

Exploring the persistence of cartographic anchors in pan- scalar maps

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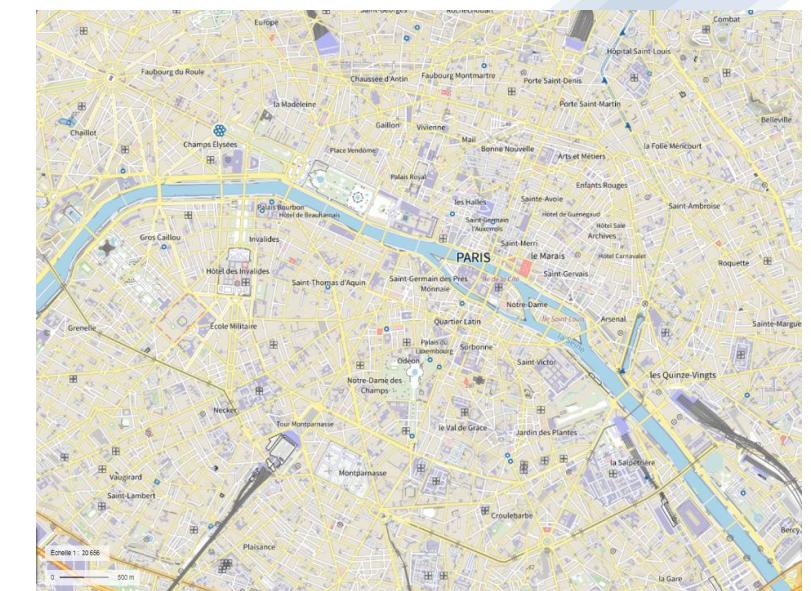
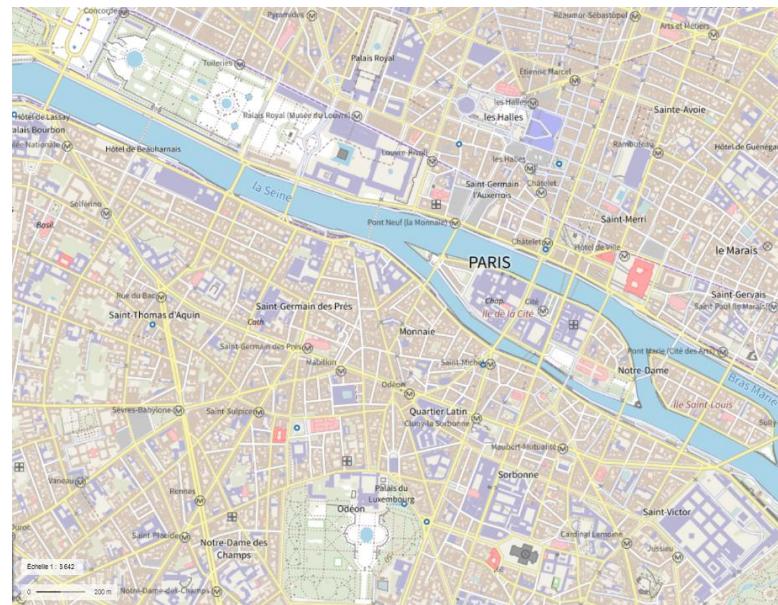


Plan de la présentation

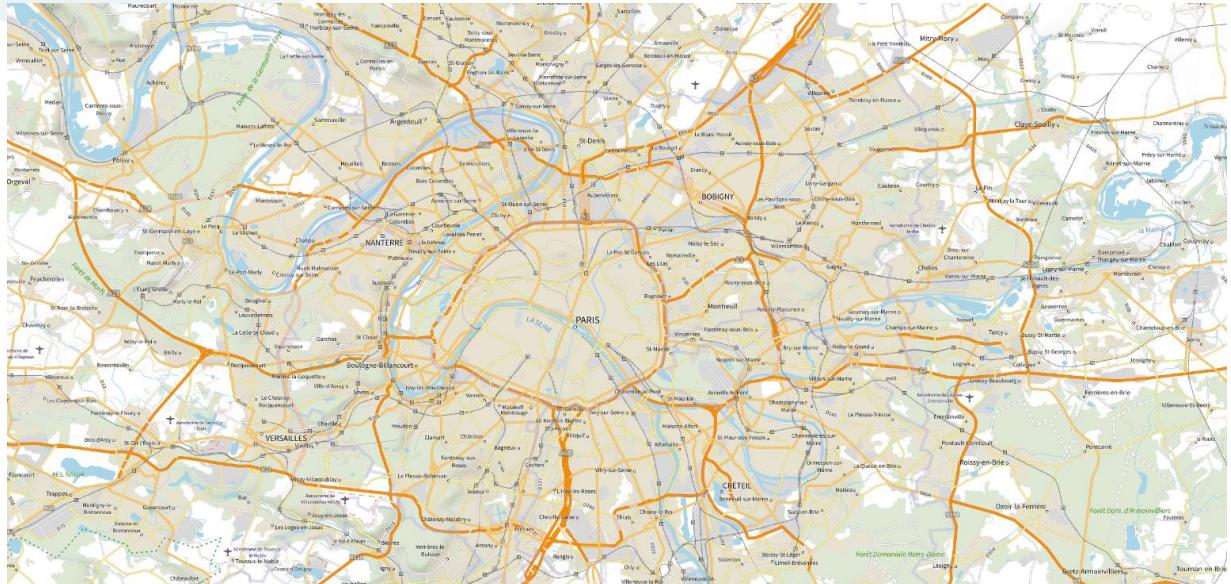
- Definition and context :
 - The LostInZoom project
 - What is a pan-scalar map?
 - What is cartographic (des)orientation
- Problematic :
 - User survey 1 : Exploring cartographic persistence
 - User survey 2 : Quantifying cartographic persistence
- Conclusion How to improve current pan-scalar maps

Definition and context

The LostInZoom project



Definition and context: Pan-scalar map



Multiscale map: IGN V1 geoportail map

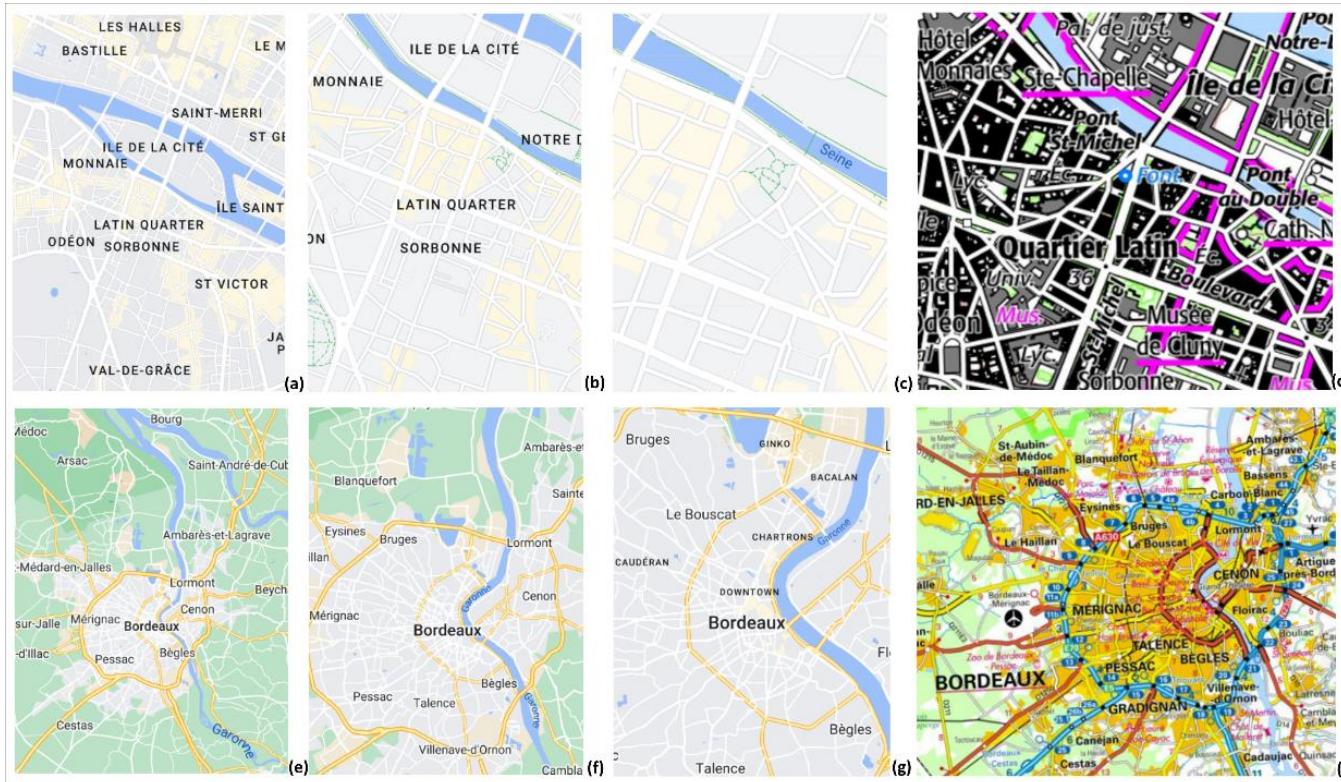


Paper map: Scan IGN 1:100000

Definition and context: Pan-scalar map

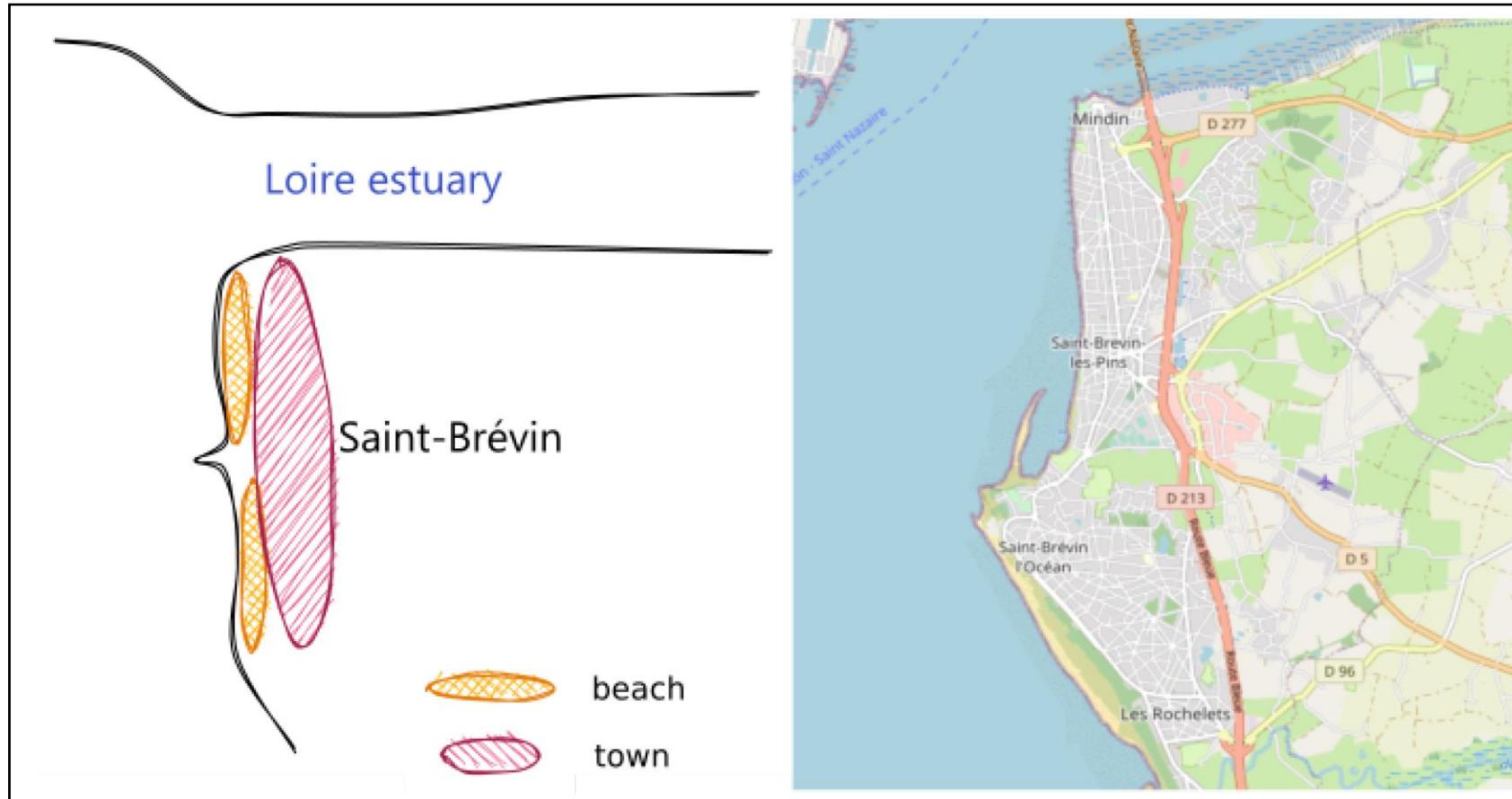
Pan-scalar map :

We define pan-scalar maps as interactive, multi-scale maps [...]. What differentiates pan-scalar maps from other online or printed maps is that cartographic representations at different **scales are never intended to be consumed individually.** (Gruget et al., 2023).



(Gruget et al., 2023).

Definition and context: cartographic (Dis)orientations

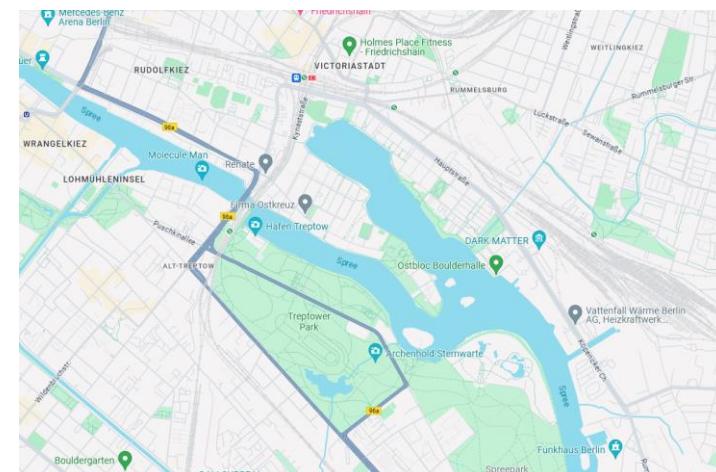


(Touya et al., 2023)

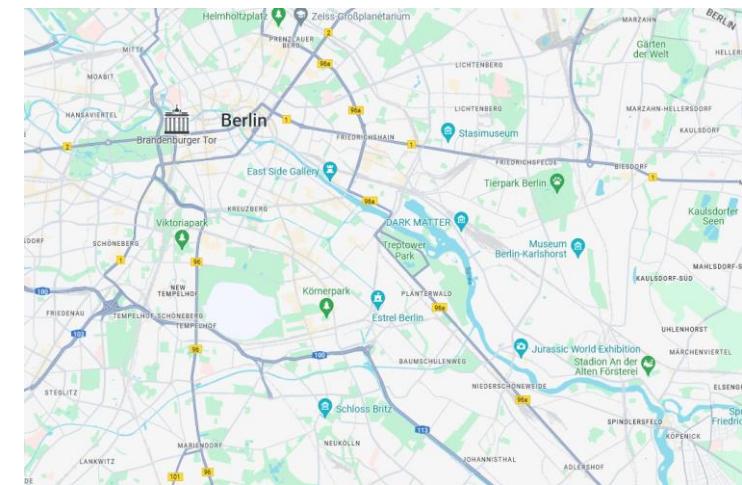
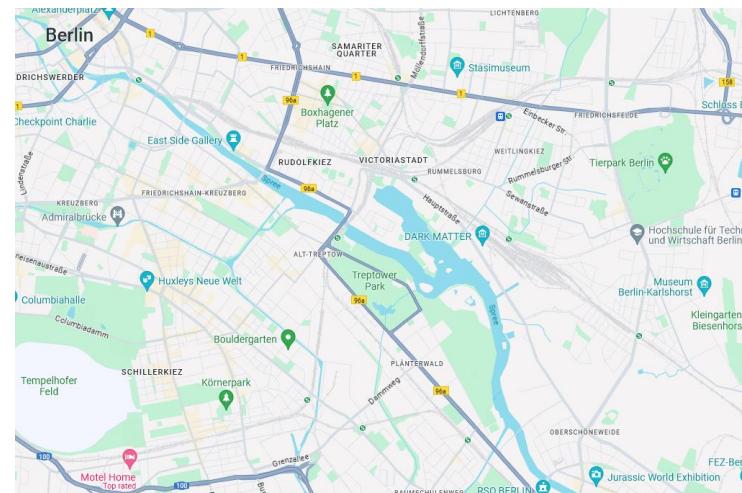
Definition and context: cartographic (Des)orientation and persistence

Cartographic disorientation:

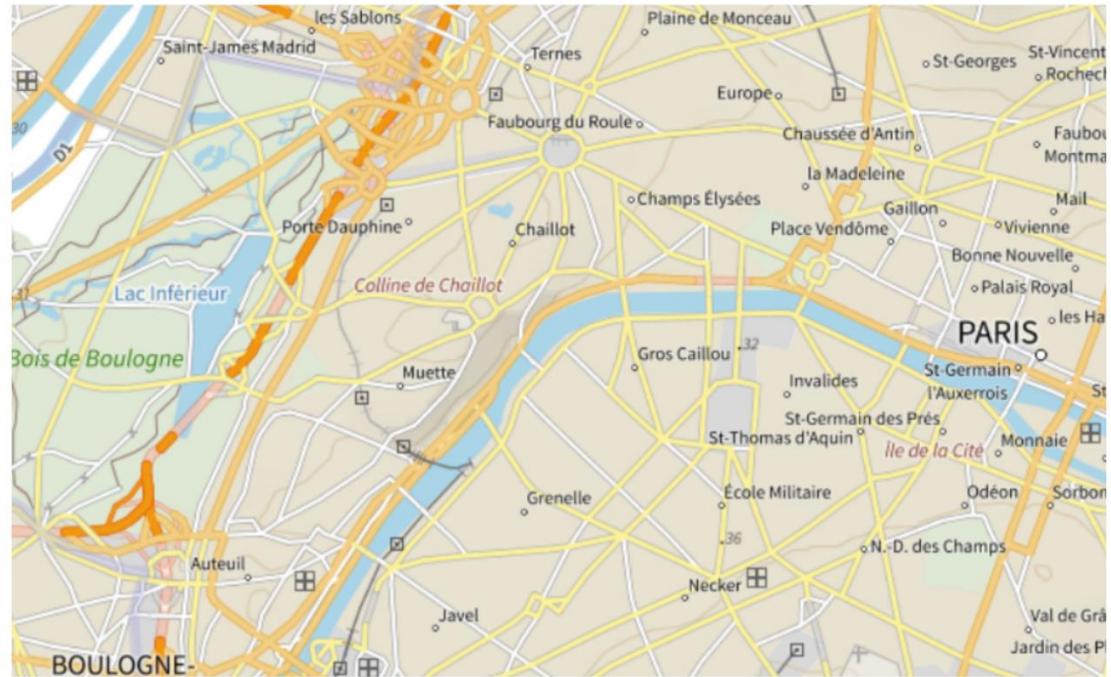
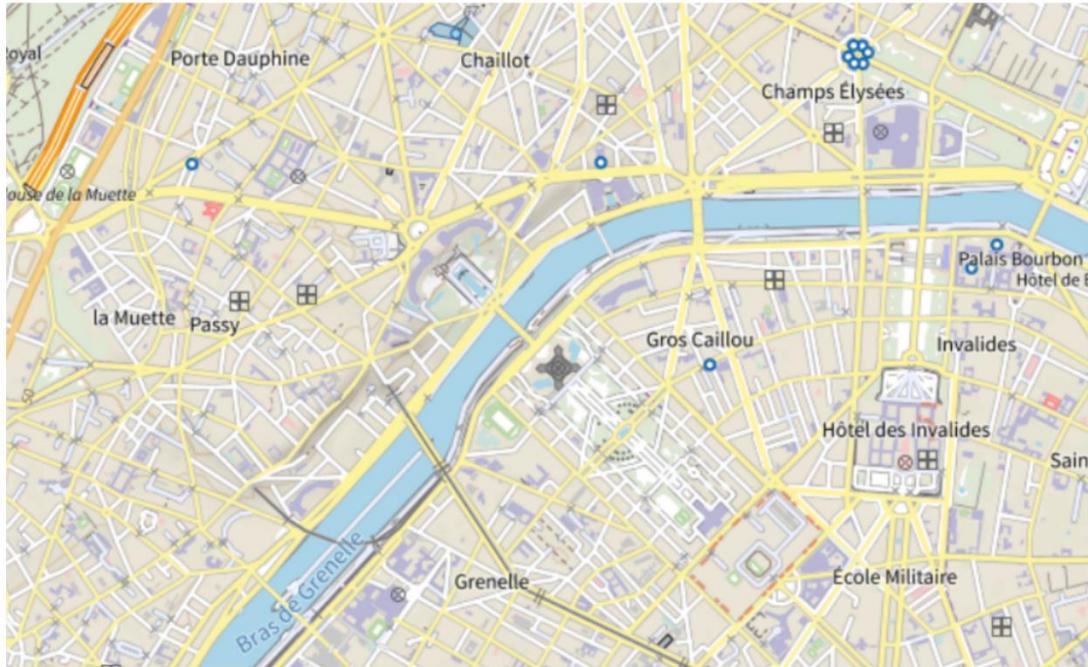
Disorientation occurs during exploration of a pan-scalar map when people **are aware that they don't know exactly where the location depicted on the map is**, or where they need to go (horizontally or vertically) to get to the desired map view. (Touya et al., 2023)



Zooming / unzooming

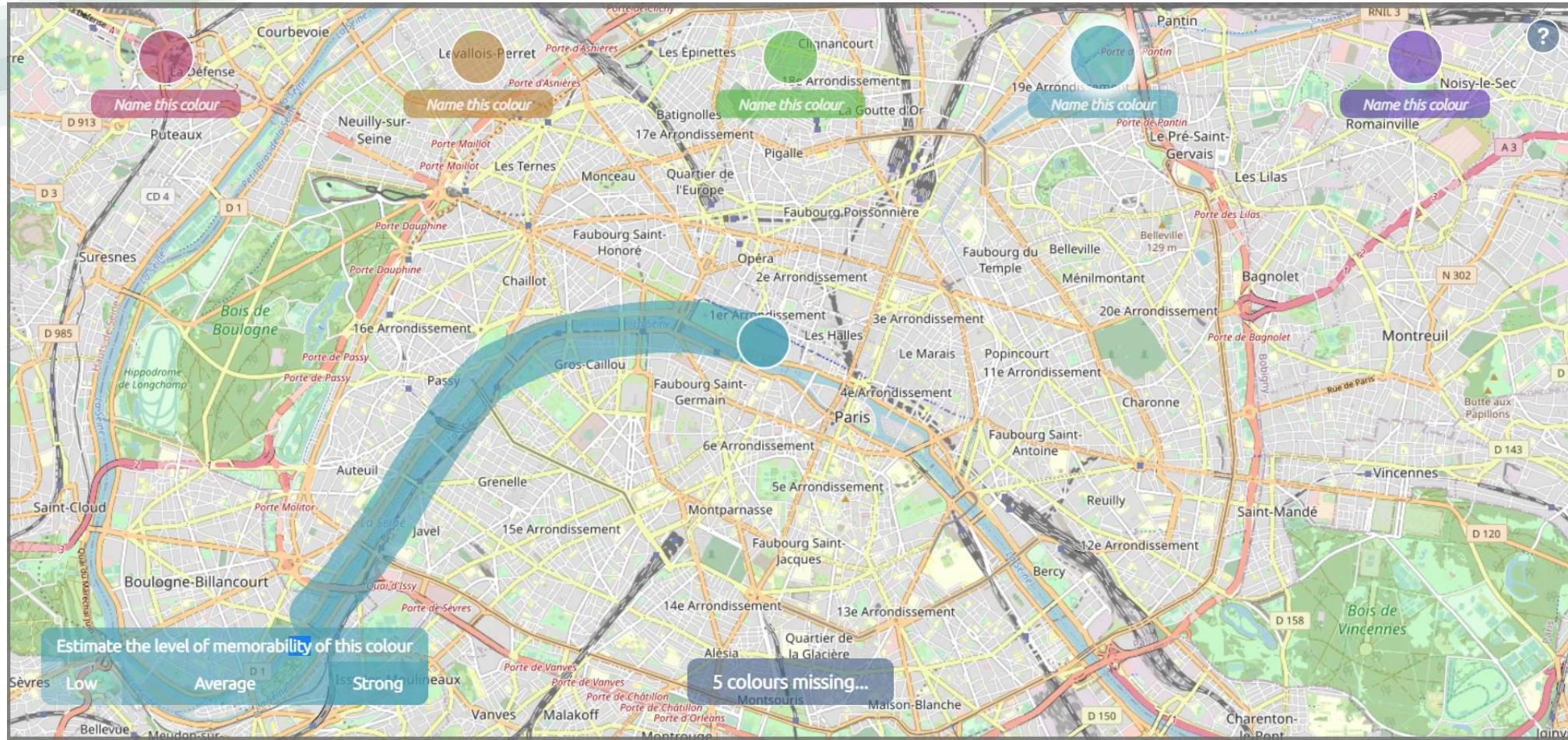


Définition et contexte : (Des)orientation cartographique Map stability



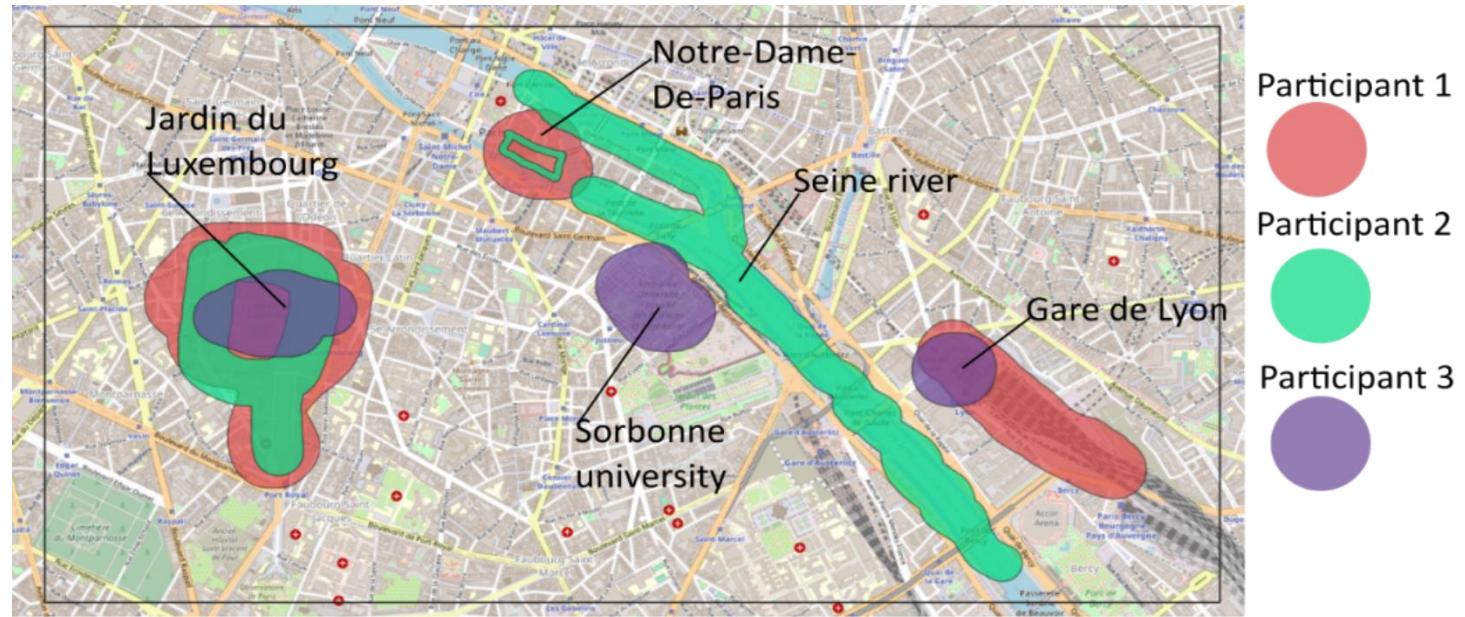
2° Cartographic persistence

User survey 1 : Exploring cartographic persistence



User survey 1 : Exploring cartographic persistence

- “**Anchor intensity**” as the importance of an anchor in a map view.
- “**Presence**” as the spatial extent of the anchor in a map view.
- “**Anchorness**” as the sum of anchor intensities through successive views



- “**Persistence**” as the evolution of intensity through successive views. The percentage of views where one anchor is sufficiently important

User survey 1 : Exploring cartographic persistence

- “Anchor intensity” as the importance of an anchor in a map view.

$$intensity(x) = \frac{\sum_{i=1}^n f(i, x)}{n}$$

$$f: ([0,1], [0,20]) \rightarrow 0, 1$$

$$x, z, min_{intensity} \mapsto \begin{cases} 0 & \text{if } x \cap drawing_i = \emptyset \\ 1 & \text{if } x \cap drawing_i \neq \emptyset \end{cases} \quad (1)$$

- “Presence” as the spatial extent of the anchor in a map view.

$$presence = \frac{area_{anchor}}{area_{view}}$$

- “Persistence” as the evolution of intensity through successive views.

$$g: ([0,1], [0,20]) \rightarrow 0, 1$$

$$x, z, min_{intensity} \mapsto \begin{cases} 0 & \text{if } intensity(x, z) < min_{intensity} \\ 1 & \text{if } intensity(x, z) \geq min_{intensity} \end{cases}$$

$$p: [0,1] \rightarrow \mathbb{N}$$

$$x \mapsto \sum_{z \in Z} g(x, z) / 21 \text{ where } Z \subseteq [0,20]$$

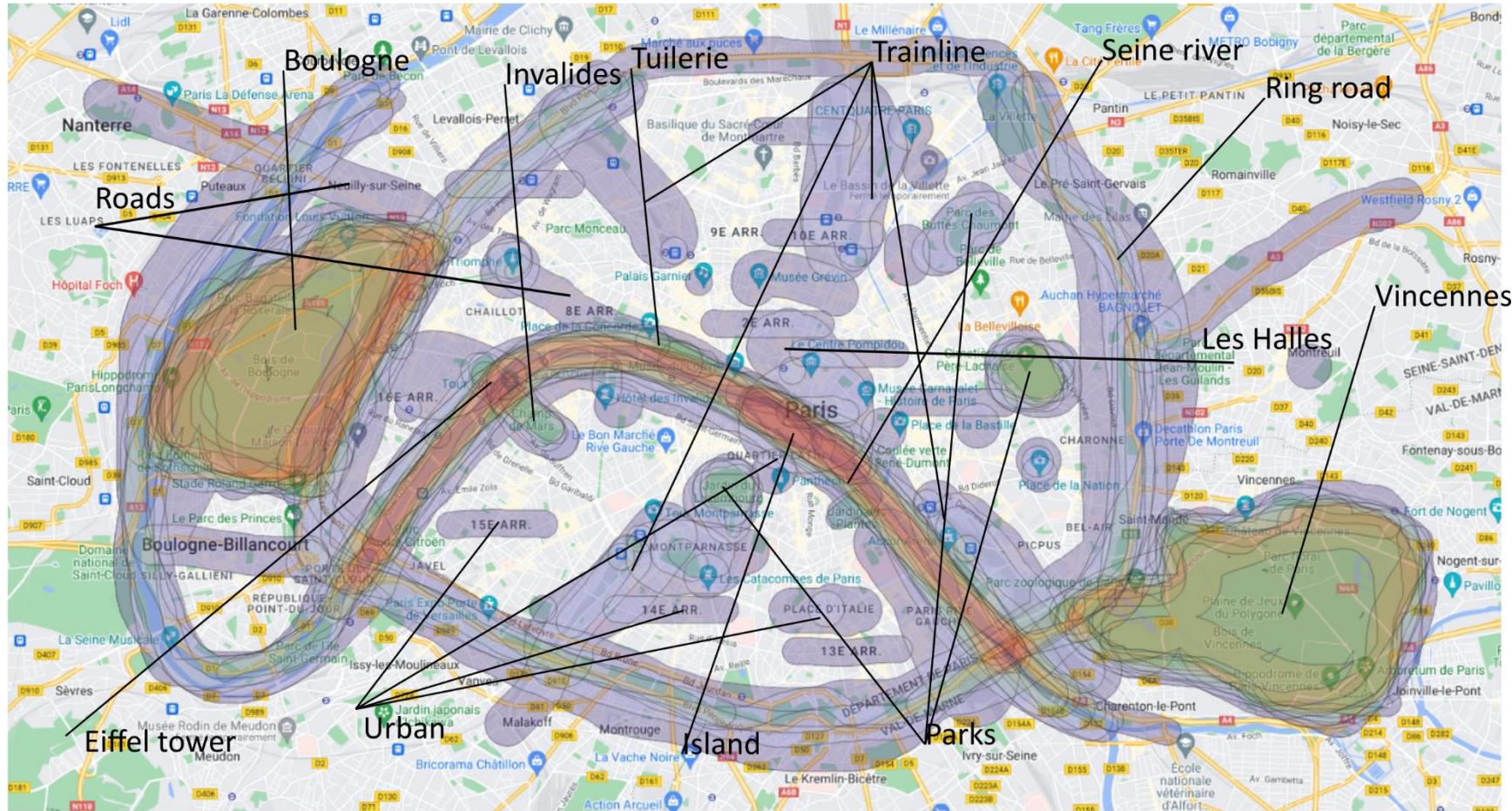


- “Anchorness” as the sum of anchor intensities through successive views

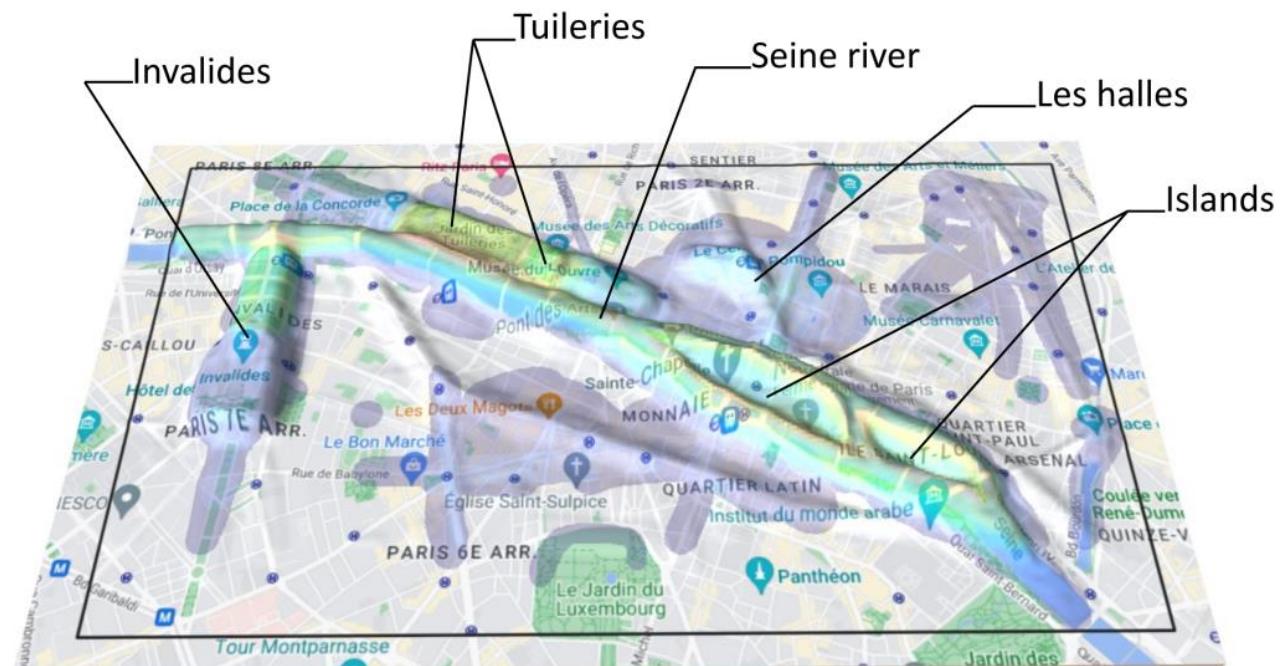
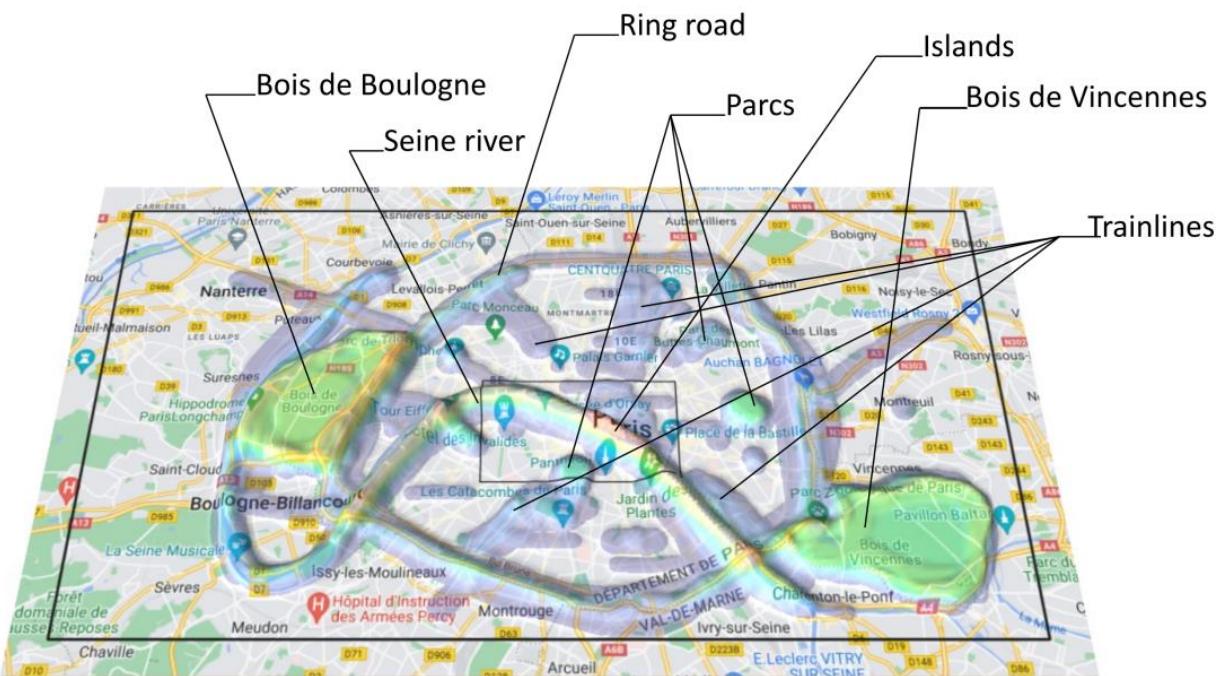
$$anchorness(x) = \sum_{z \in Z} intensity(x, z) / 21 \text{ where } Z \subseteq [0,20]$$

2° Cartographic persistence

User survey 1 : Exploring cartographic persistence

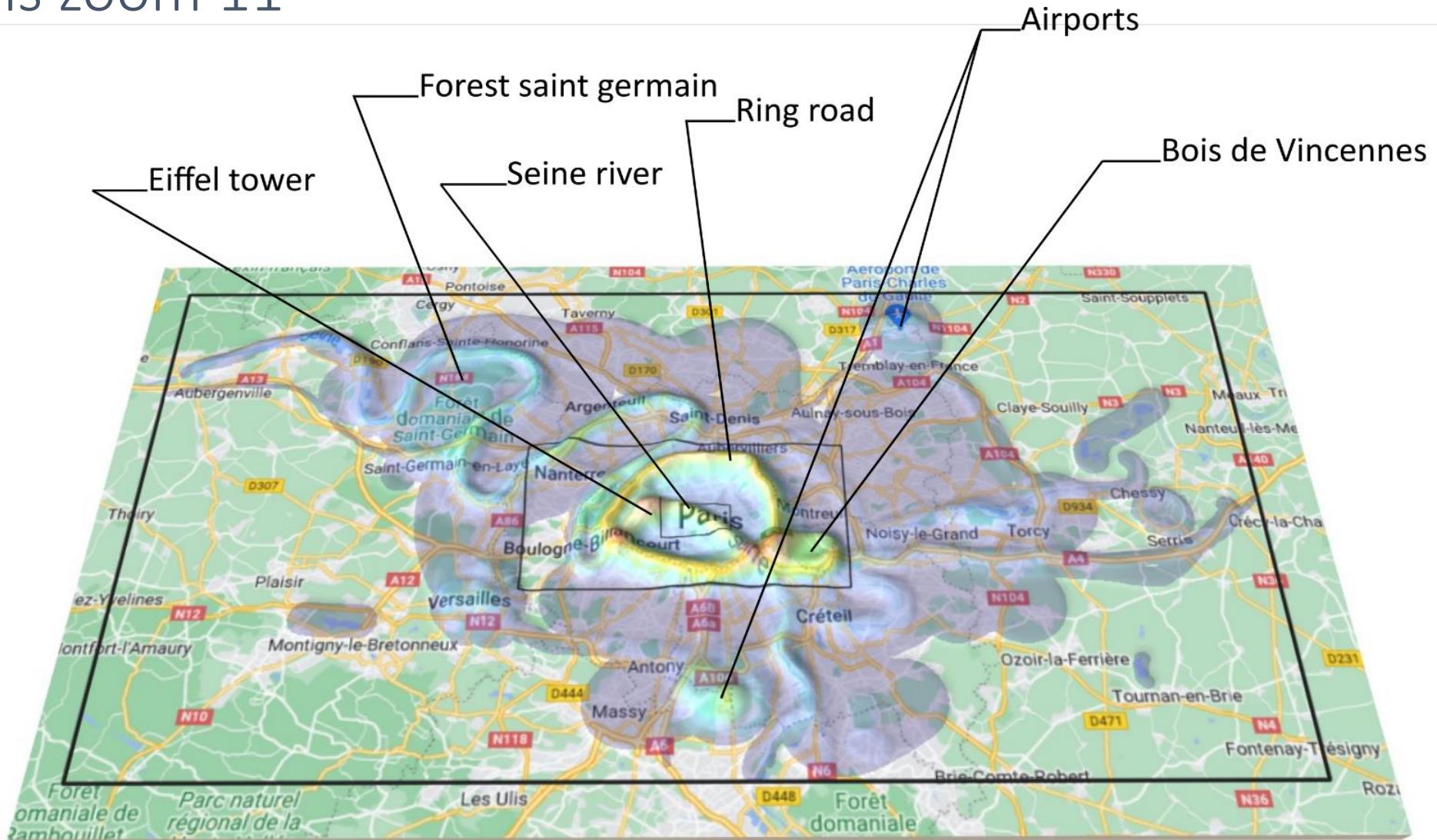


User survey 1 : Exploring cartographic persistence



User survey 1 : Exploring cartographic persistence

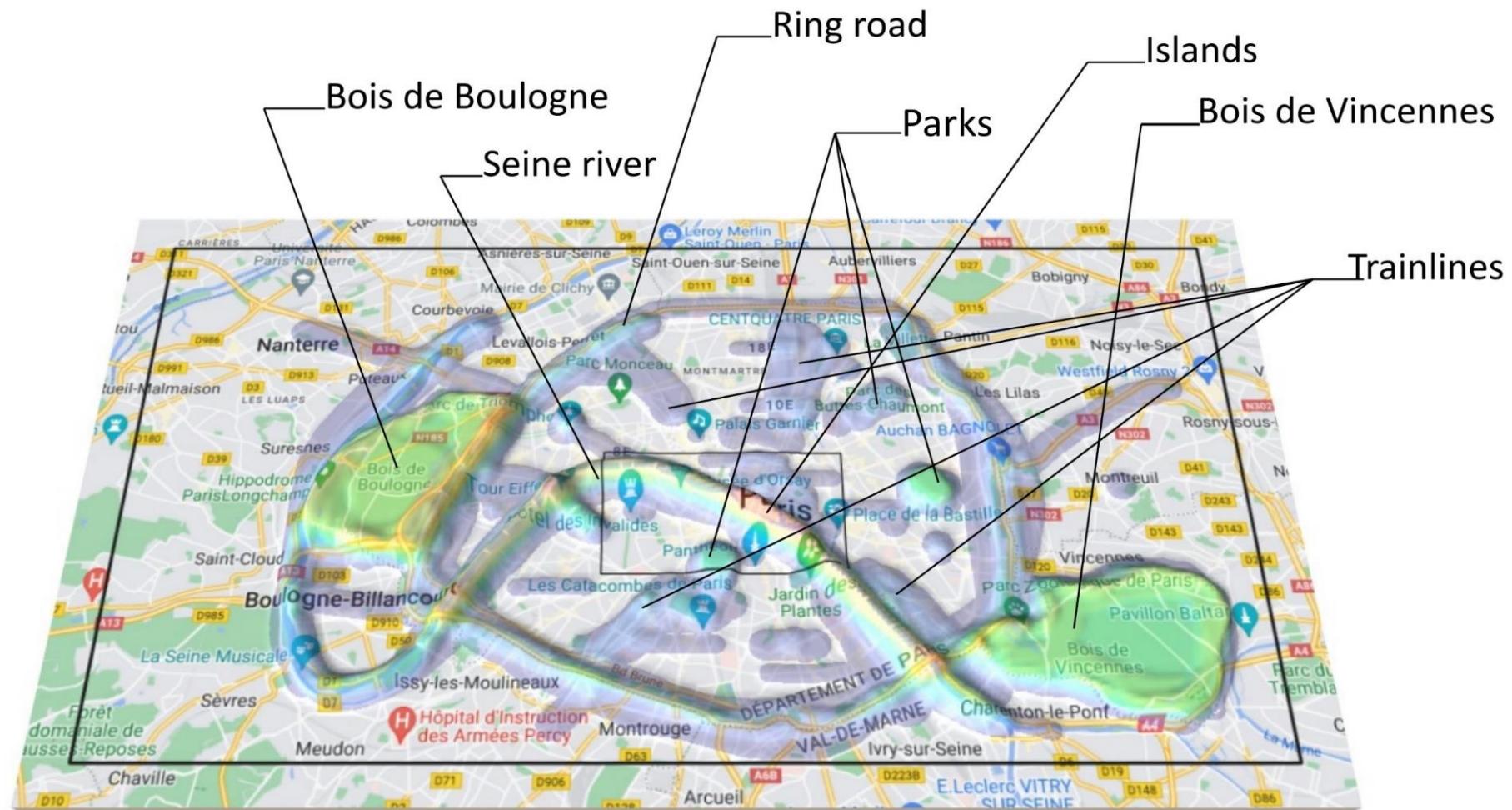
Paris zoom 11

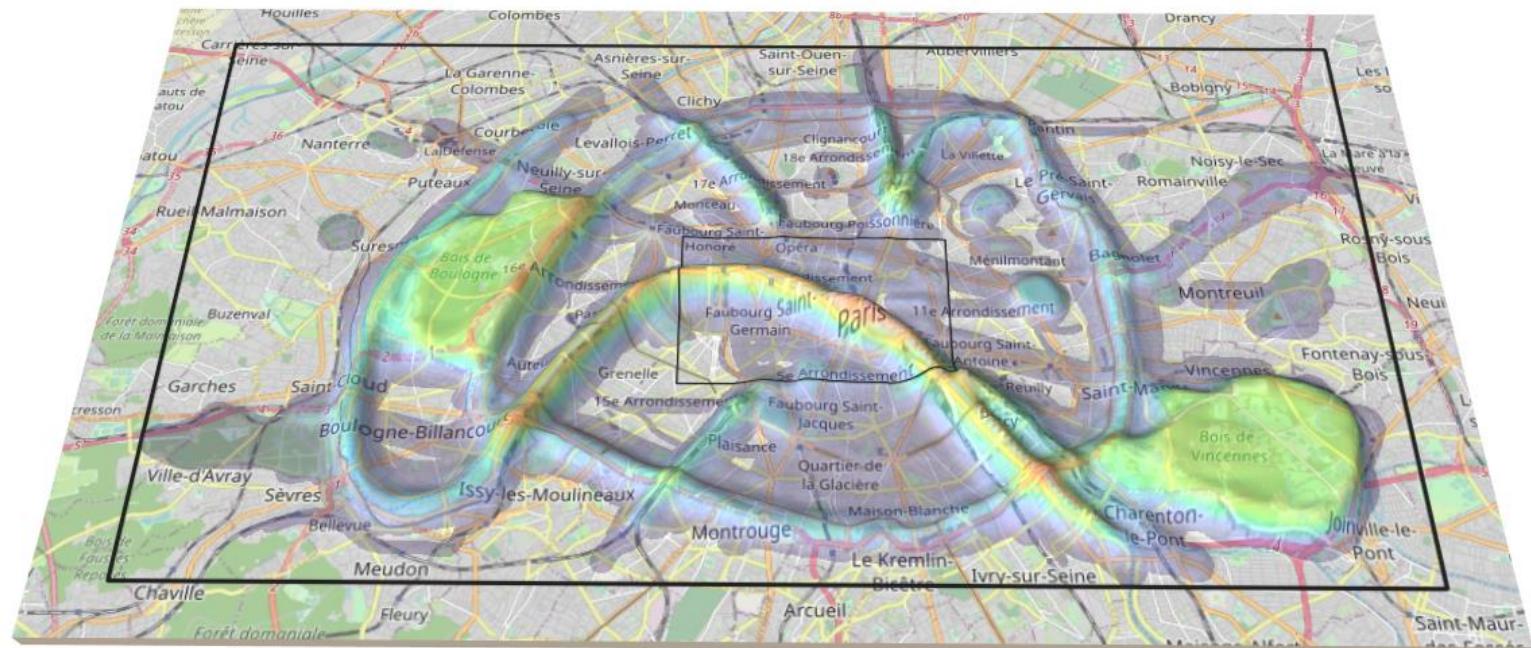




User survey 1 : Exploring cartographic persistence

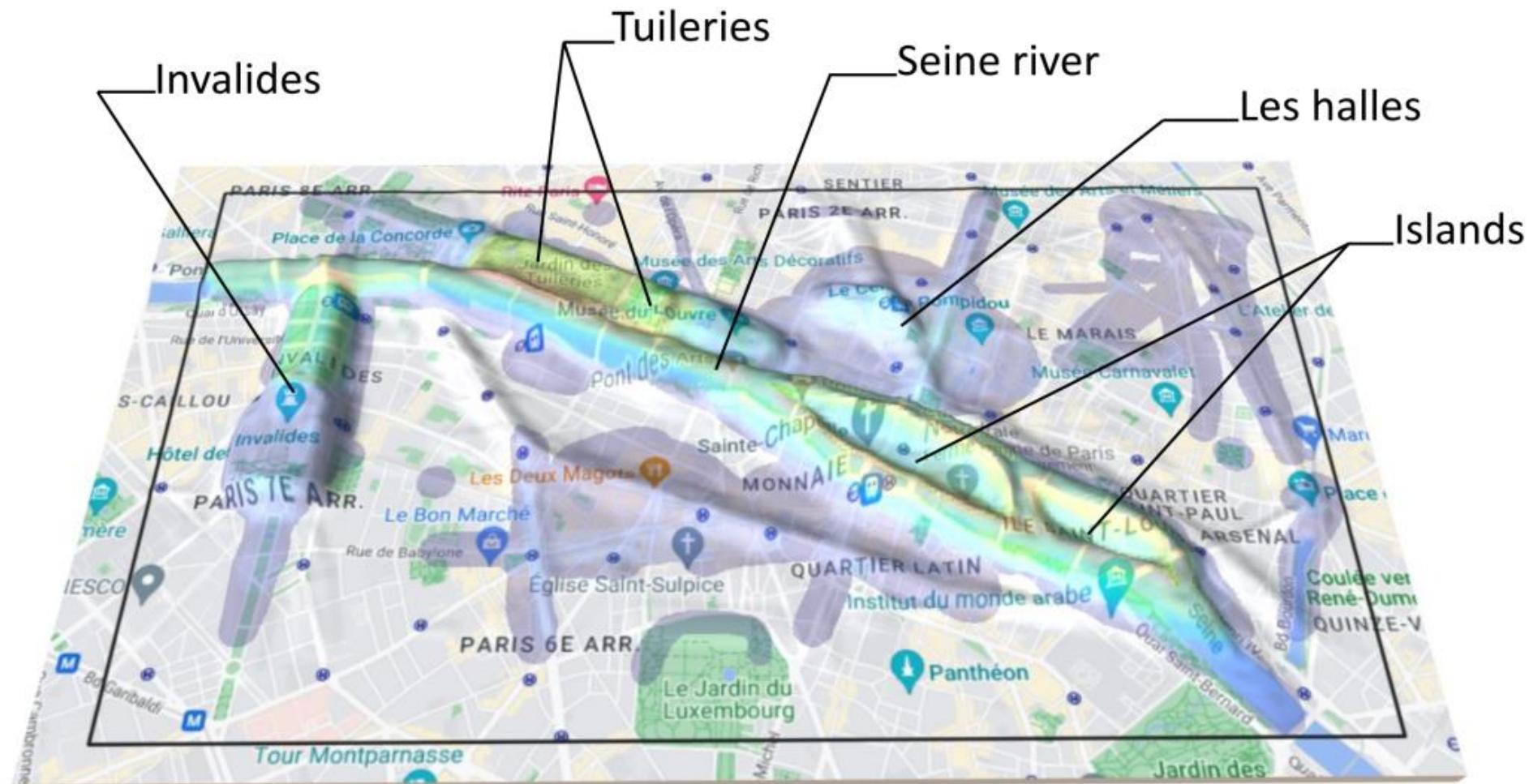
Paris zoom 13

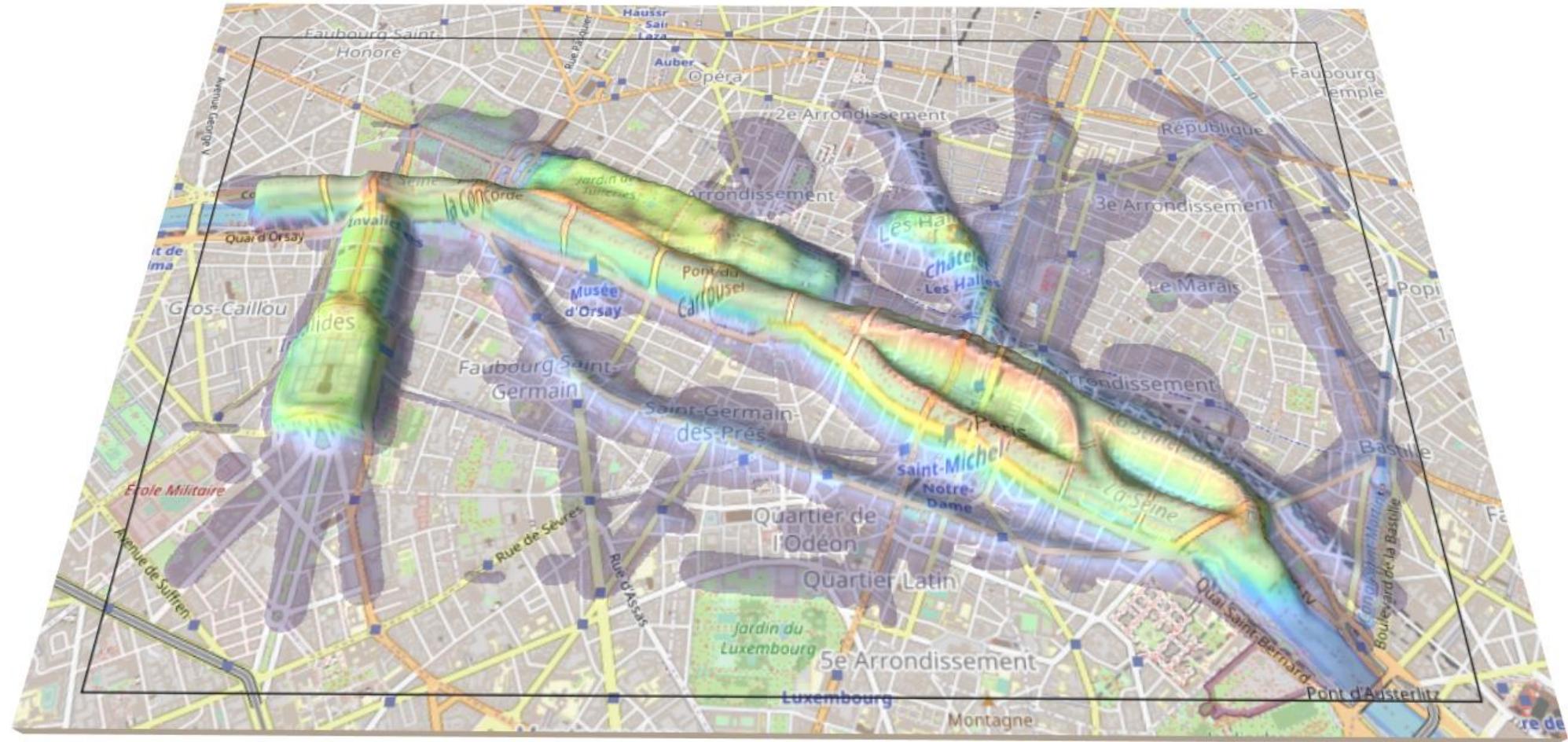




User survey 1 : Exploring cartographic persistence

Paris zoom 15



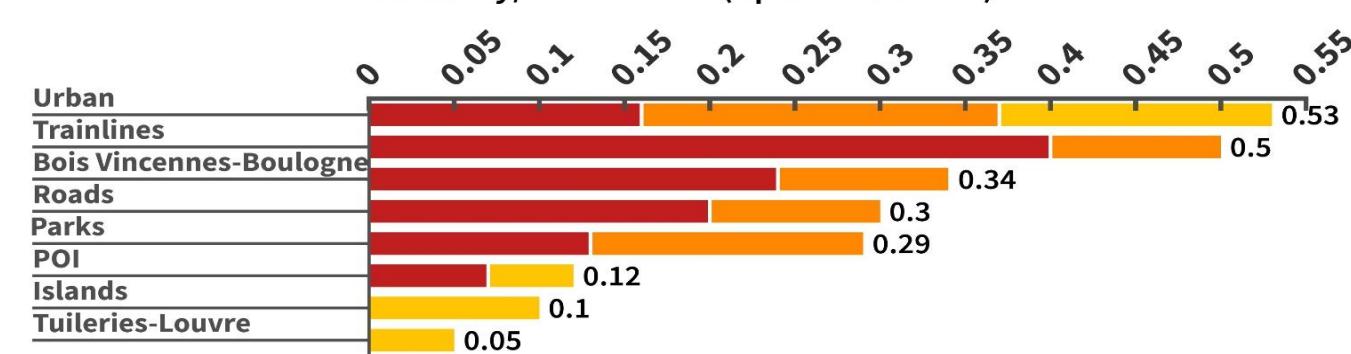
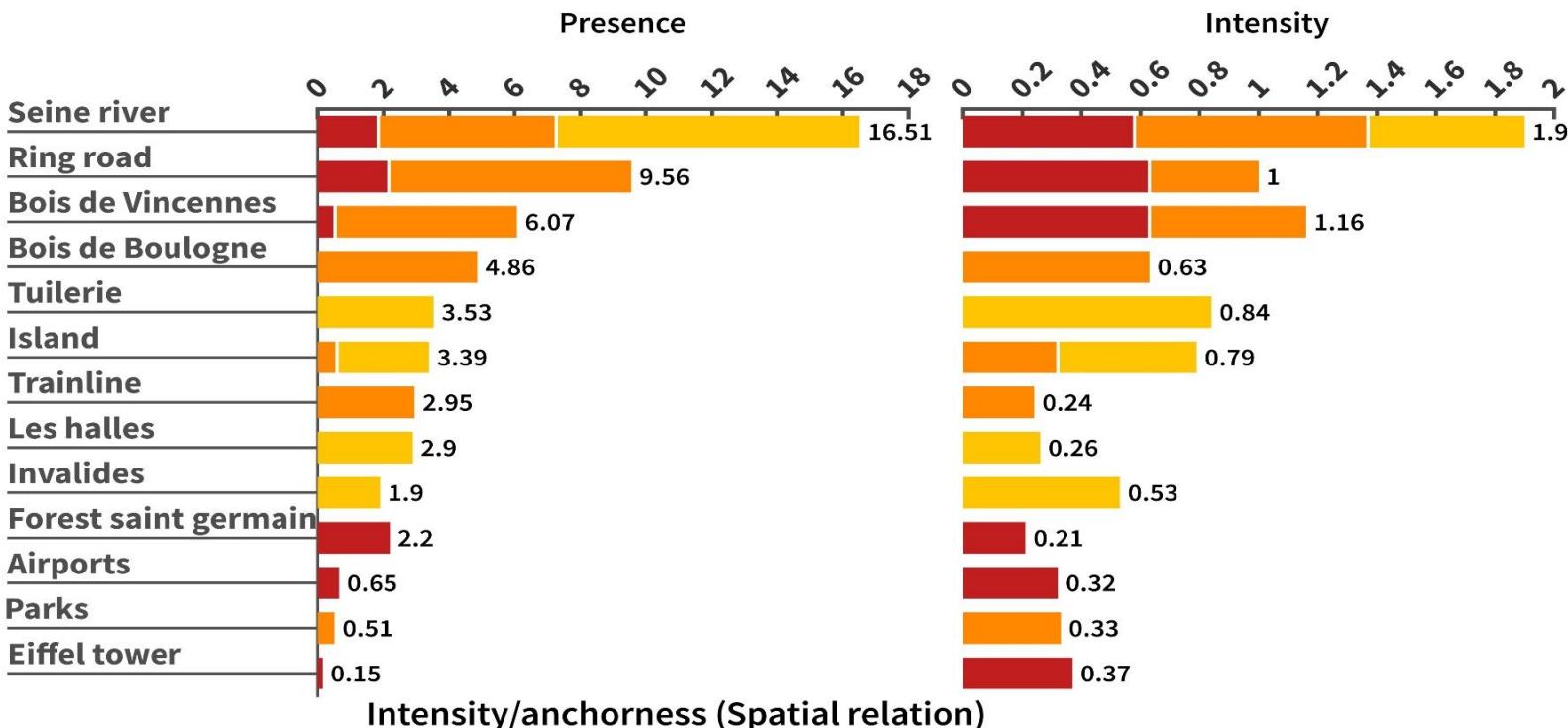


User survey 1 : Exploring cartographic persistence

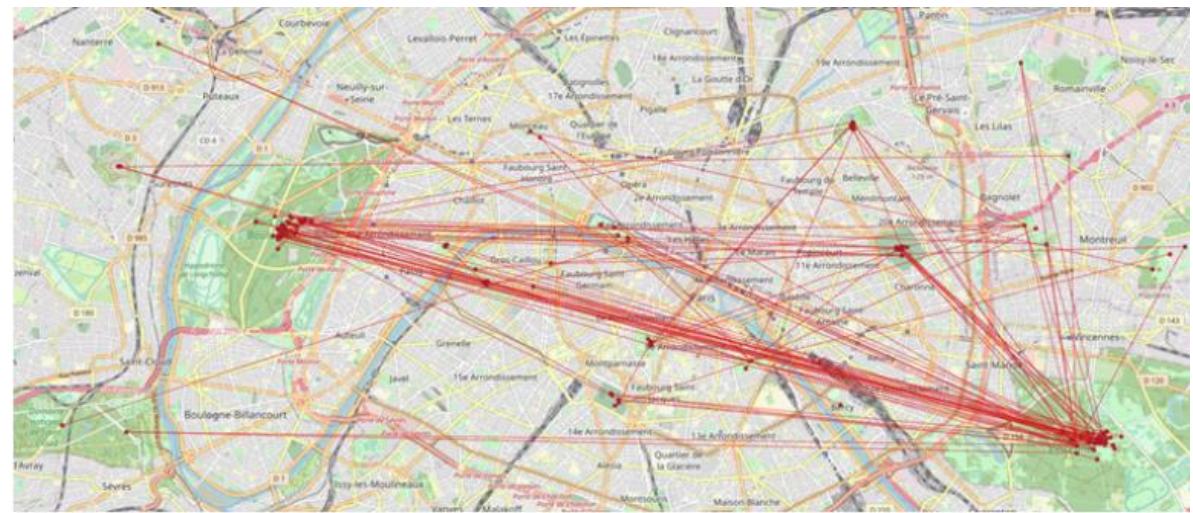
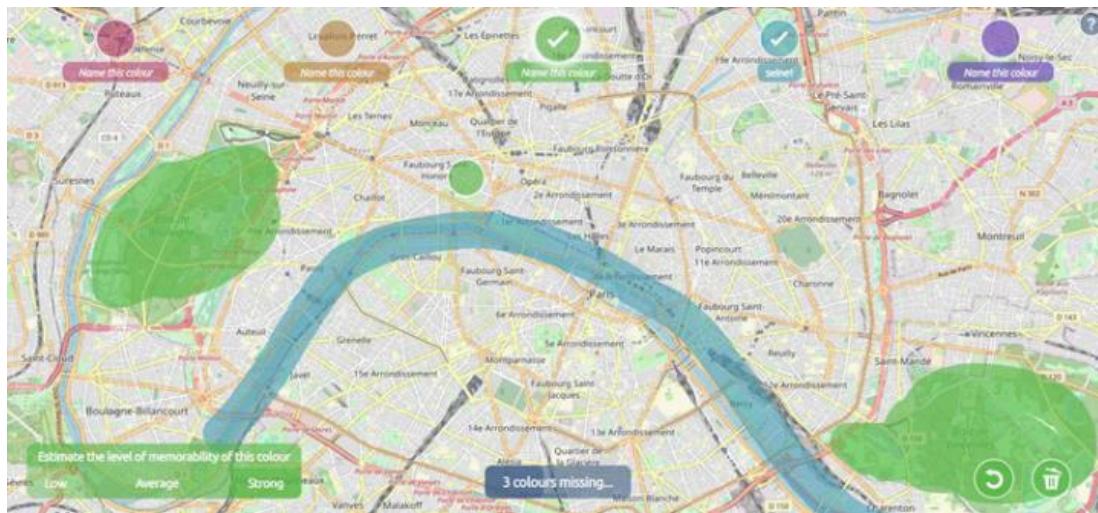
zoom 11

zoom 13

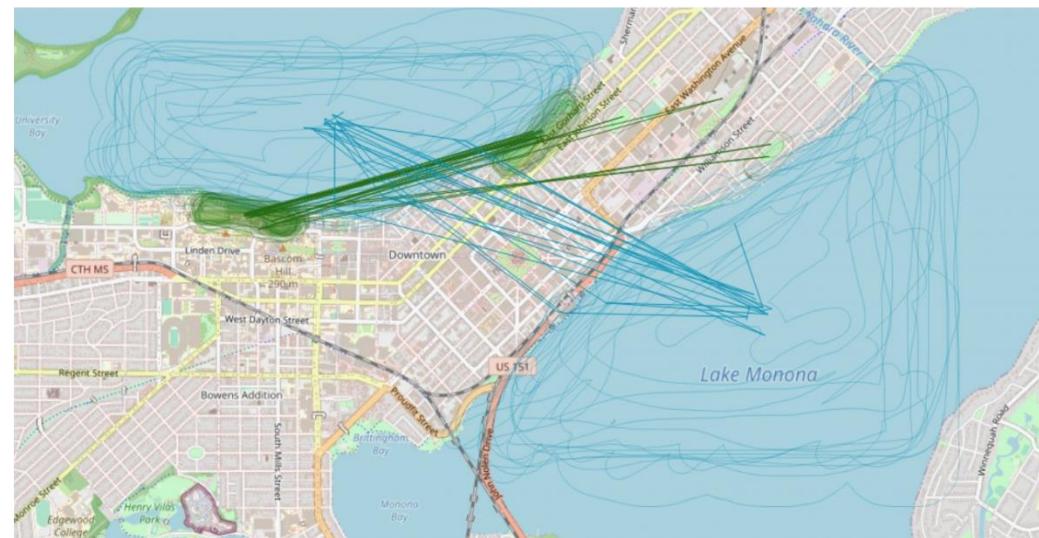
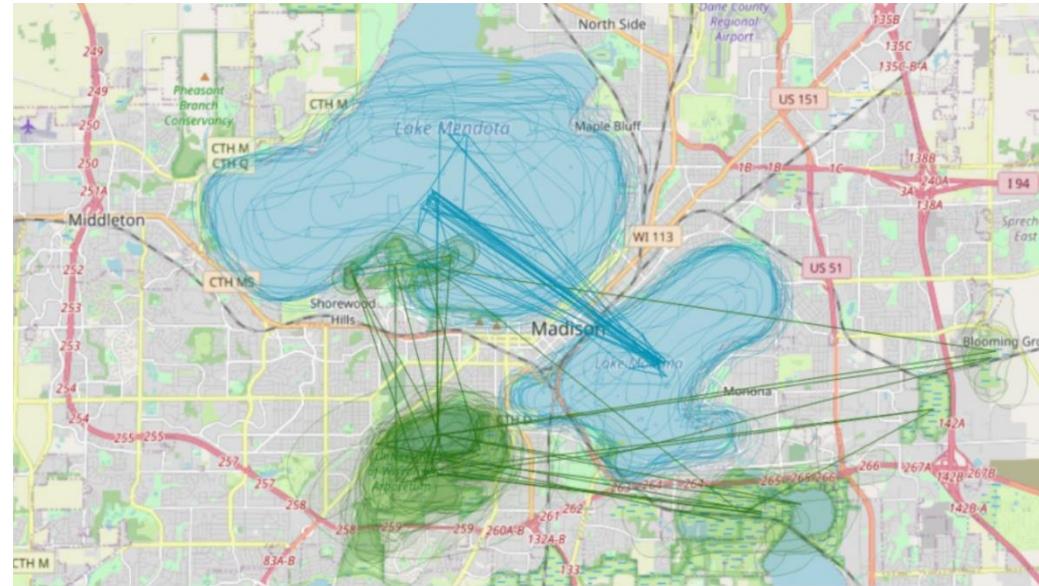
zoom 15



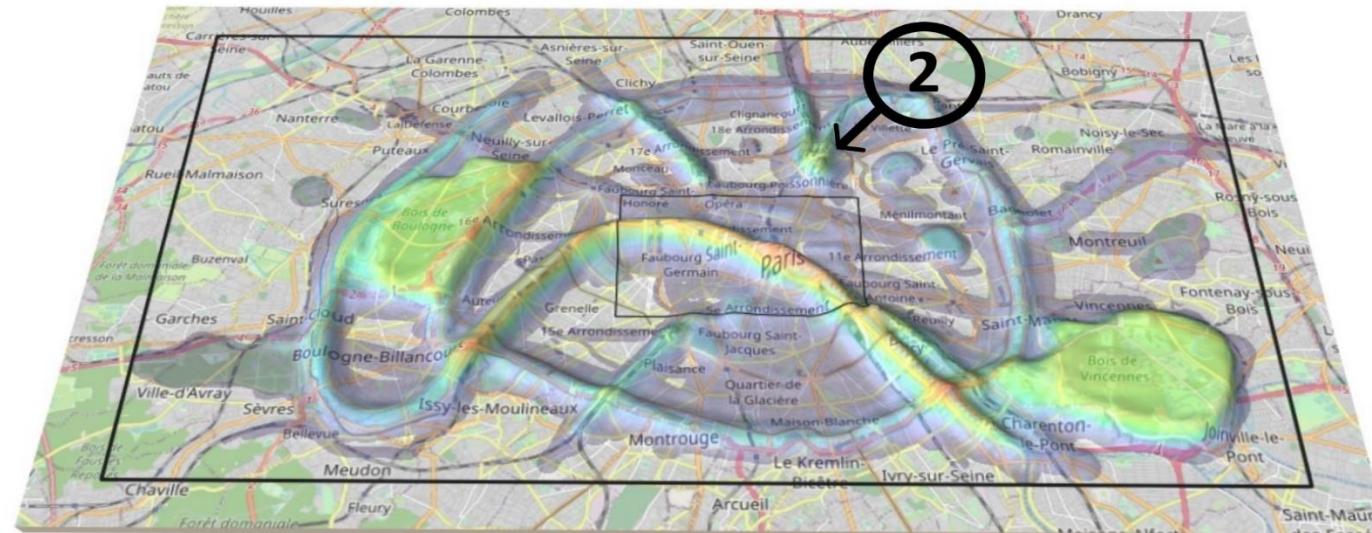
User survey 1 : Exploring cartographic persistence



User survey 1 : Exploring cartographic persistence

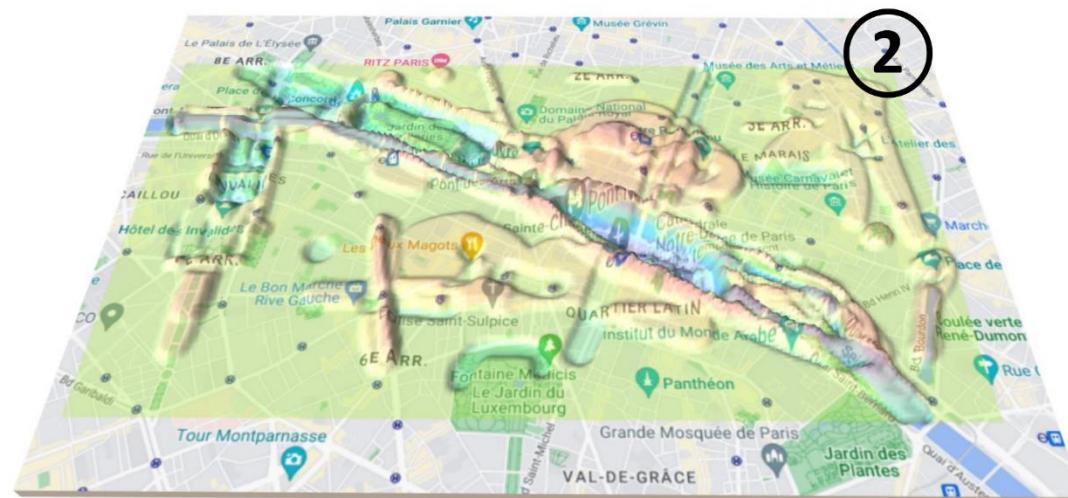
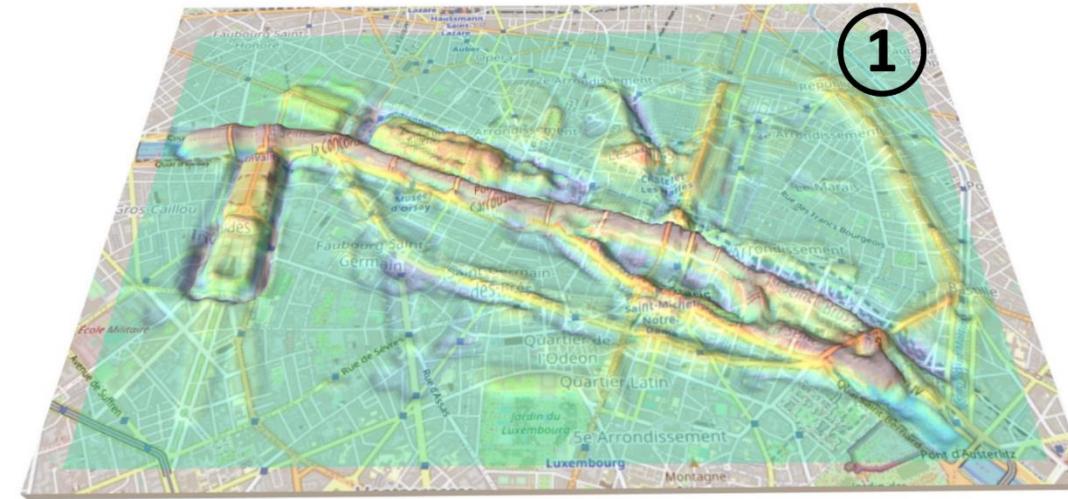


User survey 1 : Exploring cartographic persistence



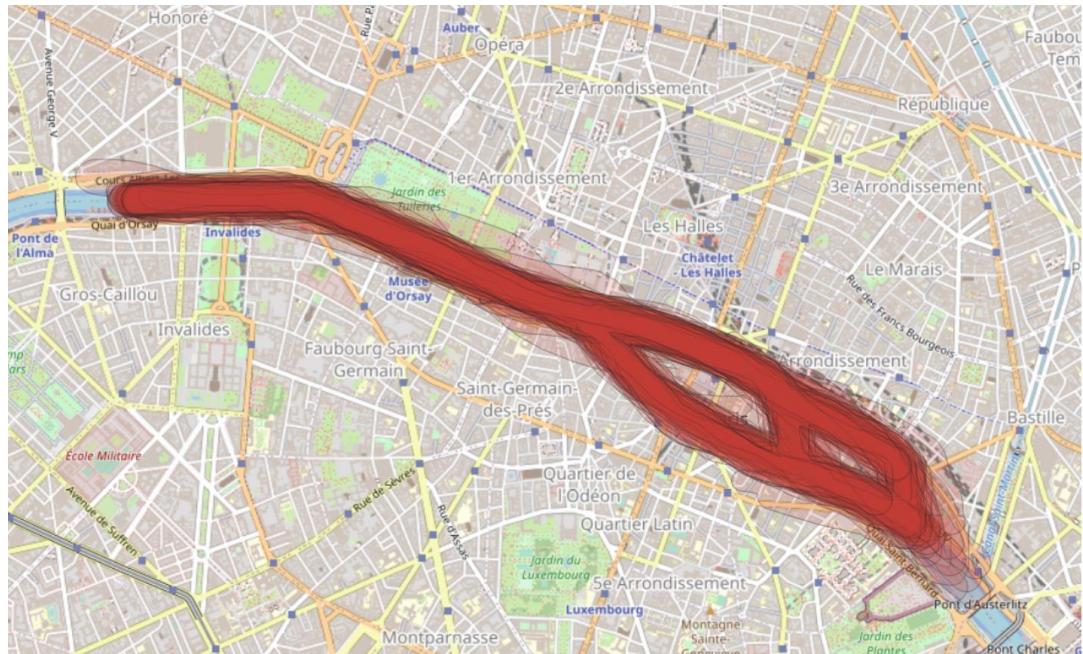
User survey 1 : Exploring cartographic persistence

Local knowledge



User survey 1 : Exploring cartographic persistence

Delineation of pan-scalar anchor



User survey 1 : Exploring cartographic persistence

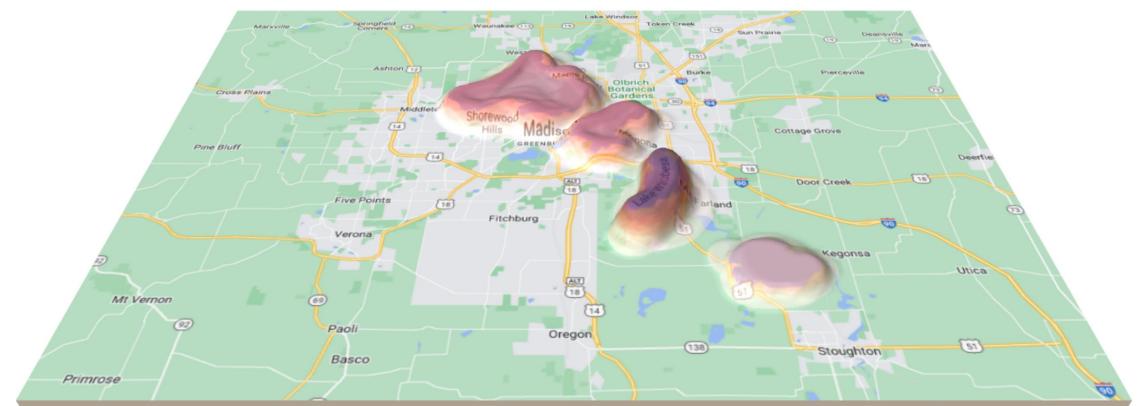
The symmetry between the anchors seems to amplify them individually.

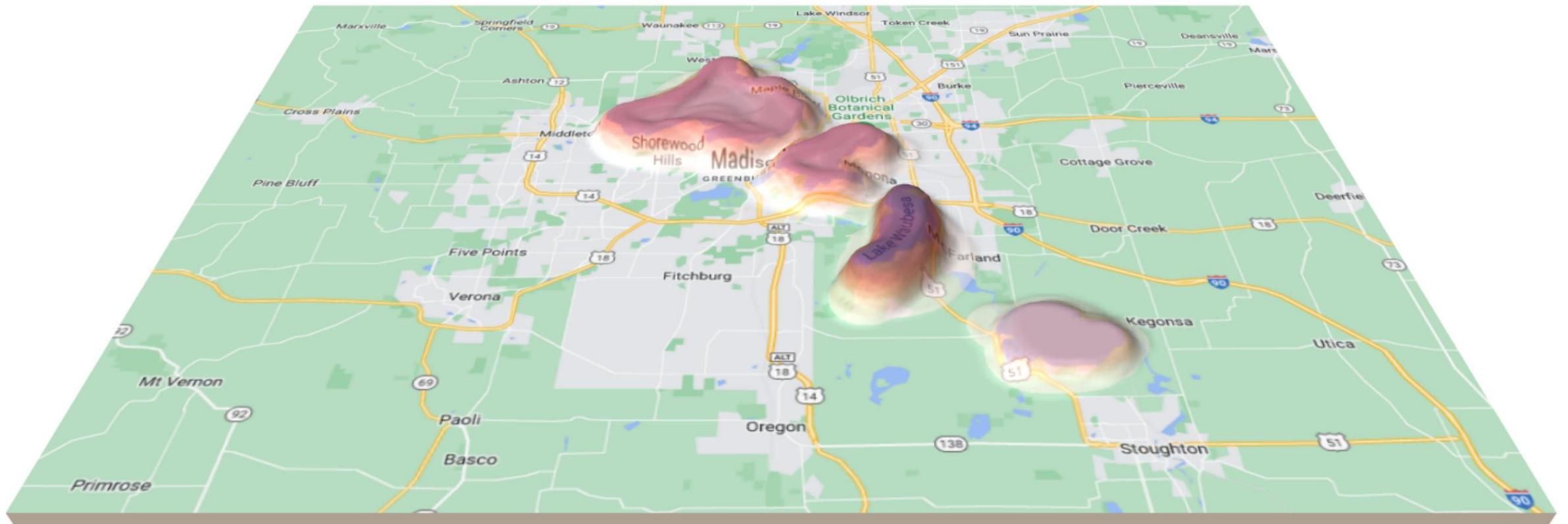
Text in the map. When an anchor contains text that describes or names it, its anchoring is more important.

The uniqueness and/or regularity of the geometry of the map anchor.

Map experience

The centrality of the map anchor
(The Lakes in Madison, the Seine in Paris).

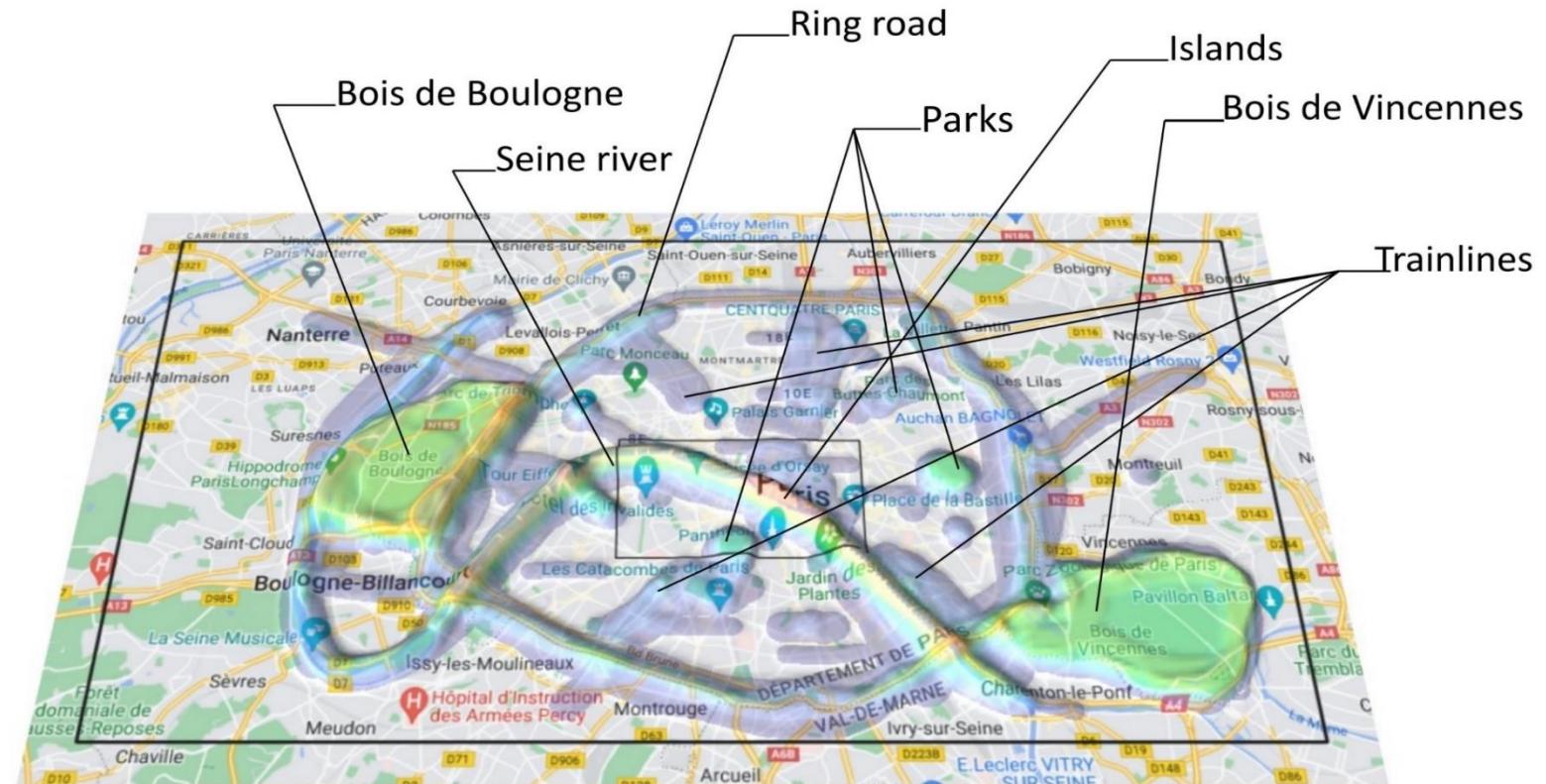




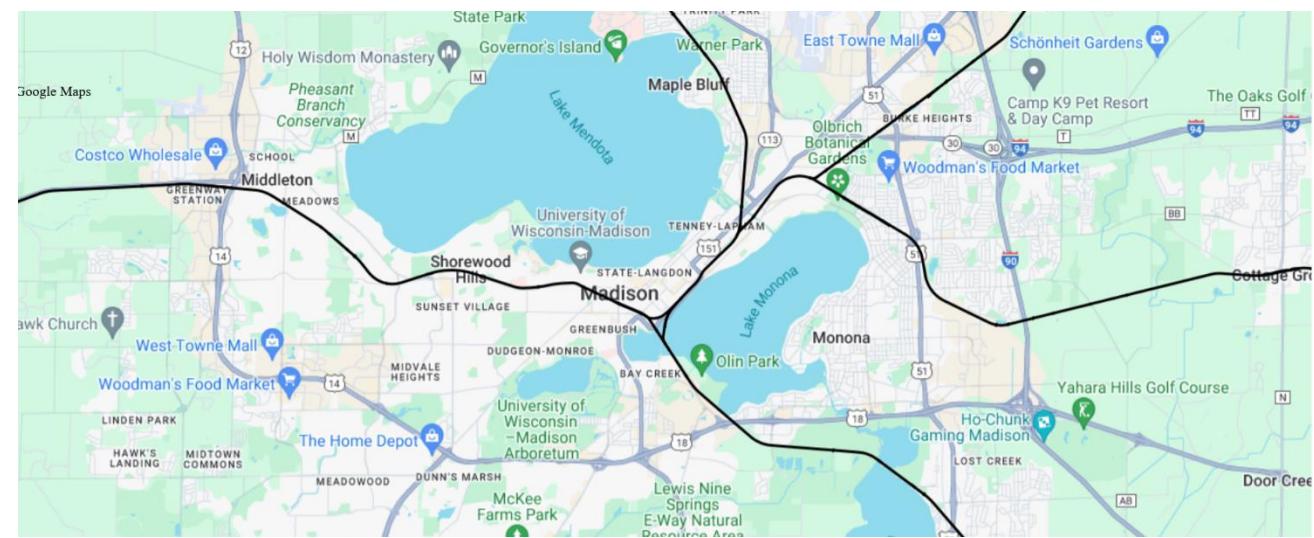
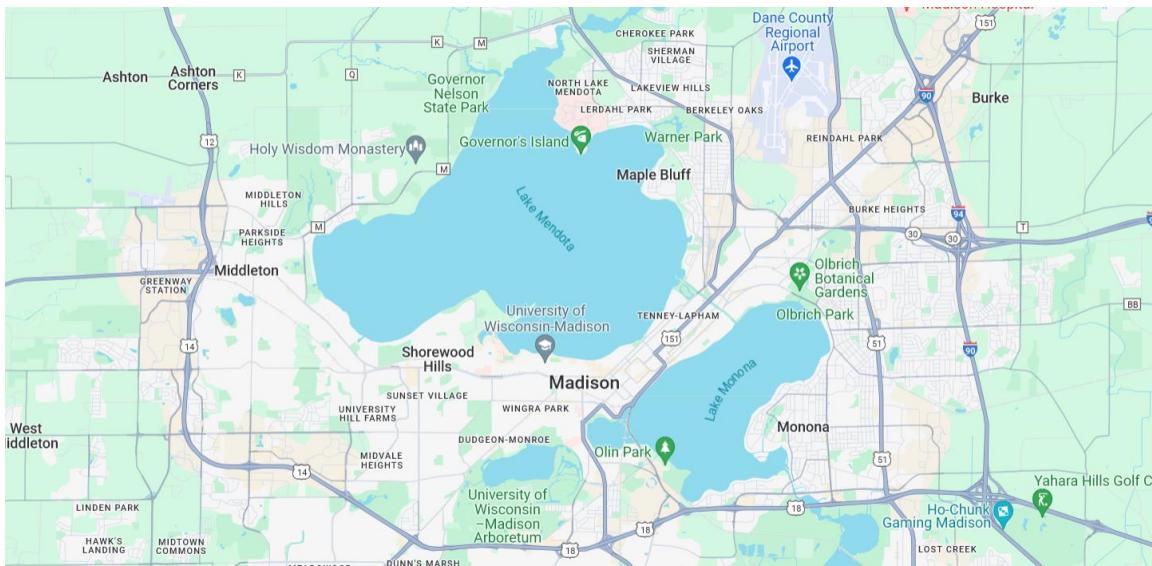
User survey 2 : Quantifying cartographic persistence

H1 : Pan-scalar exploration with increasing anchor intensity improves memorability of pan-scalar map space

H2 : A pan-scalar exploration where scale persistence enhances the memorability of pan-scalar map space

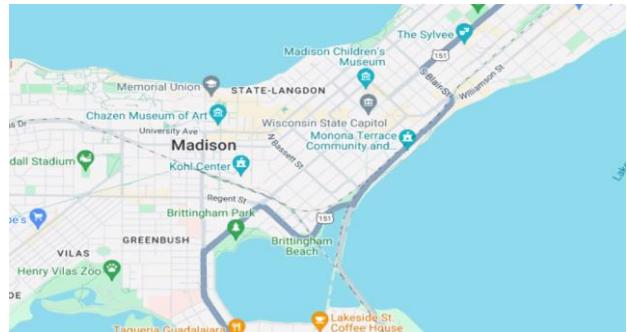


User survey 2 : Quantifying cartographic persistence

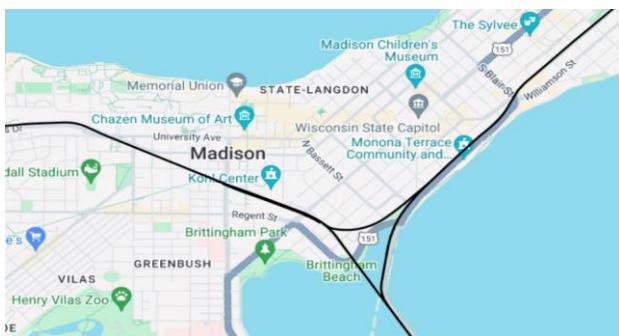


User survey 2 : Quantifying cartographic persistence

H1 : Pan-scalar exploration with increasing anchor intensity improves memorability of pan-scalar map space



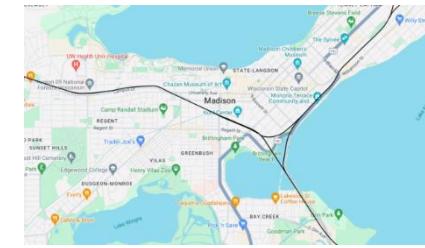
S2 zoom 12



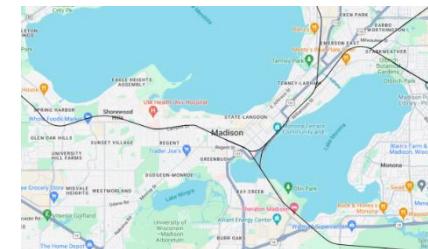
S1 zoom 12

Saillance

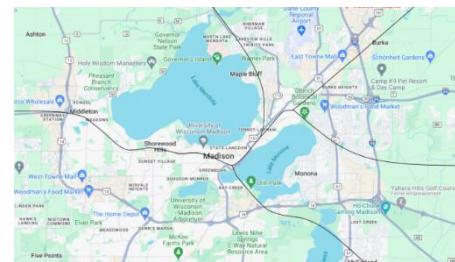
H2 : A pan-scalar exploration where scale persistence enhances the memorability of pan-scalar map space



P1 : Zoom 14



P2 : Zoom 13



P3 : Zoom 12

Persistence

User survey 2 : Quantifying cartographic persistence



User survey 2 : Quantifying cartographic persistence



Image 1



Image 2

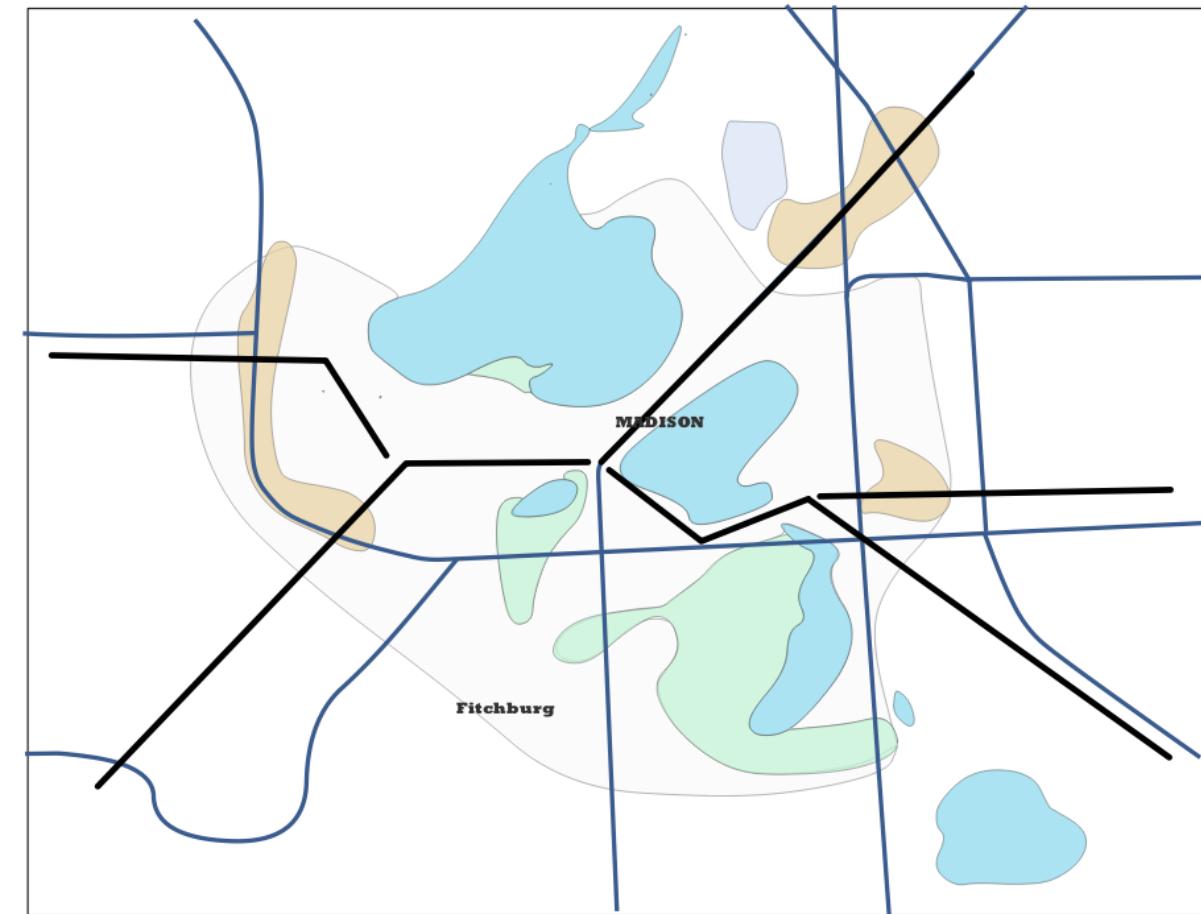
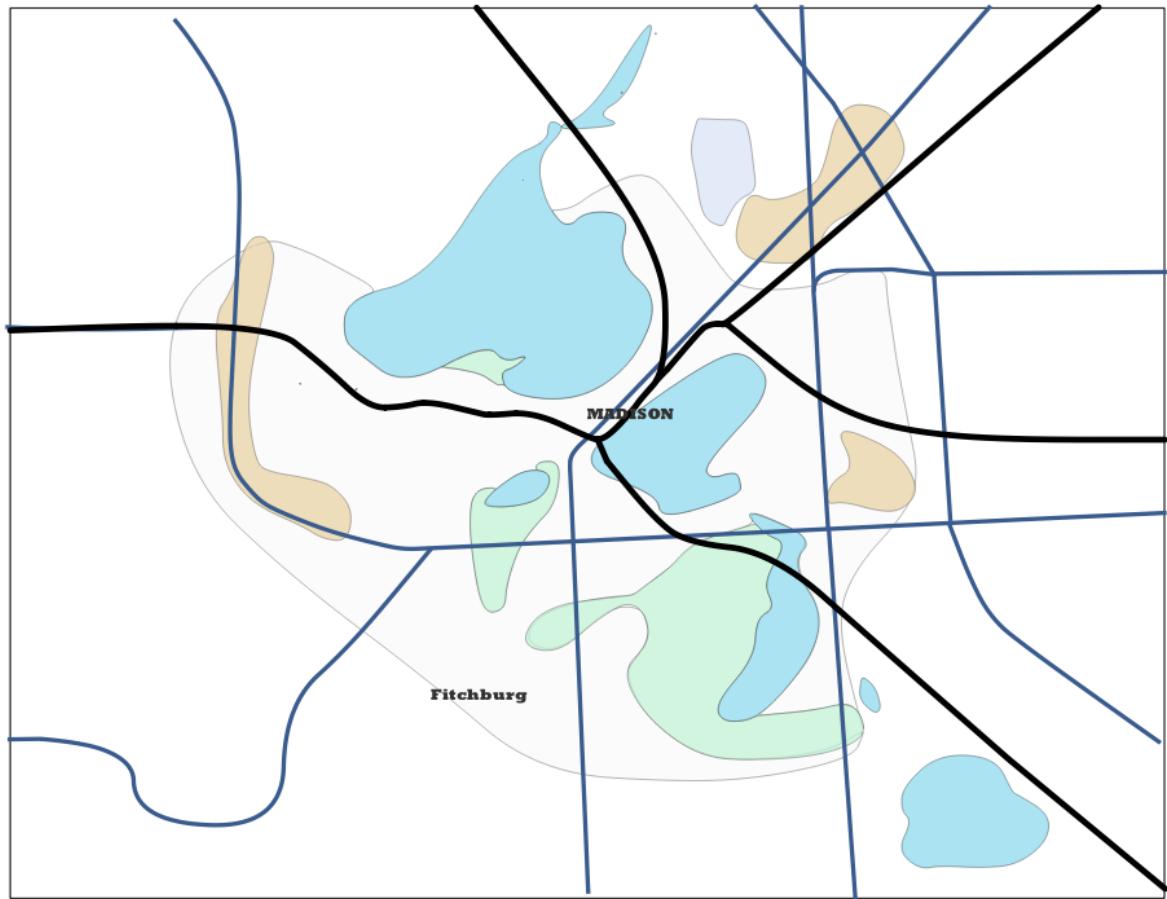


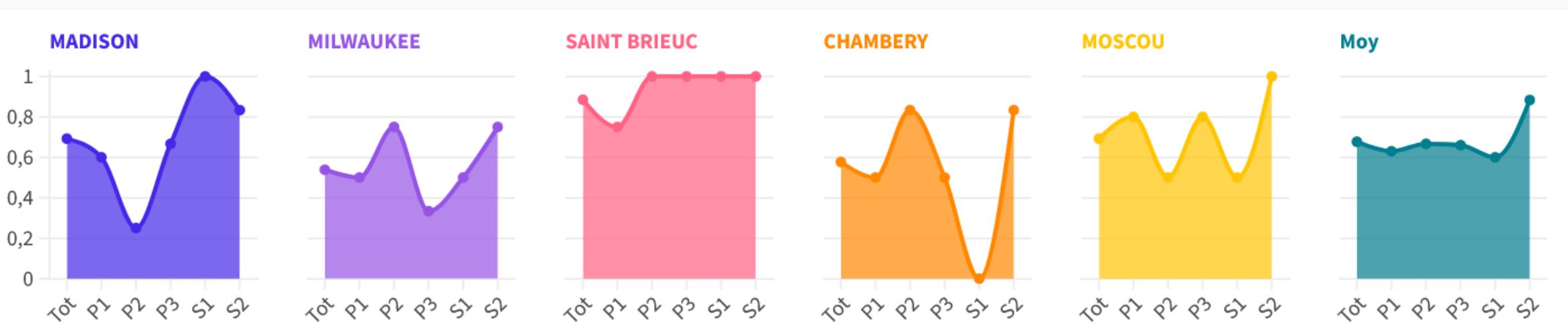
Image 3



Image 4

User survey 2 : Quantifying cartographic persistence

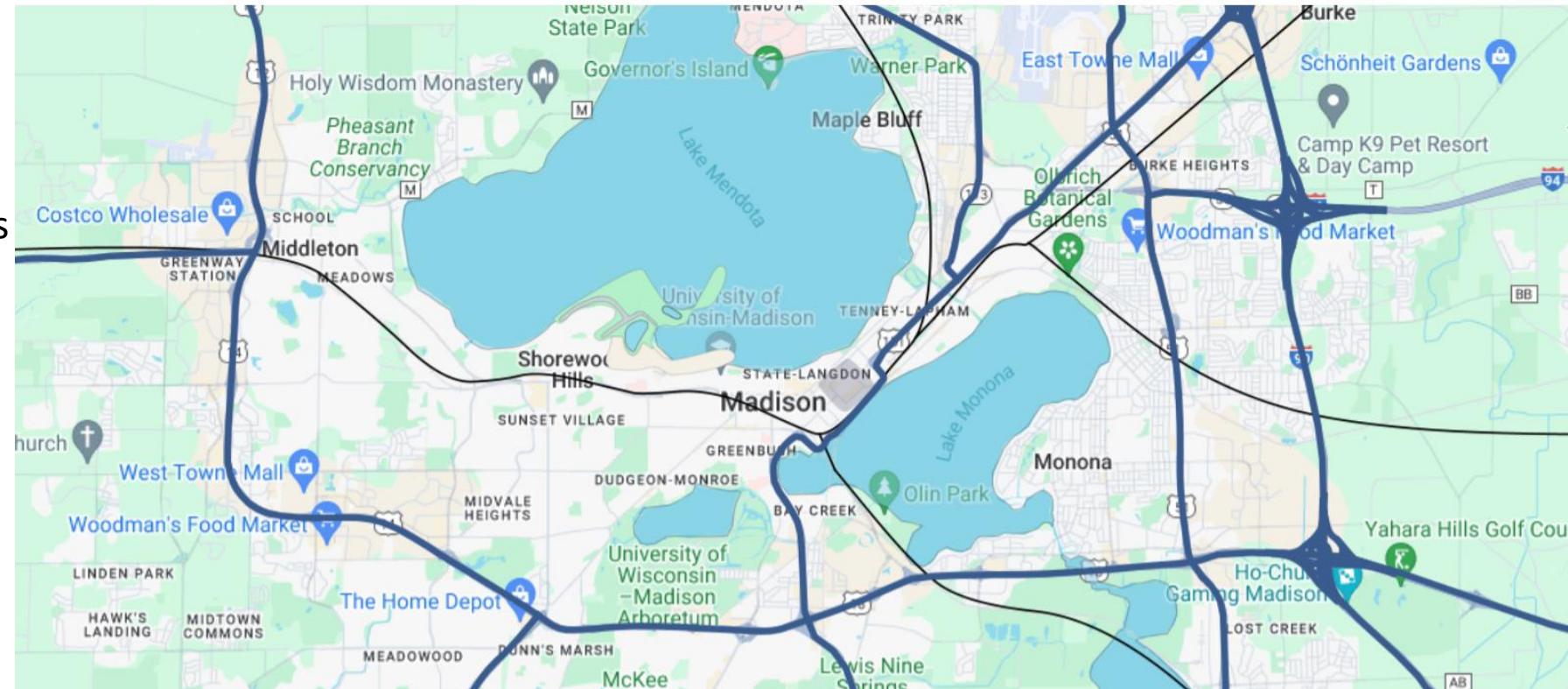




Cartographic generalization

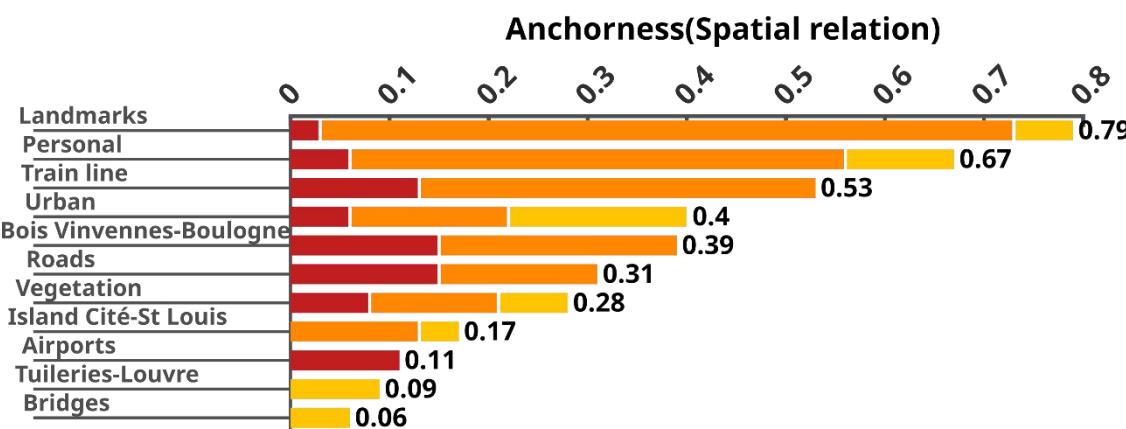
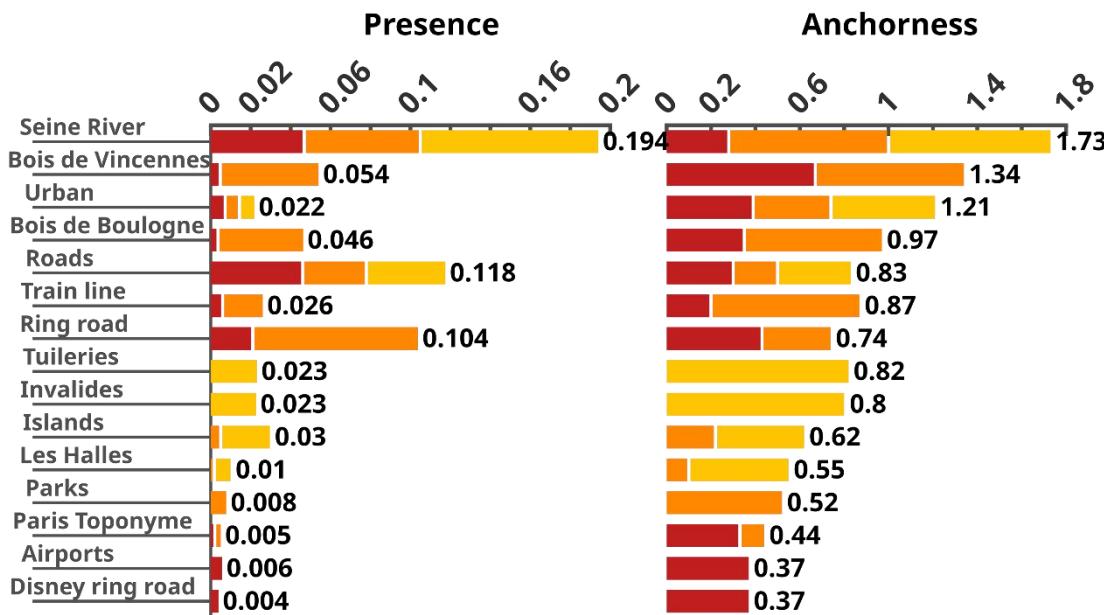
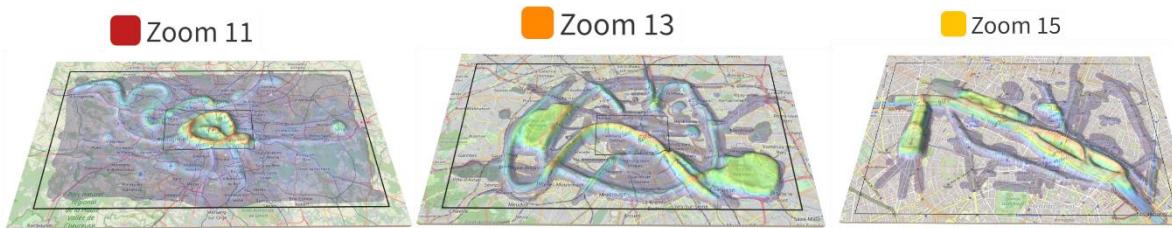
How to improve current pan-scalar maps

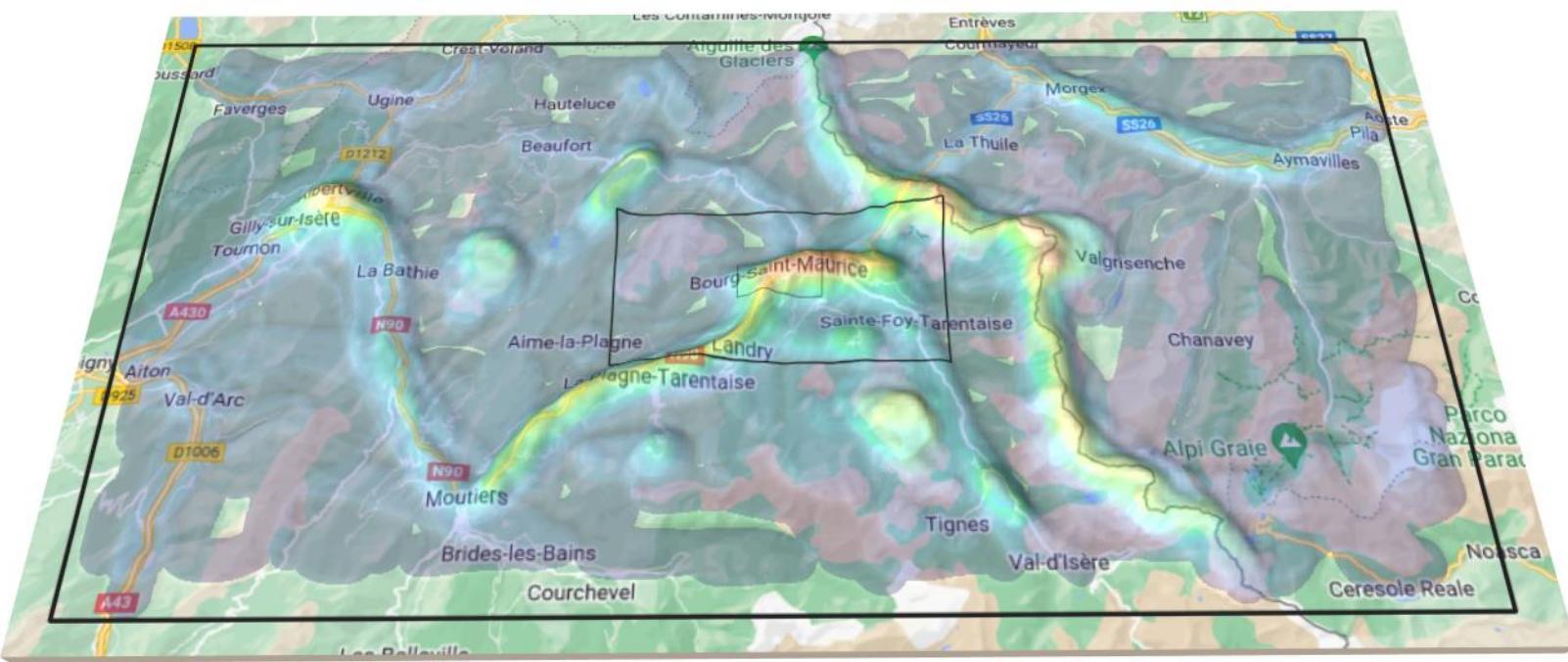
- (1) Improve anchor intensity.
- (2) Extend the scale of certain natural map anchors.
- (3) Adding anchors in visual scales ranges with no hierarchy.
- (4) Adding anchors in regions with no visual hierarchy.
- (5) enhance spatial relations between anchors to create reciprocal enhancement of their salience.

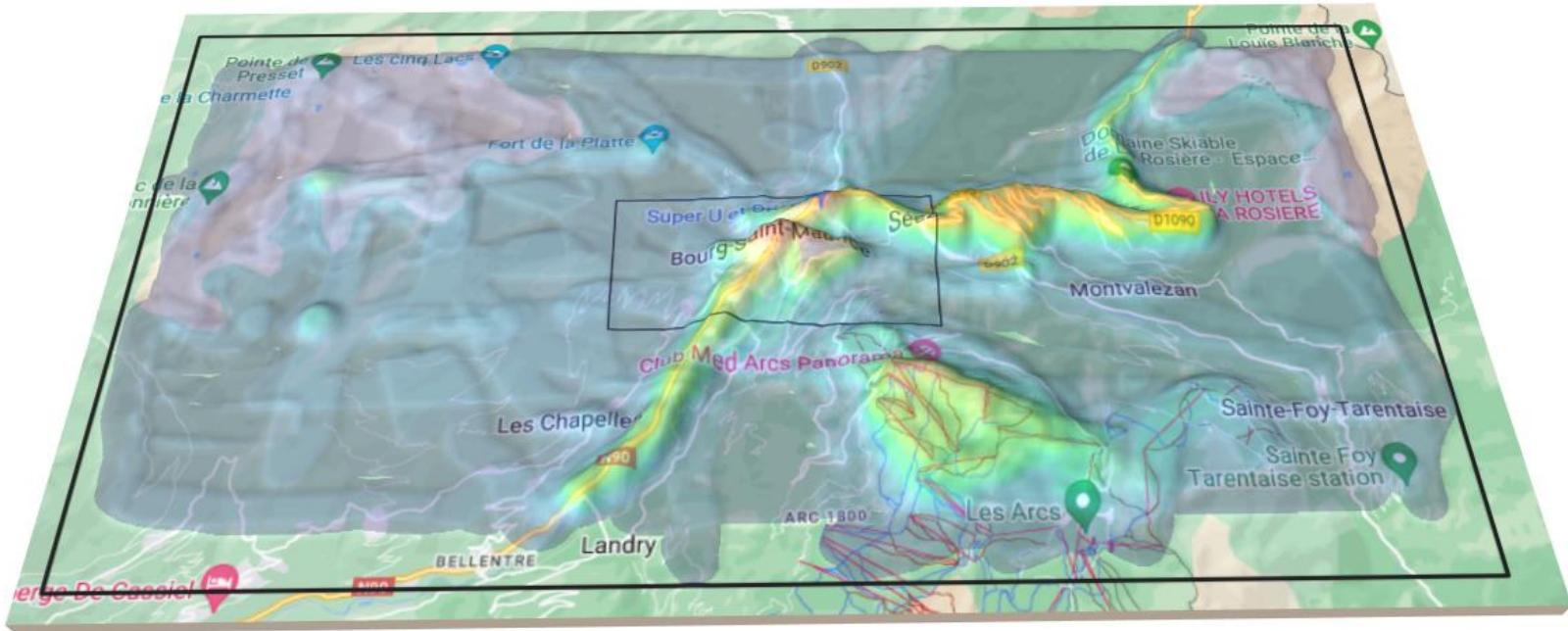


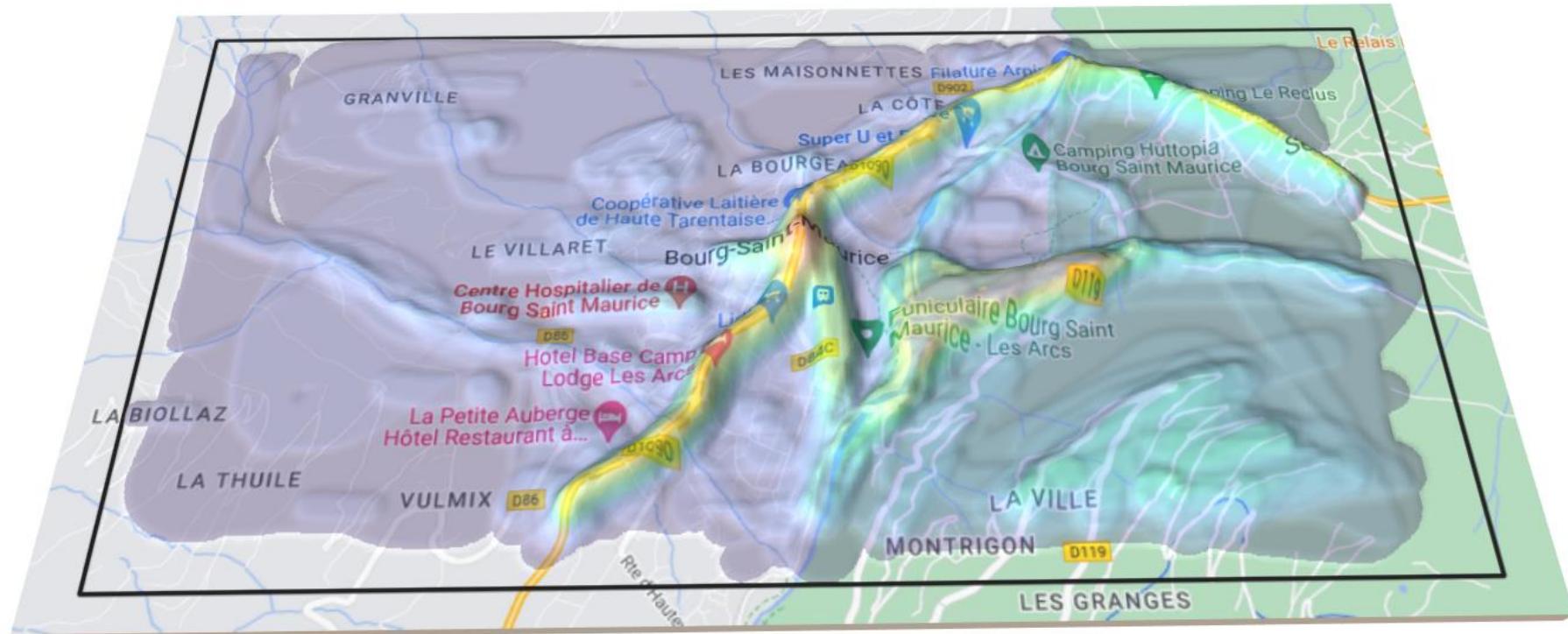
Thank you for your attention!

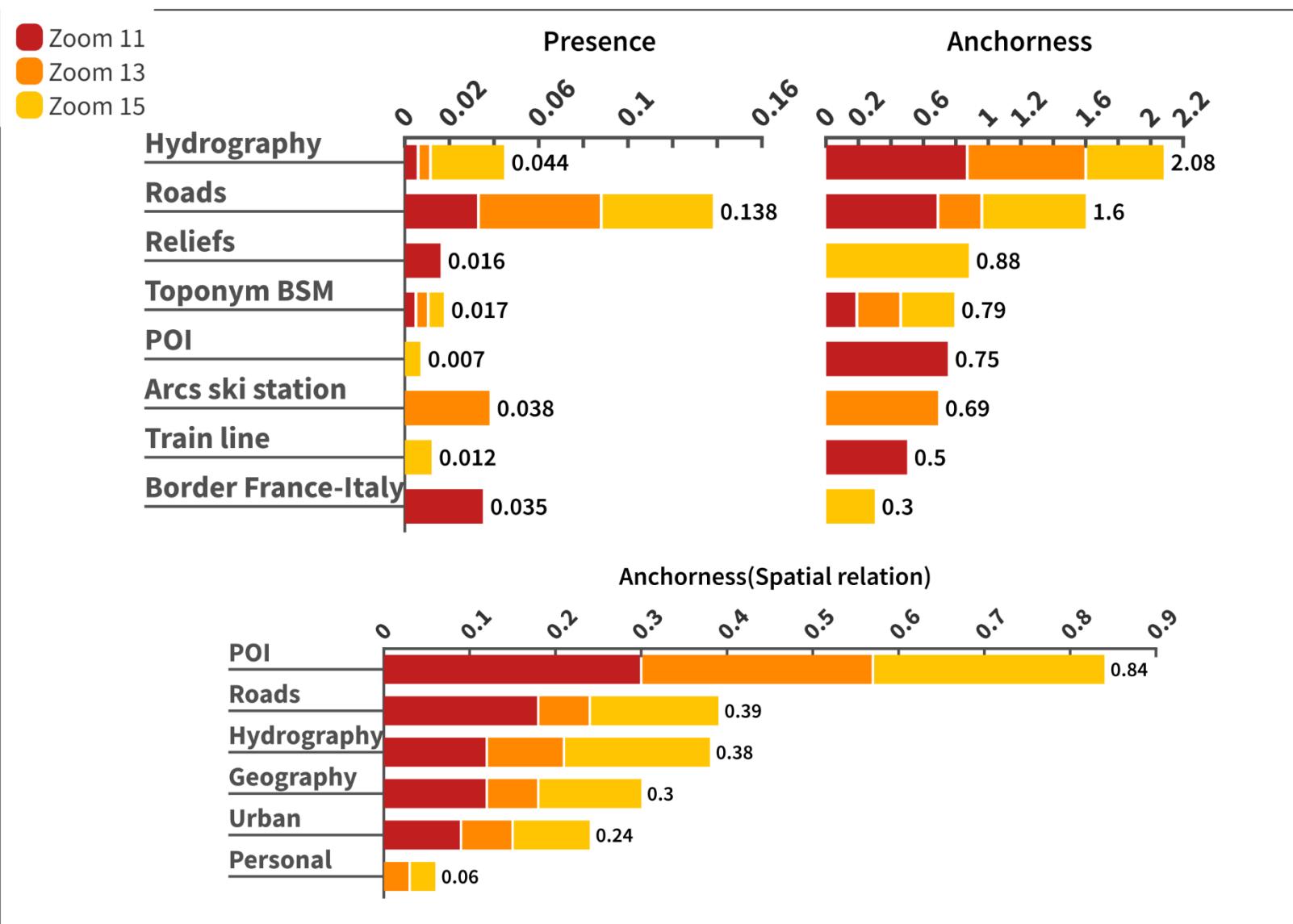
maieul.gruget@ign.fr

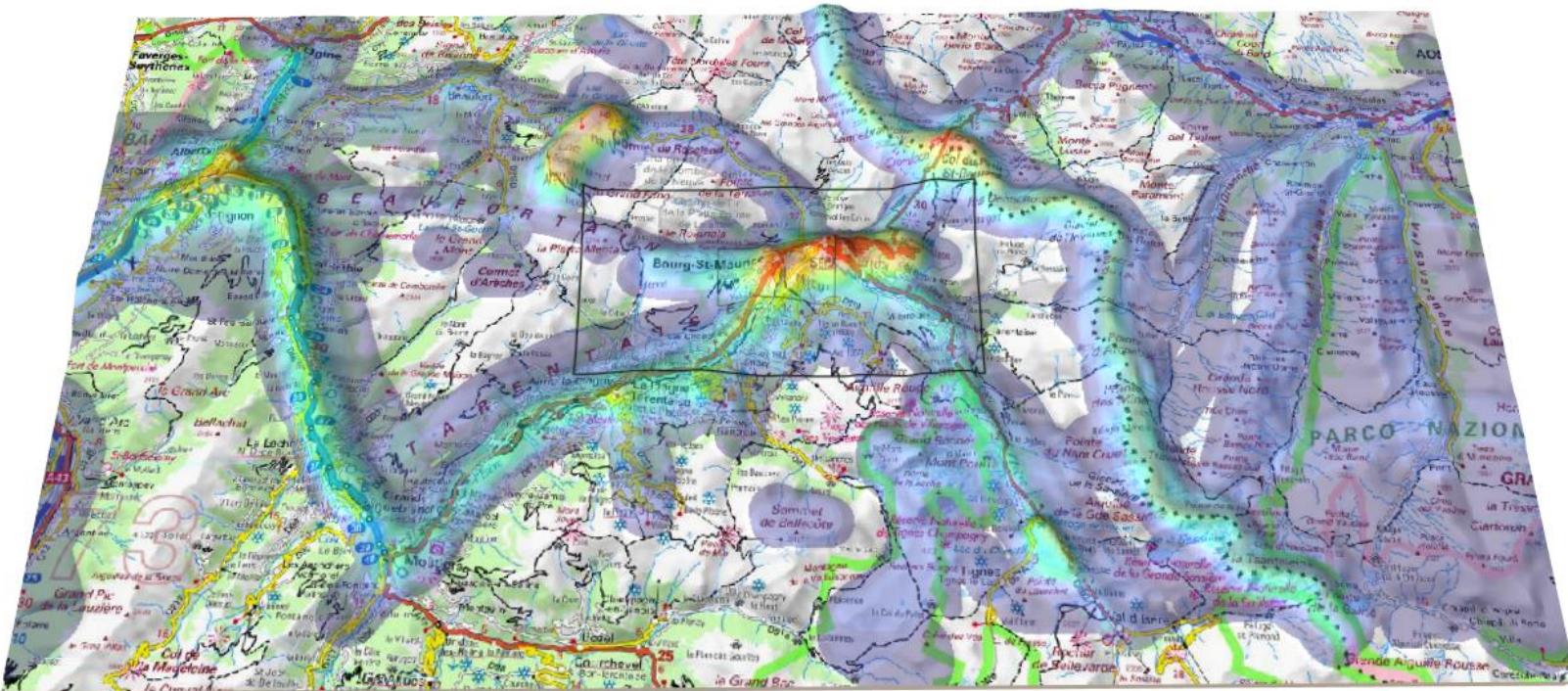


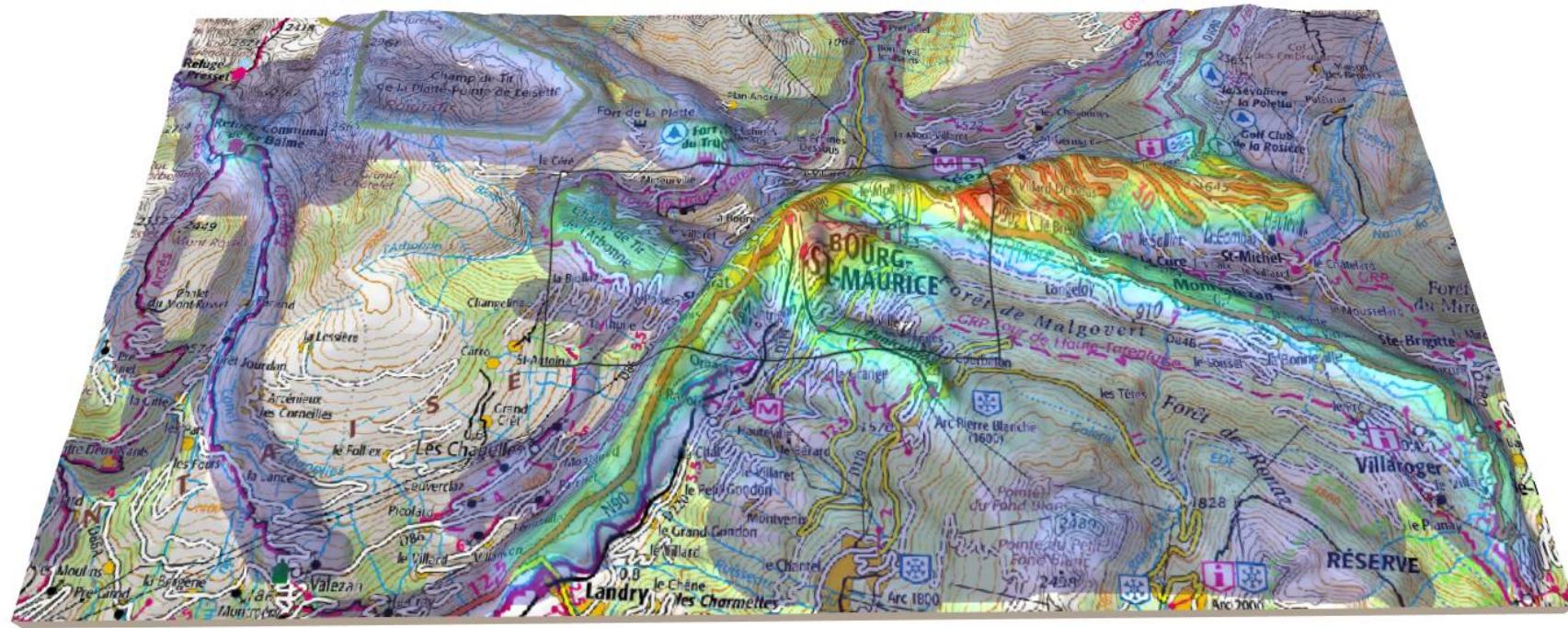


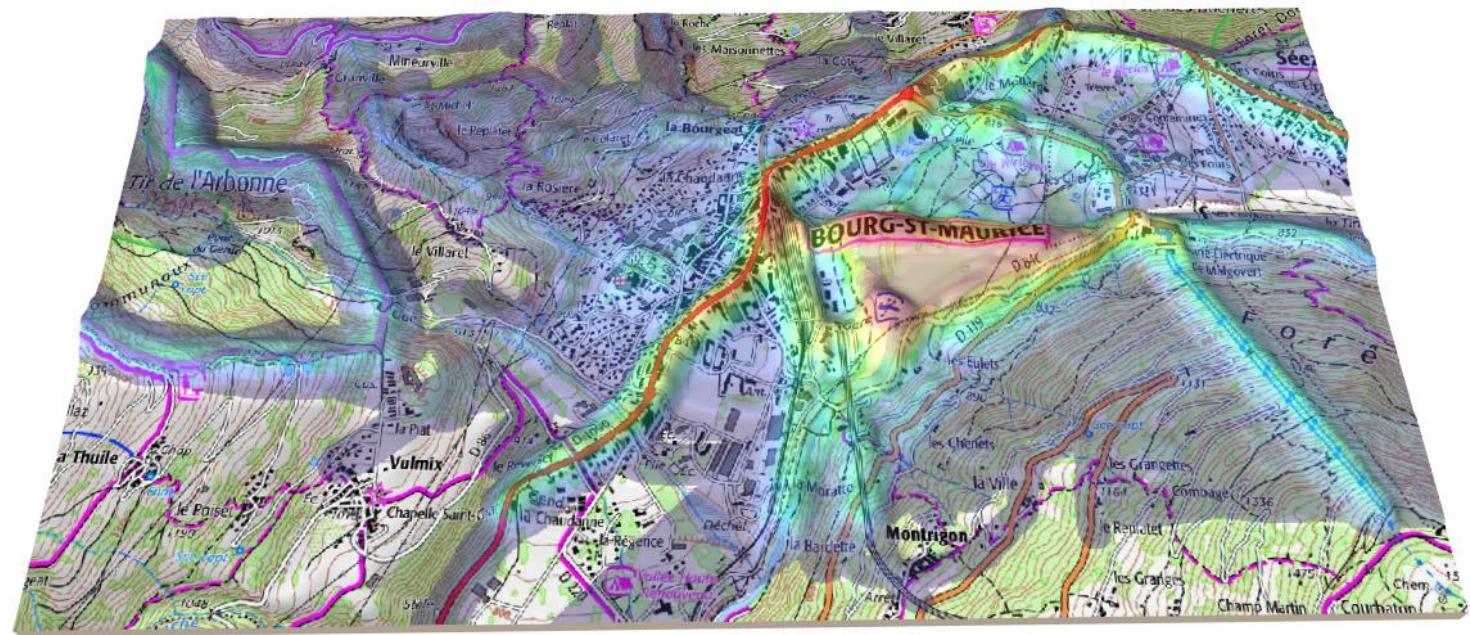








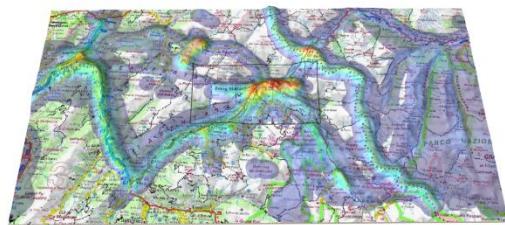




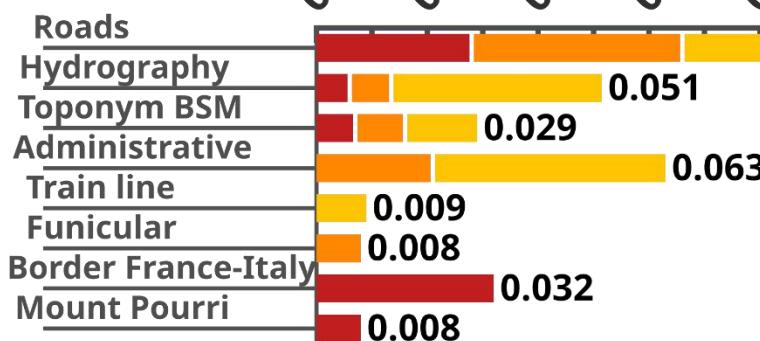
Zoom 11

Zoom 13

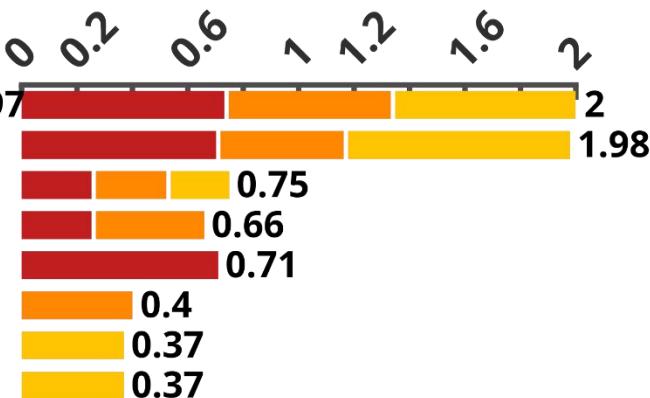
Zoom 15



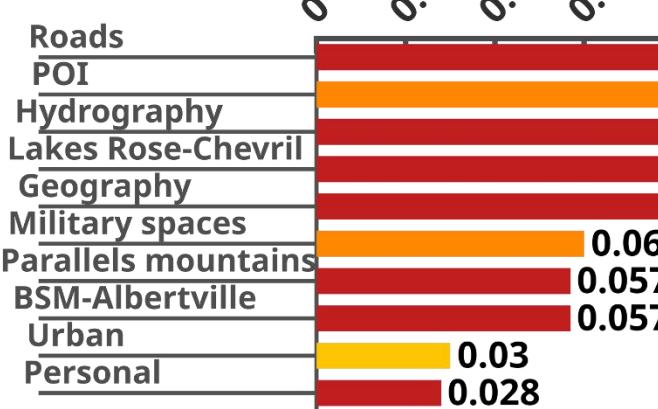
Presence

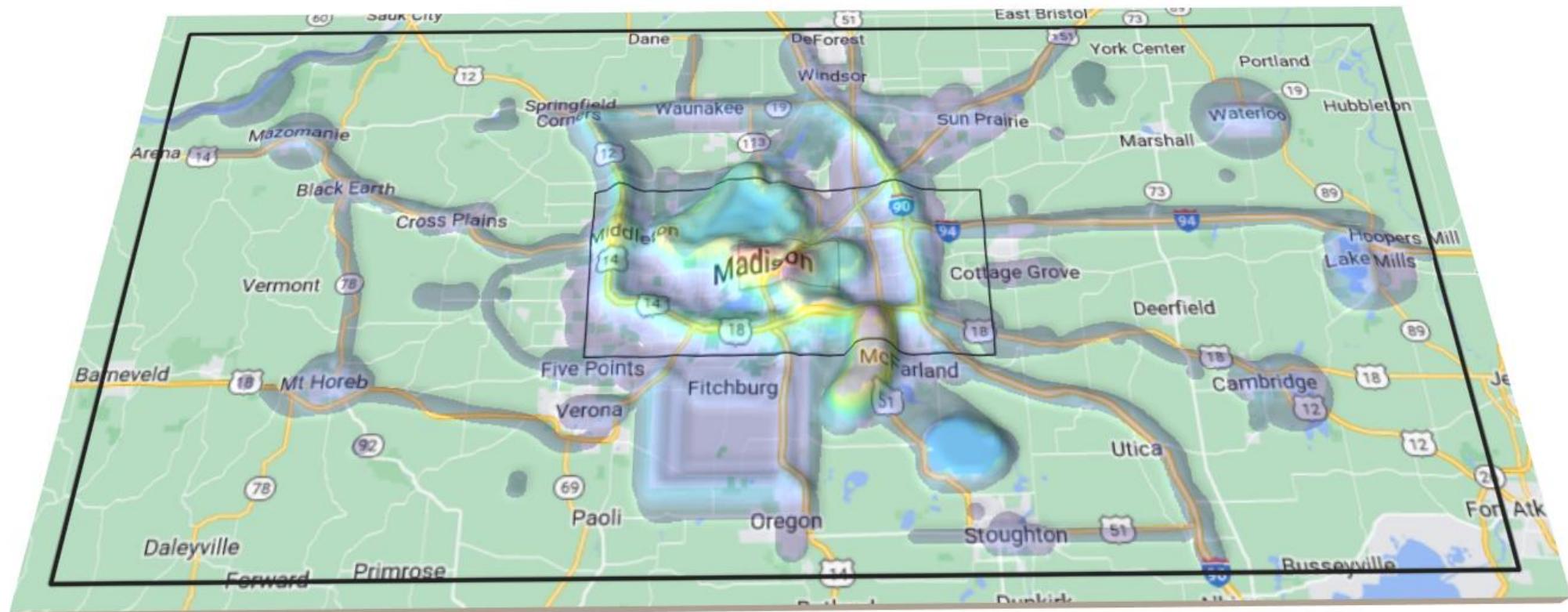


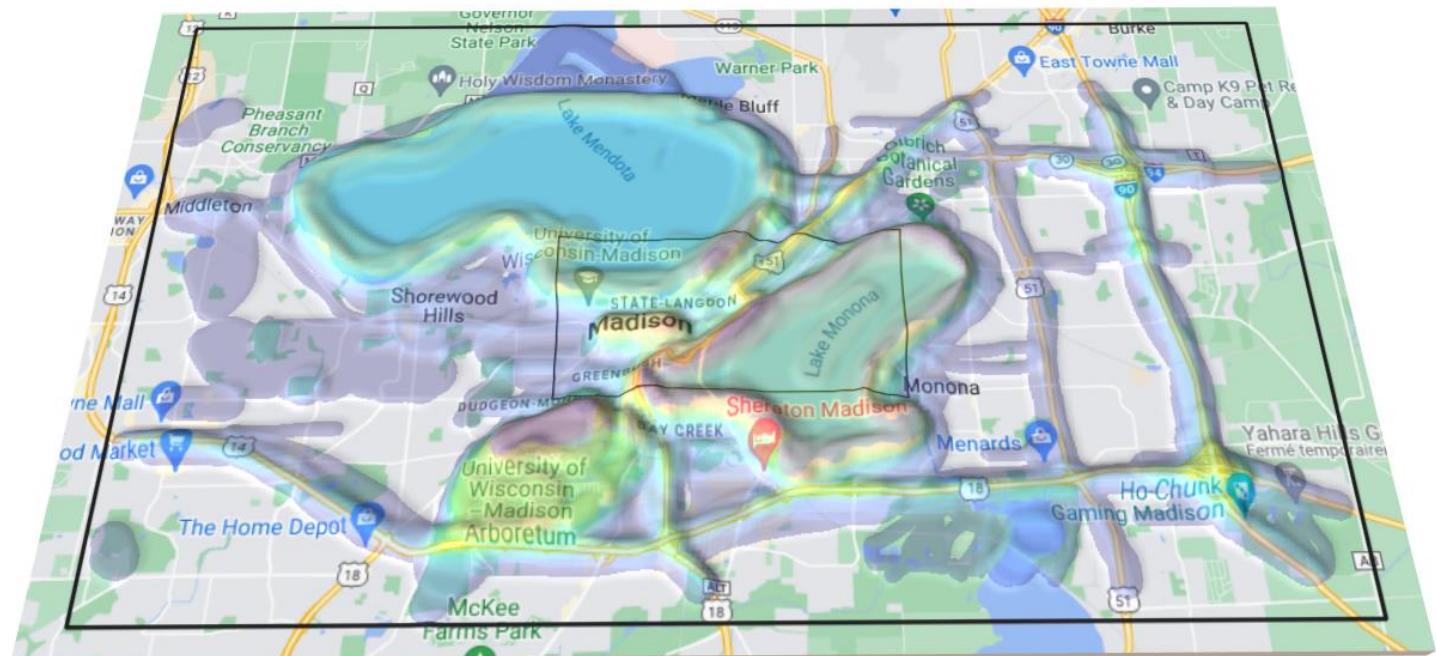
Anchorness

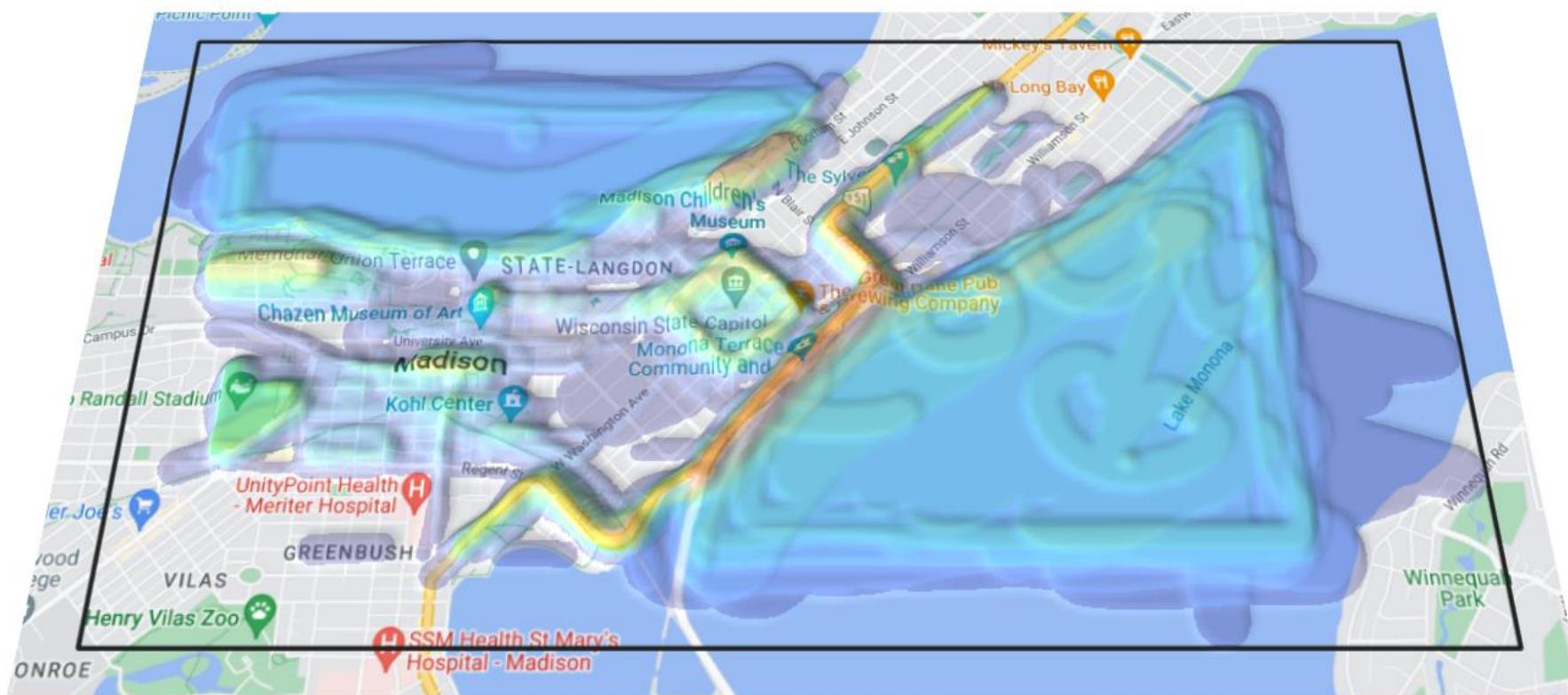


Anchorness (Spatial relation)





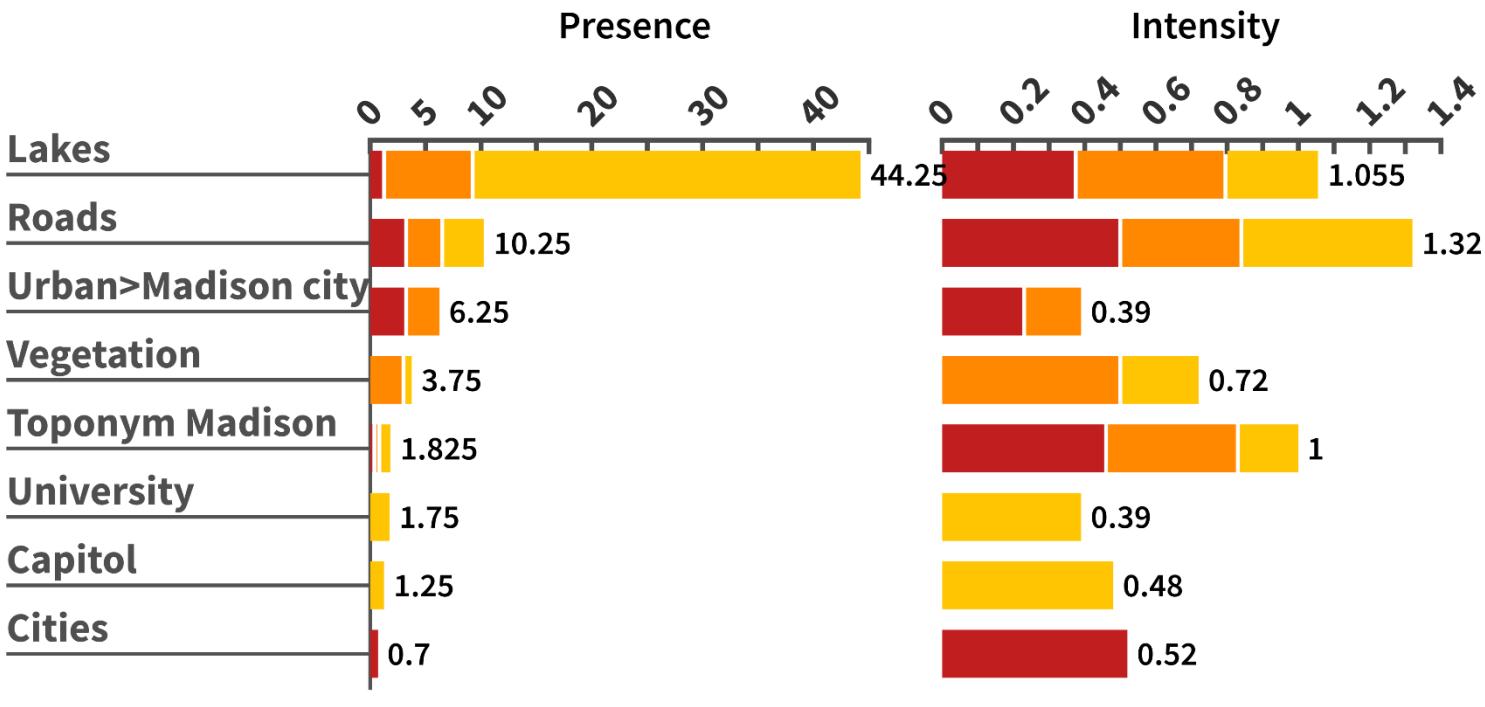




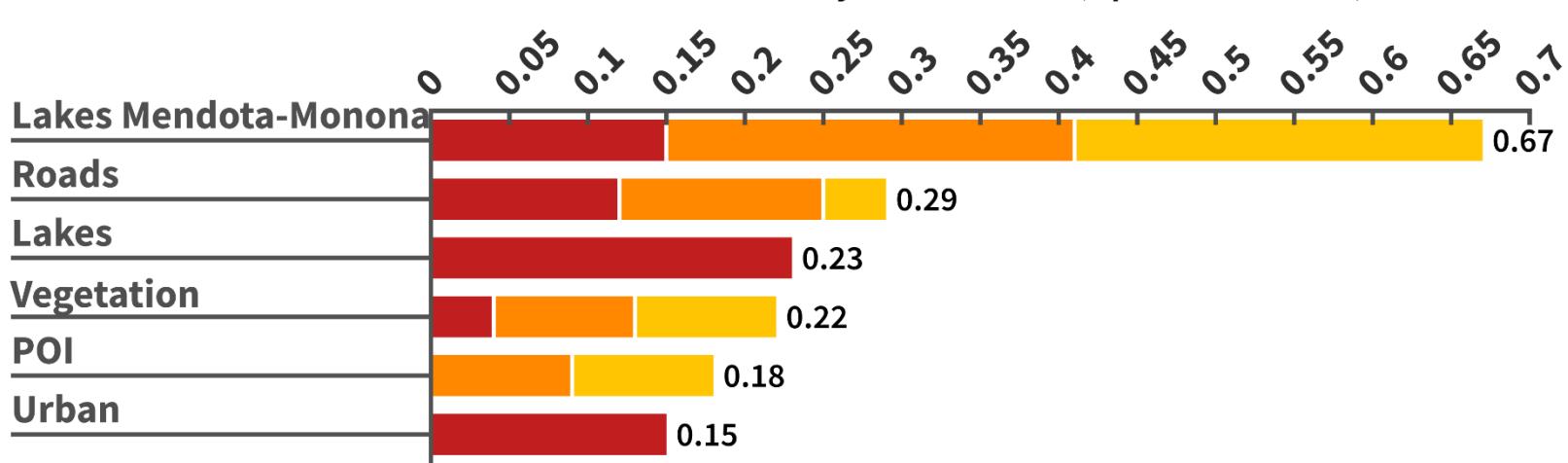
 zoom 11

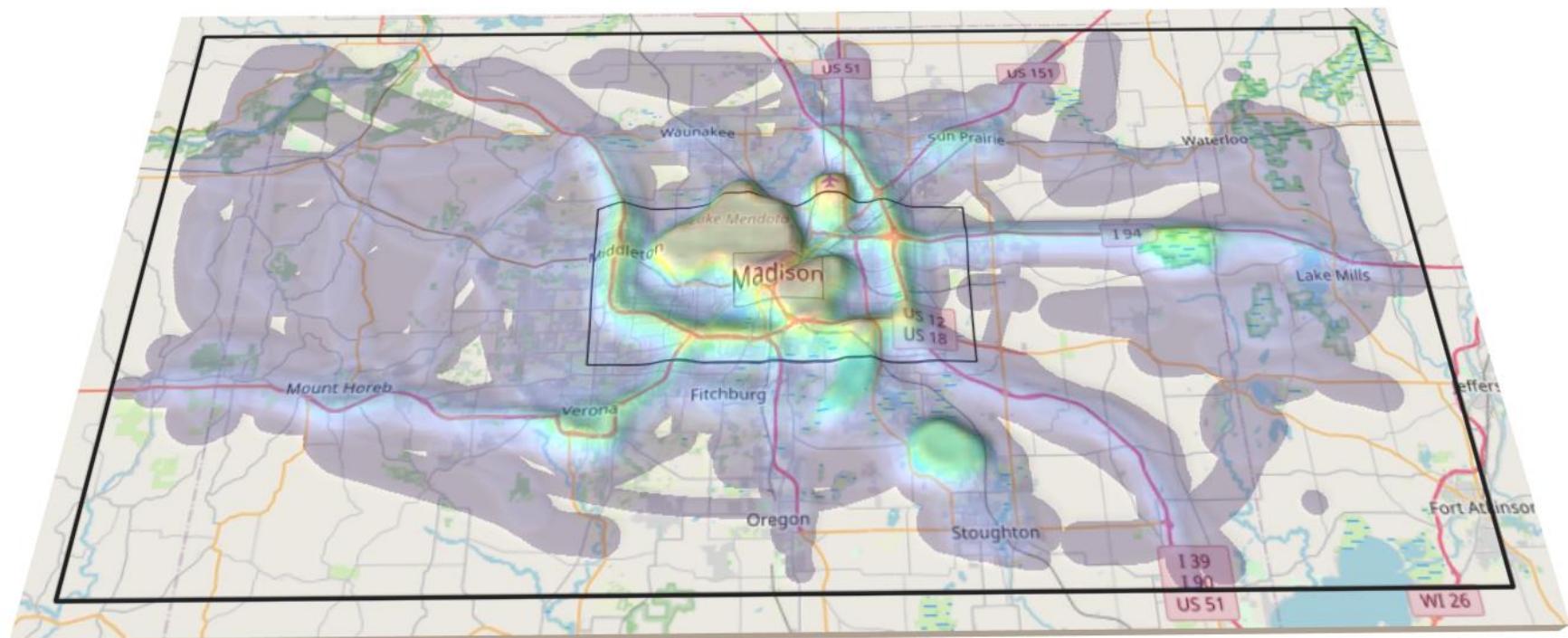
 zoom 13

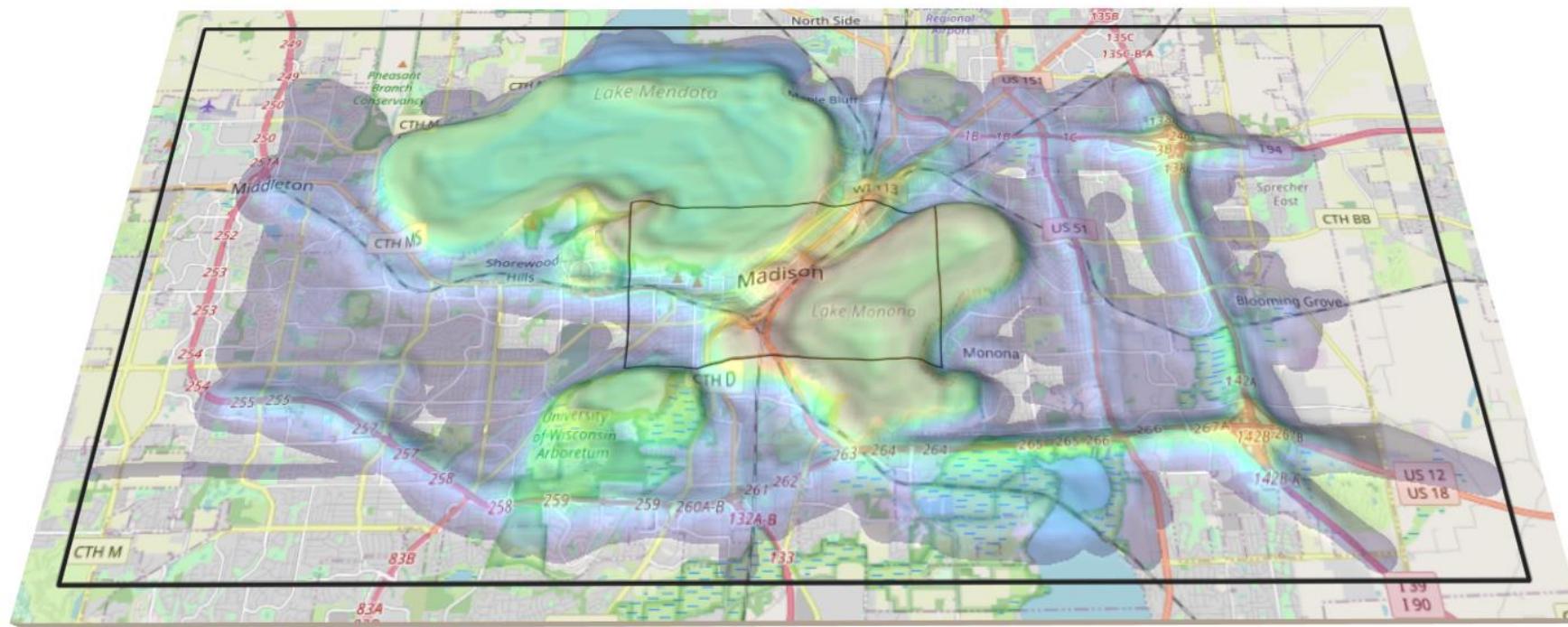
 zoom 15

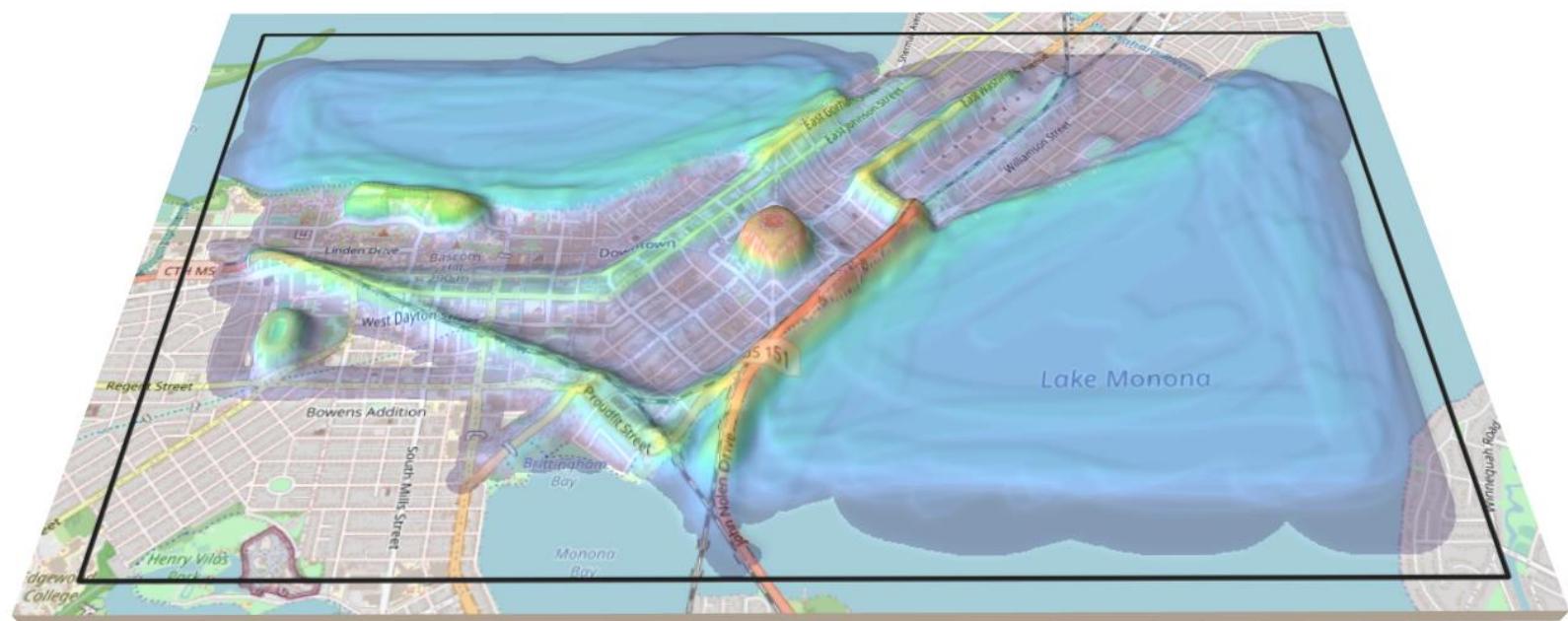


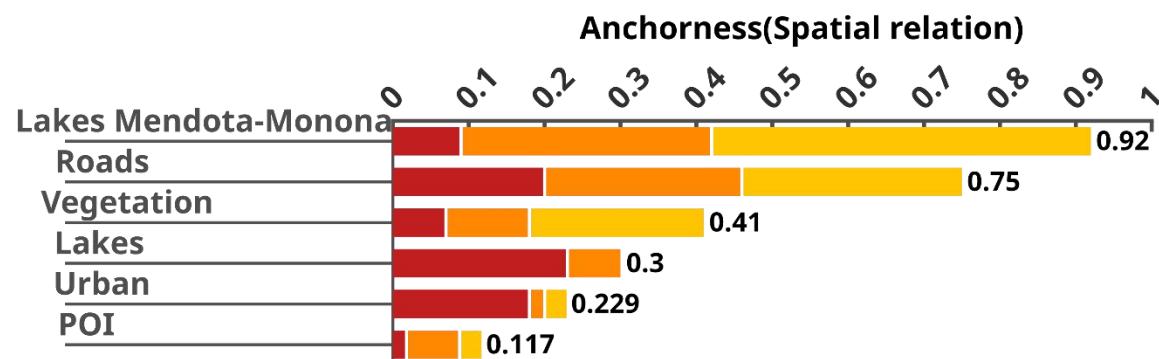
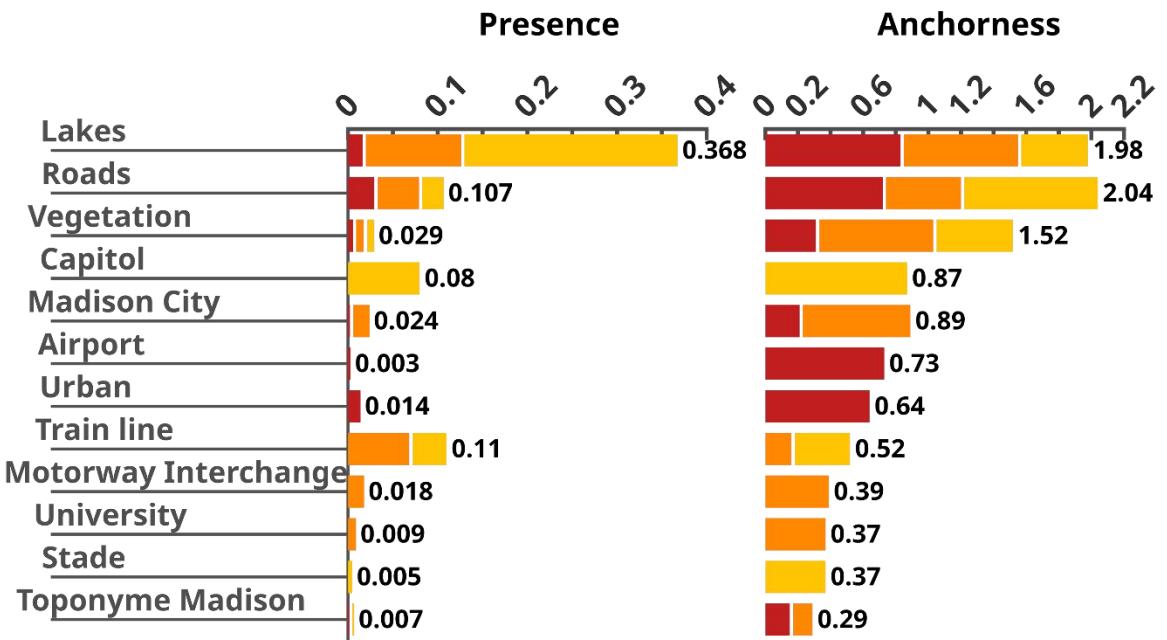
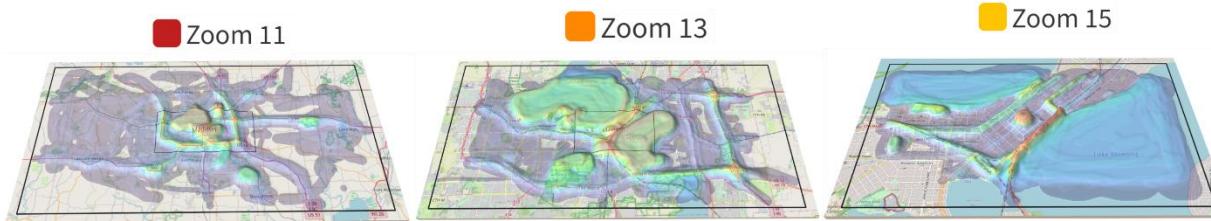
Intensity/anchorness (Spatial relation)

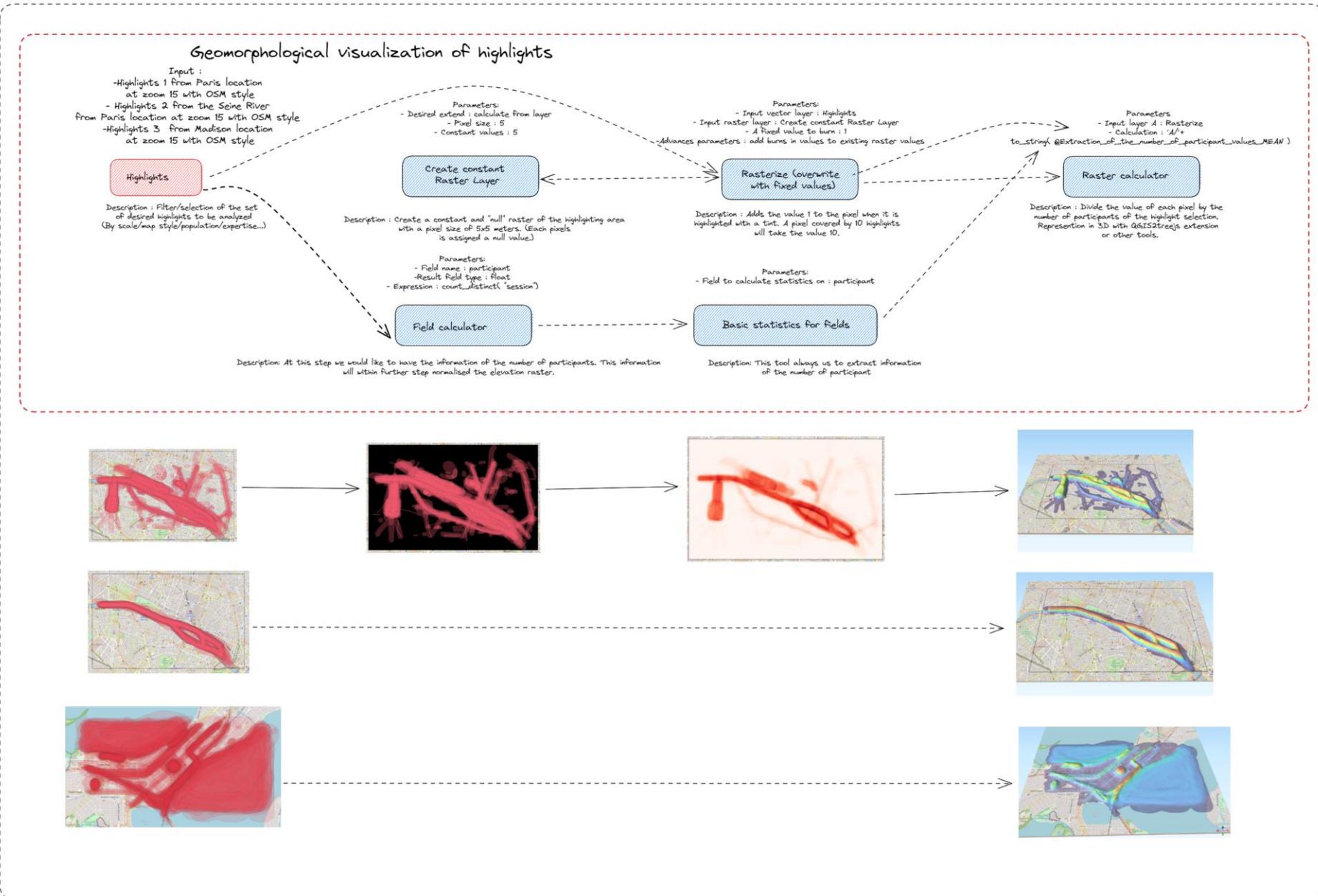












Elevation differences :

Description : Comparing the differences in elevation between highlights
 (We may also think about style, expertise, knowledge age, gender differences...)
 (Same raster extend is needed)

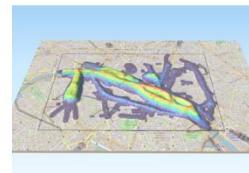
Input :
 - Highlights 1 from Paris location at zoom 15 with OSM style
 - Highlight 2
 from Paris location at zoom 15 with Google style

Highlights 1
 Description : Filter/selection of the set of desired highlights analyzed in QGIS (By scale/map style/population/expertise...)

Create constant Raster Layer
 Parameters:
 - Desired extent : calculate from highlights 1
 - Pixel size : 5
 - Constant values : 5

Rasterize (overwrite with fixed values)
 Parameters:
 - Input vector layer : highlights
 - Input raster layer : Create constant Raster Layer
 - A fixed value to burn : 1
 Advances parameters : add burns in values to existing raster values

Raster calculator
 Parameters:
 - Input layer 1 : Rasterize
 - Calculation : 'A' +
 to_string @Extraction_of_the_number_of_participant_values_MEAN)



Description : Create a constant and "null" raster of the highlighting area with a pixel size of 5x5 meters. (Each pixel is assigned a null value.)

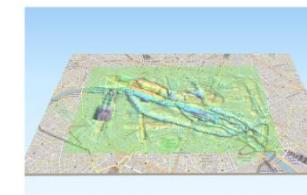
Field calculator
 Parameters:
 - Field name : participant
 - Result field type : float
 - Expression : count_distinct('session')

Basic statistics for fields
 Parameters:
 - Field to calculate statistics on : participant

Description : Divide the value of each pixel by the number of participants of the highlight selection. Representation in 3D with QGIS3Dregis extension or other tools.

Raster calculator 2
 Parameters:
 - Input layer A : Raster 1
 - Input layer B : Raster 2
 - Calculation : A - B

Description : We subtract the highlighting values from the QSM style with the highlighting values from the Google style to analyze for example privileged anchoring processes of a style compared to another one

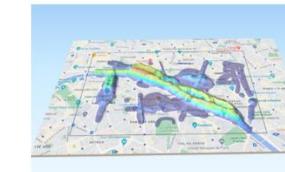


Description : At this step we want to have the information of the number of participants. This information will later normalize the elevation raster.

Create constant Raster Layer 2
 Parameters:
 - Desired extent : calculate from highlights 1
 - Pixel size : 5
 - Constant values : 5

Rasterize (overwrite with fixed values) 2
 Parameters:
 - Input vector layer : highlights
 - Input raster layer : Create constant Raster Layer 2
 - A fixed value to burn : 1
 Advances parameters : add burns in values to existing raster values

Raster calculator 2
 Parameters:
 - Input layer A : Raster 2
 - Calculation : 'A' +
 to_string @Extraction_of_the_number_of_participant_values_2_MEAN)



Description : Create a constant and "null" raster of the highlighting area with a pixel size of 5x5 meters. (Each pixel is assigned a null value.)

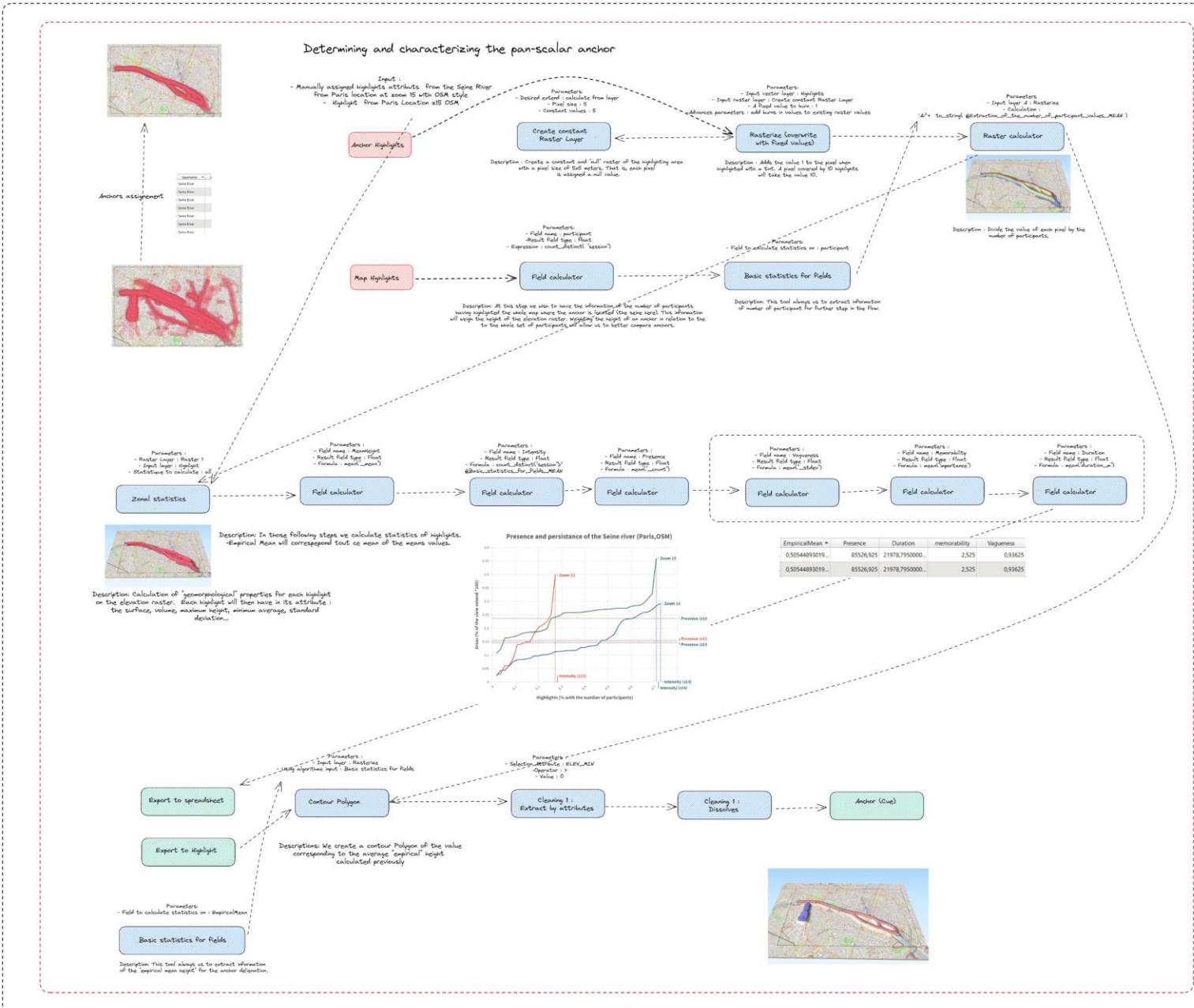
Field calculator 2
 Parameters:
 - Field name : participant
 - Result field type : float
 - Expression : count_distinct('session')

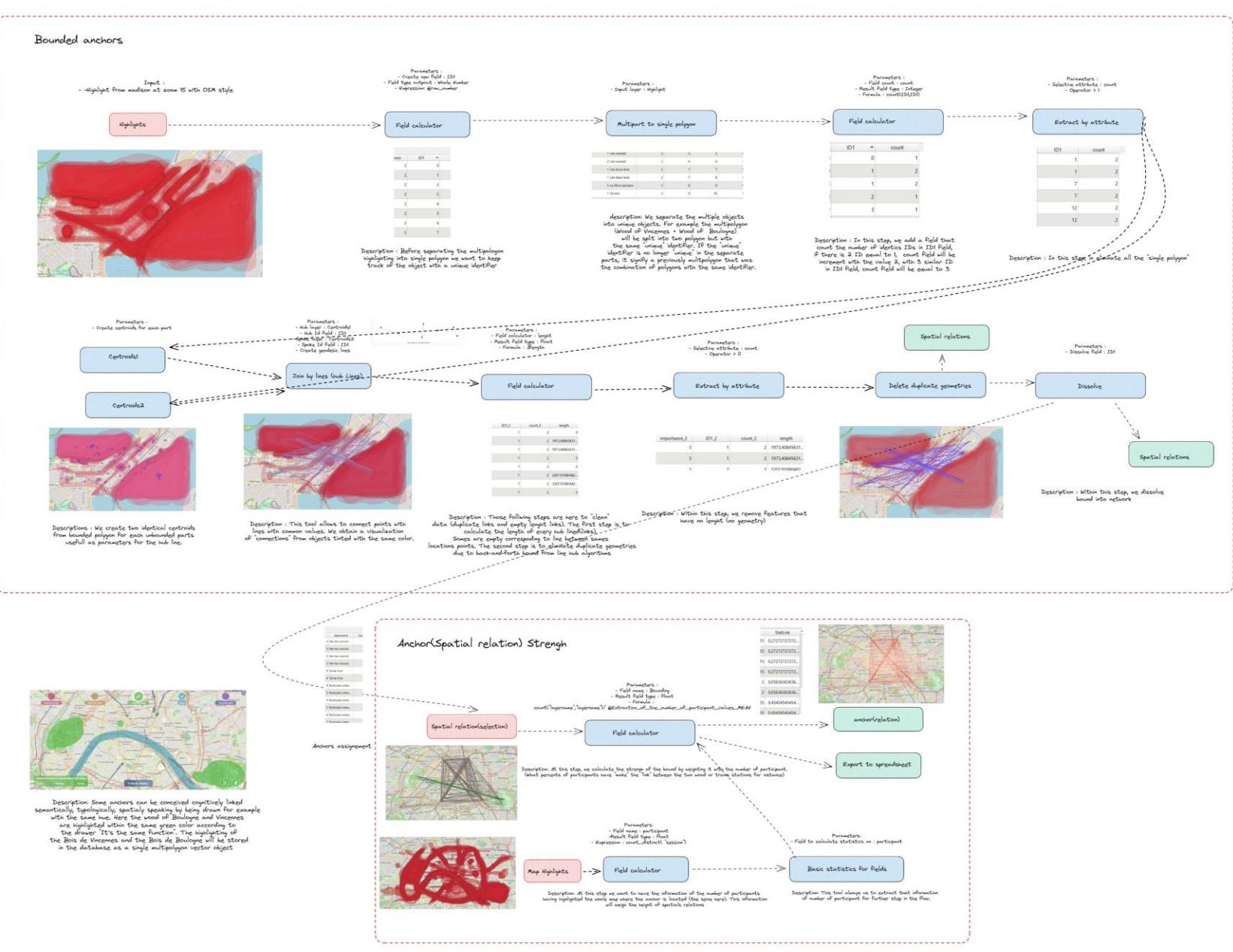
Basic statistics for fields 2
 Parameters:
 - Field to calculate statistics on : participant

Description : Divide the value of each pixel by the number of participants of the highlight selection. Representation in 3D with QGIS3Dregis extension or other tools.

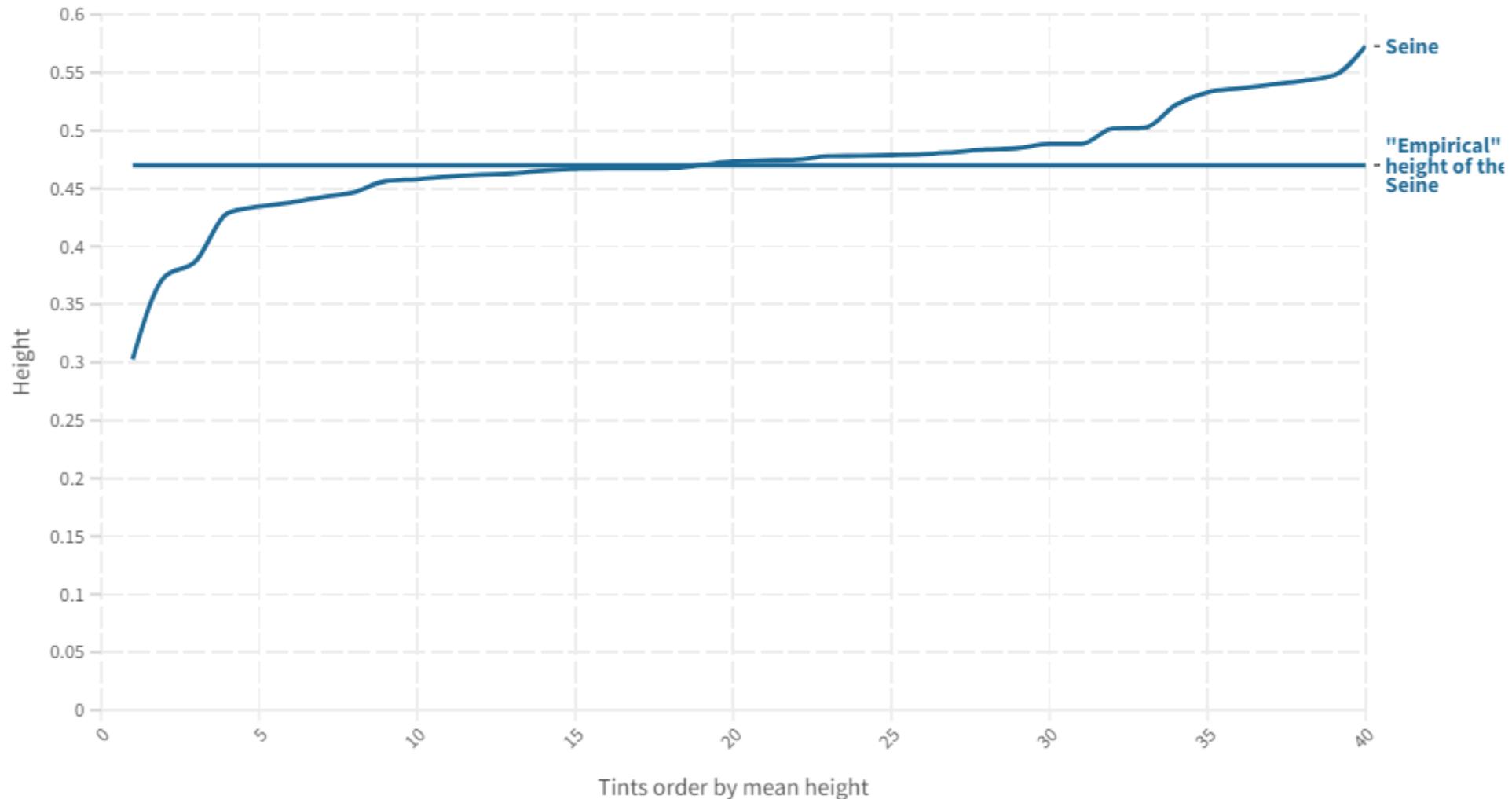
Highlights 2
 Description : Filter/selection of the set of desired highlights analyzed in QGIS (By scale/map style/population/expertise...)

Description : At this step we want to have the information of the number of participants. This information will later normalize the elevation raster.





Average heights tints and "empirical" height of the Seine river



Milwaukee

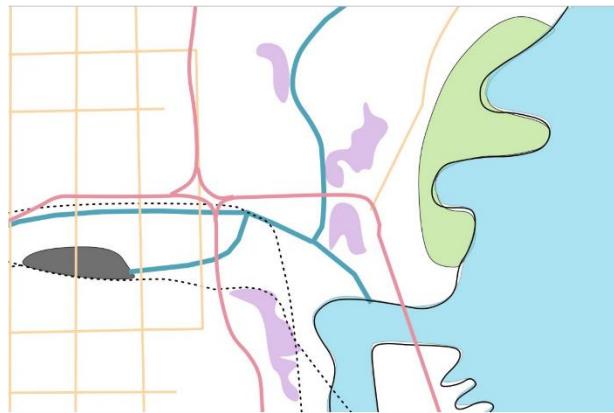


Image 1



Image 2

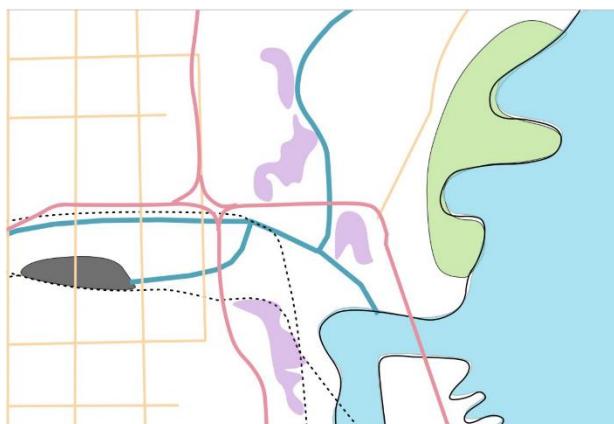


Image 3

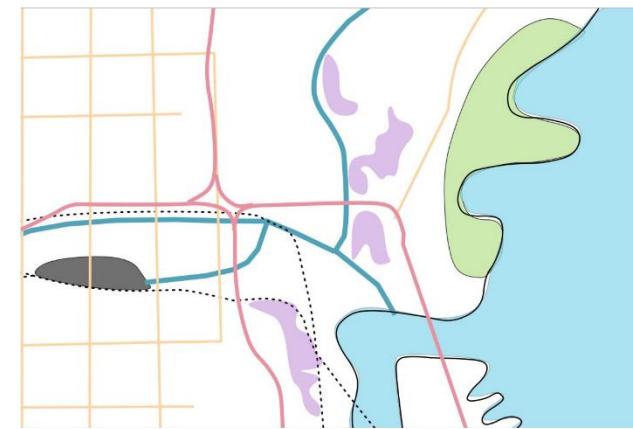
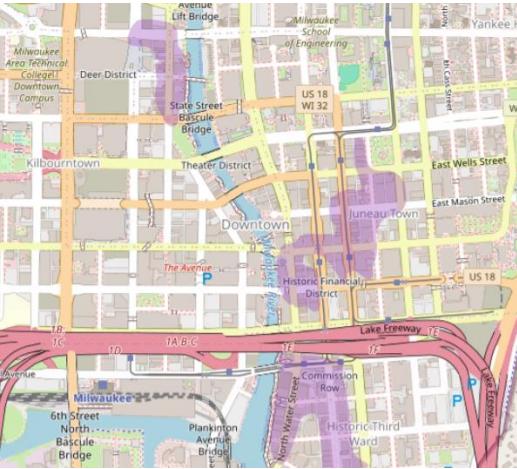
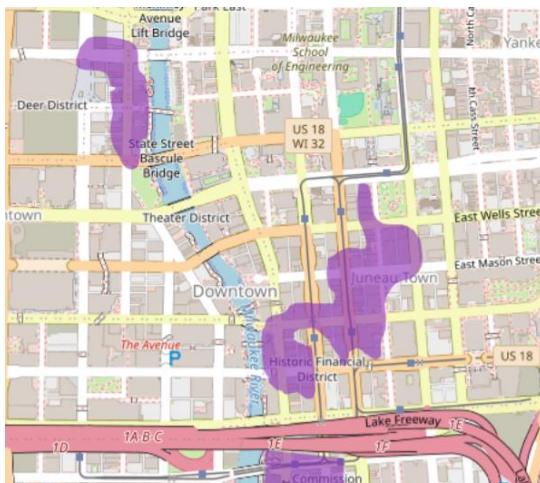


Image 4

Saillance

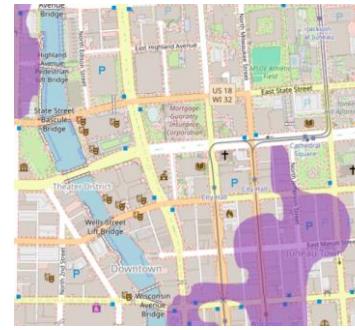


S2 zoom 12



S1 zoom12

Persistance



P1 : Zoom 16 1:9027



P2 : Zoom 15 1:18055



P3 : Zoom 14 1:36111

Saint-Brieuc

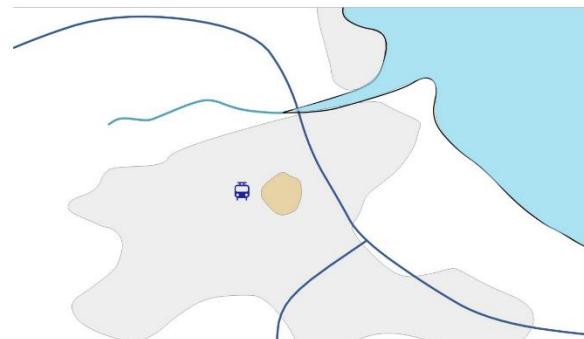


Image 1

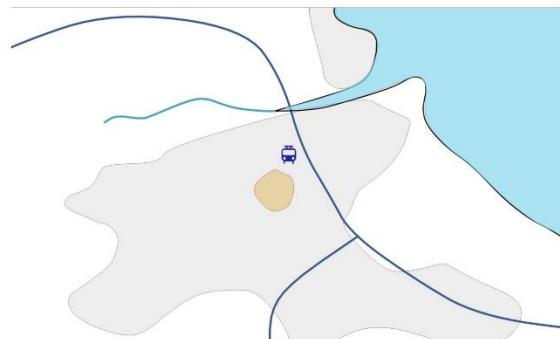


Image 2



Image 3

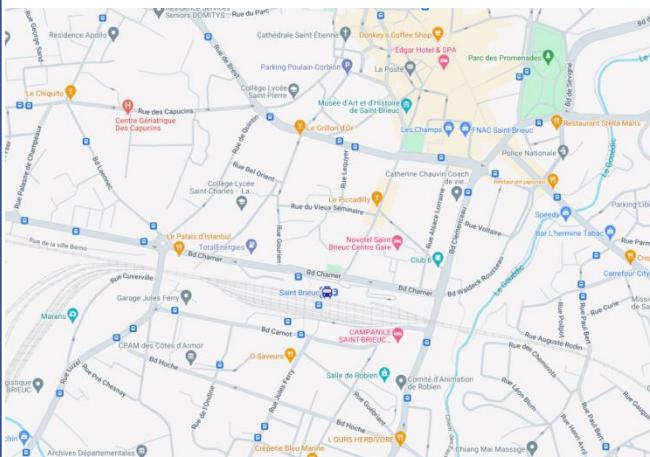


Image 4

Saillance

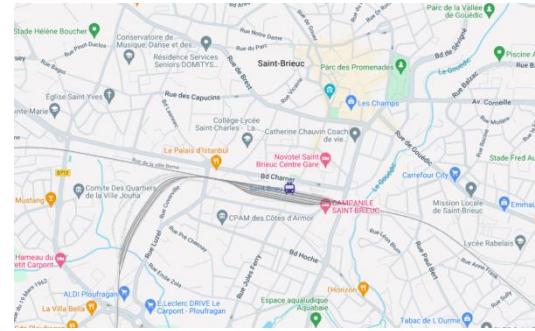


S1 zoom13

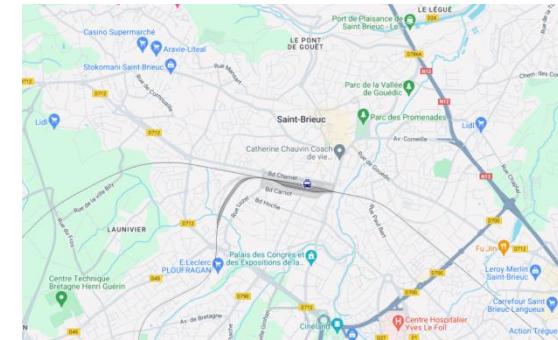


S2 zoom 13

Persistence



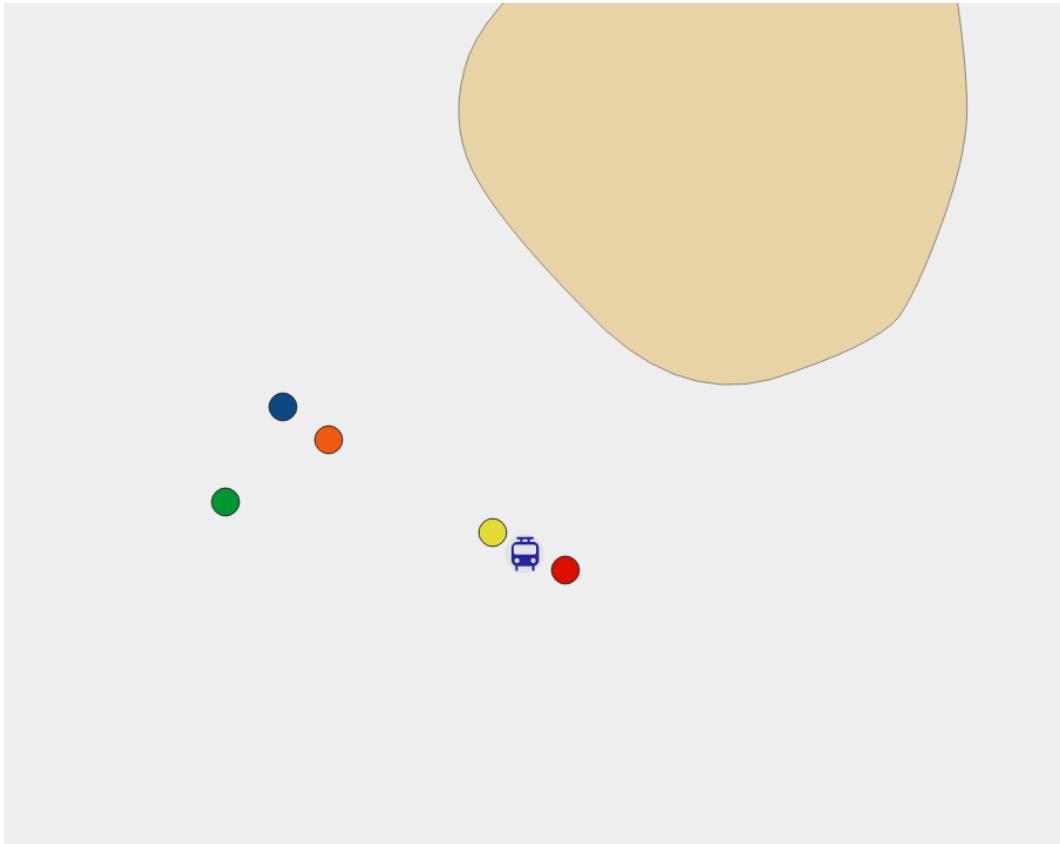
P1 : Zoom 15 1:18055



P2 : Zoom 14 1:36111



P3 : Zoom 13 1:72223



- ▼ ⚙ **Mean coordinates**
- P1
 - P2
 - P3
 - S1
 - S2
 - Merged



Chambery

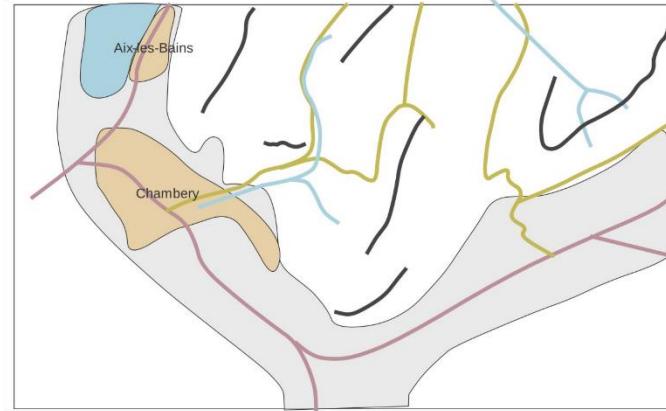
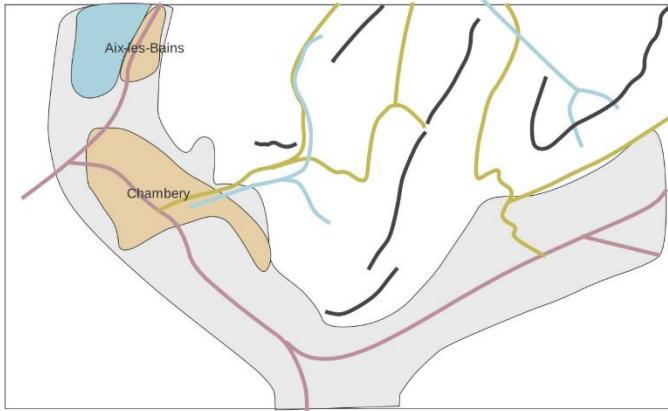


Image 1

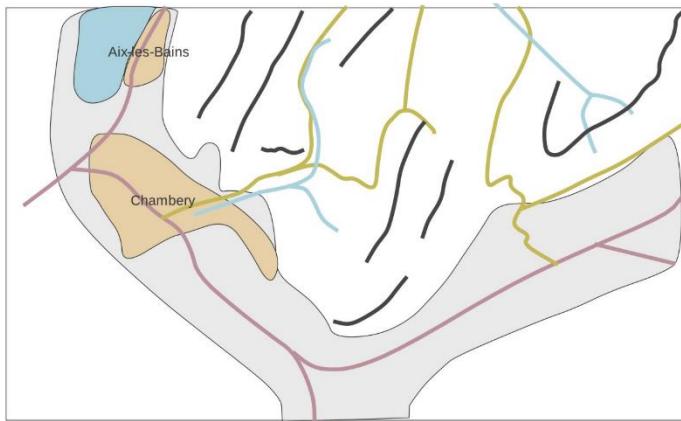


Image 2

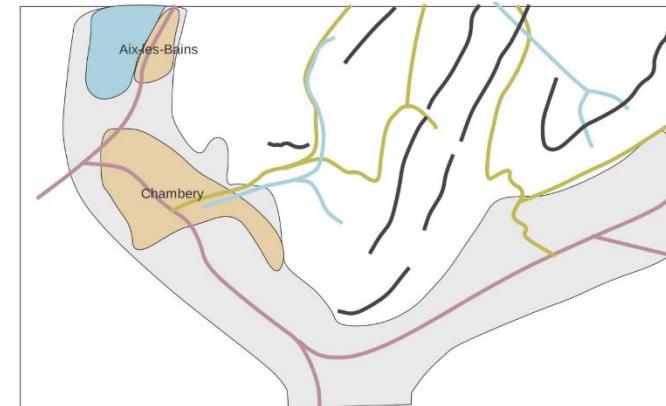


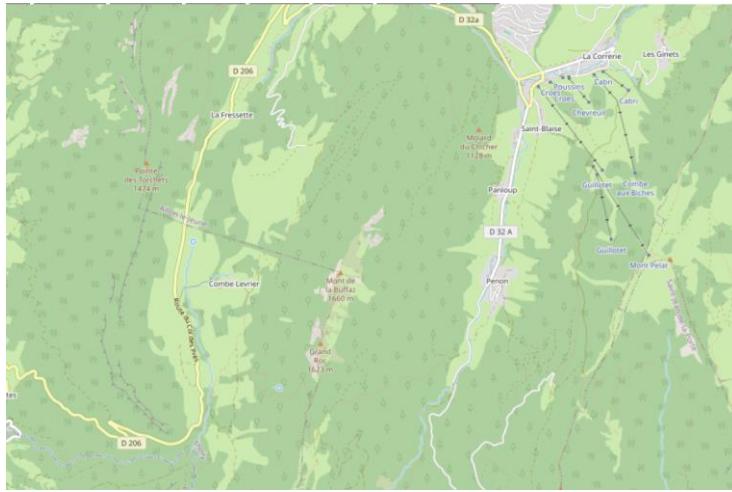
Image 3

Image 4

Saillance

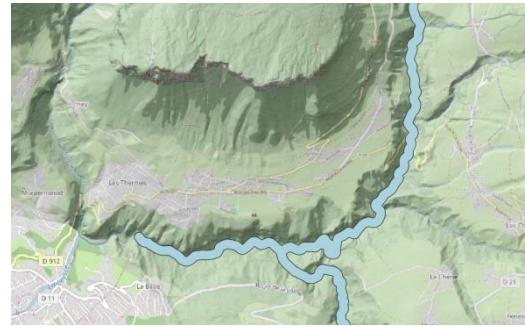


S2 zoom 12



S1 zoom12

Persistiance



P1 : Zoom 14 1:36111



P2 : Zoom 13 1:72223



P3 : Zoom 12 1:144447

Moscou

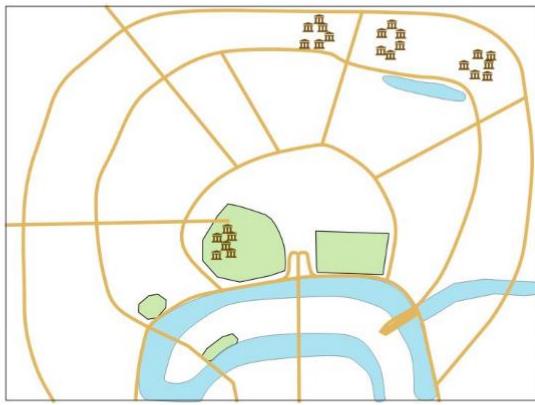


Image 1

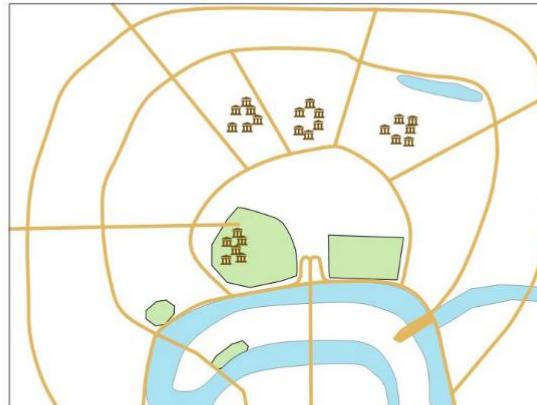


Image 2

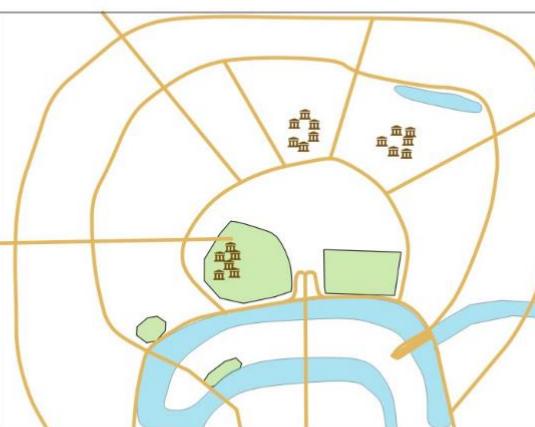


Image 3

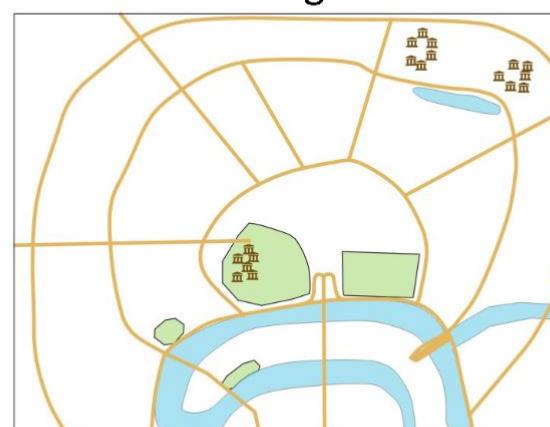


Image 4

Saillance



S2 zoom 12



S1 zoom12

Persistence



P1 : Zoom 16 1:9027



P2 : Zoom 15 1:18055



P3 : Zoom 14 1:36111

