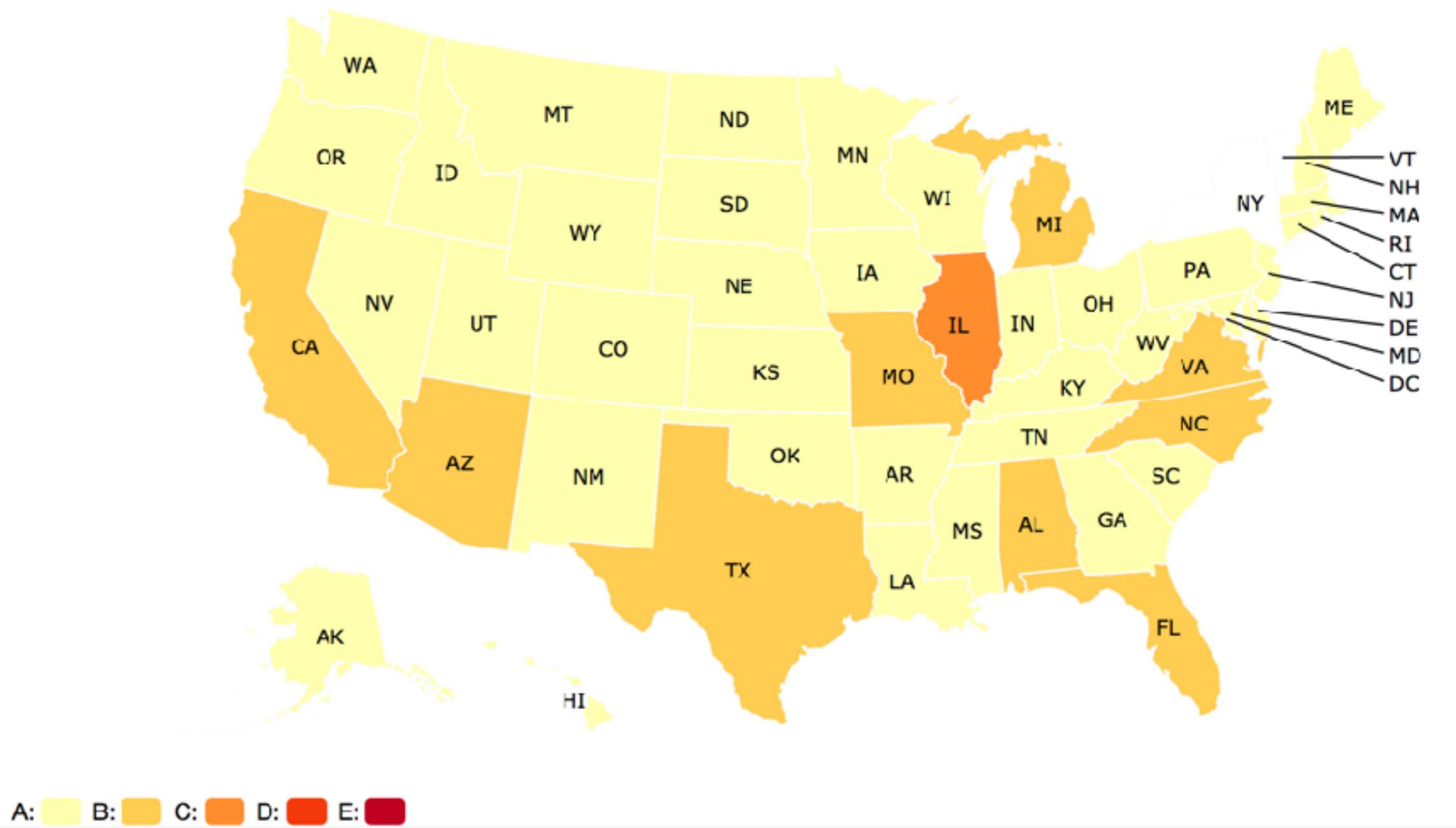
Georeferencing

Complex: ArcGIS, QGIS, R



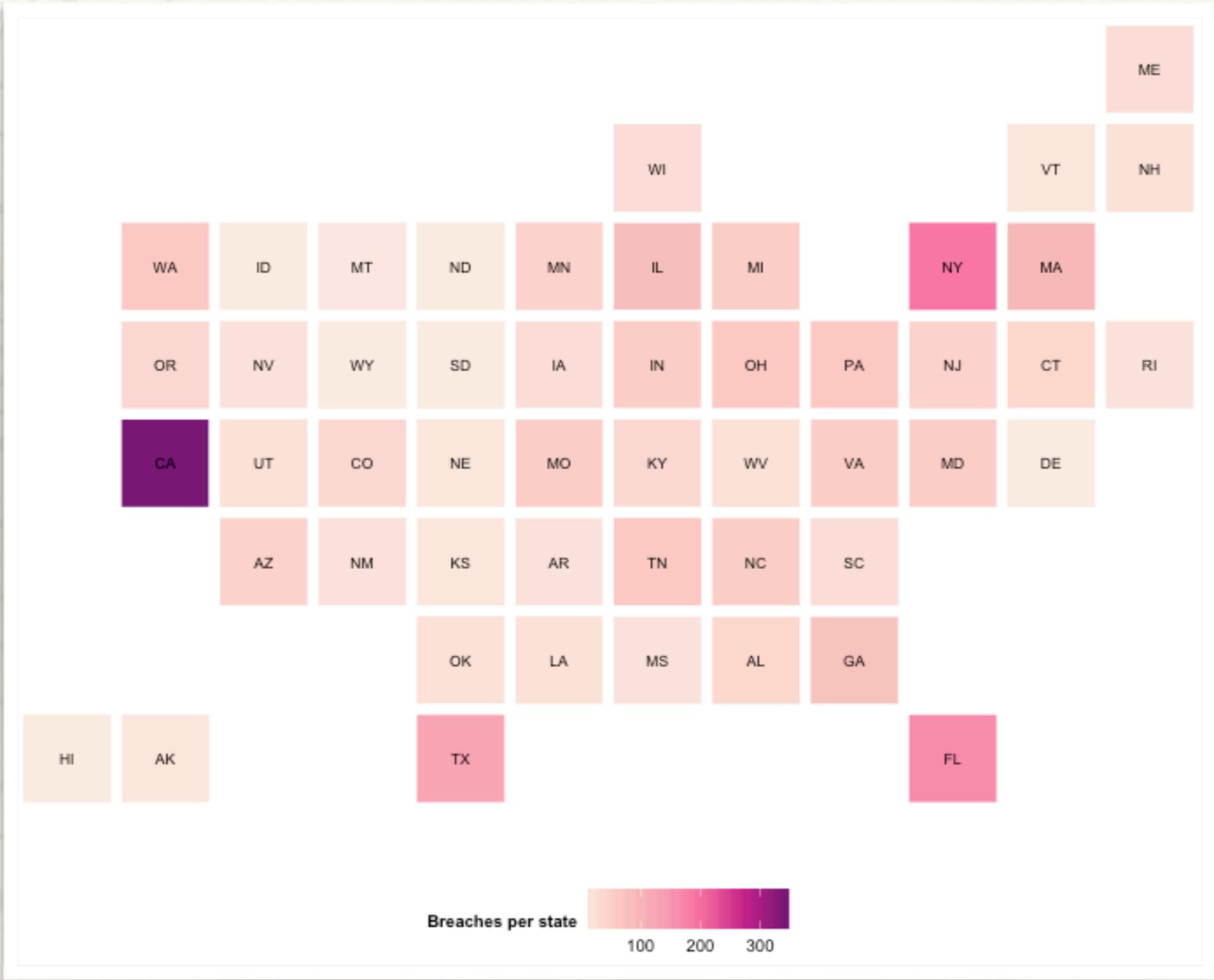
Complex: ArcGIS, QGIS, R

Dynamic Cartogramming



Dynamic Cartogramming

Complex: ArcGIS, QGIS, R



Islamic History in Maps: Overview

- ❖ Analysis of a biographical collection
- ❖ Modeling Islamic geography

The Most Difficult Part (In Practical Terms)

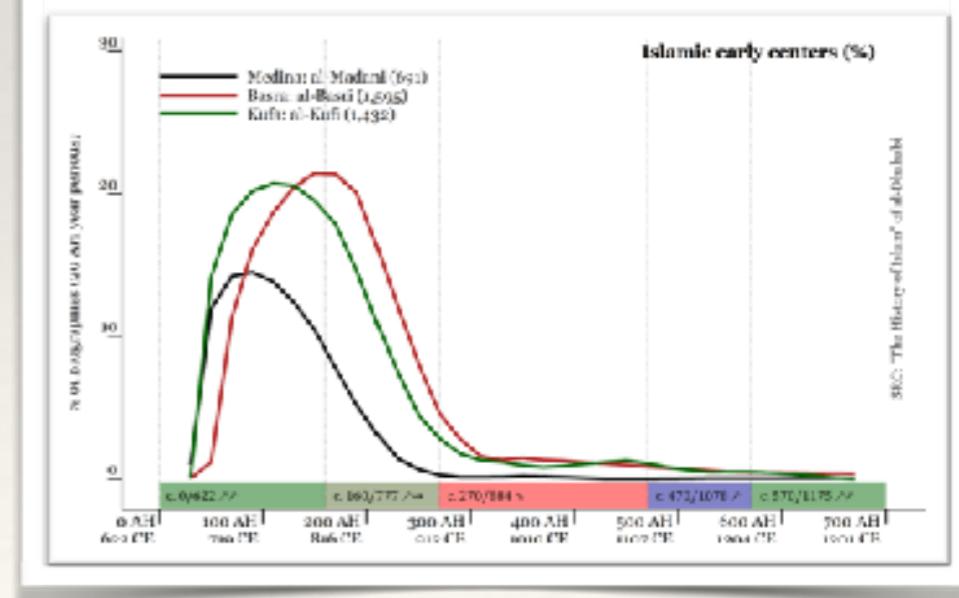
Source



Machine-
Readable
Data

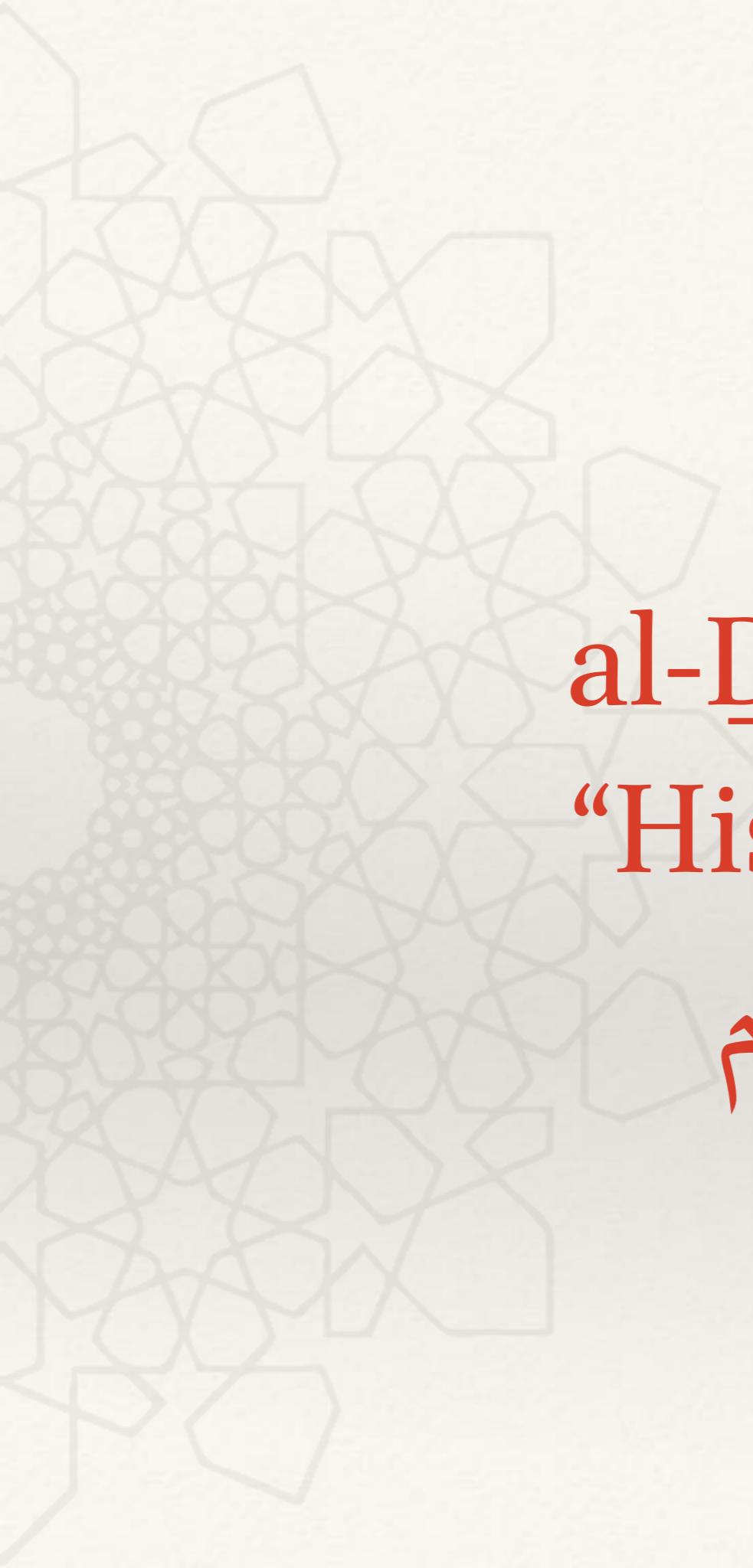
Points
Lines
Polygons

Cartograms



Islamic History in Maps: Overview

- ❖ Analysis of a biographical collection
- ❖ Modeling Islamic geography

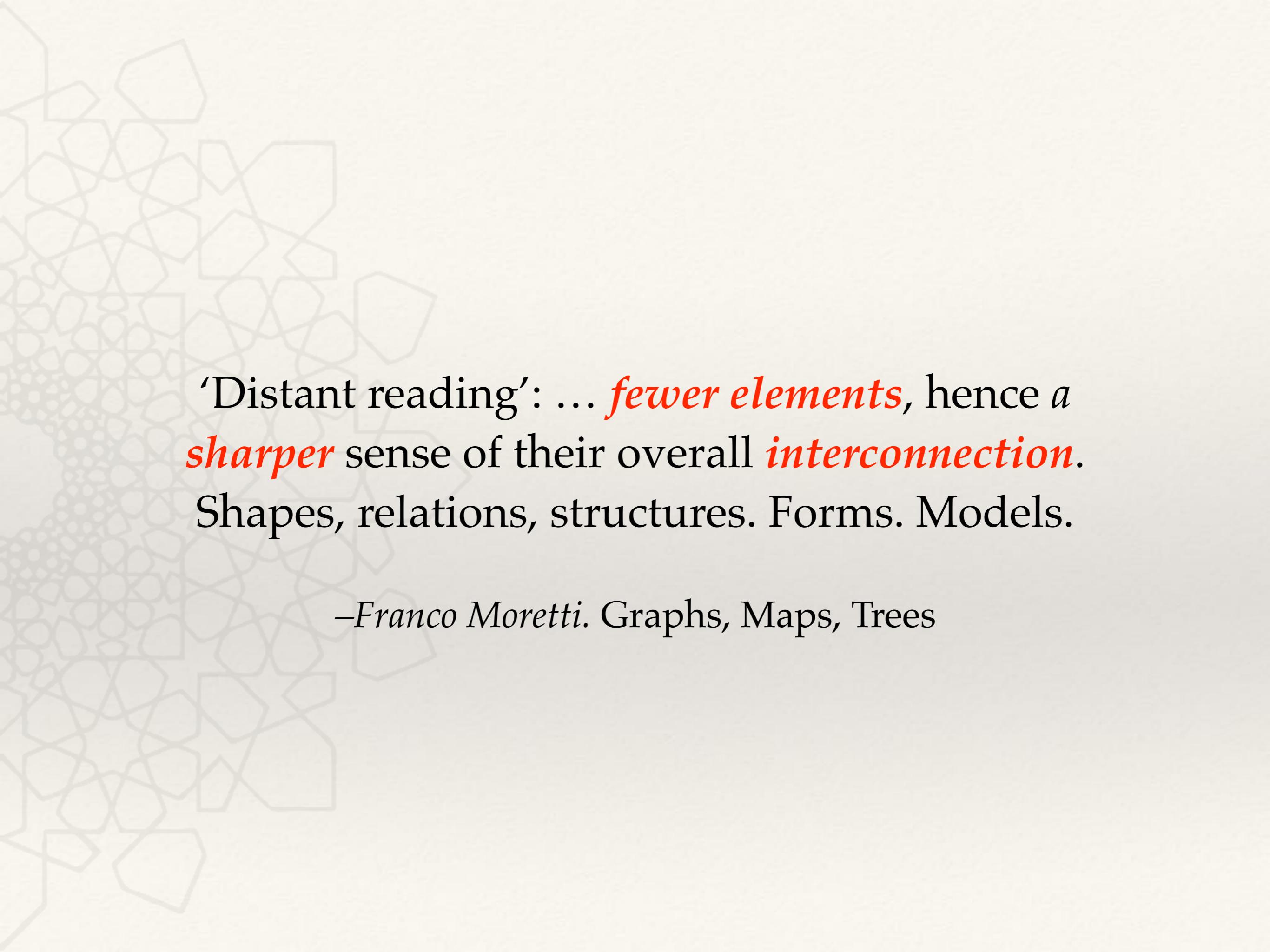


al-Dahabī and his “History of Islam”

تاریخ اسلام

al-Dahabī (d. 748/1347 CE)

- ❖ a Damascene religious scholar, Šāfi‘ī jurist and historian
 - ❖ “The History of Islam” (*Ta’rīh al-islām*)
 - ❖ “first draft” in 714/1314 CE
 - ❖ 50 volumes (here: 4-50)
 - ❖ 7 centuries (here: 41-700/661-1300 CE)
 - ❖ over 30,000 biographies (here: ~29,100)
 - ❖ ~ 3,2 mln. words



‘Distant reading’: ... *fewer elements*, hence *a sharper* sense of their overall *interconnection*.
Shapes, relations, structures. Forms. Models.

—Franco Moretti. Graphs, Maps, Trees

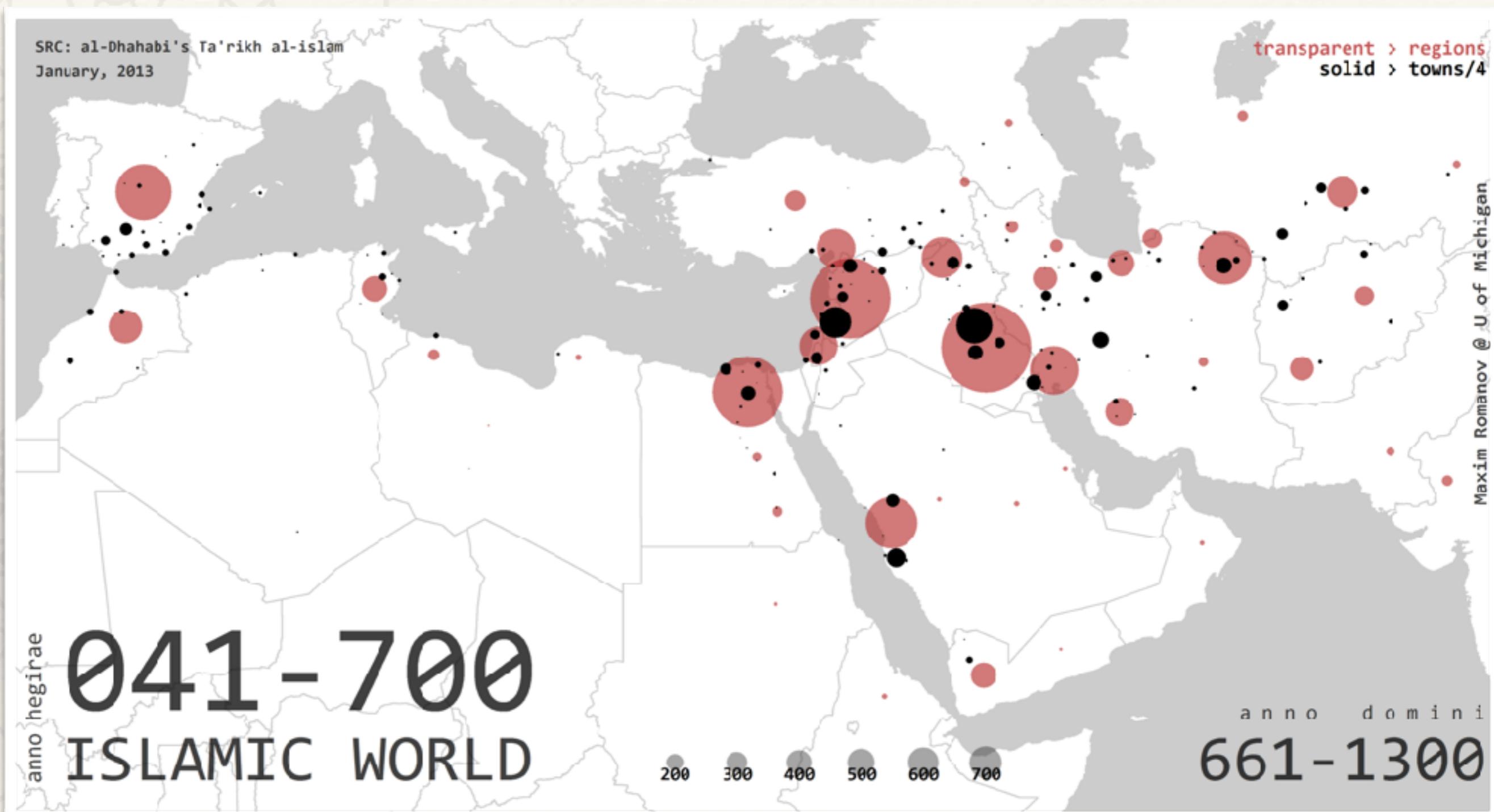
“The History of Islam”: Distant Reading

- ❖ Death dates
- ❖ Place names / Toponyms
- ❖ “Descriptive names” (*nisbats*)
 - ❖ 700 unique (frequency 10 and higher)
 - ❖ 70,000 total
 - ❖ ~ social profile (issue with their meaning*)

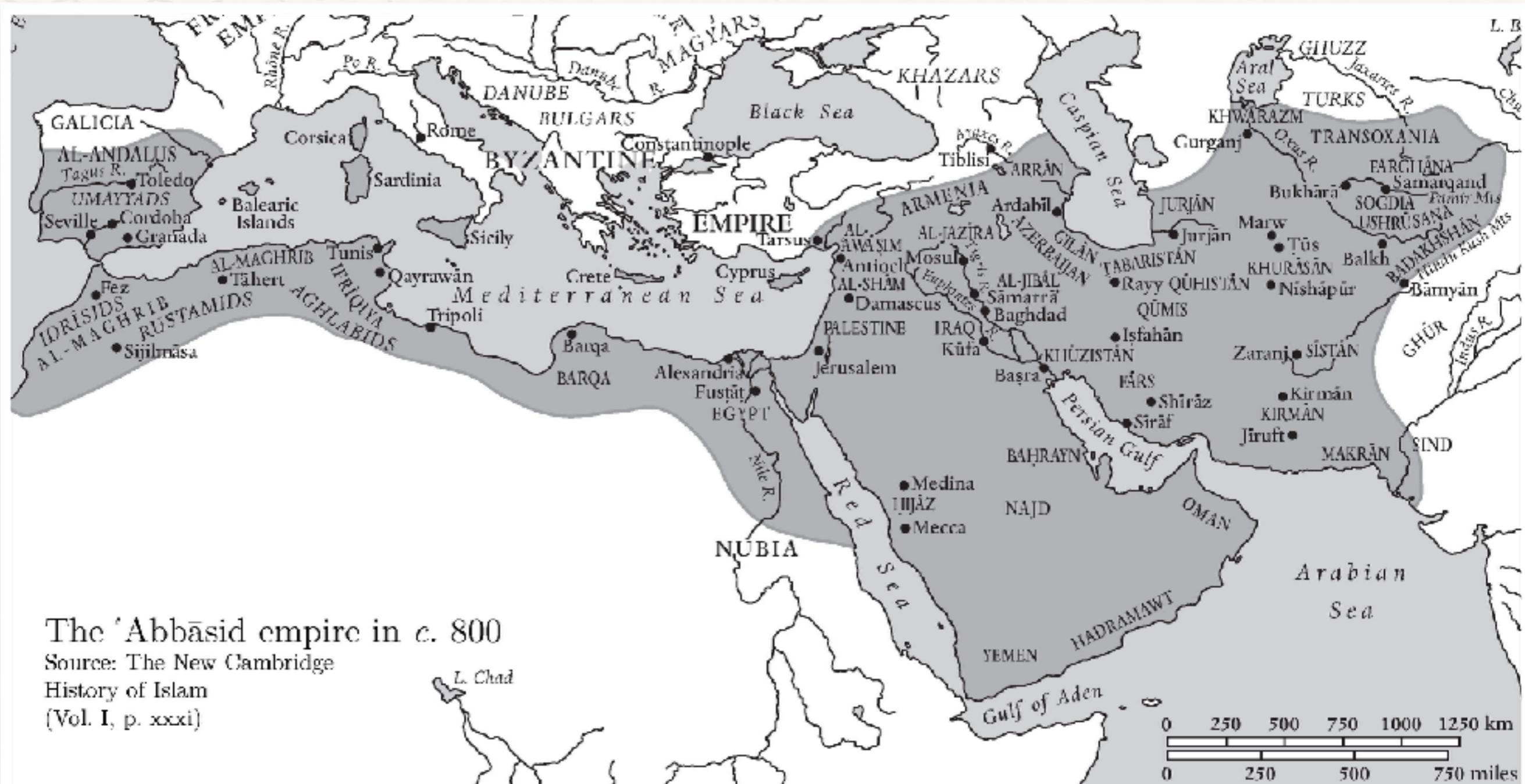


Social Geography: Coverage

Geographical Coverage



Geographical Coverage

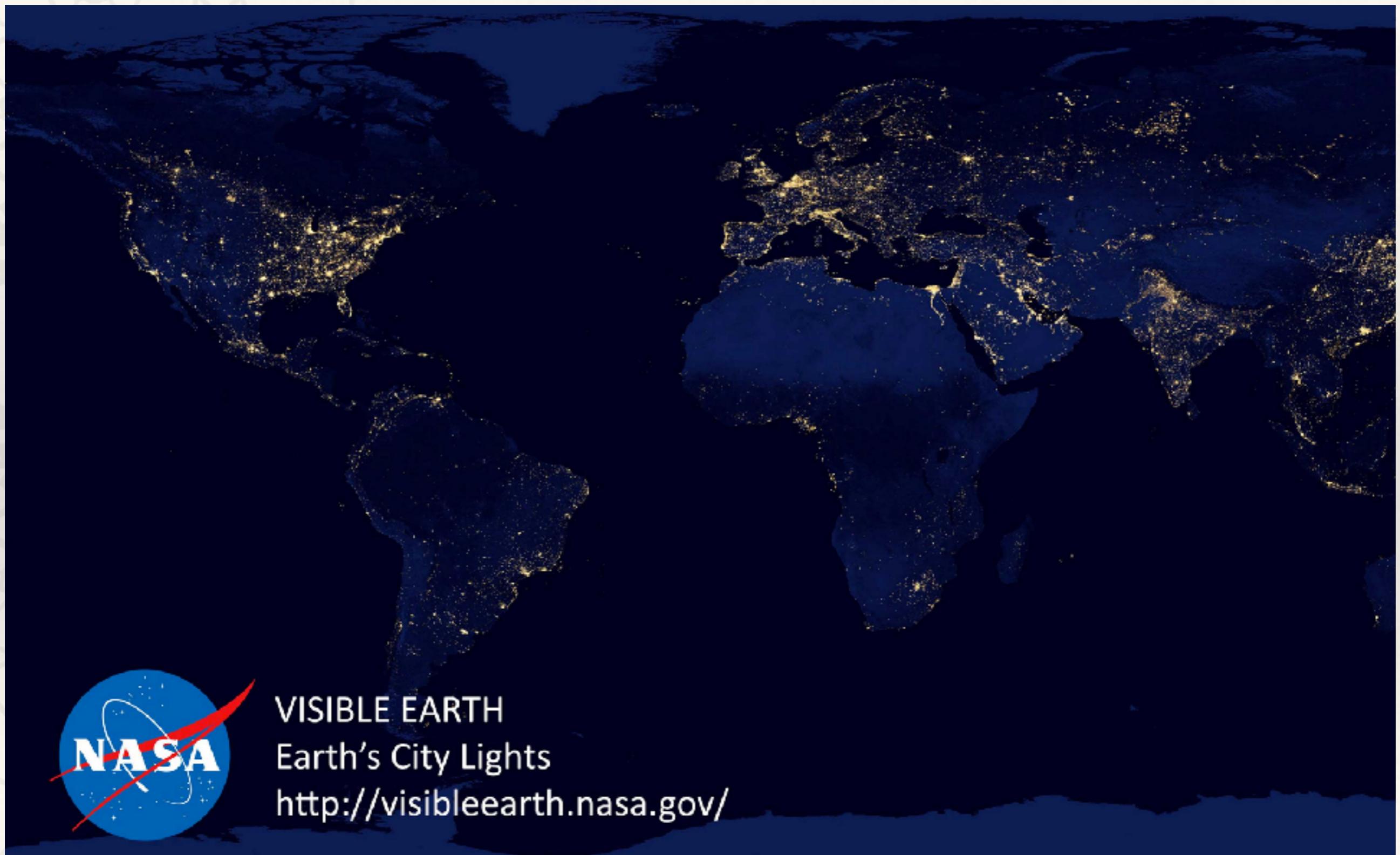


Source: Robinson, Chase F., ed. *The New Cambridge History of Islam*. 1st ed. Cambridge University Press, 2010.

Geographical Coverage: Dynamically...

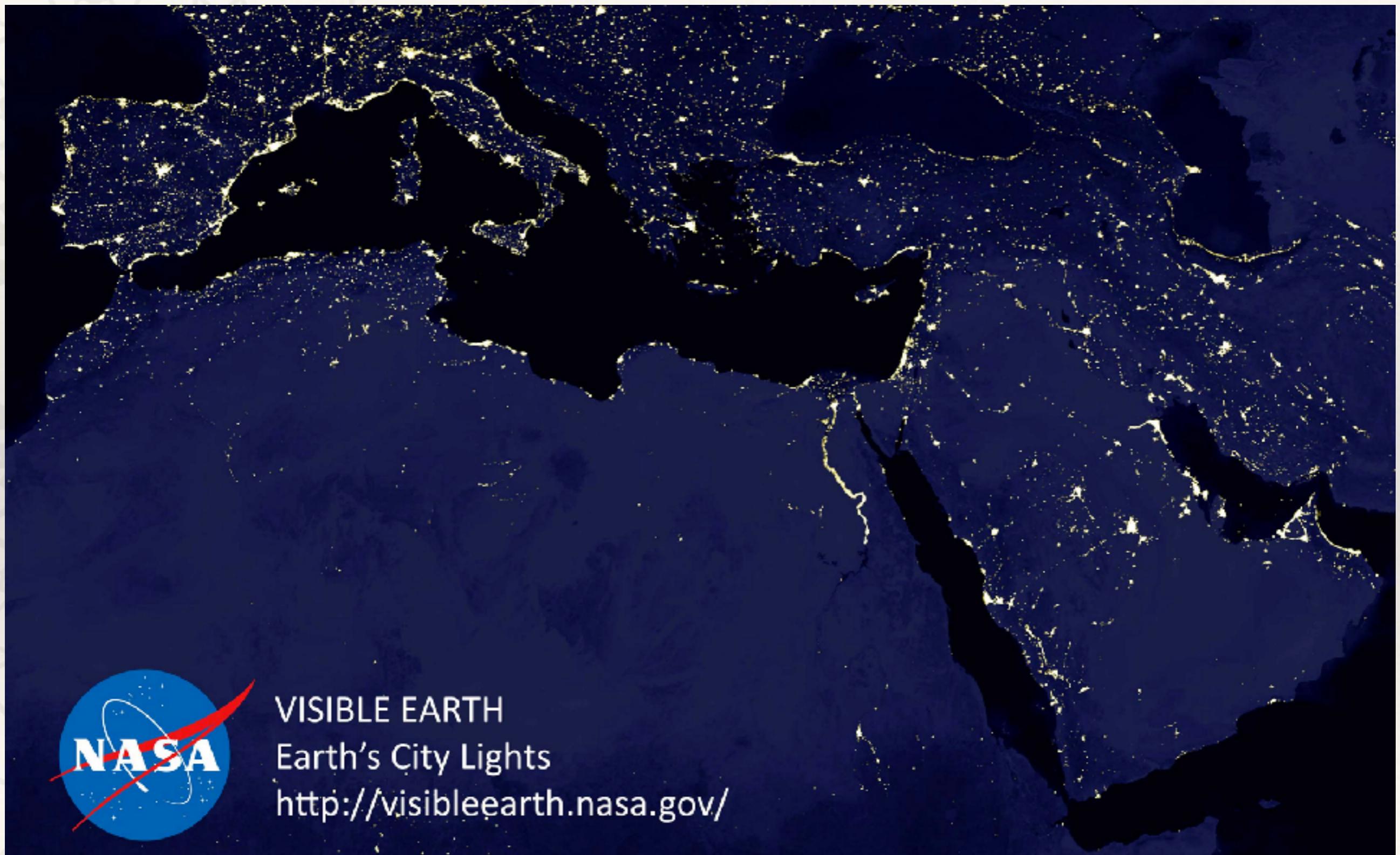


Geographical Coverage



VISIBLE EARTH
Earth's City Lights
<http://visibleearth.nasa.gov/>

Geographical Coverage



Geographical Coverage

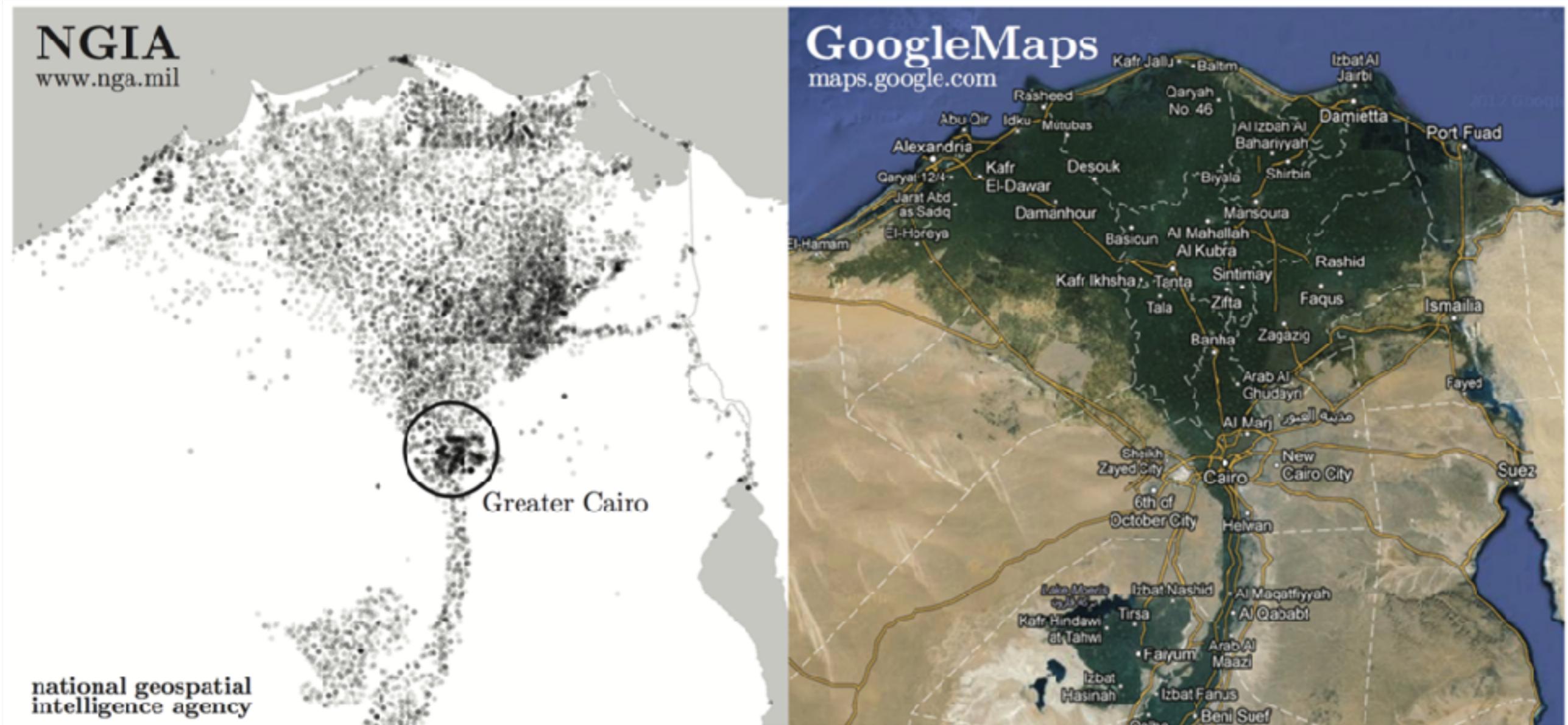
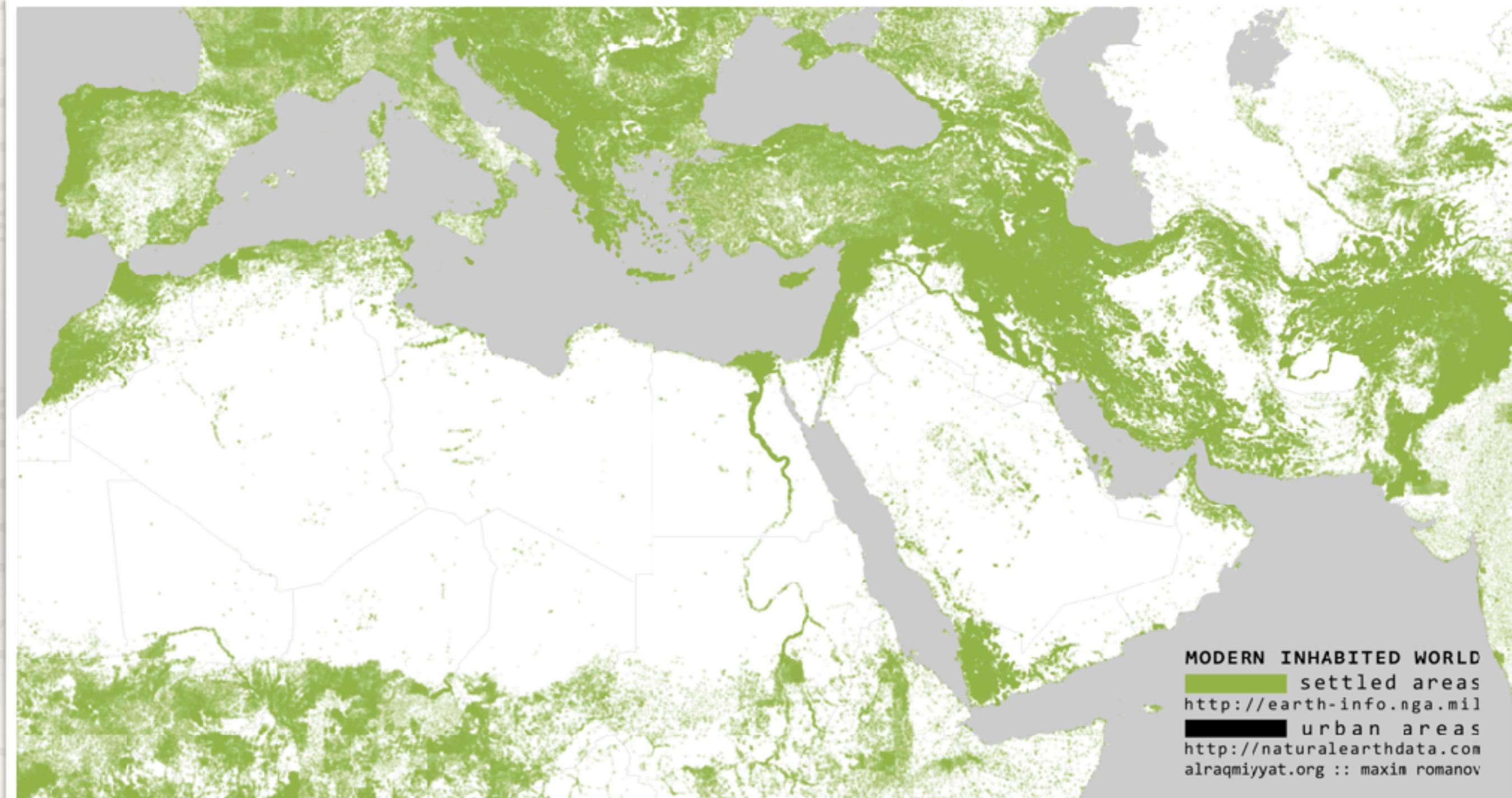
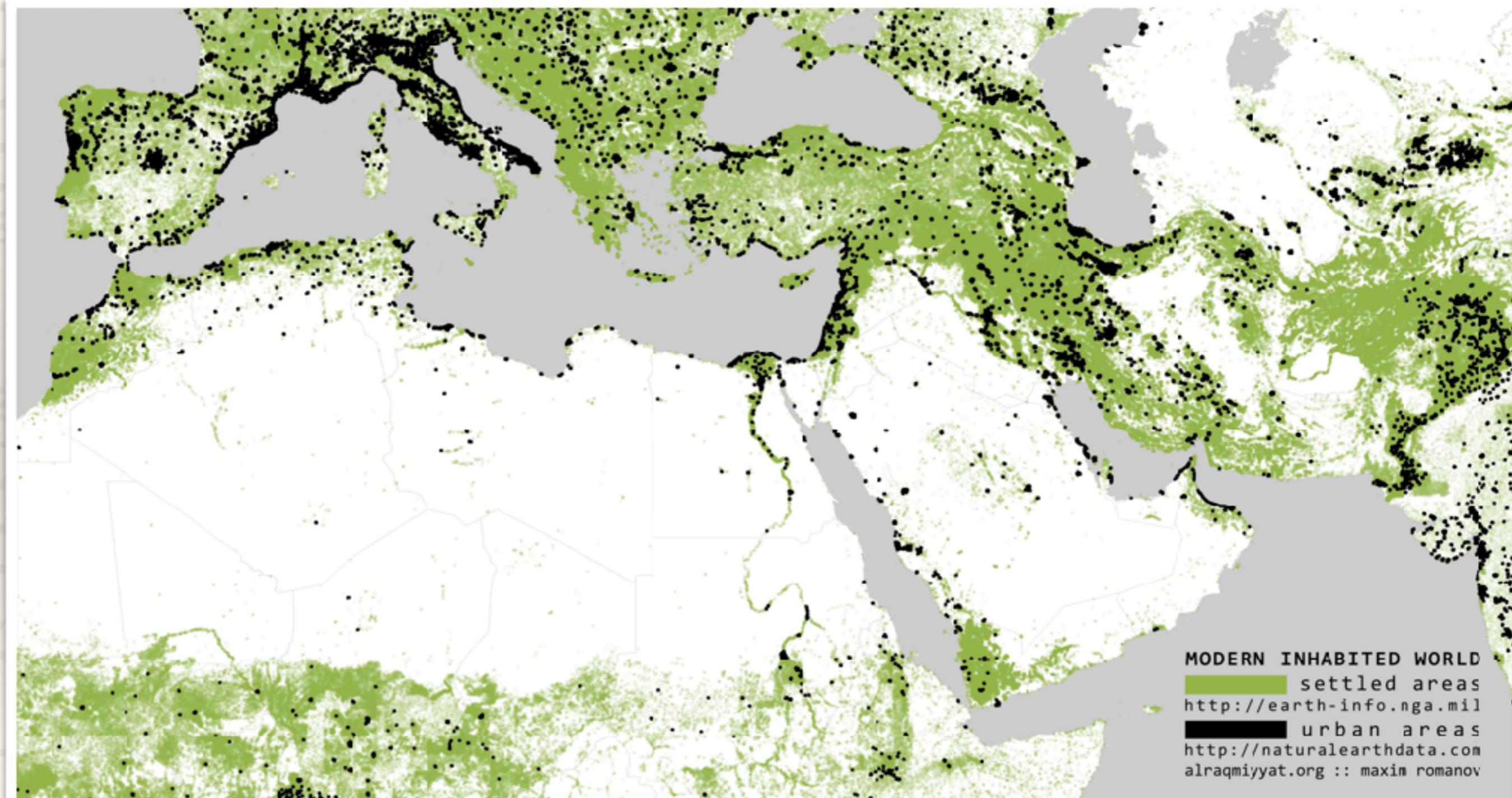


Figure 1.9: The Inhabited World: Using GIS data, one can build a map of the inhabited areas. The map on the left shows how settlements shape the Nile Delta, the valley of the Nile river, the Fayyūm Oasis, and, to a certain extent, the Suez canal; the darkest cluster represents the Cairo metropolitan area.

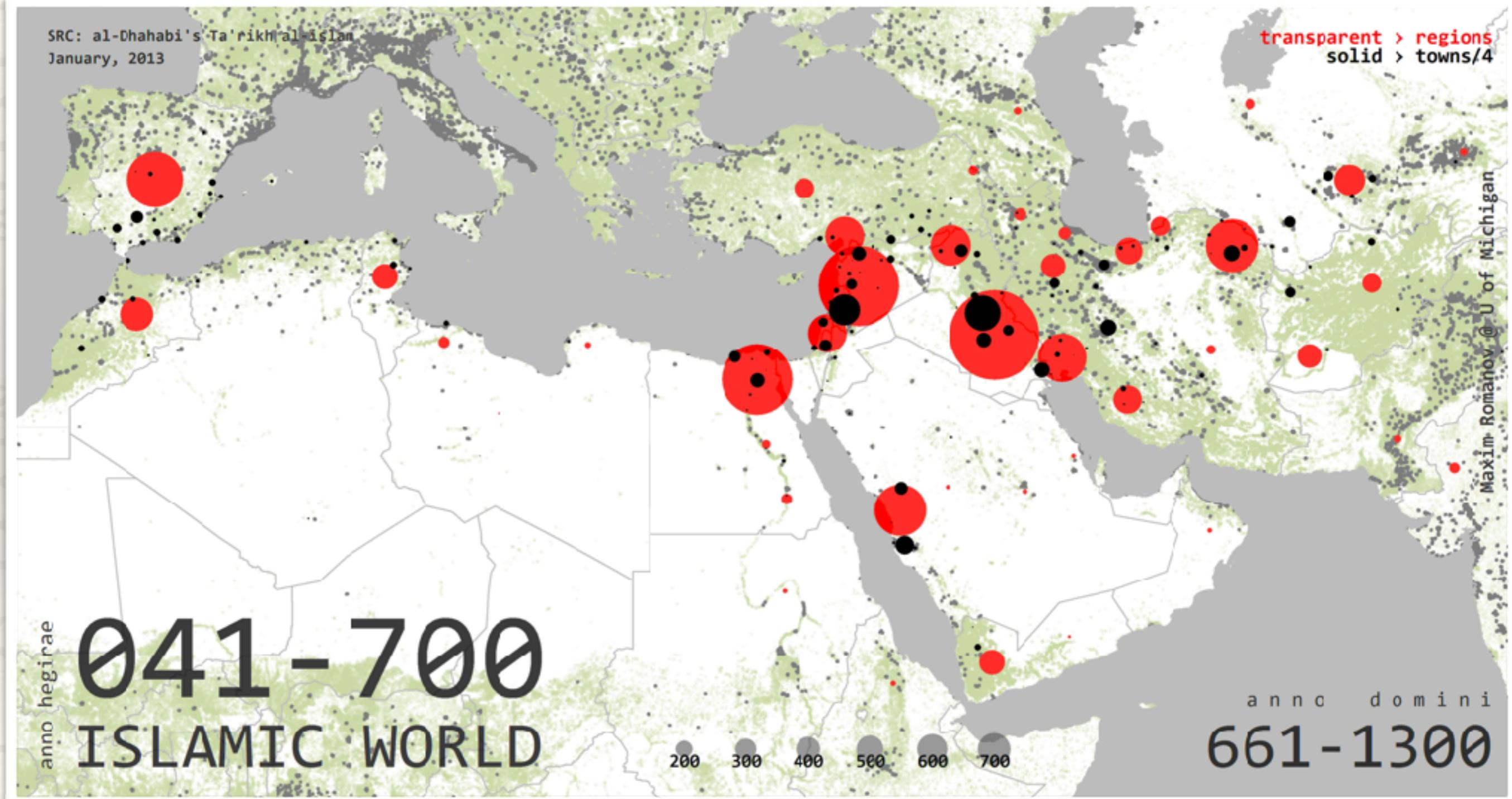
Geographical Coverage



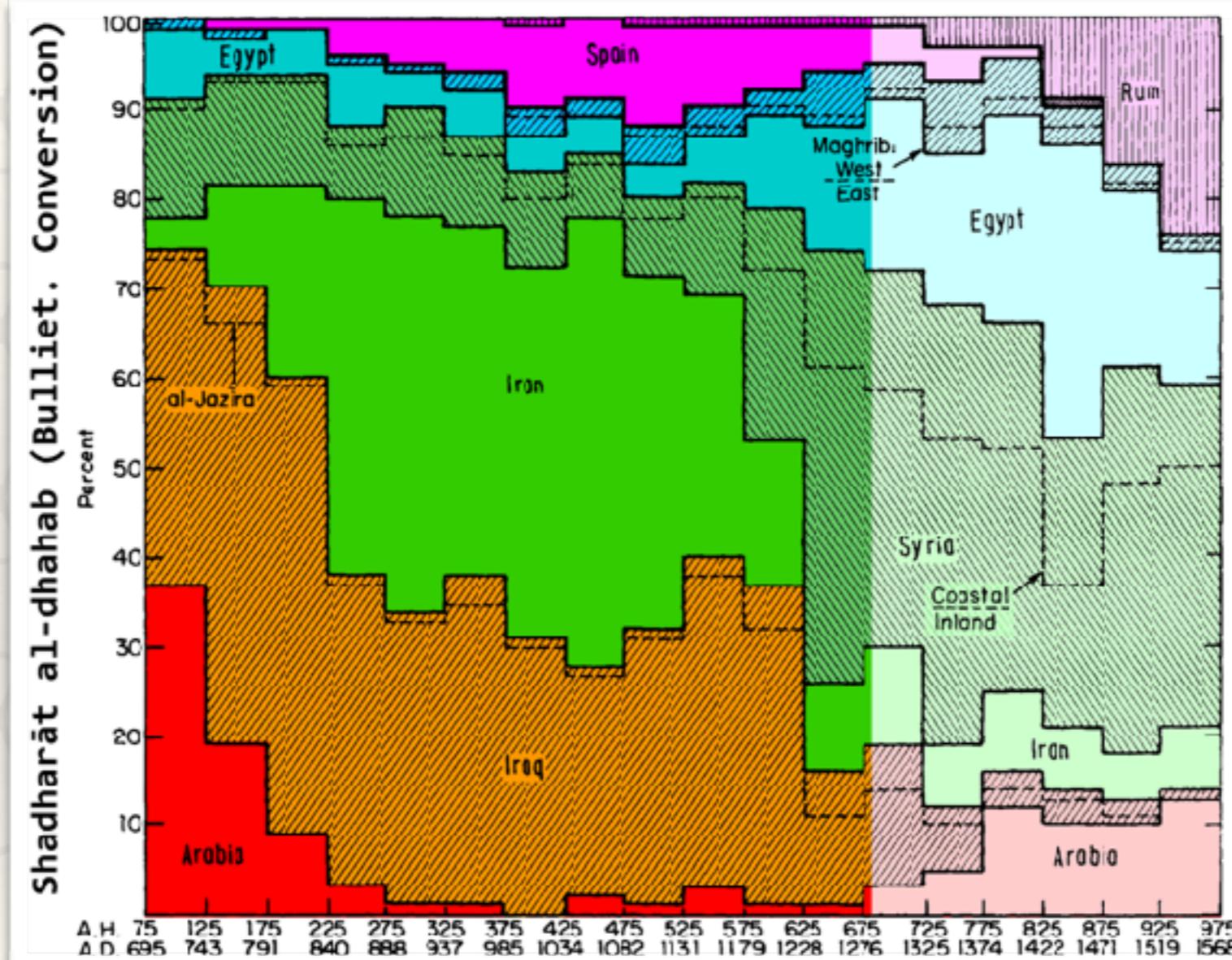
Geographical Coverage



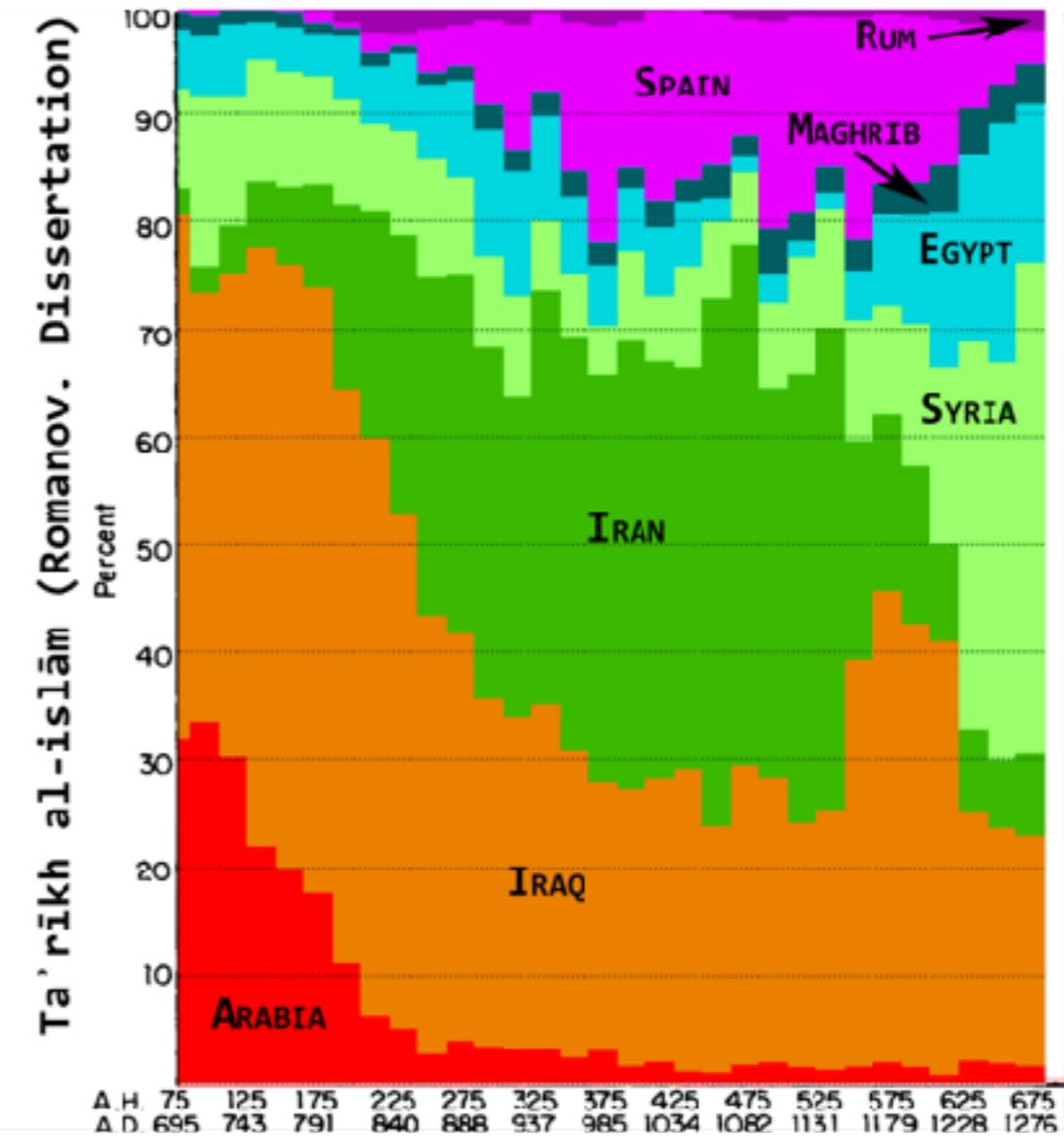
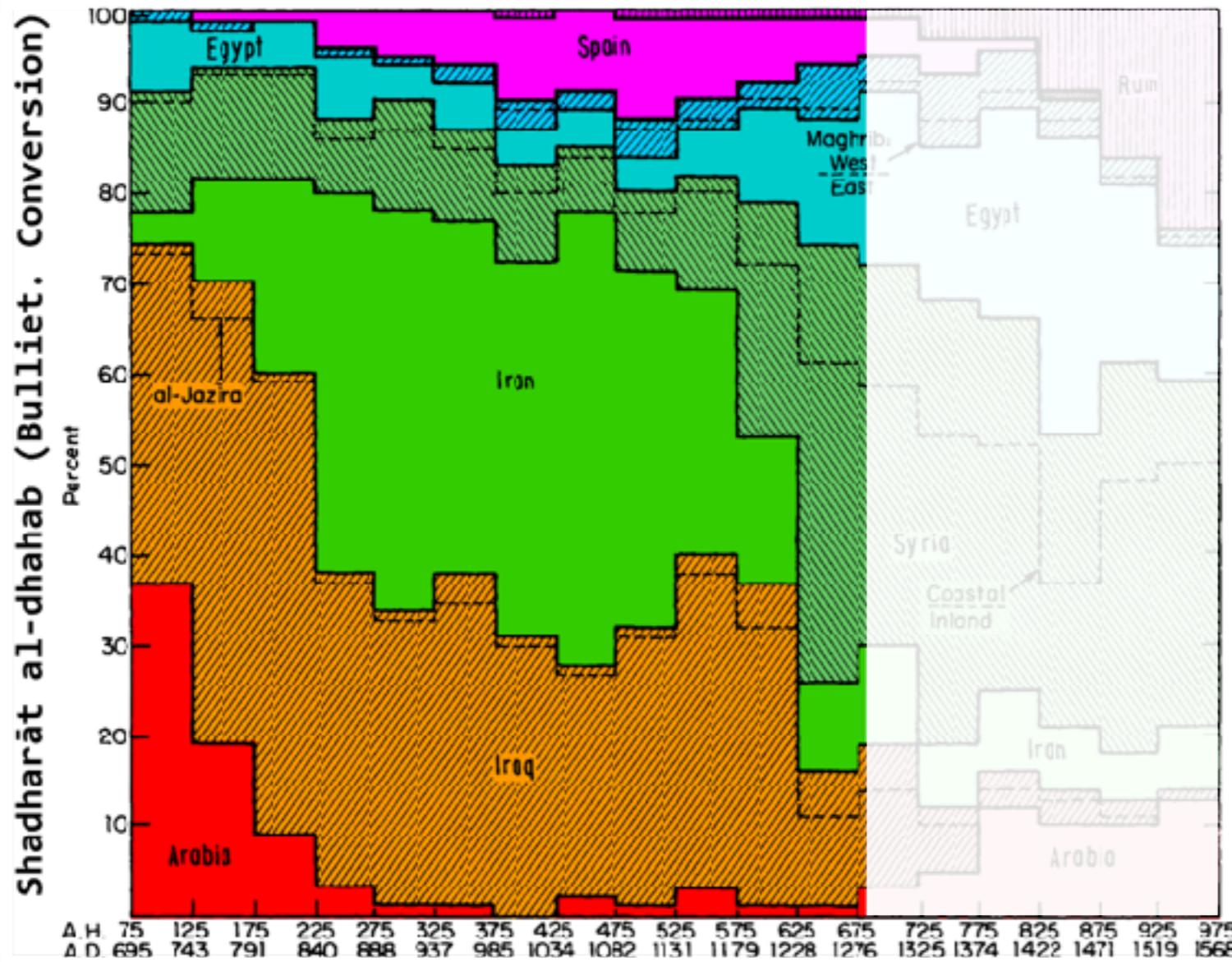
Geographical Coverage



Geo-Chronological Coverage: Comparative Perspective

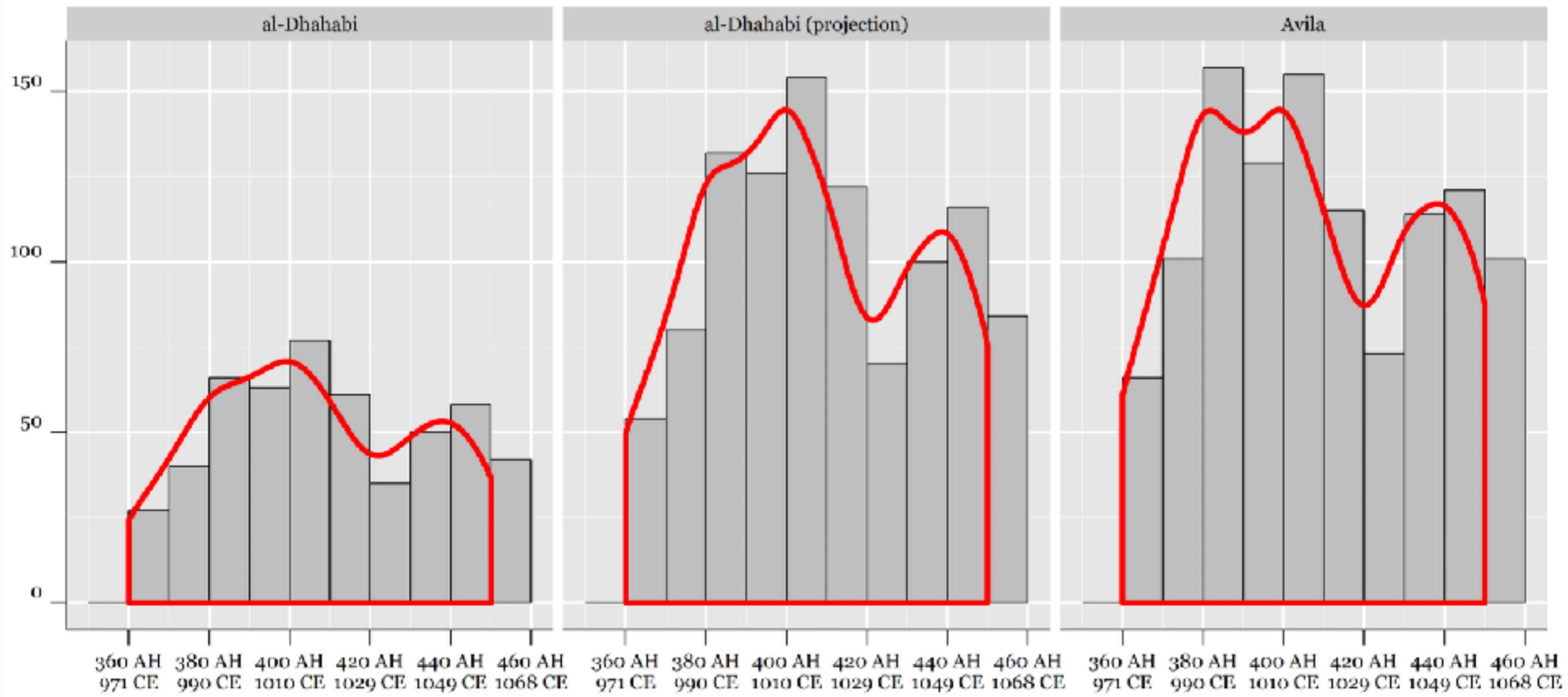


Geo-Chronological Coverage: Comparative Perspective

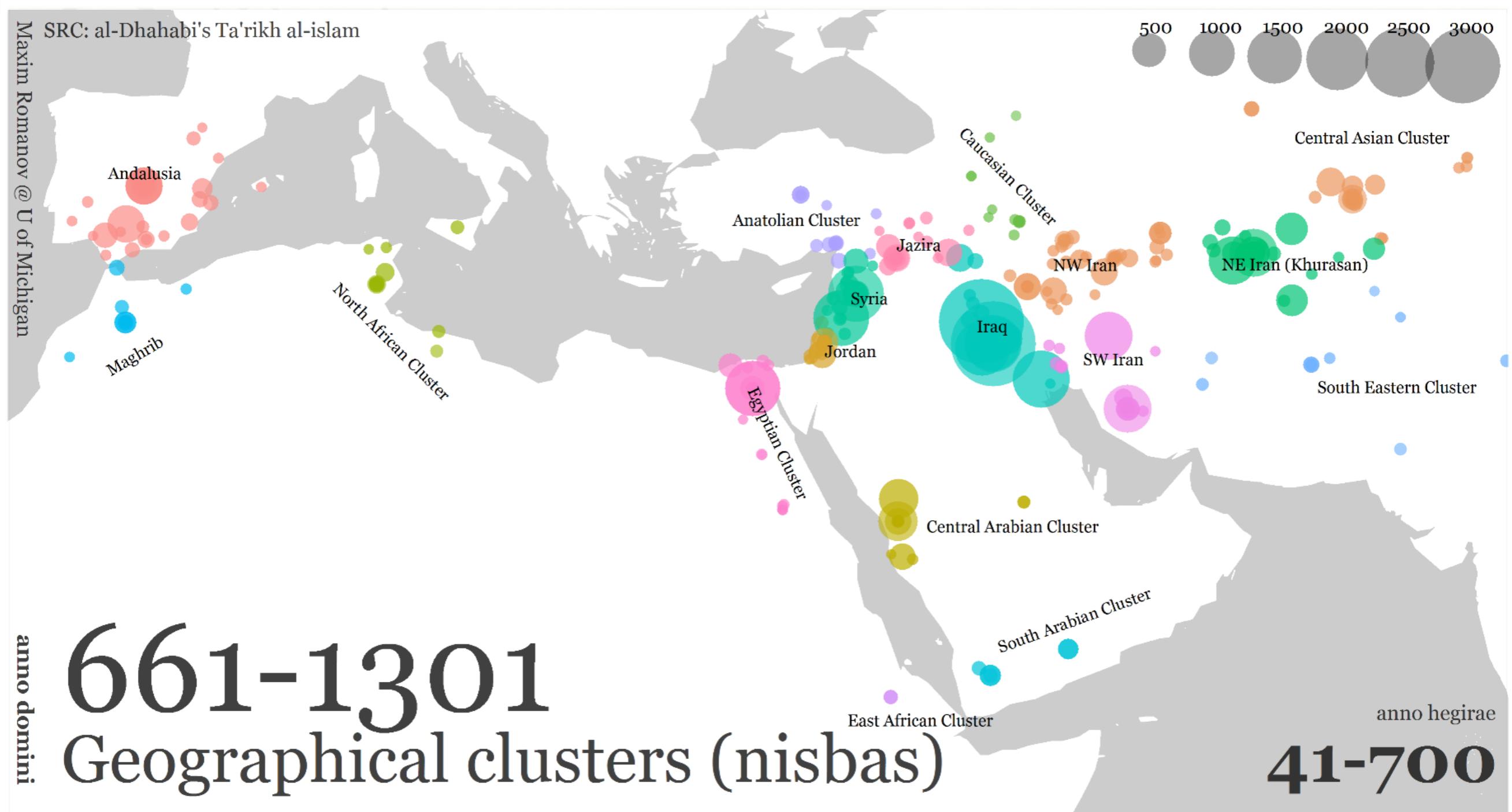


Geo-Chronological Coverage: Comparative Perspective

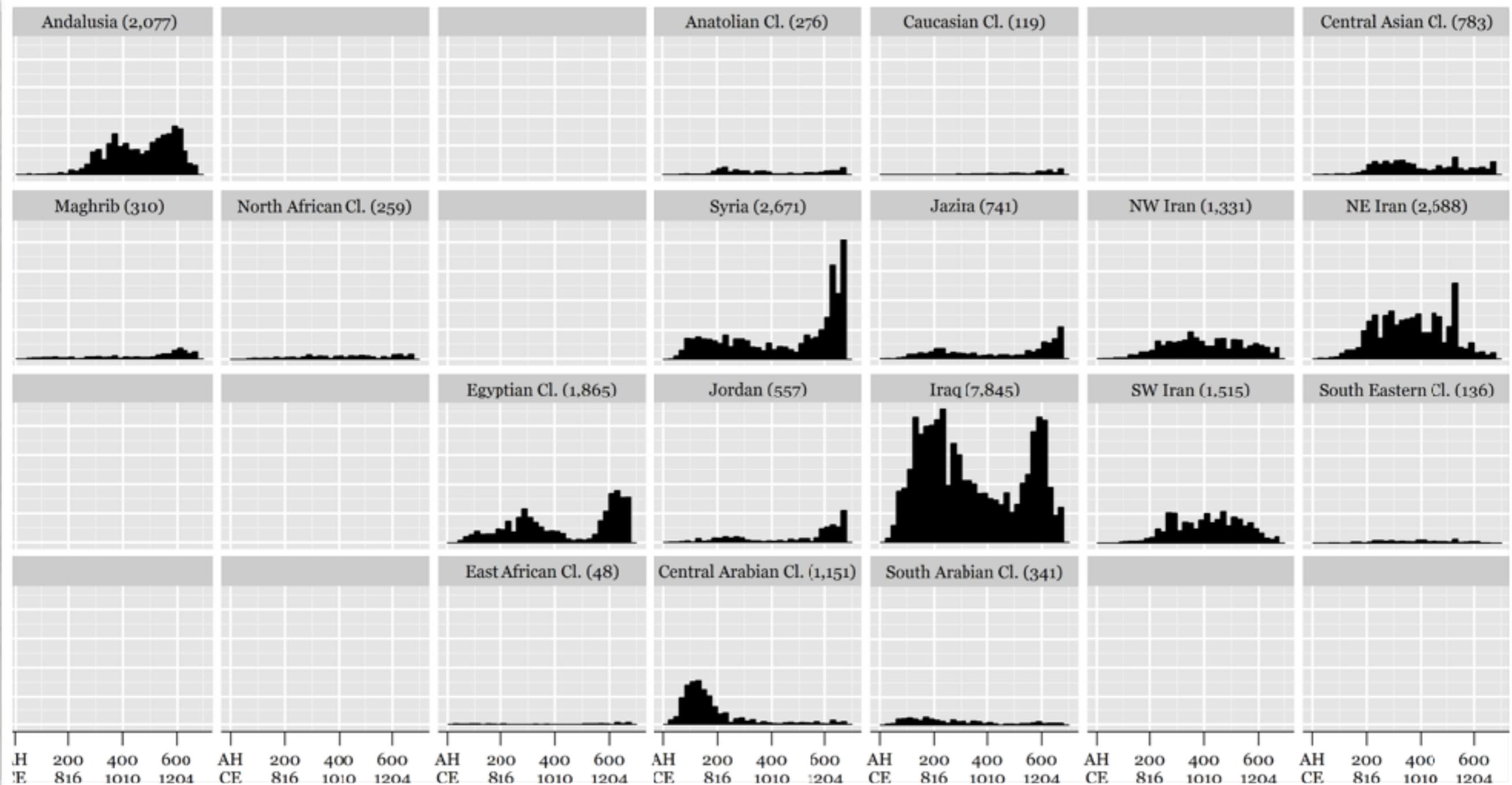
AH	370	380	390	400	410	420	430	440	450	460
in TI	42%	40%	42%	49%	49%	53%	49%	44%	48%	41%

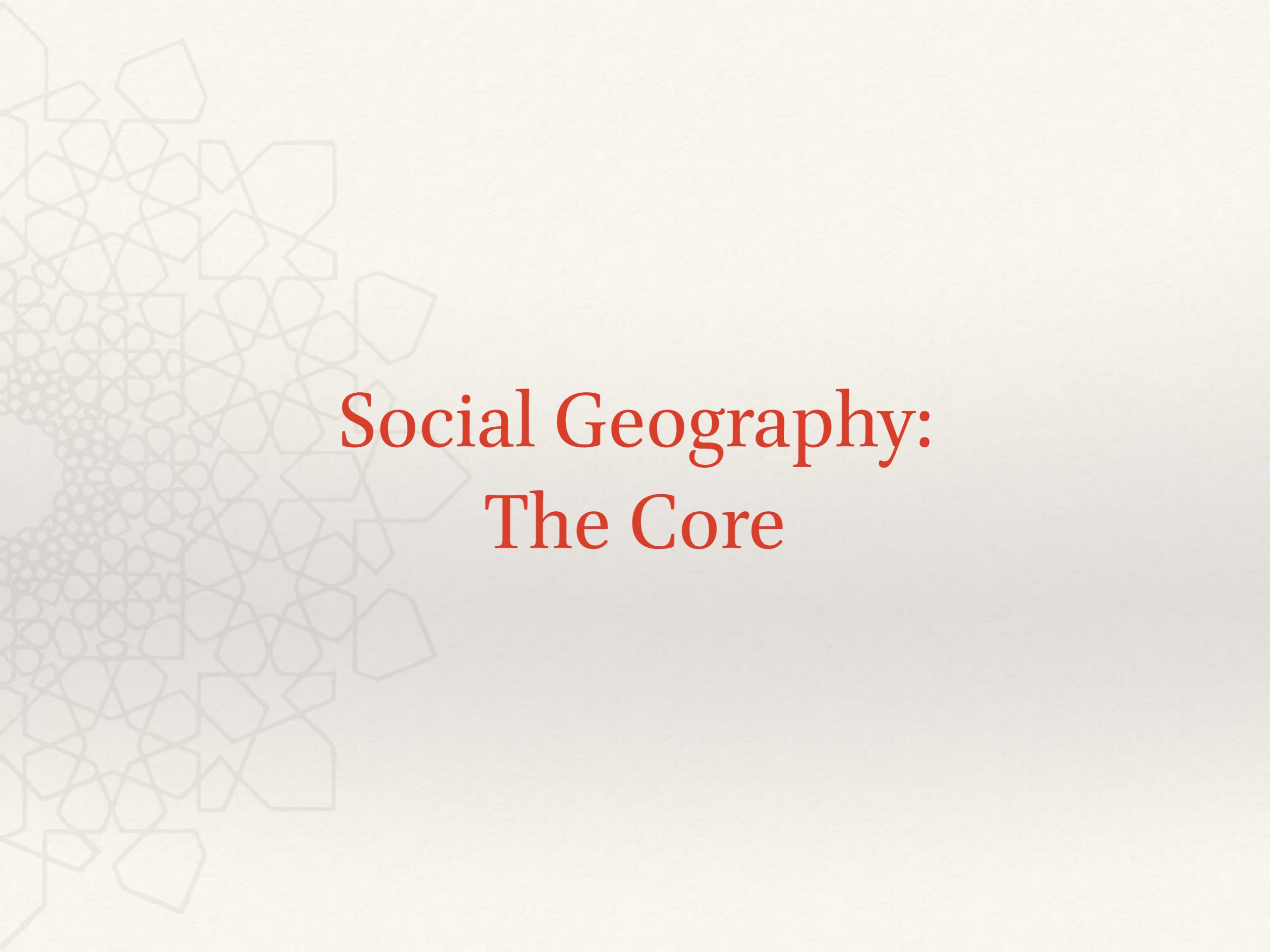


Geographical Coverage



Geo-Chronological Coverage





Social Geography: The Core

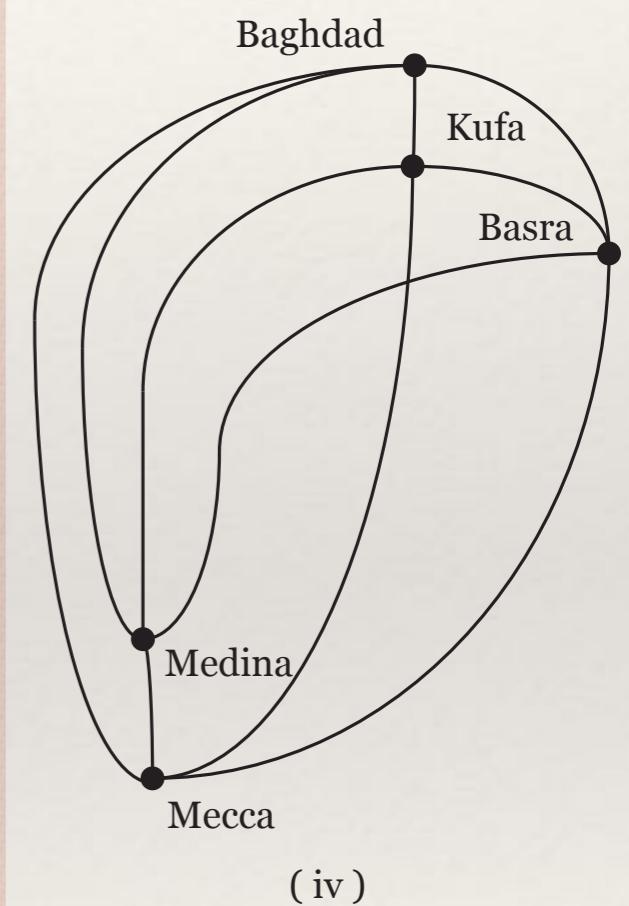
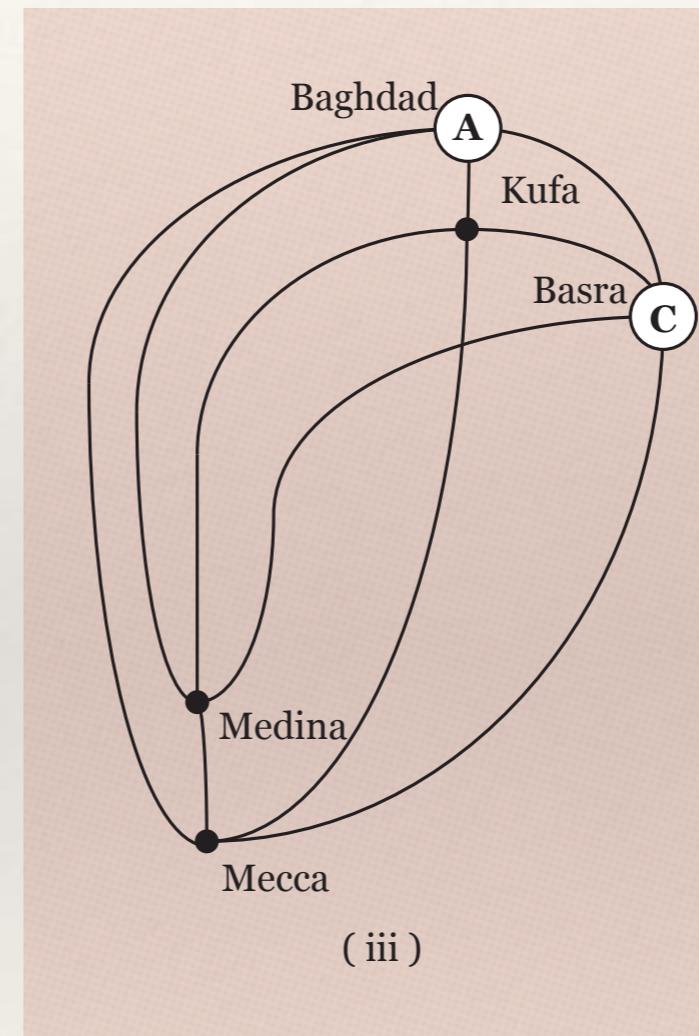
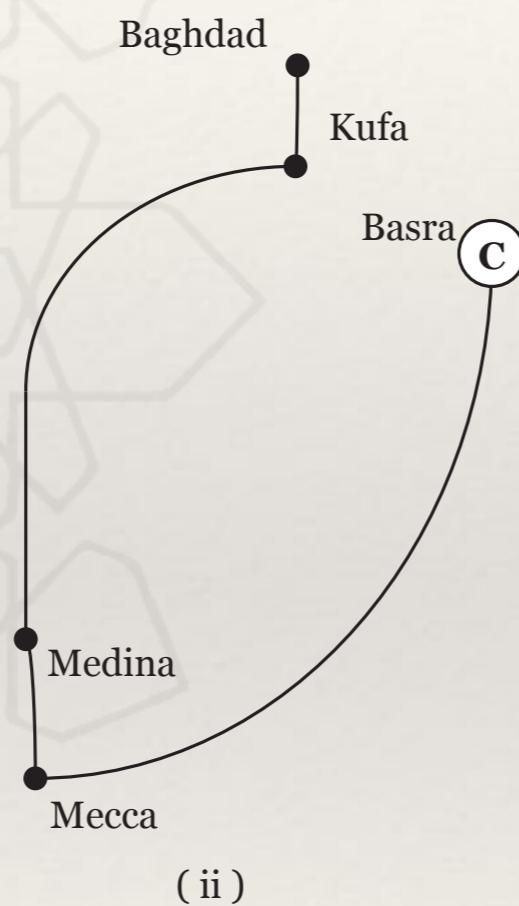
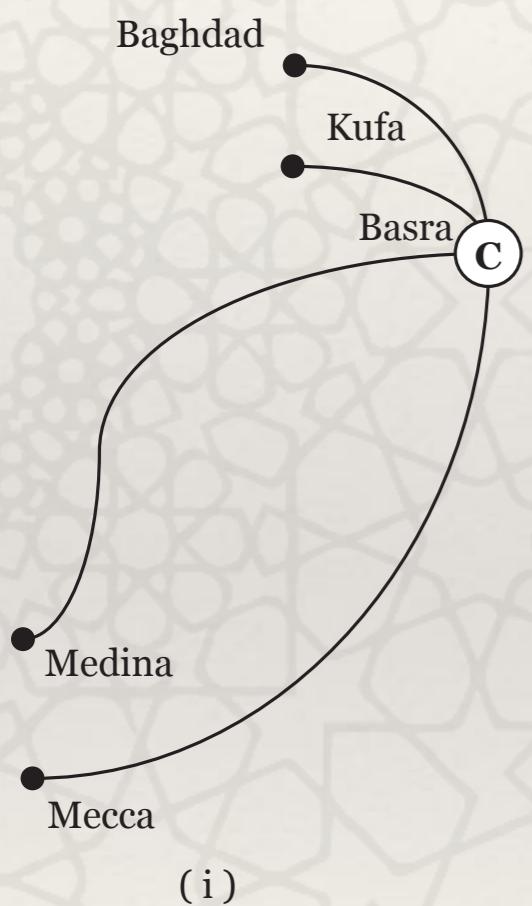
Modeling the Core



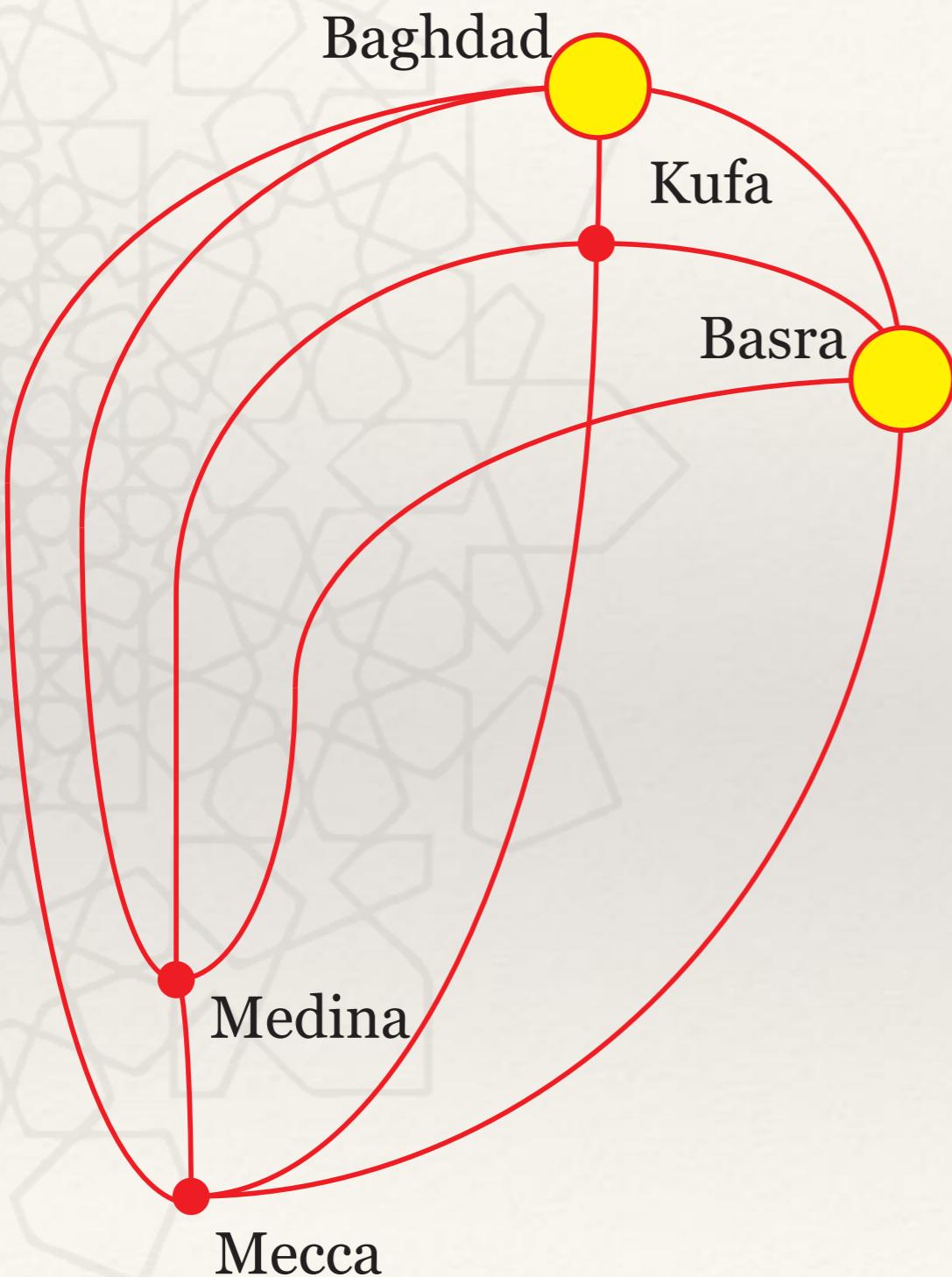
facebook

SOURCE

Modeling Geographical Connections

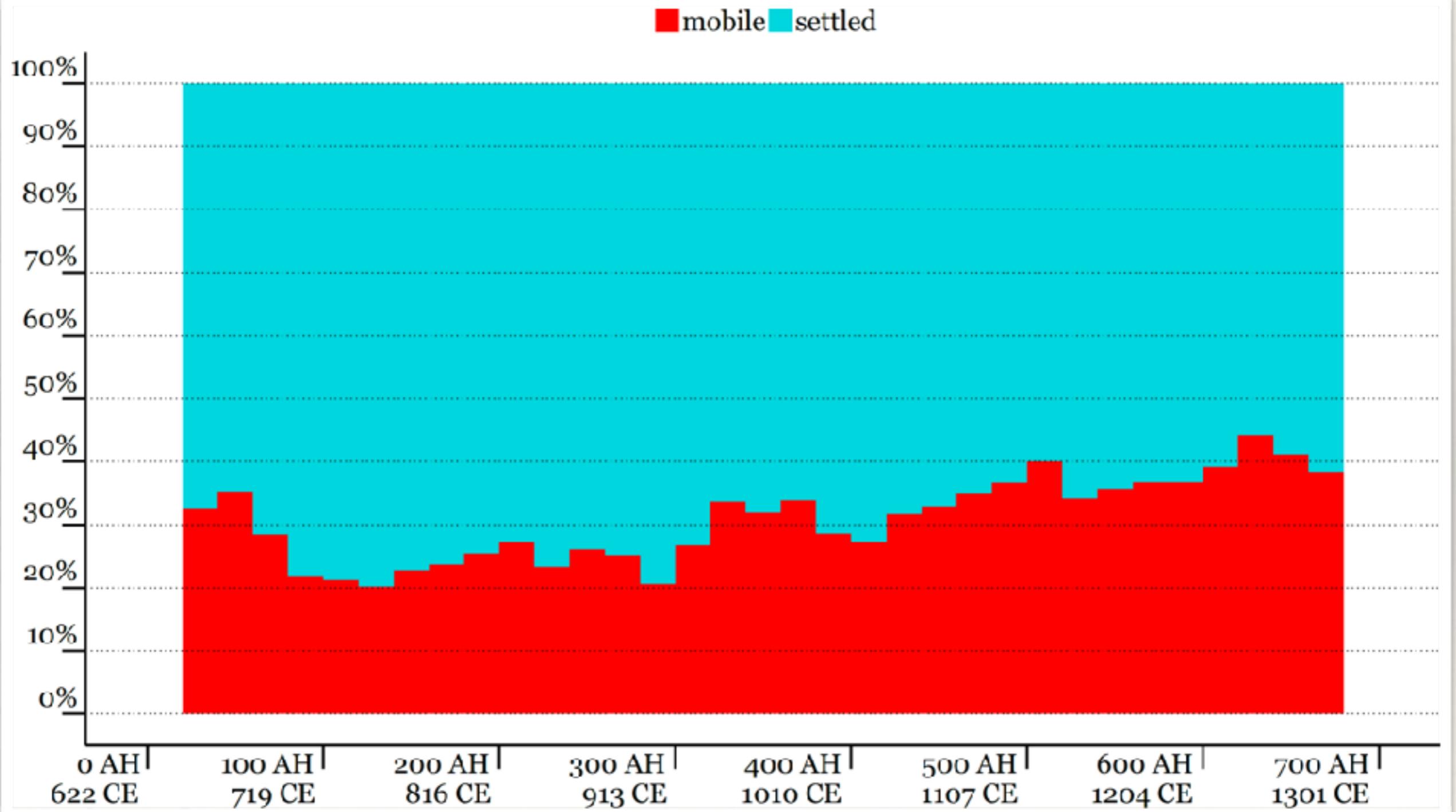


Modeling Geographical Connections



- ❖ A cartogram of a person—*al-Bağdādī* and *al-Basrī*—whose biography mentions Baghdad, Kufa, Basra, Medina and Mecca
- ❖ Such data can be grouped to show particular groups and/or periods

Transregional Mobility



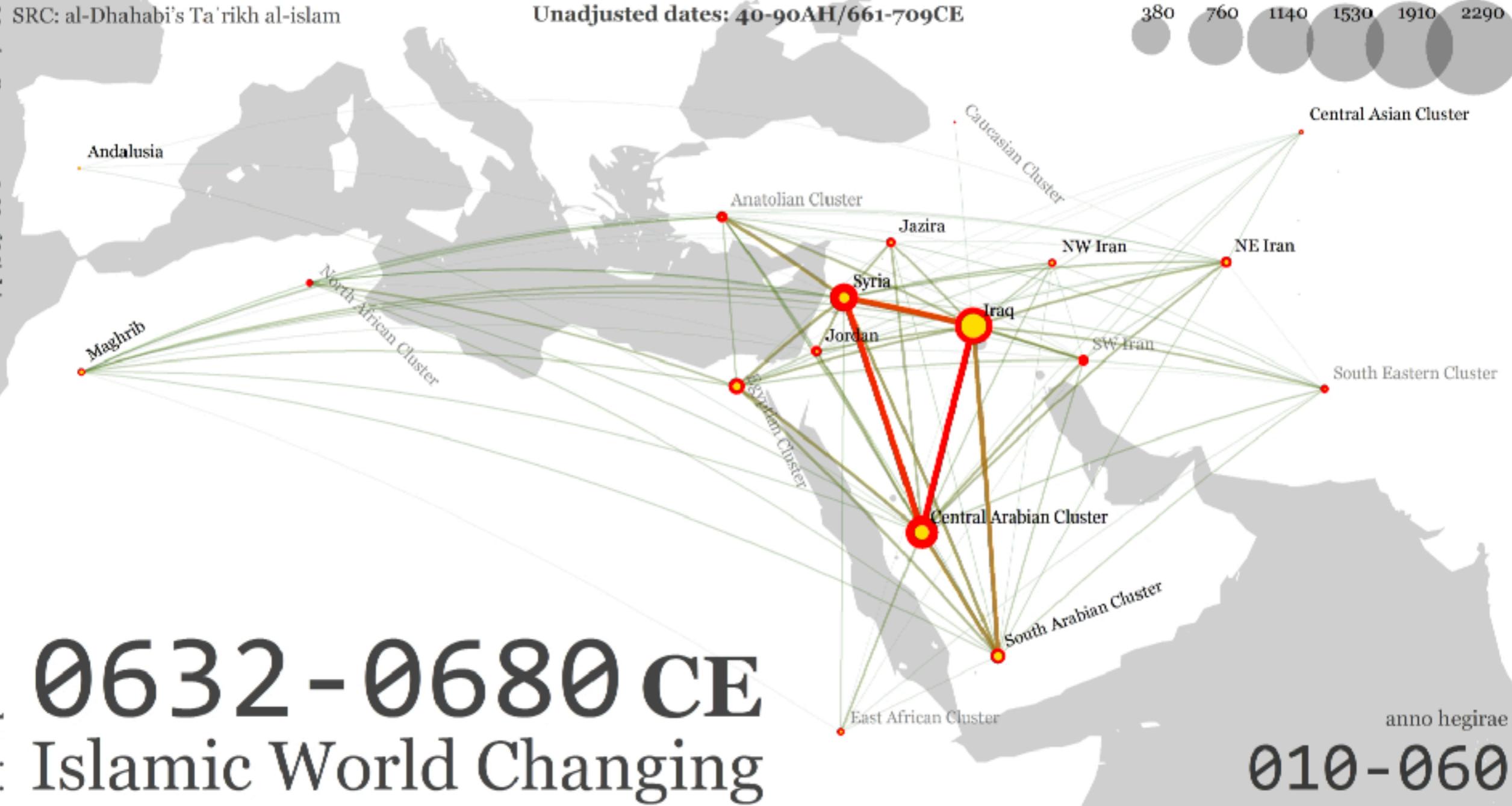
Note: 33% (9,700) with transregional connections, fluctuating within the range of 22-46%

anno domini
0632 - 0680 CE
Islamic World Changing

SRC: al-Dhahabi's *Ta'rikh al-islam*

Unadjusted dates: 40-90AH/661-709CE

380 760 1140 1530 1910 2290



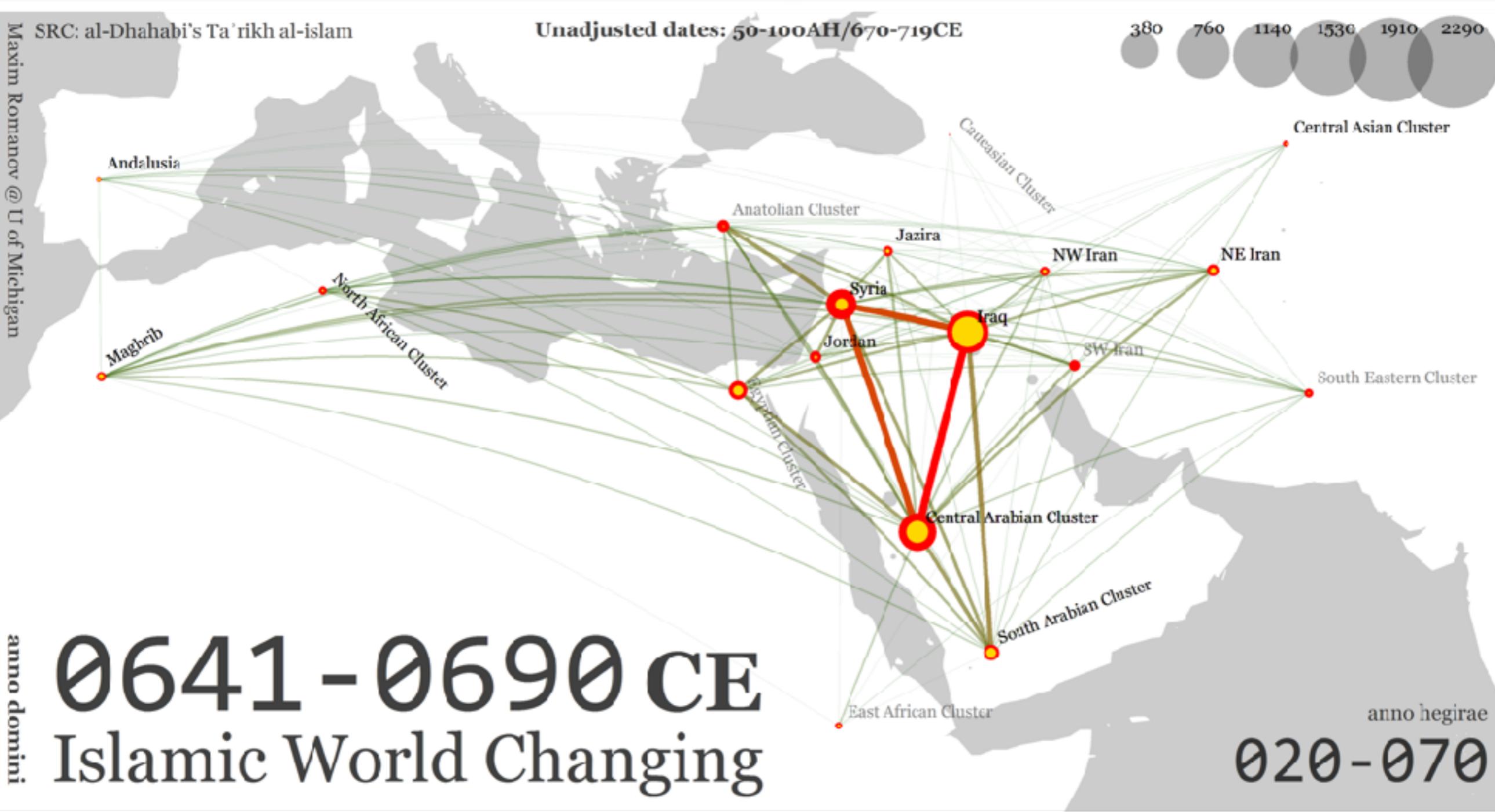
anno hegirae

010 - 060

0641 - 0690 CE
Islamic World Changing

SRC: al-Dhahabi's *Ta'rikh al-islam*

Unadjusted dates: 50-100AH/670-719CE



anno hegirae

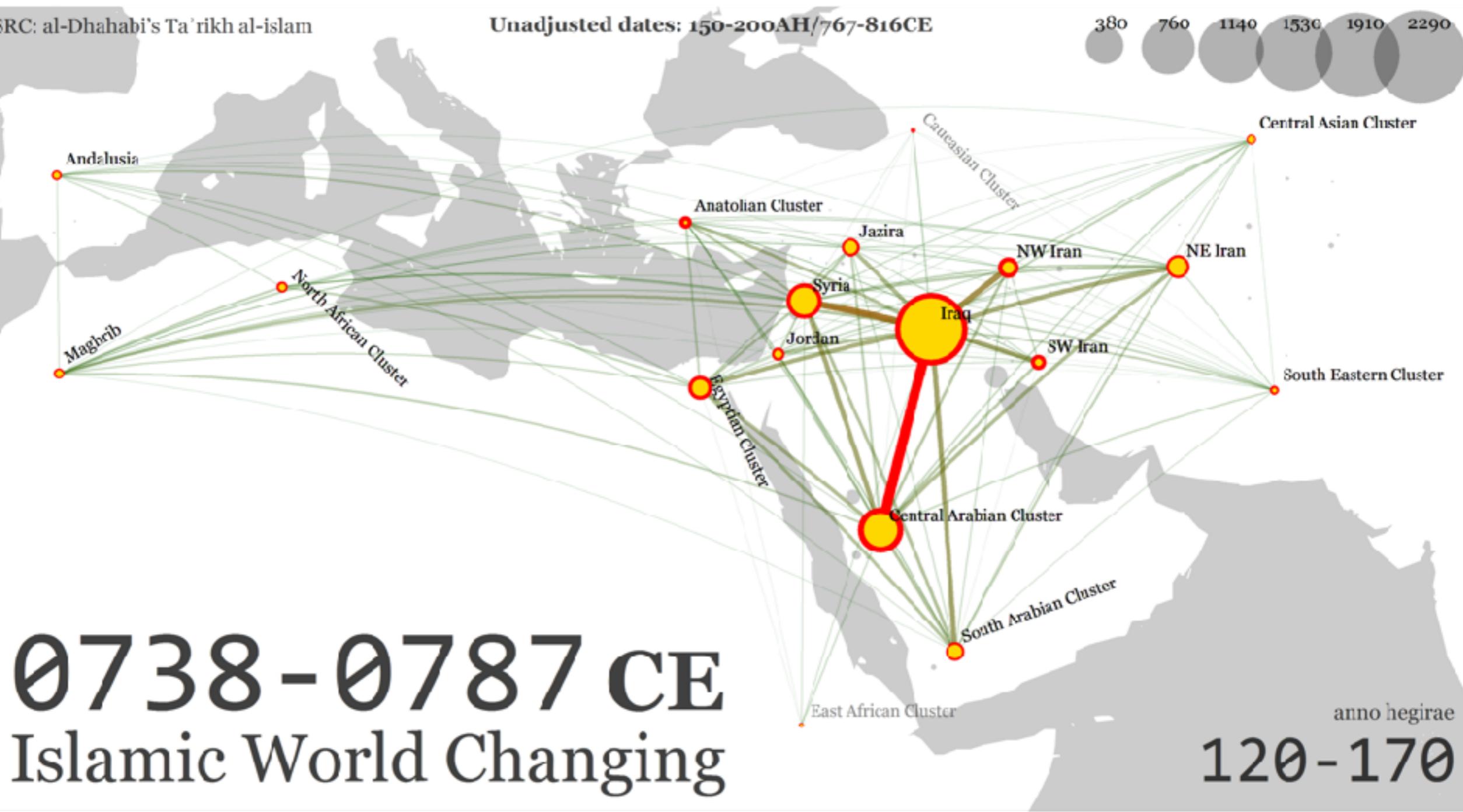
020 - 070

anno domini
0738-0787 CE
Islamic World Changing

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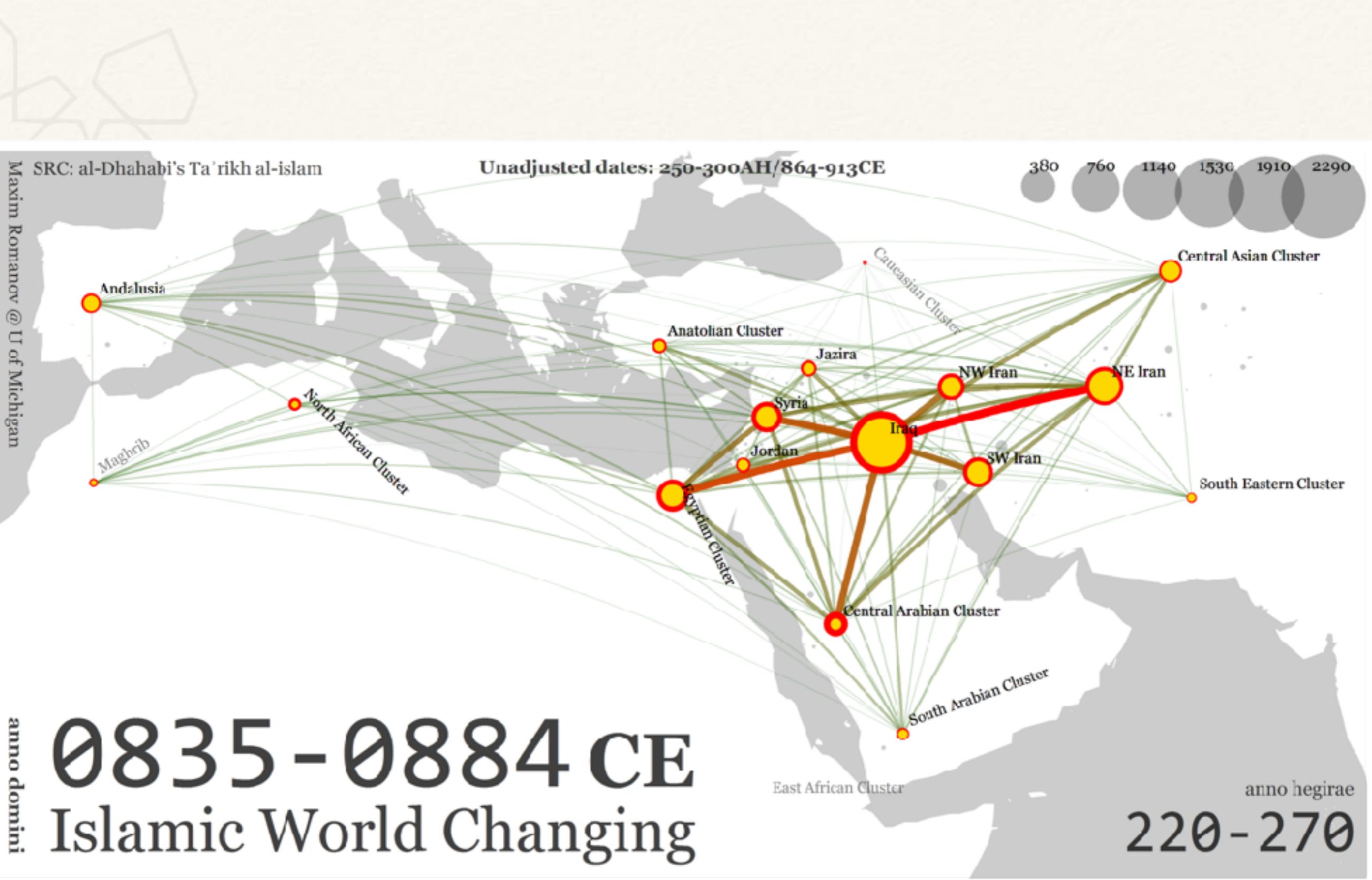
anno hegirae
120-170

0835 - 0884 CE Islamic World Changing

SRC: al-Dhahabi's *Ta'rikh al-islam*

Unadjusted dates: 250-300AH/864-913CE

380 760 1140 1536 1910 2290



anno hegirae

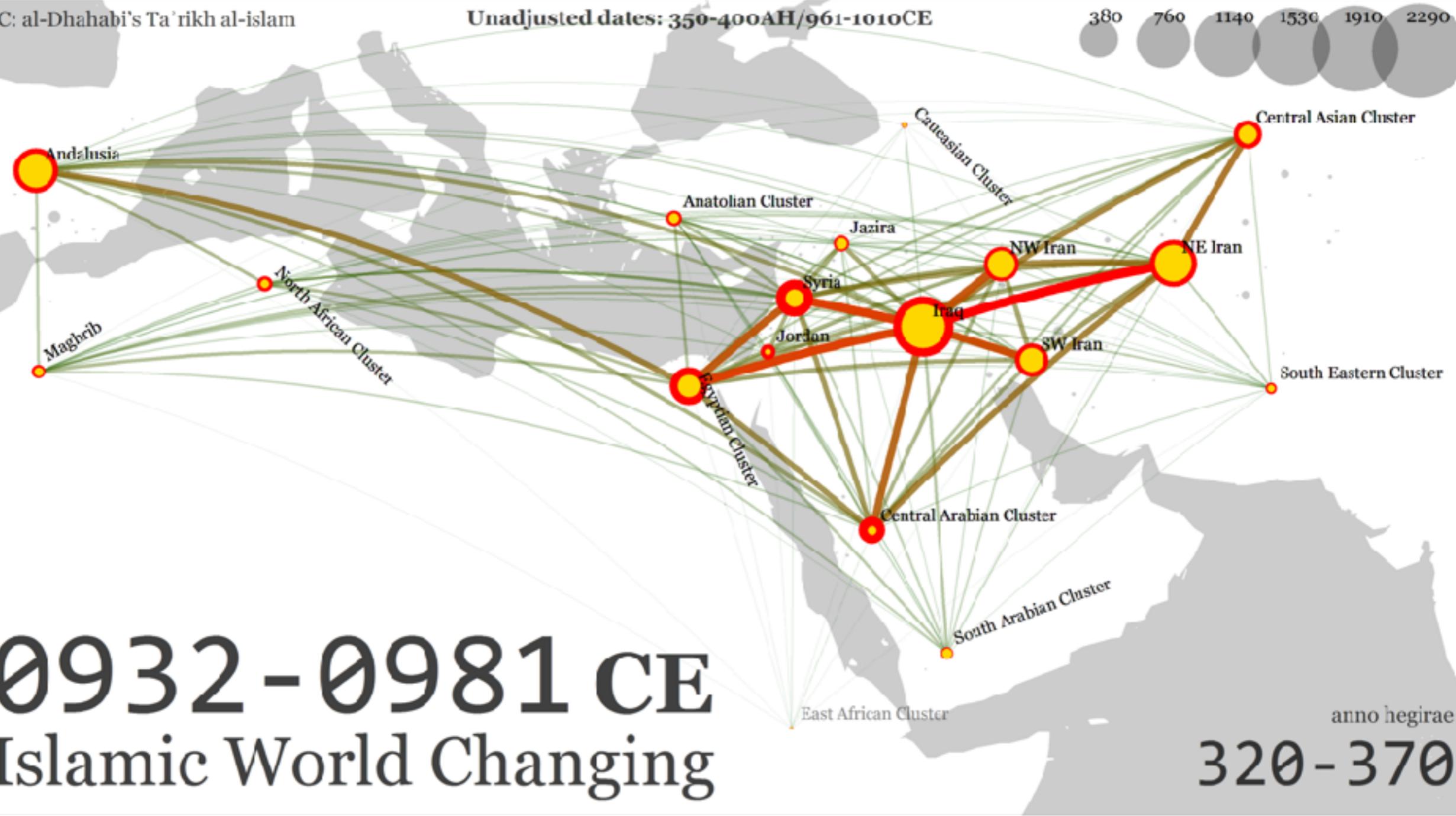
220-270

0932-0981 CE Islamic World Changing

SRC: al-Dhahabi's *Ta'rikh al-islam*

Unadjusted dates: 350-400AH/961-1010CE

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anno hegirae

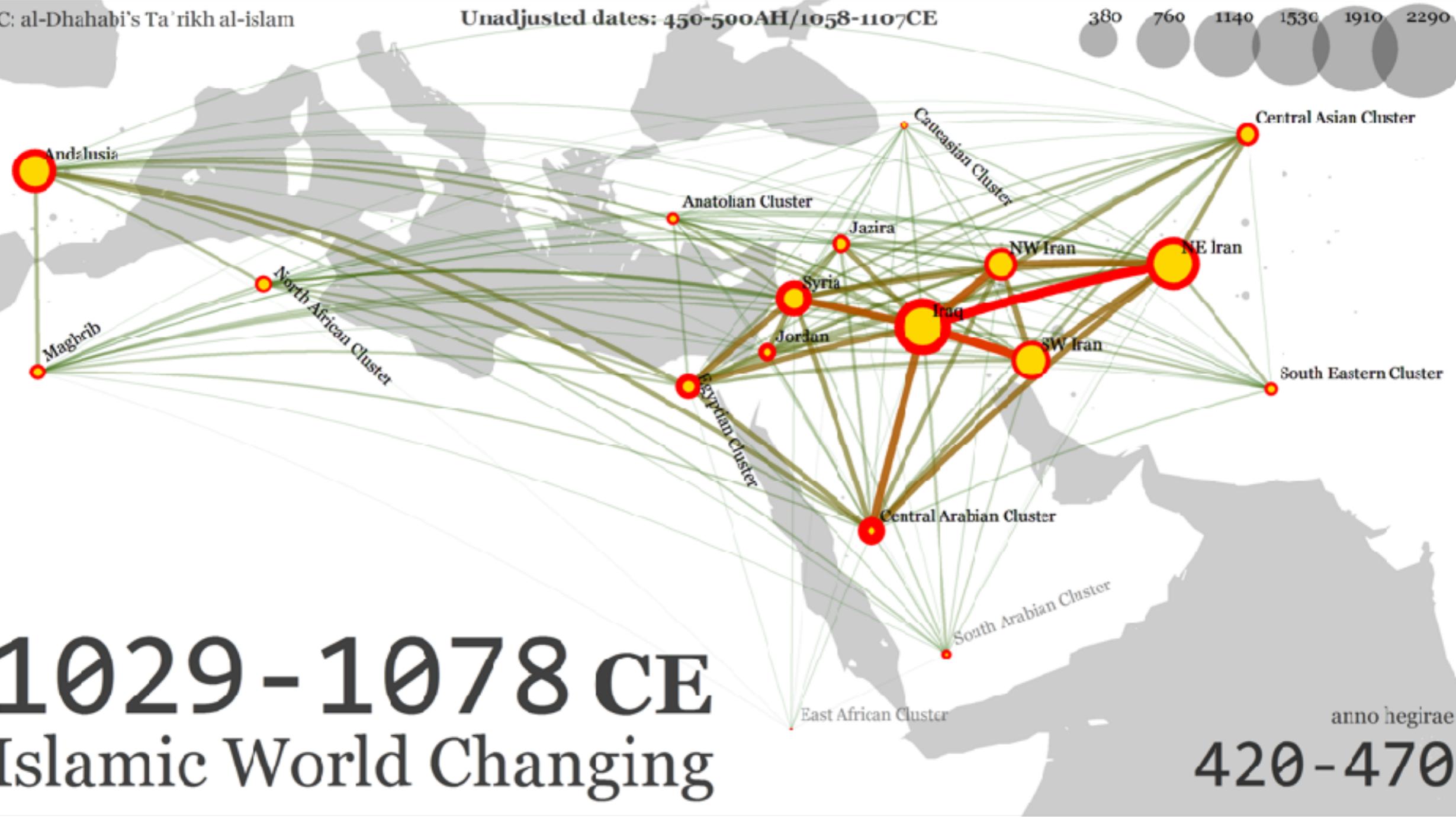
320-370

1029-1078 CE Islamic World Changing

SRC: al-Dhahabi's *Ta'rikh al-islam*

Unadjusted dates: 450-500AH/1058-1107CE

380 760 1140 1536 1910 2290



anno hegirae

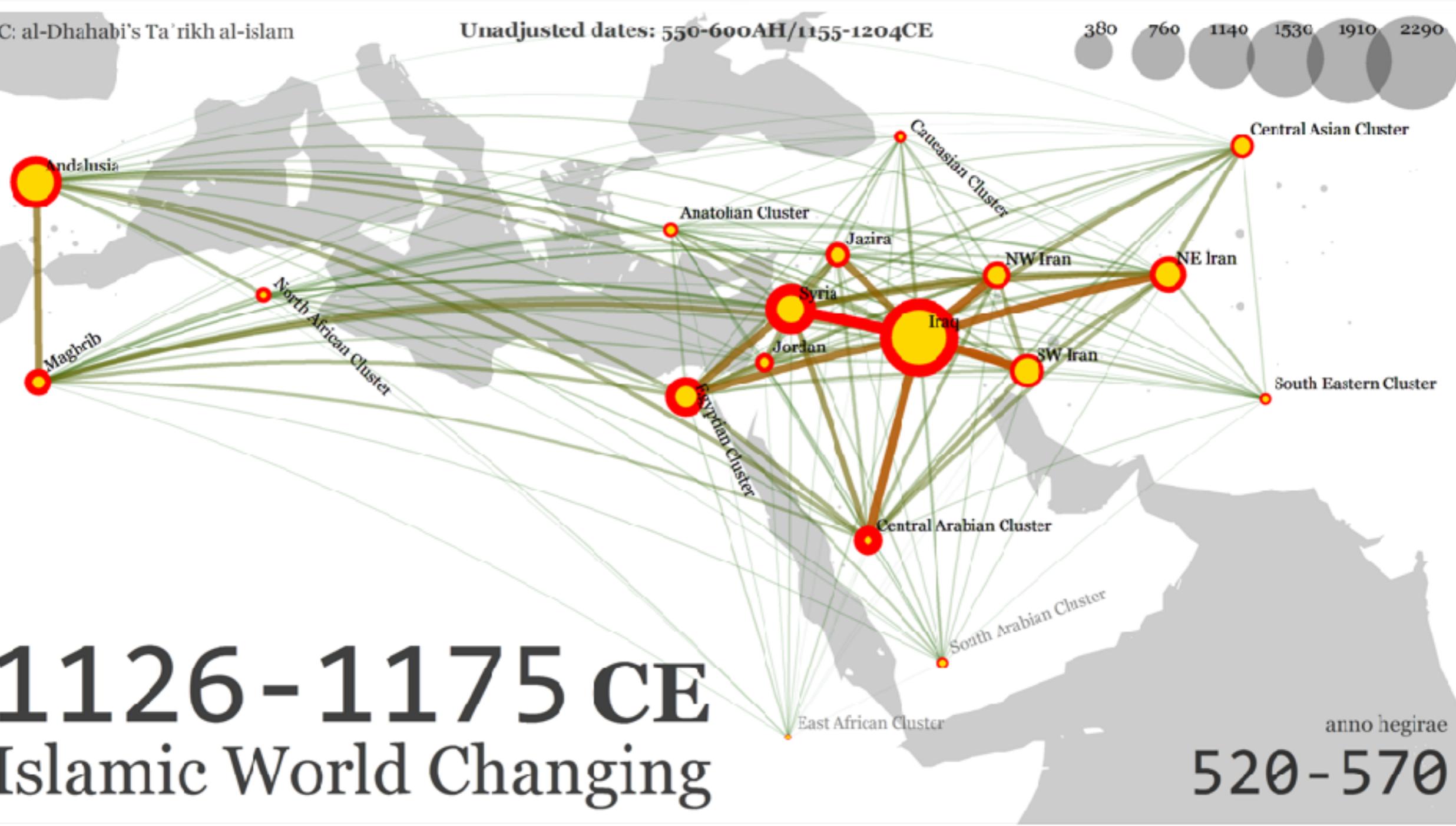
420-470

1126-1175 CE Islamic World Changing

SRC: al-Dhahabi's *Ta'rikh al-islam*

Unadjusted dates: 550-600AH/1155-1204CE

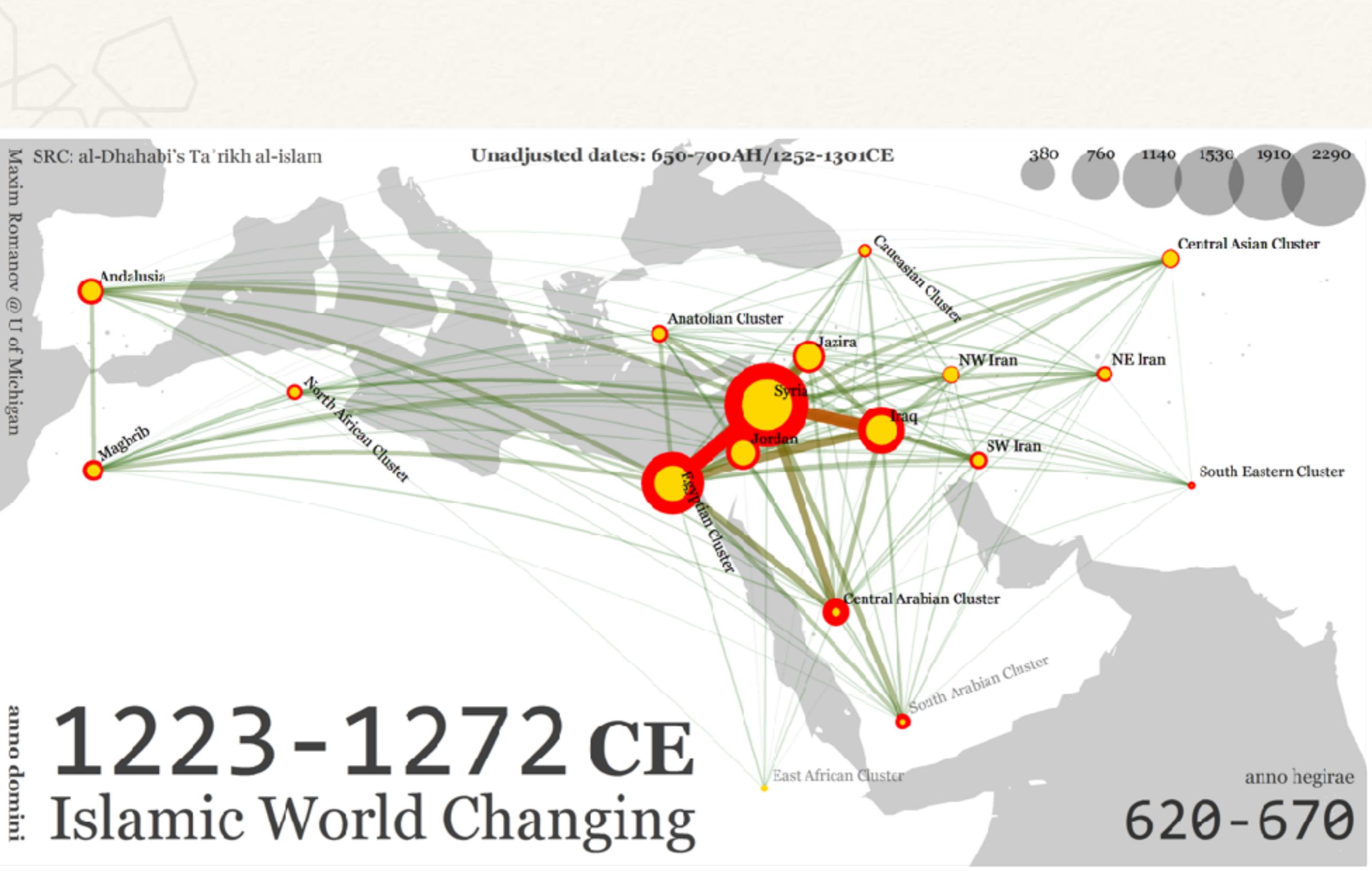
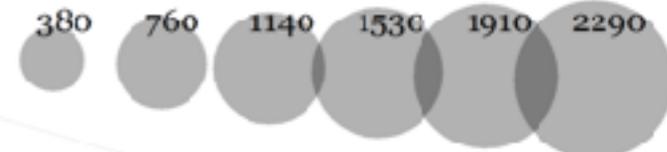
380 760 1140 1536 1910 2290



1223-1272 CE Islamic World Changing

SRC: al-Dhahabi's *Ta'rikh al-islam*

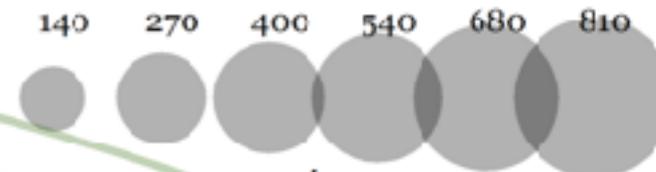
Unadjusted dates: 650-700AH/1252-1301CE



Regional Integration

SRC: al-Dhahabi's Ta'rikh al-islam

Unadjusted dates: 50-700AH/670-1301CE



802/

190/22

138/32

31/7

259/23

27/3

154/33

28/4

135/6

3/2

137/22

44/9

38/19

44/9

33/4

8/1

140

270

400

540

680

810

2,048 Visitors**241** Migrants**2,360** Natives/Residents:

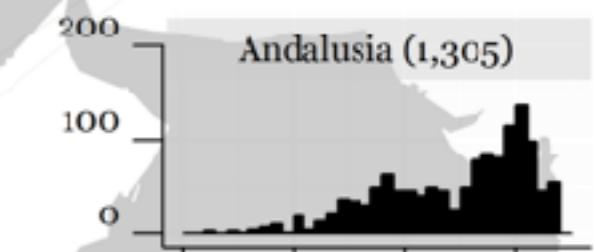
802 - with local connections

1,241 - with transregional connections

1,305 - total number of transregional connections

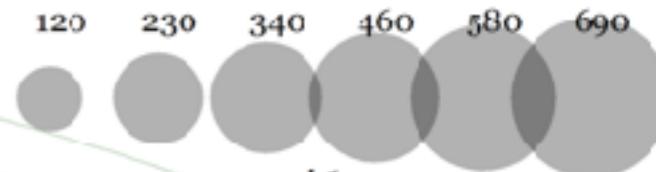
0641-1272 CE

Connections: Andalusia

**020-670**

SRC: al-Dhahabi's Ta'rikh al-islam

Unadjusted dates: 50-700AH/670-1301CE



14/4

8/3

47/5

2,312 Visitors**526** Migrants**2,736** Natives/Residents: **452** - with local connections **1,398** - with transregional connections **2,077** - total number of transregional connections

38/7

143/15

20/2

39/10

249/81

54/10

684/192

138/42

181/42

452/

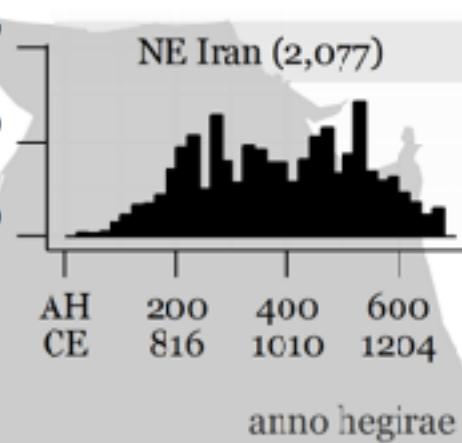
49/13

214/30

47/2

0641-1272 CE

Connections: NE Iran

**020-670**





Urban centers

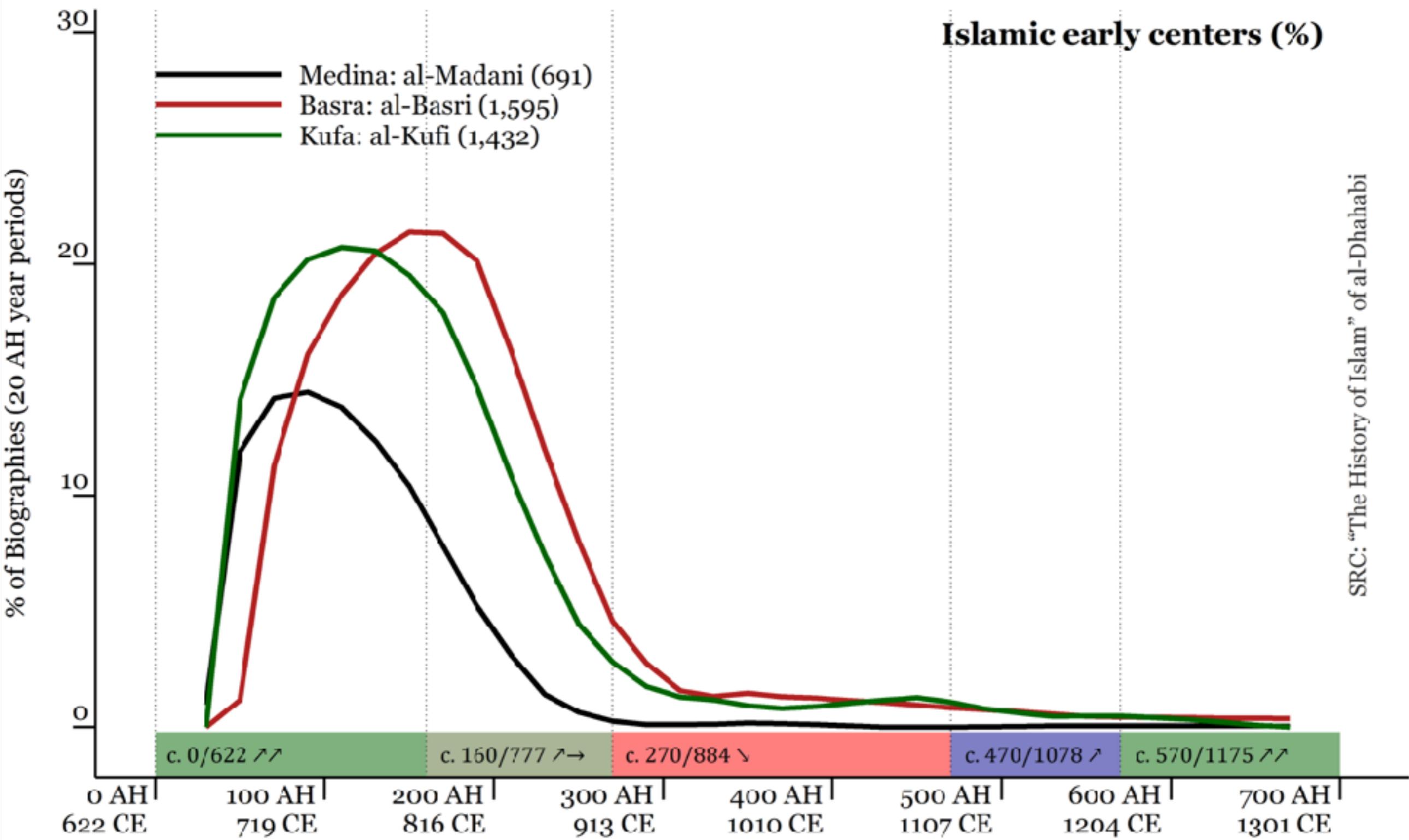
SRC: al-Dhahabi's *Ta'rikh al-islam*

Unadjusted dates: 40-70AH/661-690CE

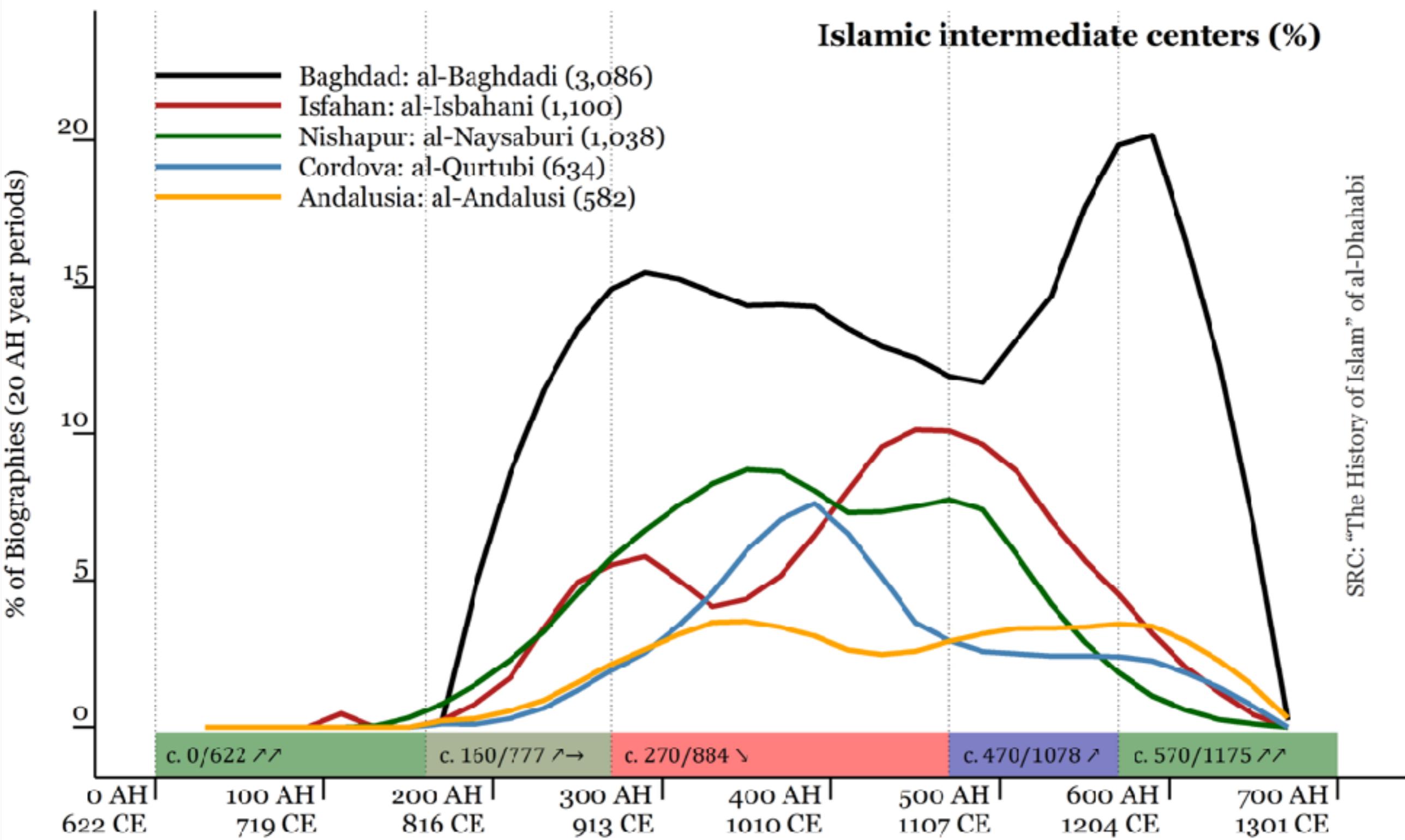
130 260 390 520 650 780



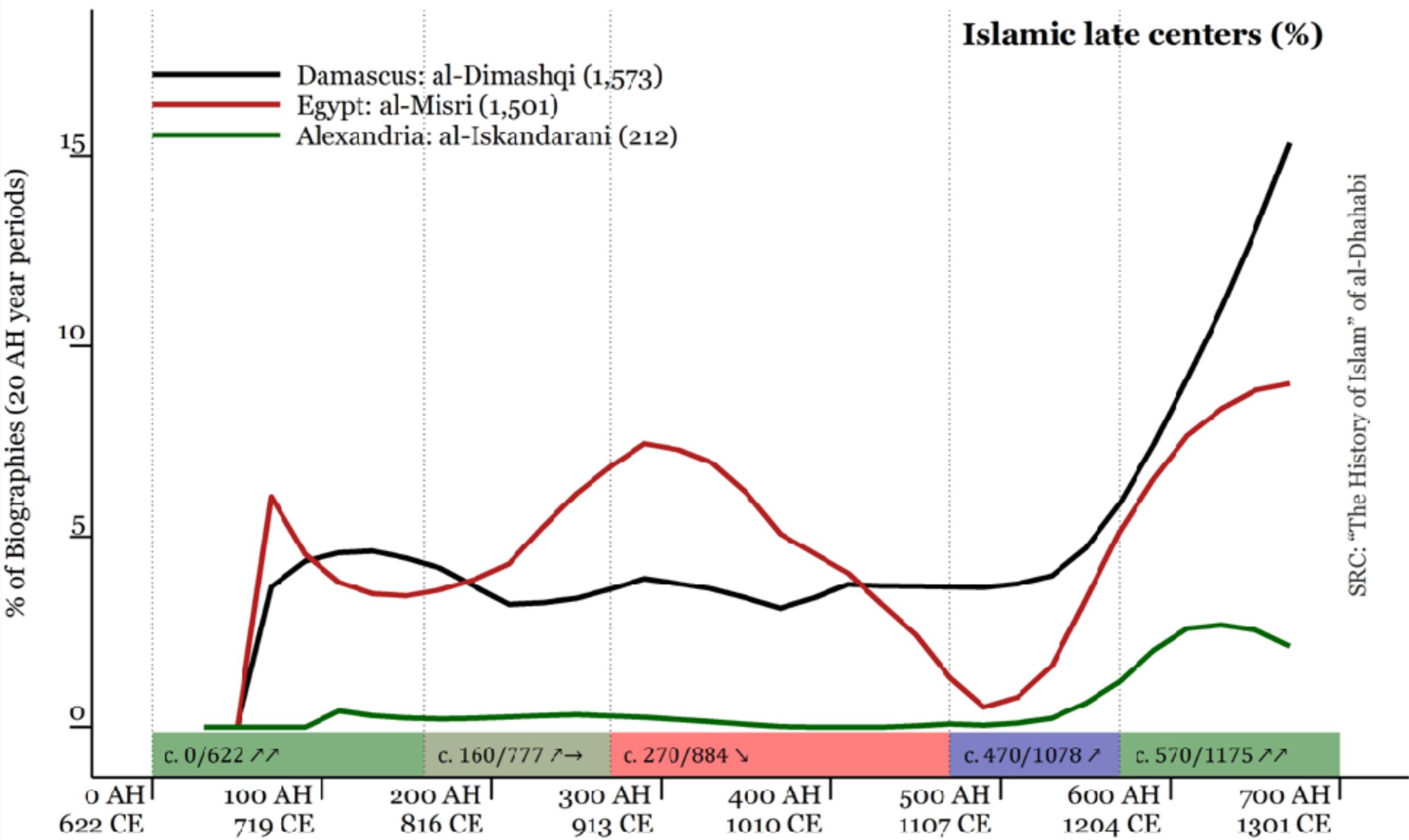
Islamic early centers (%)

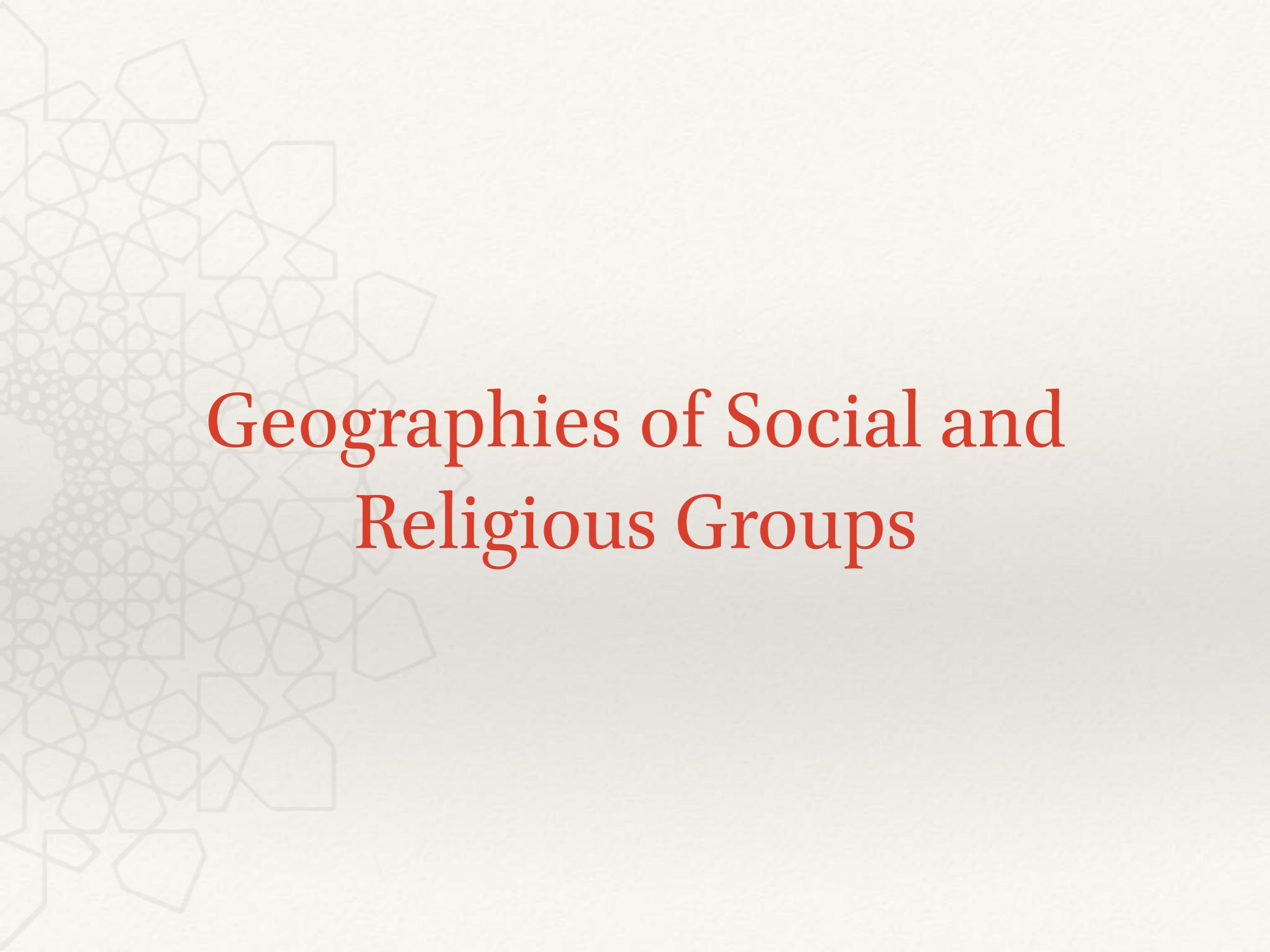


Islamic intermediate centers (%)

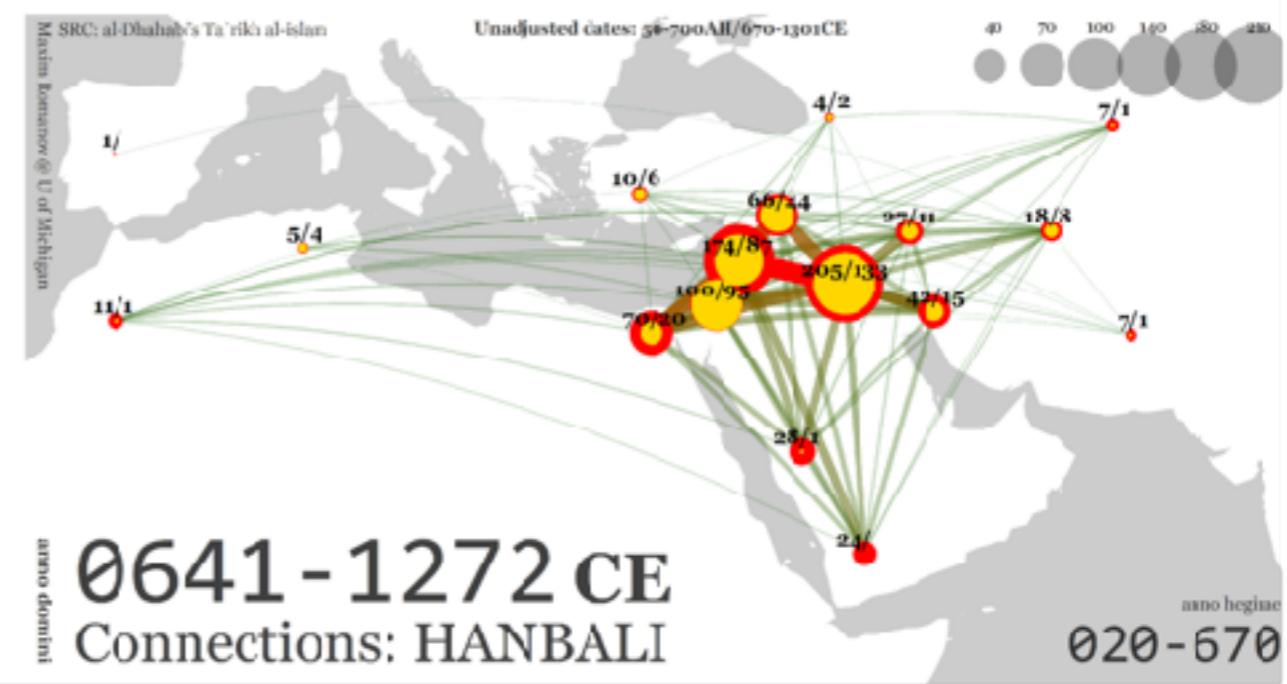
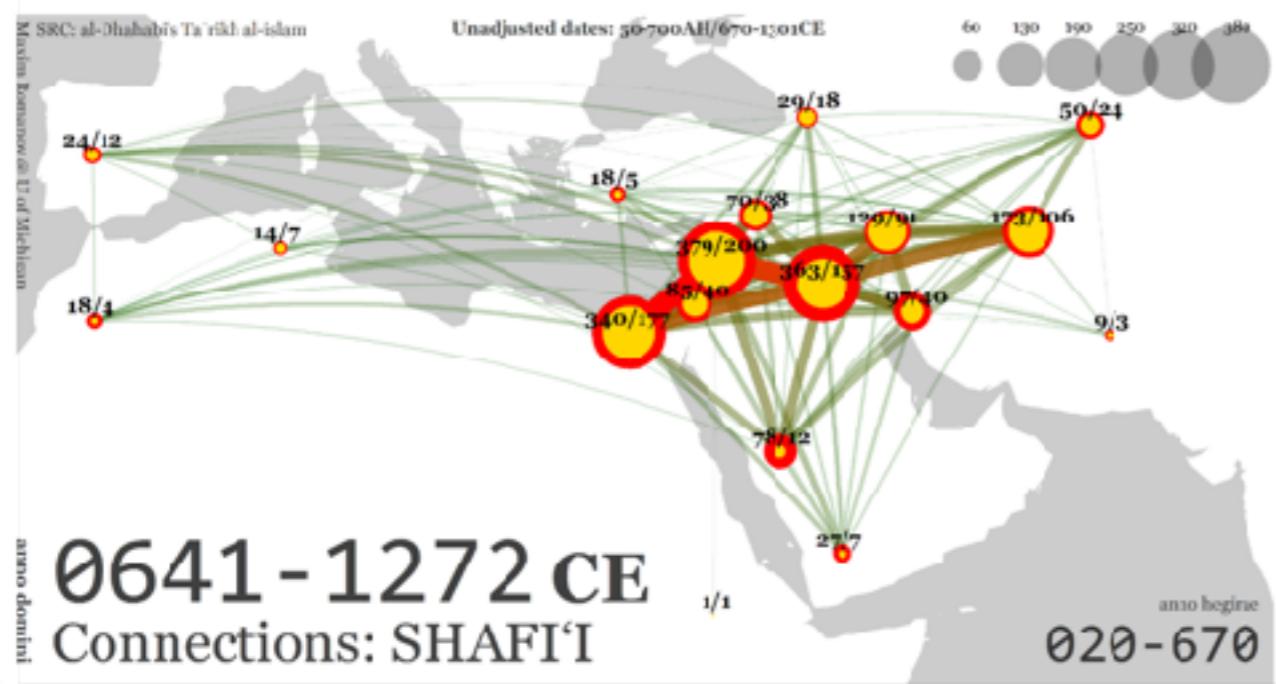
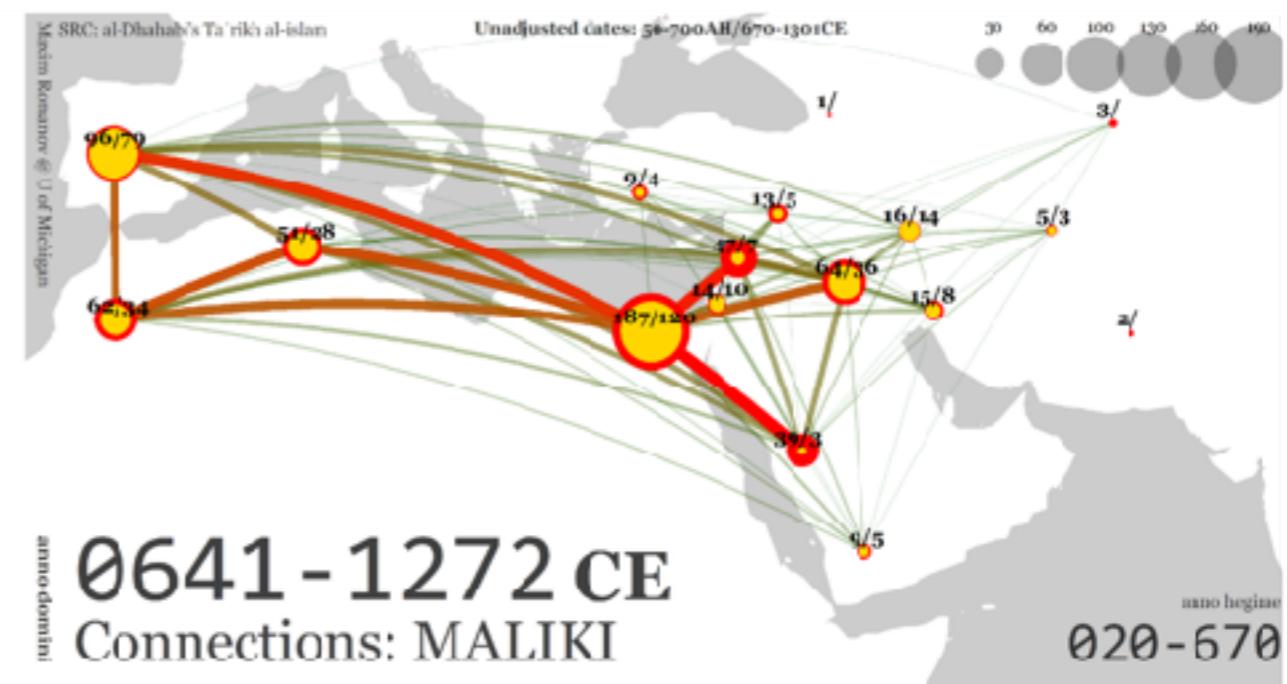
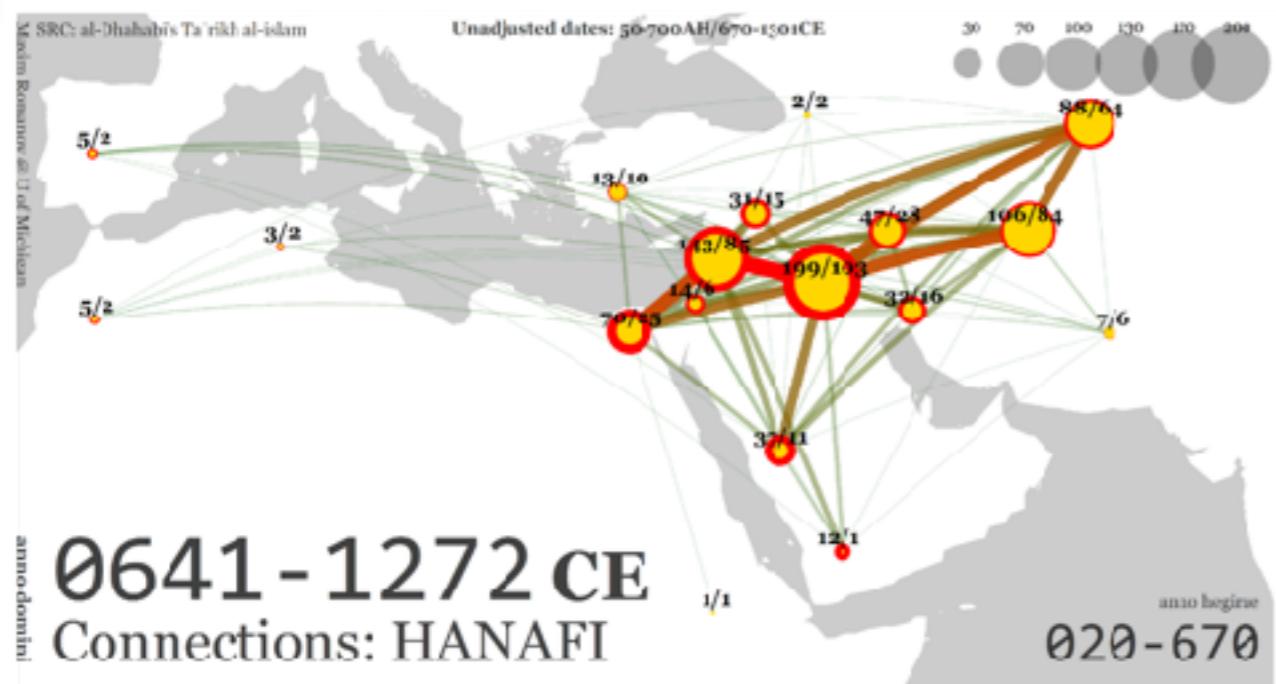


Islamic late centers (%)





Geographies of Social and Religious Groups



Islamic History in Maps: Overview

- ❖ Analysis of a biographical collection
- ❖ Modeling Islamic geography

al-Turayyā: *the latest iteration*

?

al-Turayyā Gazetteer

This is a new working version of *al-Turayyā Gazetteer* (or *al-Turayyā Gazetteer*). Currently it includes over 2,000 toponyms and almost as many route sections georeferenced from Georges Coenn's *Atlas du monde arabo-islamique à l'époque classique. Xe-Xe siècle* (Leiden: Brill, 1983). The functionality is still under development. You can use an earlier version of *al-Turayyā*, where you can browse the Gazetteer by clicking on any toponym marker. The popup will show the toponym both in Arabic script and transliterated. We are using a slightly modified transliteration system that facilitates conversion between fully transliterated, transliterated, and Arabic forms of toponyms. It should be easily understandable. There may be typos, because of the nature of how the data has been generated, so please, let us know if something should be corrected. The popup also offers a selection of possible sources on a toponym in question. You can check Arabic sources: currently al-San'ā'i's *Kitāb al-āṣāfi* and Yāqūt's *Muṣṭafā al-bulbūn*. Currently, the Gazetteer will only check for exact matches, which means that in some cases there will not be any entry at all, while in other cases there may be more than one and they may refer to other places with the same name. Improving the precision of this lookup is on our to-do list. You can also check if there is information on a toponym in question in Brill's *Encyclopaedia of Islam*, *Persia*, and *WSiglos*. It can be found [here](#).

Note on transliteration: The website uses a somewhat unconventional transliteration system, which was developed to facilitate computational analysis. Unlike more traditional transliteration schemes the current one uses one-to-one letter representation, with every Arabic letter transcribed distinctively, which allows for an automatic conversion between transliteration and the Arabic script. The overall scheme should be easily recognizable to Arabs (new letters are as follows: ئ for ئَمْبَعَدْ; ظ for ظَاهِرْ; and ظ for ظَاهِيَّةْ).

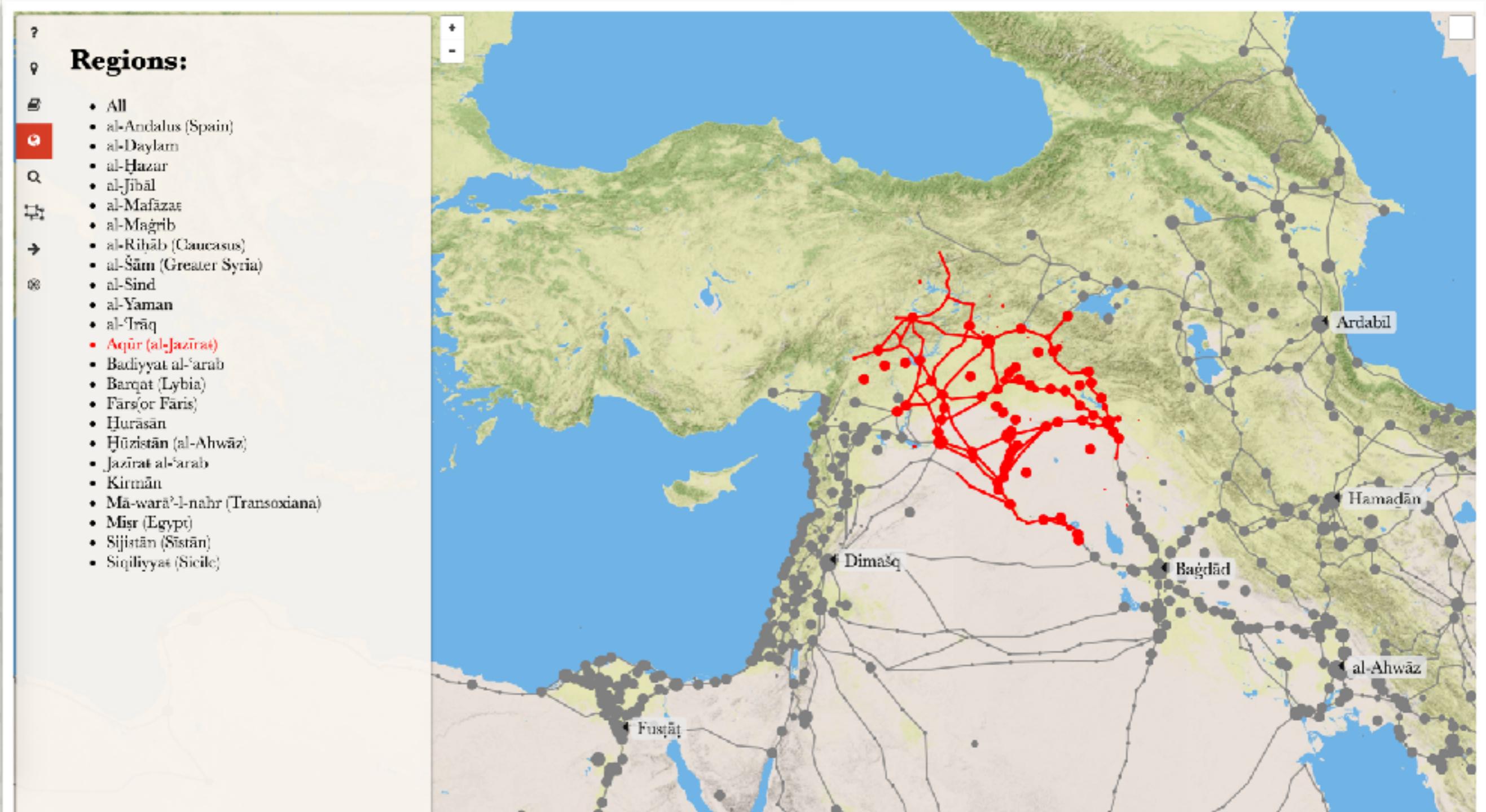
Credits and Acknowledgments:

Current team: Masoumeh Seydi and Maxim Romanov @ U Leipzig. **Former contributors:** 2013–2014: Cameron Jackson (class of 2014, double-major in Arabic and Computer Science, Tufts)—technical and conceptual development; 2013: Adam Tavares, programmer @ Perseus Project, Tufts—technical development. **Special thanks to:** 2013–2014: Vickie Sullivan (Chair, Classics Department, Tufts U); 2013—Gregory Crane and the Perseus DL and the U Leipzig teams for support and inspiration.

Open Data:

Map showing the distribution of georeferenced toponyms and route sections across the Middle East and Central Asia. The map is color-coded by region, with labels for major cities like Ardabil, Šahrastān, Naysabur, Samarqand, Dīmasq, Bağdād, al-Altwāz, Širāz, and al-Sirgān. The map interface includes zoom controls (+, -) and a legend.

al-Turayyā: *Modeling Regions*

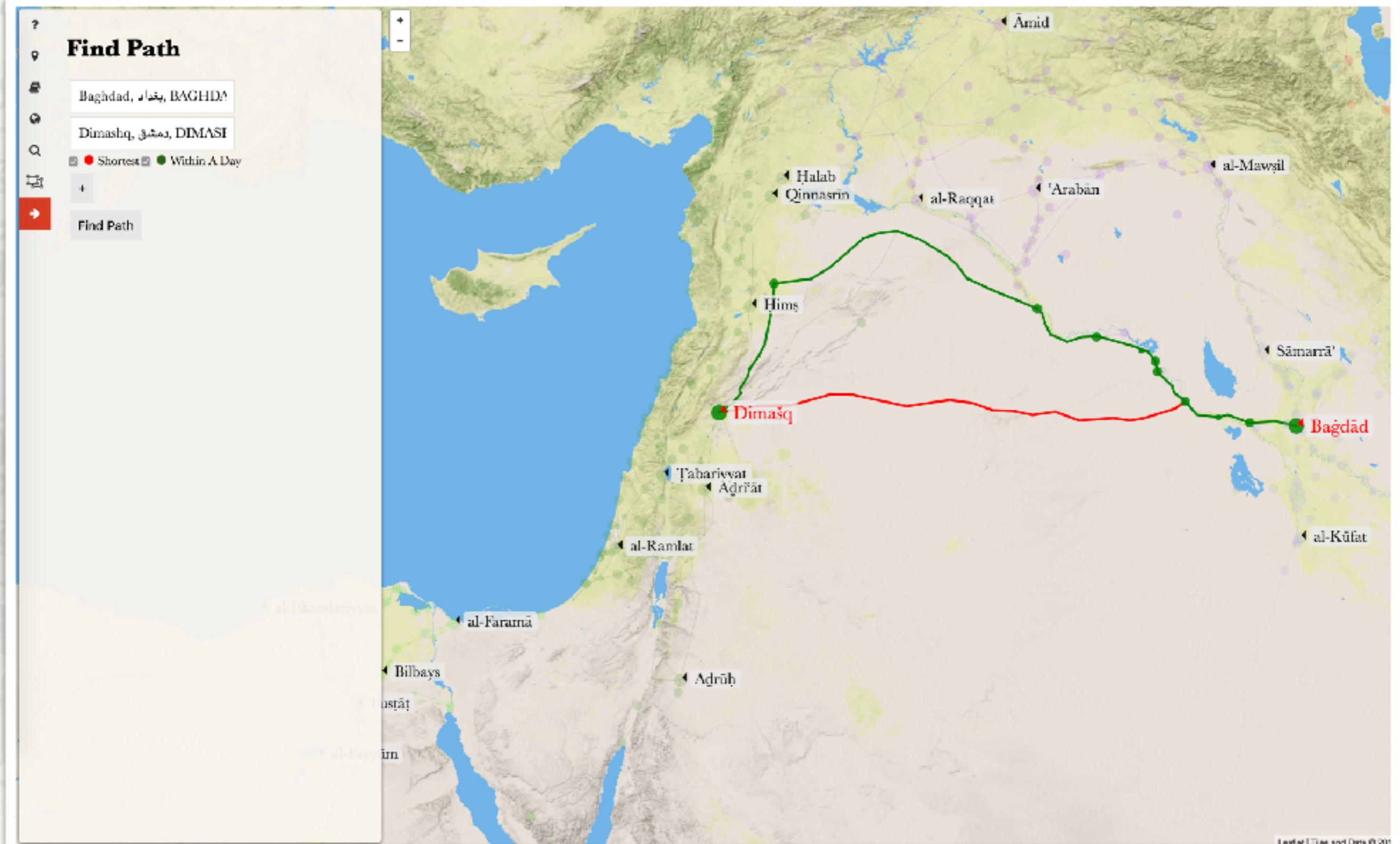


al-Turayyā: Modeling Regions



With Masoumeh Seydi (Phd Candidate in DH, U Leipzig)
Building on Cameron Jackson's work (Class 2015, Tufts)

al-Turayyā: *Finding Routes*



al-Turayyā: Consulting Primary Sources

Sources on: بغداد

- al-Himyarī's *Rasaq al-ni'āt* (بغداد) (100% match)

بغداد

دار مملكة خلقه بني العباس؛ وفيها أربع لغات: بغداد بلدان ميكلين؛ وبغداد محببة الأخيرة، وبغداد بالتون، ومقدان بالمن بلال من الباء، ونذكر وقوتث، قالوا: وبغداد بالفارسية خطبة القسم لأن يخ سهم وناد خطبة، وكذلك [v.1, p.109] كره الأصمعي هذه التسمية، وكانت قرية من قرى الفرس فأطلقها أبو جعفر عليها ففيها مدينة وقال الجرجاني: ياخ بالفارسية هو البستان الكبير الشجر، وناد: سهلن، لمناه معلق الساين، قال أبو عثمان الهدى: كما تشير مع جبرين عبد الله الجبل حق التي ان اد بوضع فقاذه أي موضع هلا؟ قالوا: قطربل، فترك دابه ثم قال: حمت التي حمل الله عليه وسلم يقول: عجني مدينة بين دجلة والموج والمرارة وقطربل يعني أنها خارج كل أرض وتبع لها جملة الأرض، وفي رواية يخصف بها، كما أتصب، وحيث بغداد لأنها أهدى إلى كسرى حصني من الشرق وكانت ٤ صحن يقال له بع قال التخصي: بغدادي أي أحاطي إلهي يعني الصحن، وهذا كان المترجون يكترون أن يسموا بغداد بهذا الاسم ويقولون بغداد بالحال الهمة، وكان أبو جعفر المنصور يبعث وجلاس سنة حسن وأربعين ومائة يطلبون له مرضعا يبي في مدينة هضبوا هم درجنا مرضعا سقي جاء مرضعا بالصراة وقال: هذا مرضع أرضاء لأنه المرة من القرارات ودجلة والموج والمرارة، وكان أبو جعفر هذا وهو عبد الله بن محمد بن علي بن عبد الله بن العباس بي مدينة بين الكورة والجزرية ساجها الماشية فأقام بها مدة إلى أن عزم على توجه إليه محمد الهدى لغير المصانقة في سنة أربعين ومائة فصار إلى بغداد فوافته بها وقال: ما اسم هذا الموضع؟ فقال: بغداد، فقال: هذه والله المدينه التي أعني أبي محمد بن علي أي أباينا وأتزلا ويزلا ولدي من يعيدي، ولقد شئت عنها الملوك في الجاهلية والإسلام حتى يتم تدبر الله تعالى وحكمه في وصح الروايات وتحت الدلالات والعلامات لأيتها المورة في الدجلة والمرات من واسط والأبلة والأهوان وفارس وعمان والجامة وما يحصل بذلك، وكذلك ما يأتي من الموصل وقوار زبيحة وأقرهان وأرمينة والرقة والشام والتغور ومصر والمغرب وأصفهان وكثير خراسان طالحة الذي ذكرها لي وأخلق عنها كل من تقدمي والله لأنينا ثم أسكنها أيام حسي ويسكناها ولدي من يعيدي ثم تكون آخر مدينة في الدنيا ثم لأبين بعدها أربع مدن لا تخرج واحدة منها أنها قديناها وبين الرافقة ولم يستثنها وهي مملة والمصيمة والمصورة، فوج في حشر الصناع والقعة من الشام والمومل

For the Seminar

