



Statistics Canton of Zurich

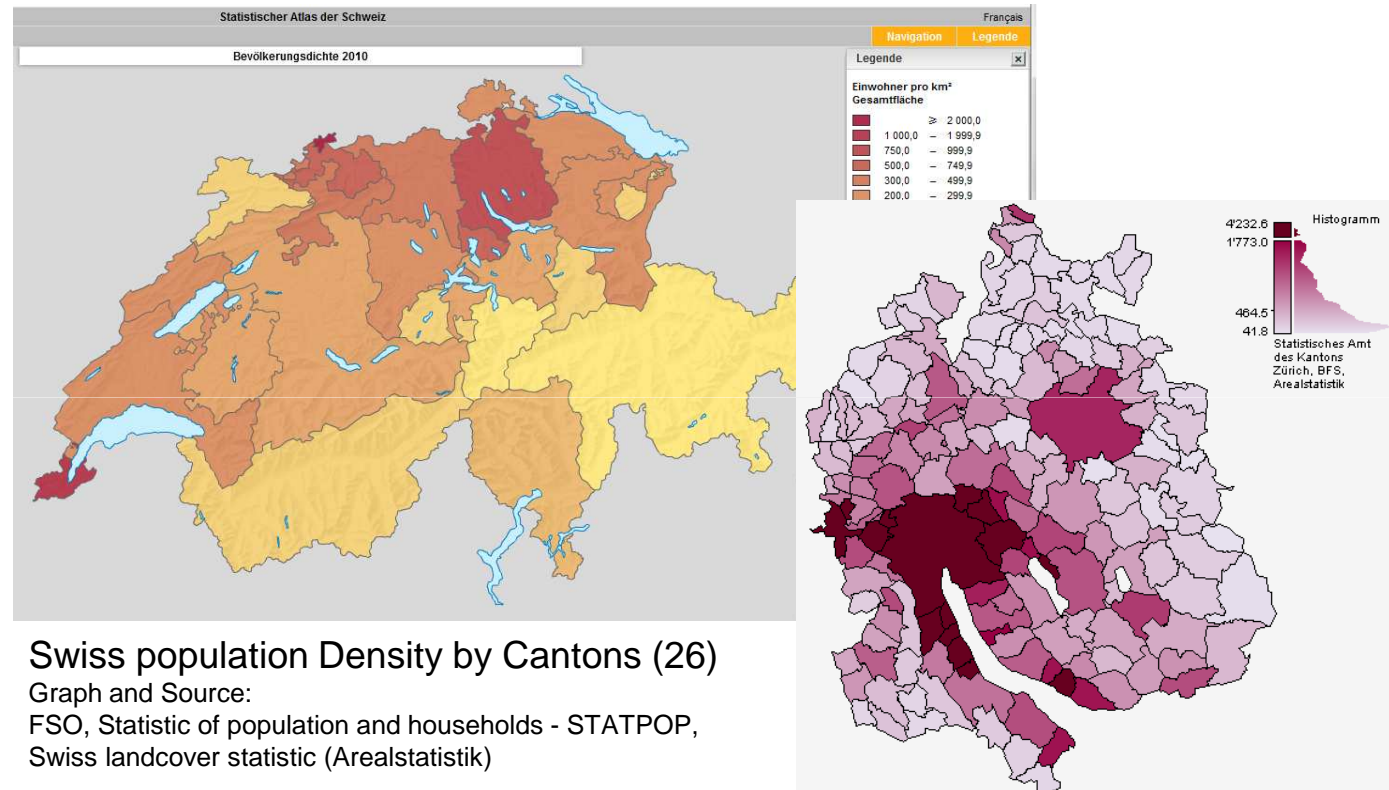
Day Time Population

Claudia Hofstetter / Adrian Herzog



Day Time Population
Lisbon, 14.10.2011
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Population Canton of Zurich



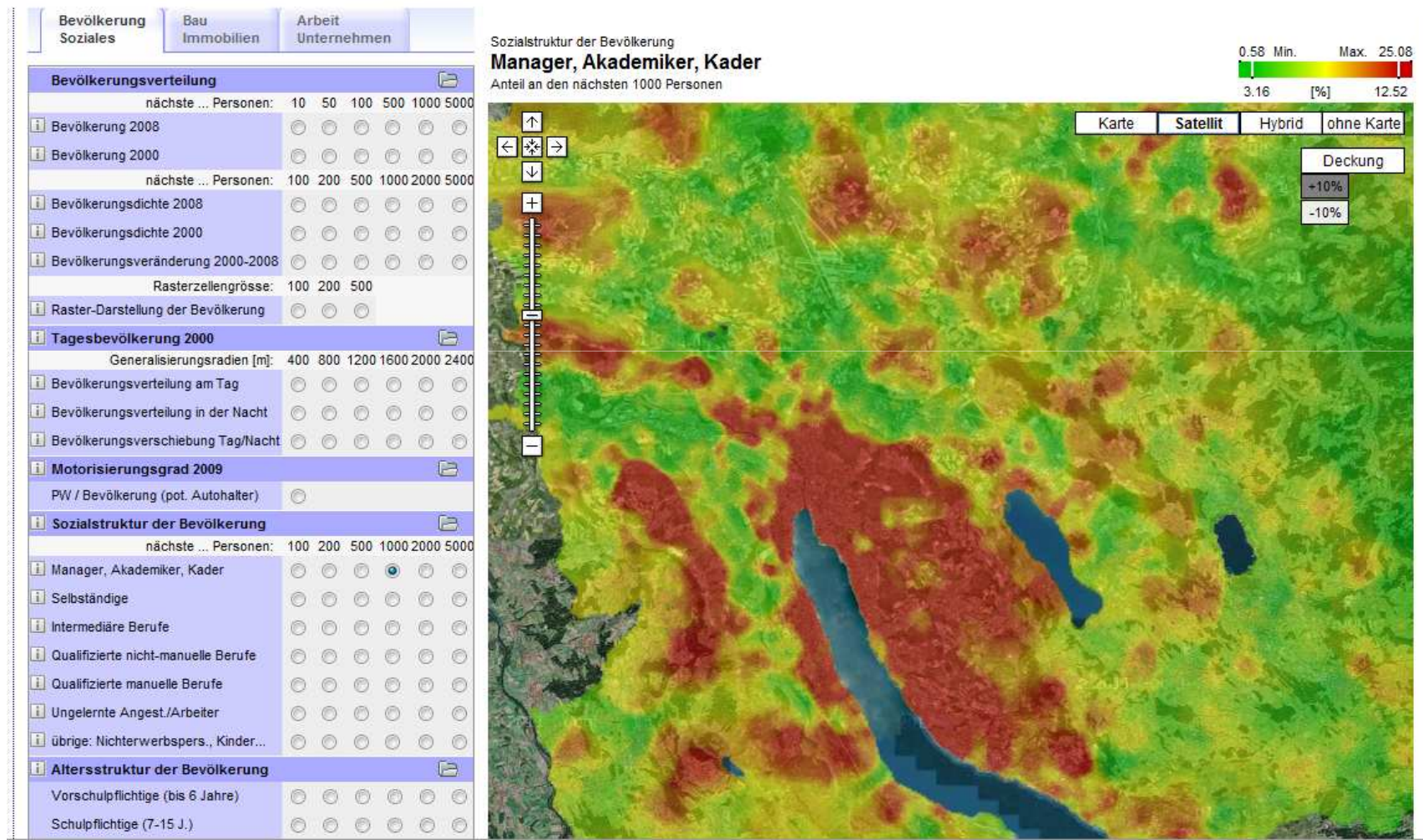


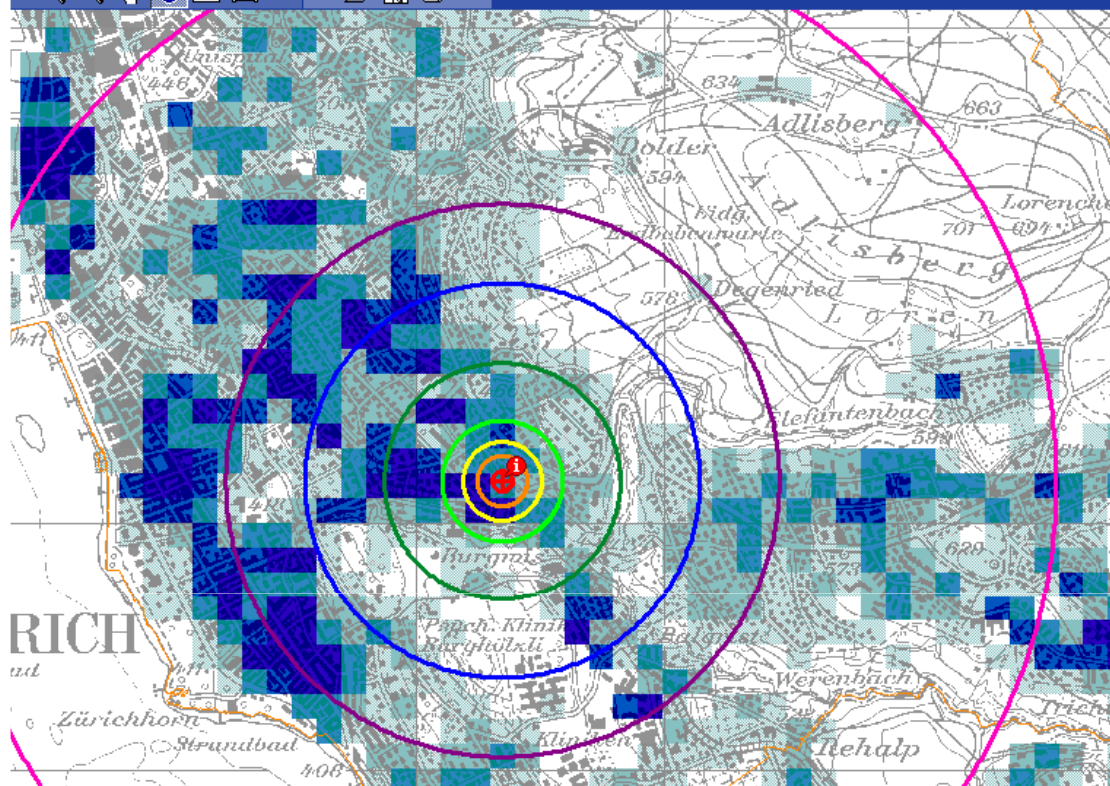
why a Day Time Population of Zurich ?

- Swiss Census data 2000 allows easy modeling of a simplified day time population. It is a complete inventory of residential, working place and school locations. Starting point for a future more realistic and detailed model with multiple timeslices based on Swiss Census 2010 and other sources
- our policy: make data accessible to the public
 - present data in a perceivable way : geospatial access is an intuitive way of understanding.
 - find ways that make data accessible without hurting confidentiality (1-3)
 - make a difference between data dissemination and data publishing or visualization, or between absolute grid values and spatial patterns
 - several webapplications for interactive visualizations of the highresolution data for the Canton of Zurich
 - instead of discrete grid data: point access, or attributive query, concept of neighbourhood grid and hot spot maps.



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Umgebungsanalyse 2.1

[Lesebeispiel](#) [zurück](#) [Tabelle drucken](#)

Bevölkerung
Soziales

Bau
Immobilien

Arbeit
Unternehmen

Zürich, Koordinate: 685349 / 246169 [Gemeindeinfos](#)

[Dokumentation & Quellen](#)

Radius der Umgebung	41 m	102 m	159 m	244 m	477 m	799 m	1119 m	2239 m	Gmde.-wert	Ka-wert
Personen im Jahr 2008	200	500	1000	2000	5000	10000	20000	50000		
Zum Vergleich: Bevölkerungszahl 2000										
Volkszählung 2000	182	455	958	1966	4950	9713	19569	49427		
Bevölkerungsdichte [Personen / qkm]										
per Ende Juni 2008	38611	15444	12563	10683	6995	4984	5080	3174	4259	
Volkszählung 2000	35109	14044	12037	10501	6925	4841	4971	3138	4140	
Altersstruktur 2008 [Anteile in %]										
Vorschulpflichtige (bis 6 J.)	6.2	6.2	5.6	5.5	5.1	5.3	5.0	5.0	5.4	
Schulpflichtige (7-15 J.)	5.0	5.0	5.0	5.6	6.1	6.1	5.8	5.6	6.3	
Jugendliche (16-19 J.)	1.5	1.5	1.9	2.1	2.3	2.6	2.6	2.7	2.9	
Junge Erwachsene (20-24 J.)	3.5	3.5	4.1	4.3	4.2	4.3	4.4	4.5	6.0	
Mittl. Erwachsene (25-44 J.)	36.6	36.6	37.7	38.5	38.4	37.1	37.8	36.1	38.7	
Ältere Erw. (45-64 J.)	26.3	26.3	25.8	25.1	25.4	24.7	25.5	26.4	23.2	
3. Alter (65-79 Jahre)	13.7	13.7	12.7	11.8	11.4	11.6	11.6	12.6	11.1	
4. Alter (über 80 Jahre)	7.2	7.2	7.3	7.0	7.3	8.3	7.3	7.1	6.3	
Herkunft 2008 [Anteile in %]										
Schweizer	81.3	81.3	79.3	78.6	78.4	76.6	75.9	75.5	69.9	
Nicht-Schweizer	18.7	18.7	20.7	21.4	21.6	23.4	24.1	24.5	30.1	

Die folgenden Angaben sind Auswertungen aus der Volkszählung 2000.

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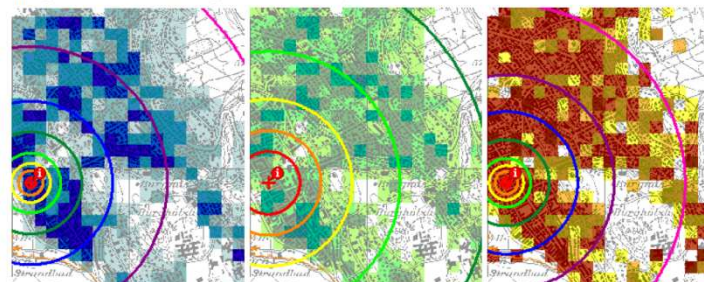
[Disclaimer](#)

zeigen

2	4	5	0	7	12	4	4	0
3	6	14	8	9	7	5	11	0
4	12	10	5	28	23	18	13	13
9	4	4	9	20	14	4	6	0
2	9	3	4	5	4	17	8	8
5	5	13	16	1	19	5	22	13
10	5	8	8	15	11	9	5	6
0	2	10	10	9	2	7	4	9
0	0	1	20	16	11	5	15	15

Radius	Anzahl Zellen	Summe
0	1	5
1	5	34
2	13	155
3	29	306
4	49

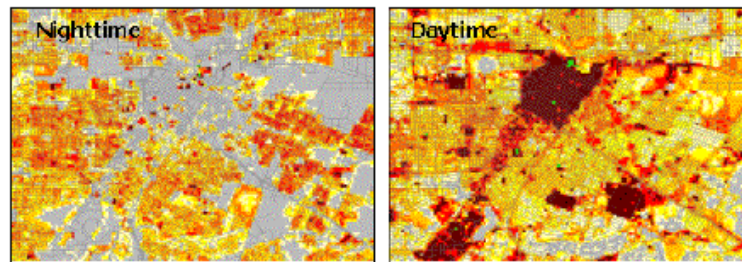
Hintergrundkarten: Bevölkerung, Gebäude, Arbeitsplätze



inspiring daytime population visualizations on the web

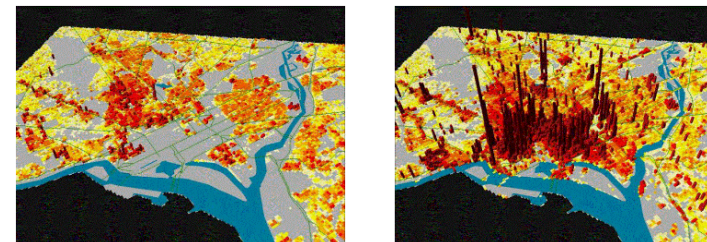


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Houston Day versus Night

Source: Oak Ridge National Laboratory

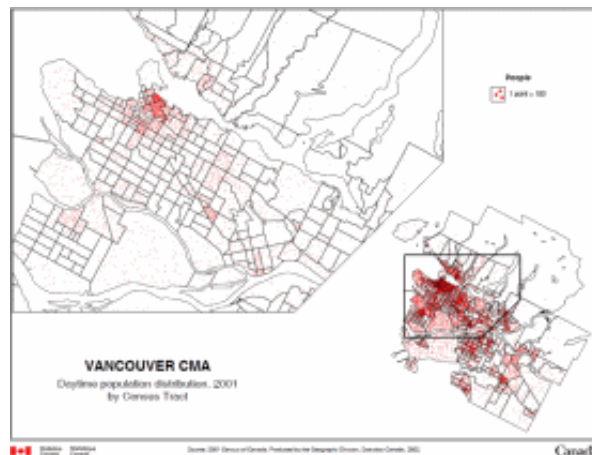


Washington DC Nighttime

Washington DC Daytime

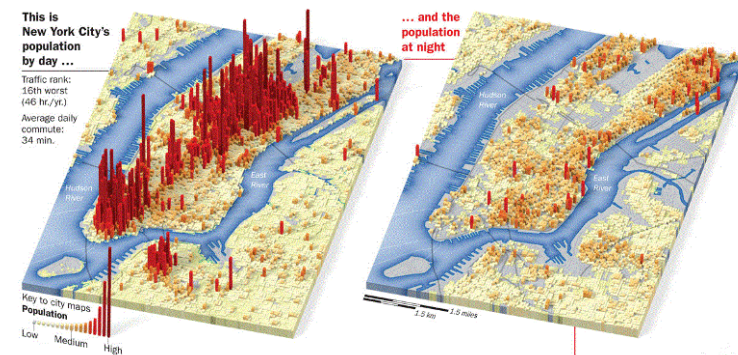
Washington DC

Source: Oak Ridge National Laboratory



Vancouver Daytime Population

Statistics Canada, Census Metropolitan Area - Daytime population distribution, 2001 by Census Tract



New York - Day versus Night population

Joe Lertola, Time Magazine 2010



Locations of People for a simplified Daytime Population Distribution

- place of work of employed people (outside of residence)
- school locations of scholars and students (outside of residence)
- not commuting persons at home (unemployed, retired persons, young children)
- persons from outside the region commuting in for work or school
- high resolution statistical surface, based on individual locations
- **not** considered: movements for shopping, cultural events, recreation, sports, journeys during work or school and individual locations during transport.



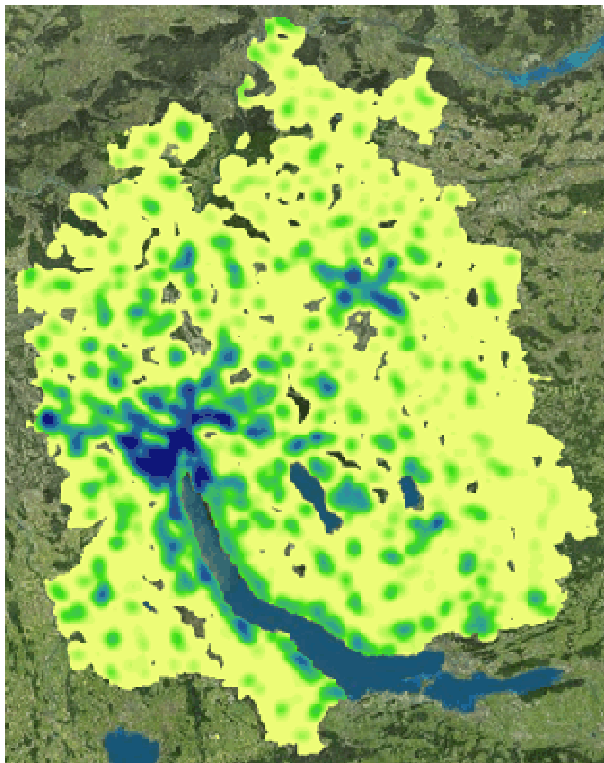
simplified data model

approaches maybe best a situation around 10 am on weekdays

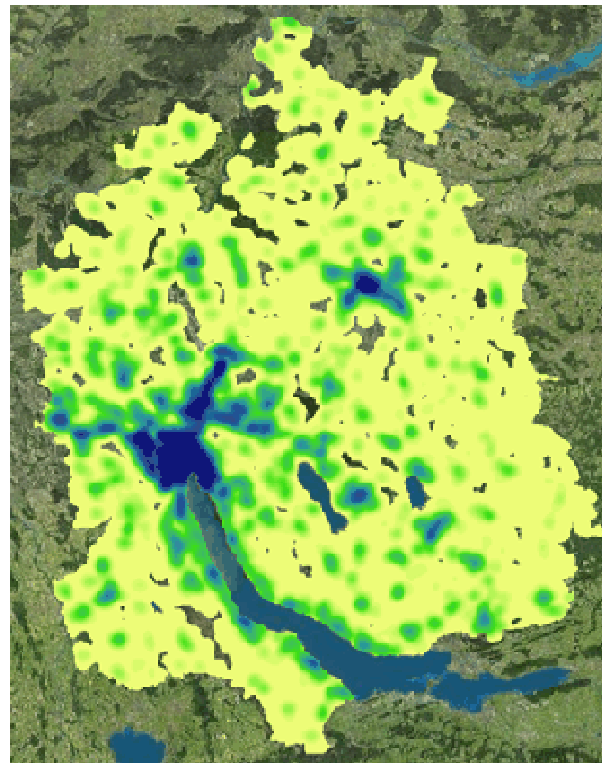
Hot Spot Maps

- kernel density estimation for different generalization levels
- GoogleMaps application (regional atlas of geostatistical structures)
- Population Density Canton of Zurich 2000 by...

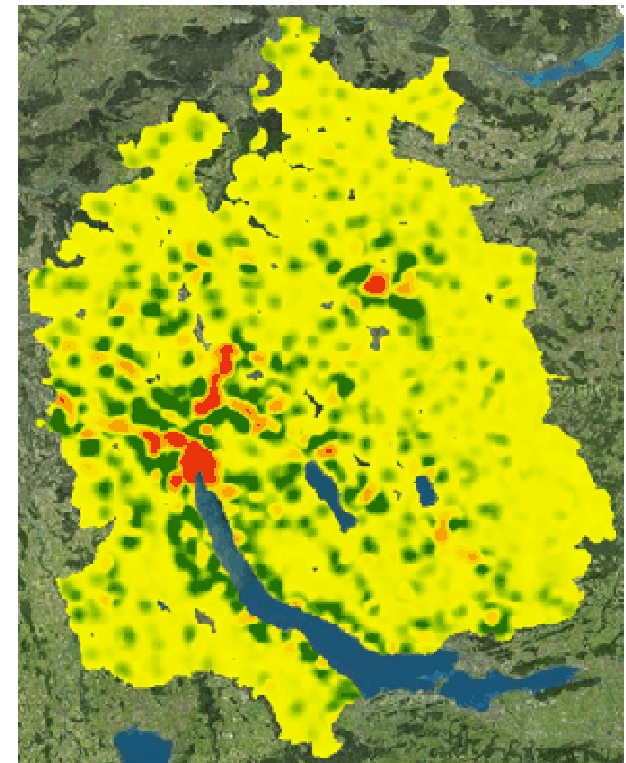
night...



day...



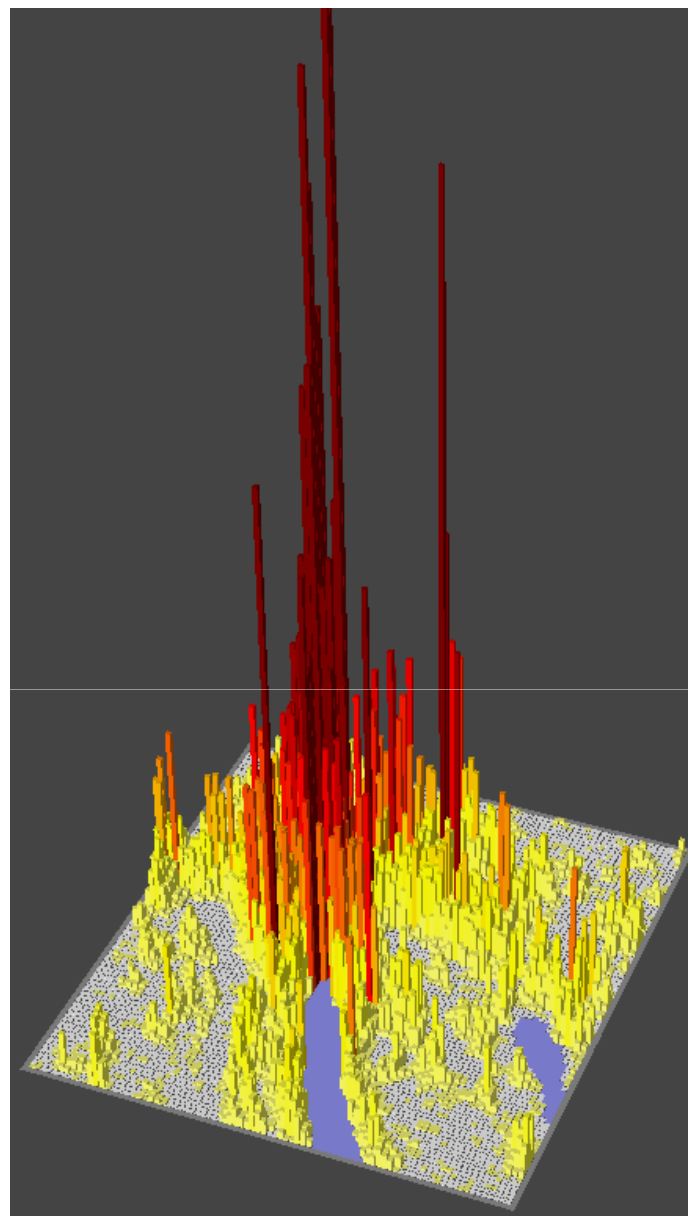
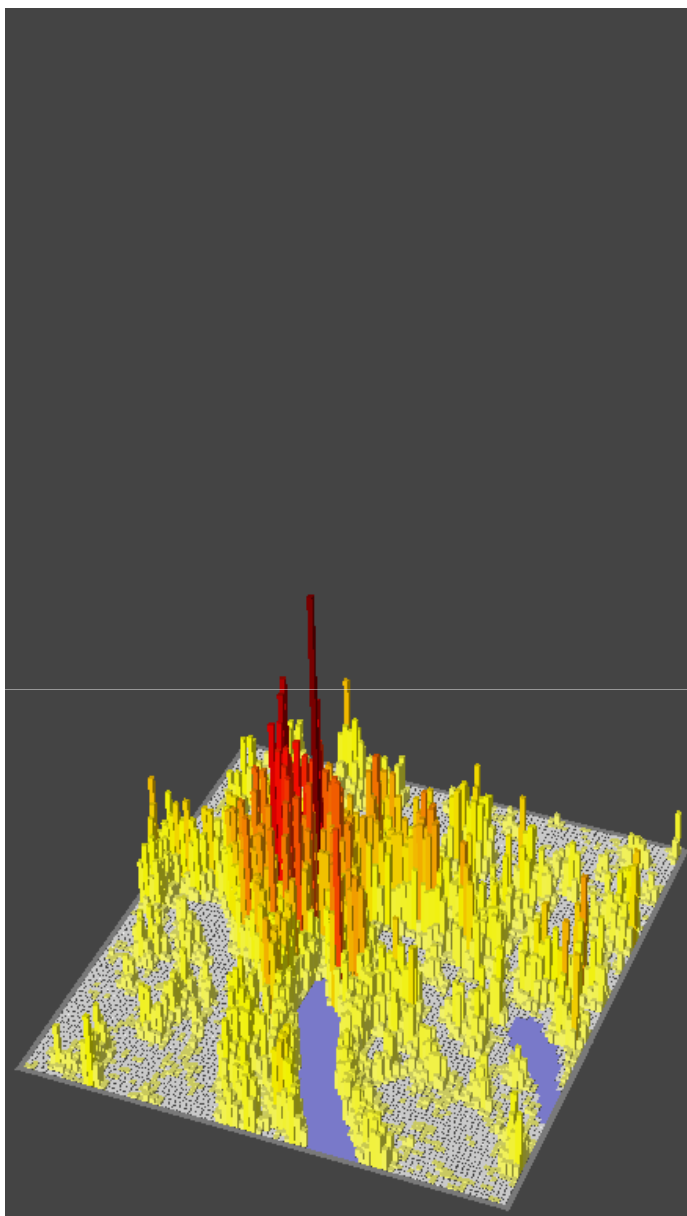
change: day minus night





3D-Model of Night and Daytime Population

- better differentiation of high value range and extreme values
- 250x250m grid
- open source tools
 - StructureSynth to generate 3D-structures
 - Sunflow for a high quality rendering
- data quality problem: most students and employees of university are located at one adress, although campus is all over the city.



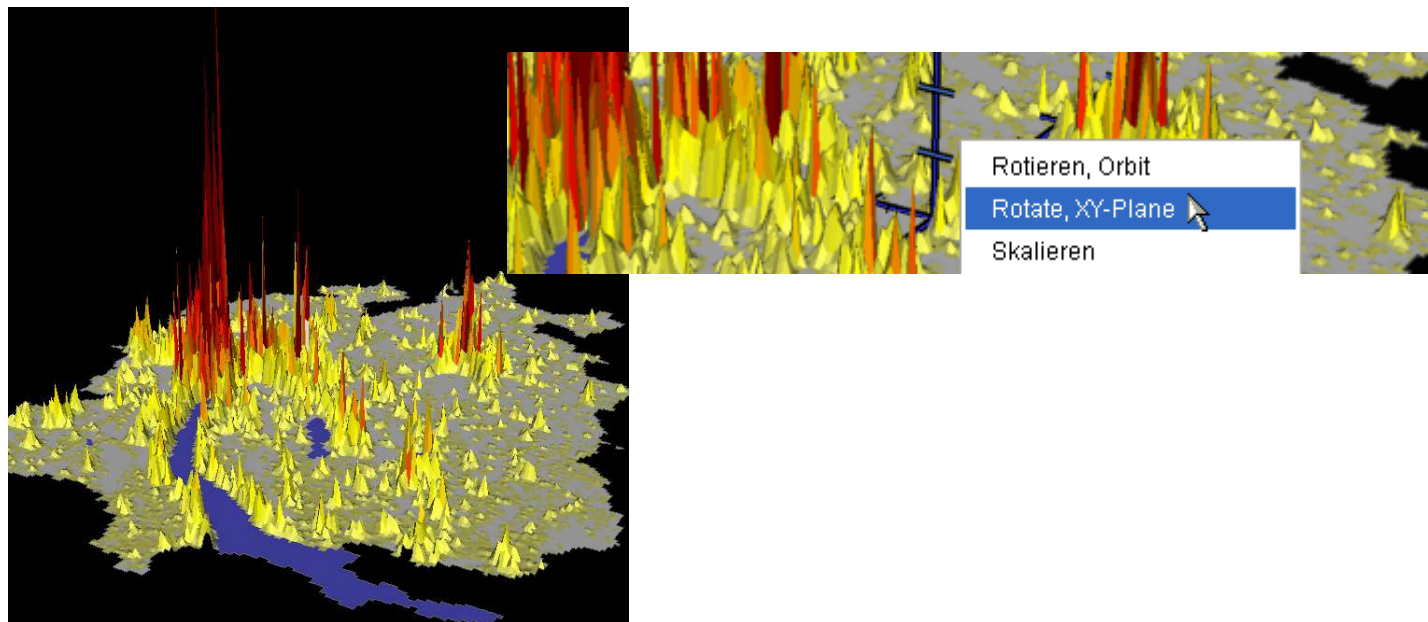
Night and Daytime Population City of Zurich

3D-model based on a 250x250m grid (with StructureSynth, Sunflow)

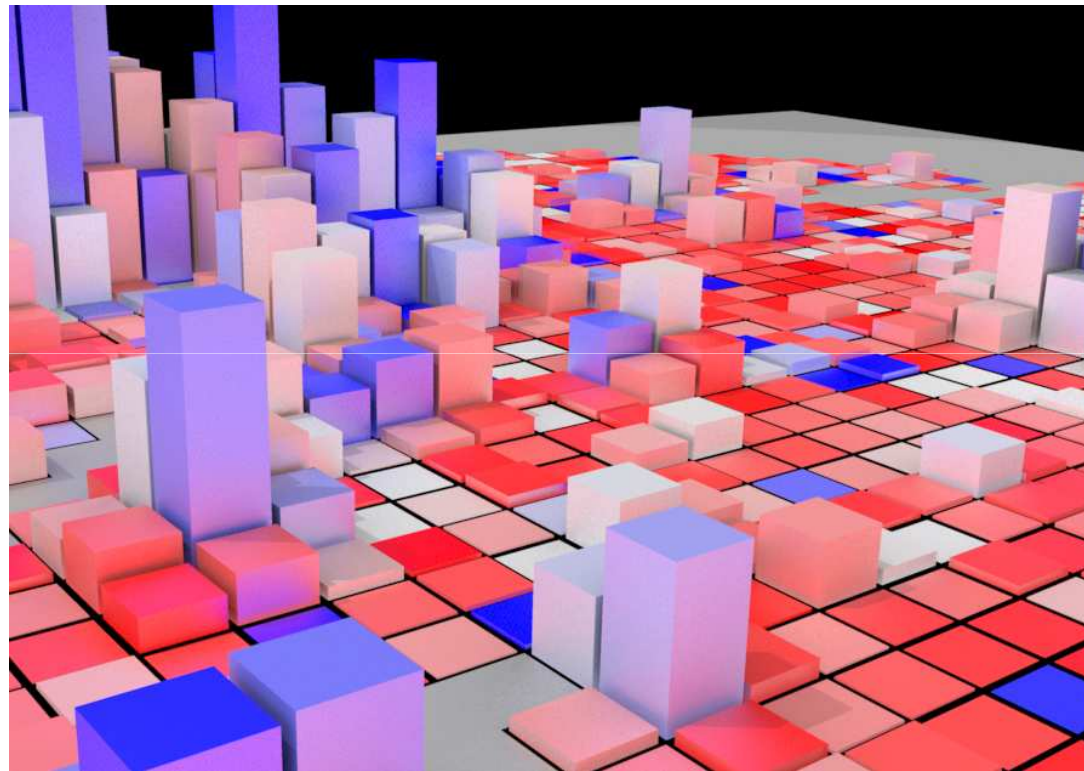


Interactive 3D-Model

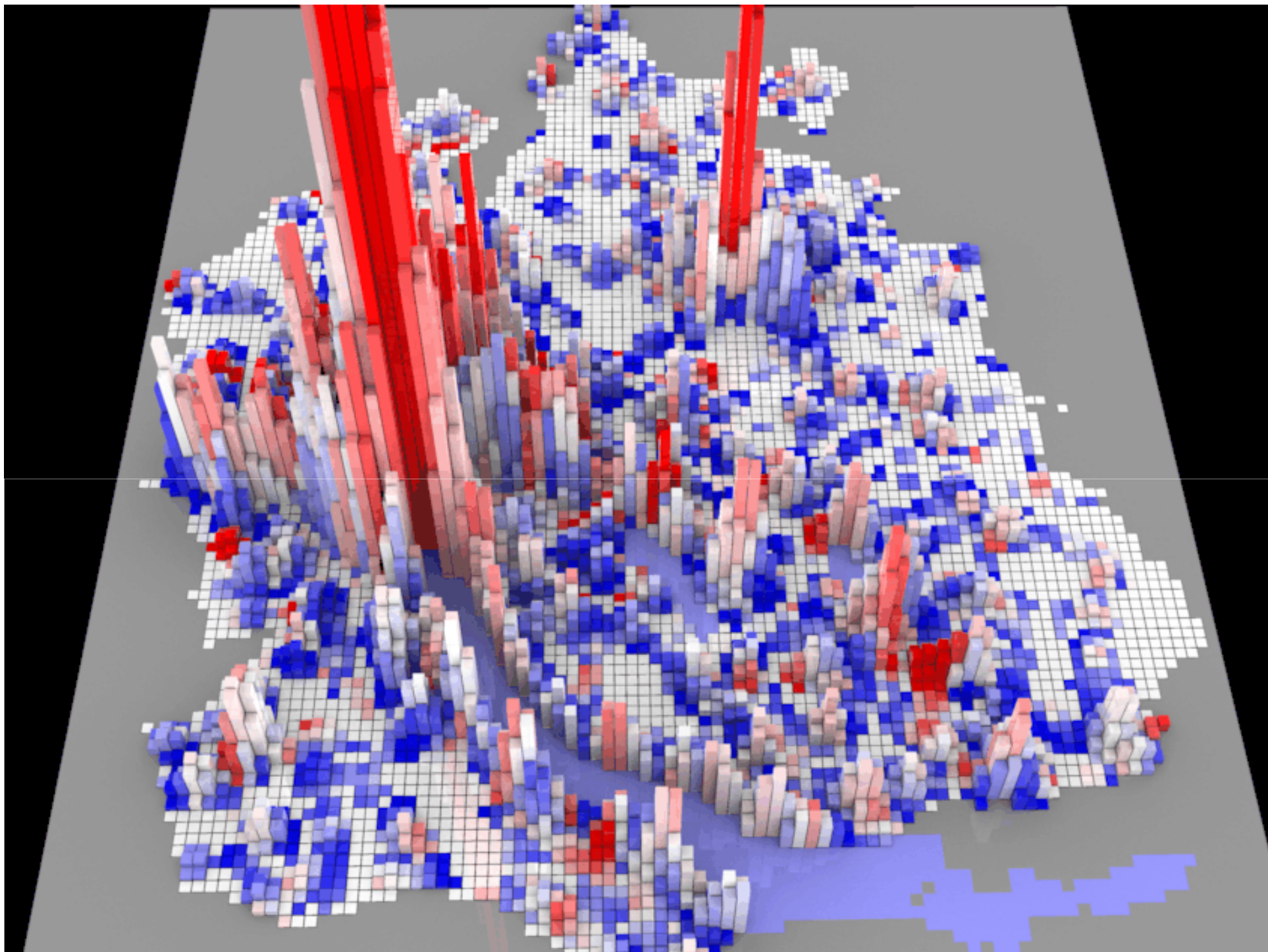
- explore the visualization freely from all viewpoints
- Javaview: open source webtool
- good speed - low grafic quality

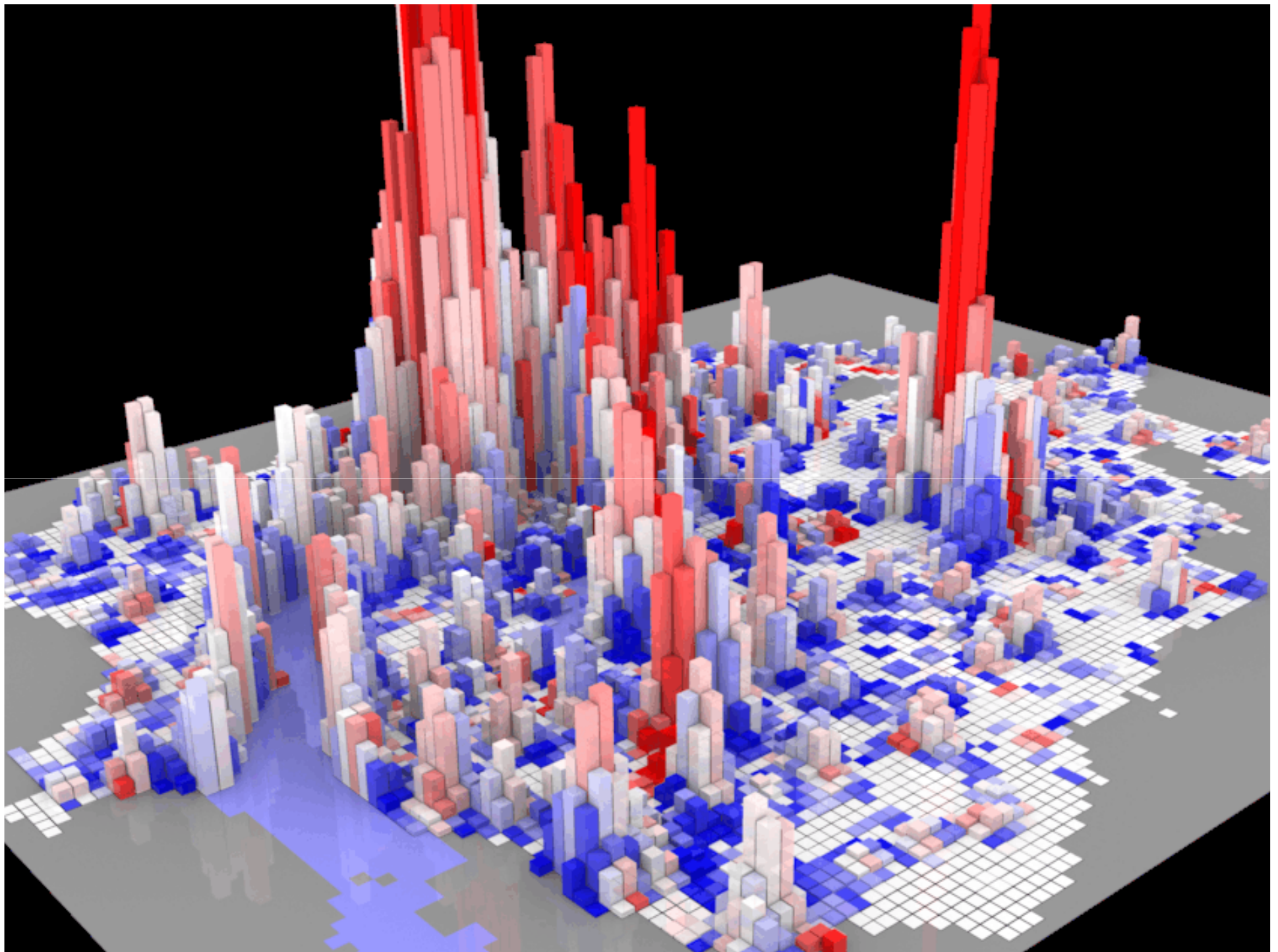


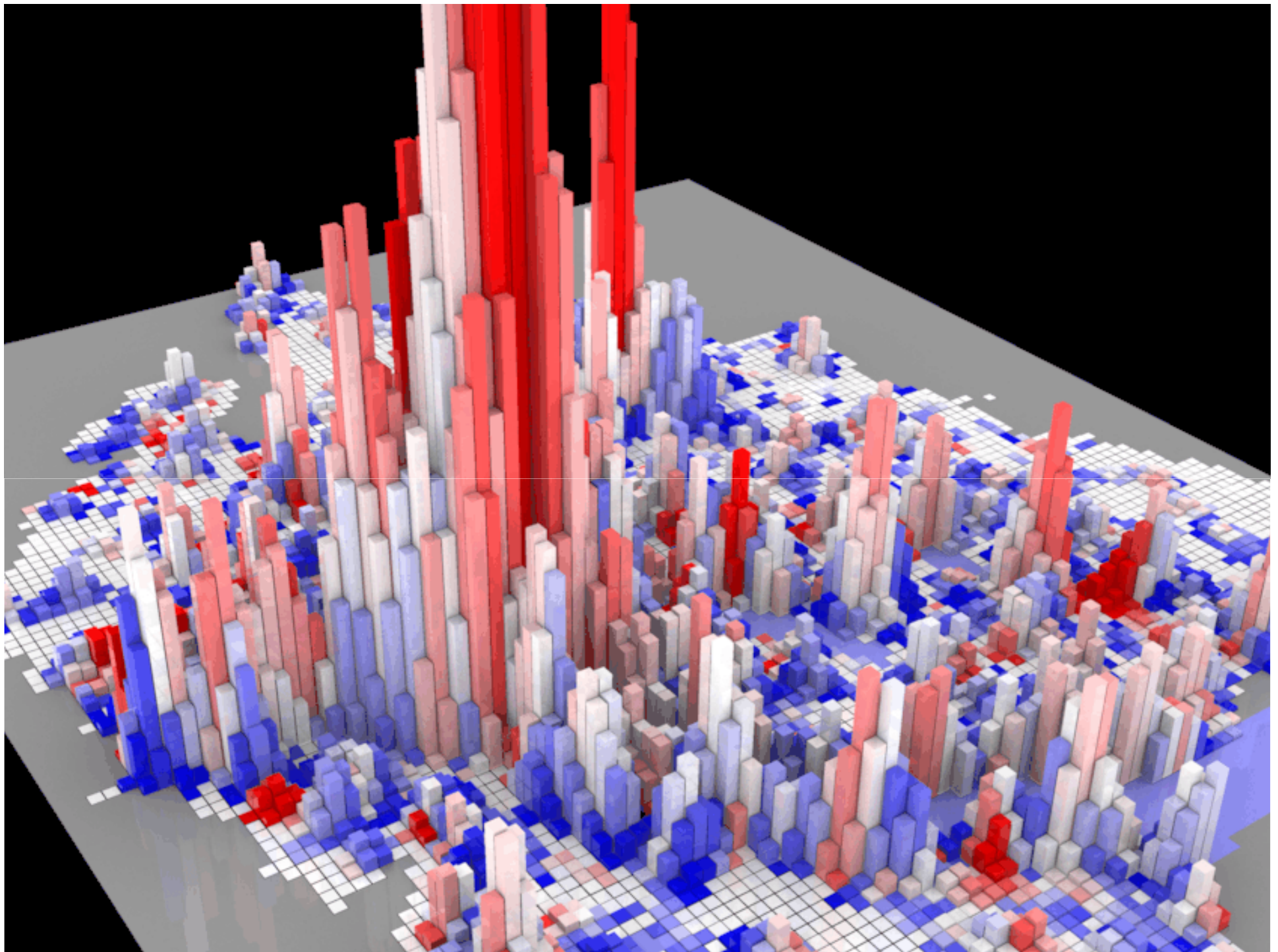
Photorealistic Rendering and Color Key

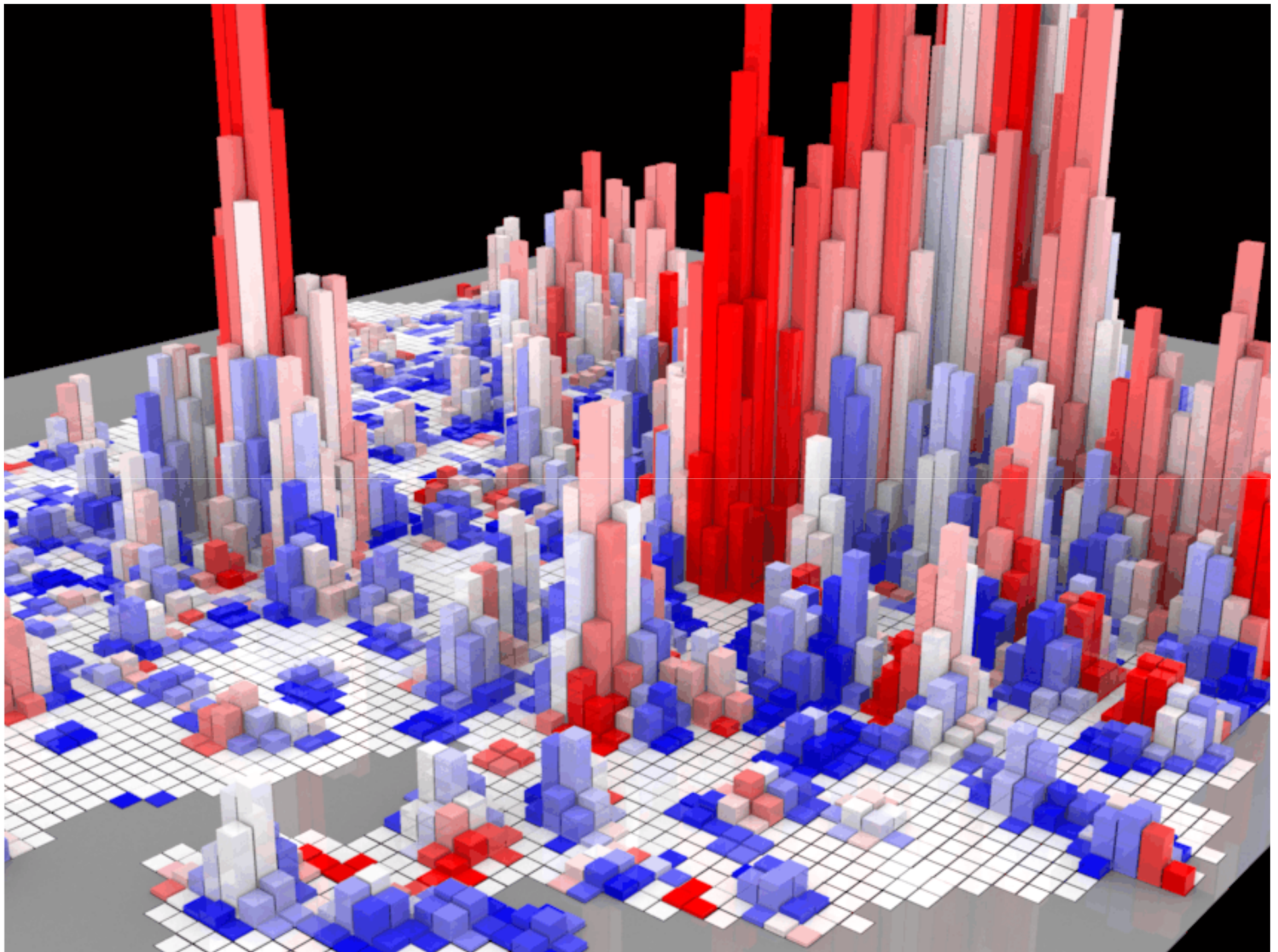


- bar height: daytime population quantity in 250x250m grid
- red or blue : residential or working area
- the intenser the colors, the purer a working or residential zone



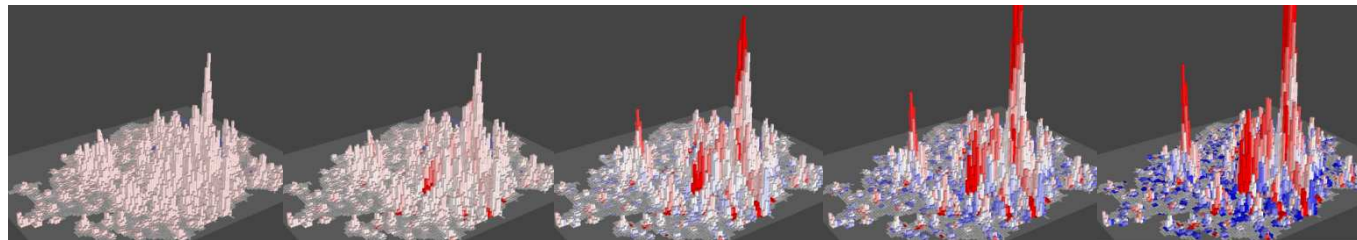








24 hours 3D-Population Density Animation

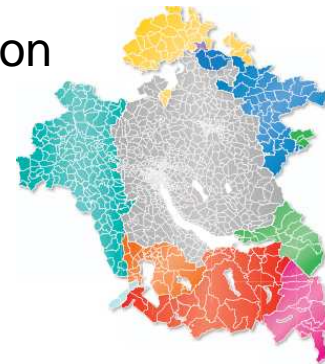


- interpolation of the two 12 hour peaks
 - continuous animation over 24 hours
 - NOT correct situations at any time of the day or week (no 24/7)
 - detailed film of the spatial and temporal movements
 - animations from different view angles
-
- start: night situation in rose
 - growing or diminishing stacks until daytime peak
 - daytime peak with maximum color intensity.



Outlook: new Data Sources 2010

- Swiss census 2010 fully **register based, annually**
- focused on **basic information** like age, sex, nationality
- **samples** for topics like social structure, education, structure of households, commuting behaviour, employment
- **additional sources:**
 - census of enterprises (annually in the future)
 - school statistics of the department of education
 - Zurich traffic model: information about spatial distribution of cultural, shopping and other attractors assigned to traffic zones.





Updated Day Time Population 2010

- more reality, more activities, more timeslices
- no more direct information about who leaves home, who does not. Discriminant analysis to split the residents into who leaves and who stays at home.
- add daytime locations from other data sources:
 - census of enterprises, includes commuters from outside
 - school statistics , includes commuters from outside
 - Zurich traffic model: disaggregate information about the people displacing for further activities (shopping, sport, culture, transport) from transport zones to the daytime population grid
 - Optimize estimated parameters by a fit method to balance the distribution.
- adjust parameters for multiple timeslices



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Thank you !

Questions ?



geostatistical webapplications

Statistics Canton of Zurich

- [regional atlas of geostatistical structures](#)
- [environmental analysis \(statistics of the neighbourhood of a point\)](#)
- [settlement history Canton of Zurich by age of buildings](#)
- [Localisator](#)