# Tile-based GIS

Felix Delattre

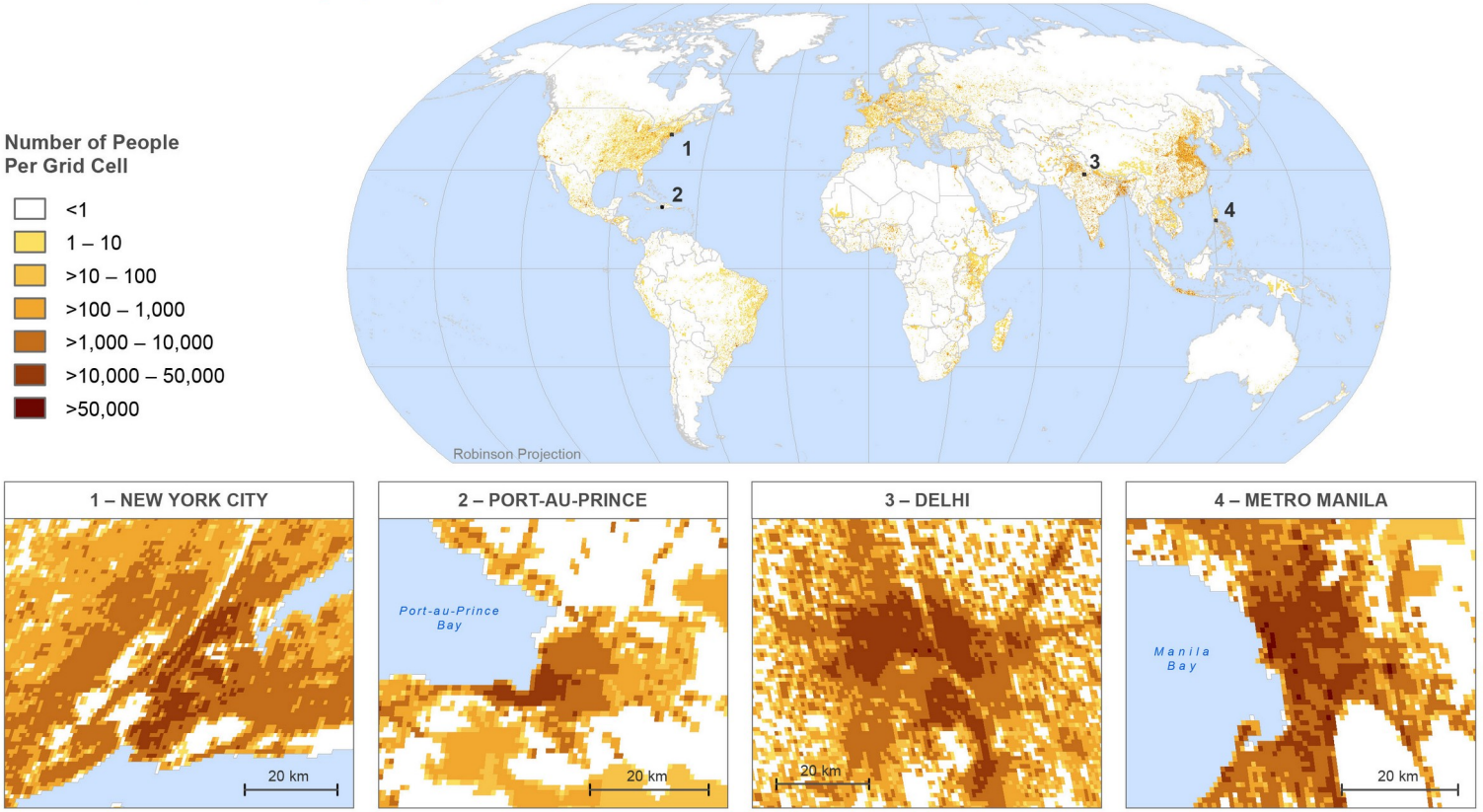
UP 42

# What is tile-based GIS?

- Grid based data GIS.

# Global Human Settlement Population Grid (GHS-POP), 2000

## Global Human Settlement Layer (GHSL)




Map Credit: CIESIN Columbia University, July 2021.

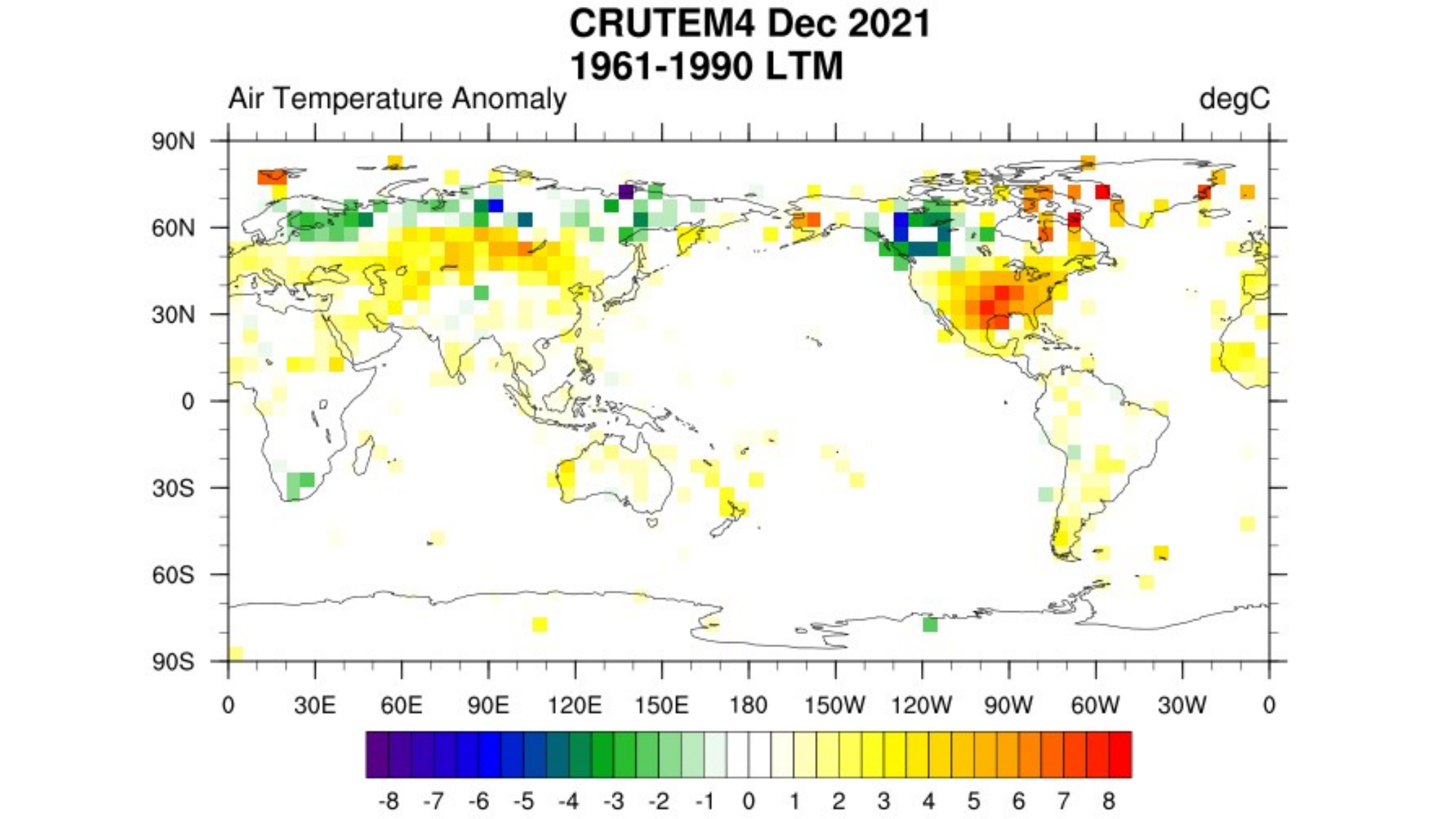
The Global Human Settlement Layer: Population and Built-Up Estimates, and Degree of Urbanization Settlement Model Grid data set is part of the Global Human Settlement Layer (GHSL) collection. This map displays the GHS-POP 2000 raster layer, which provides data on the spatial distribution of population expressed as a continuous value representing the number of people per grid cell for the year 2000.

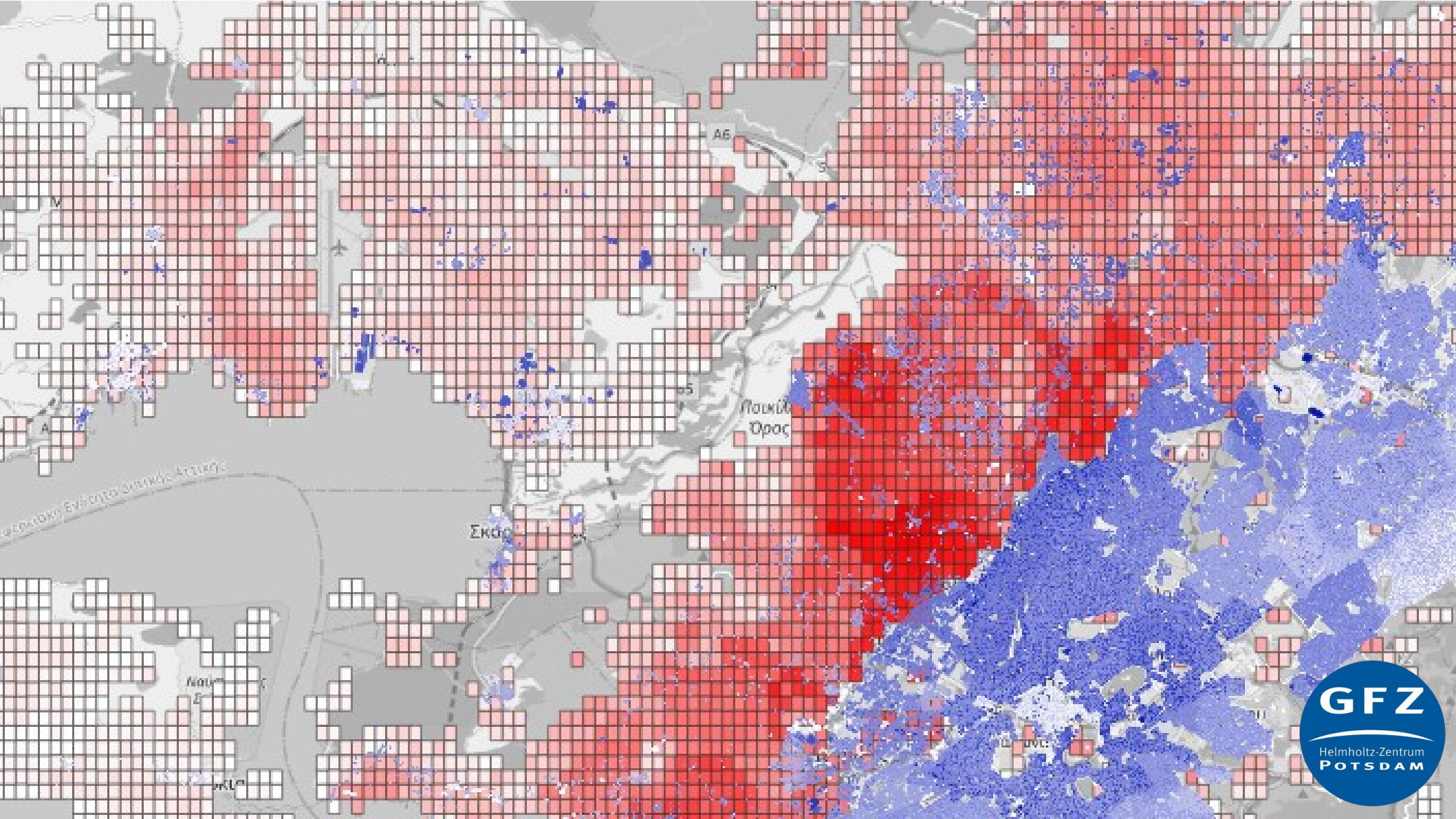
Center for International Earth Science Information Network
EARTH INSTITUTE | COLUMBIA UNIVERSITY

Data Source: Joint Research Centre - JRC - European Commission, and Center for International Earth Science Information Network - CIESIN - Columbia University. 2021. Global Human Settlement Layer: Population and Built-Up Estimates, and Degree of Urbanization Settlement Model Grid. Palisades, NY: NASA Socioeconomic Data and Applications Center (SEDAC). https://doi.org/10.7927/h4154f0w.

© 2021. The Trustees of Columbia University in the City of New York.

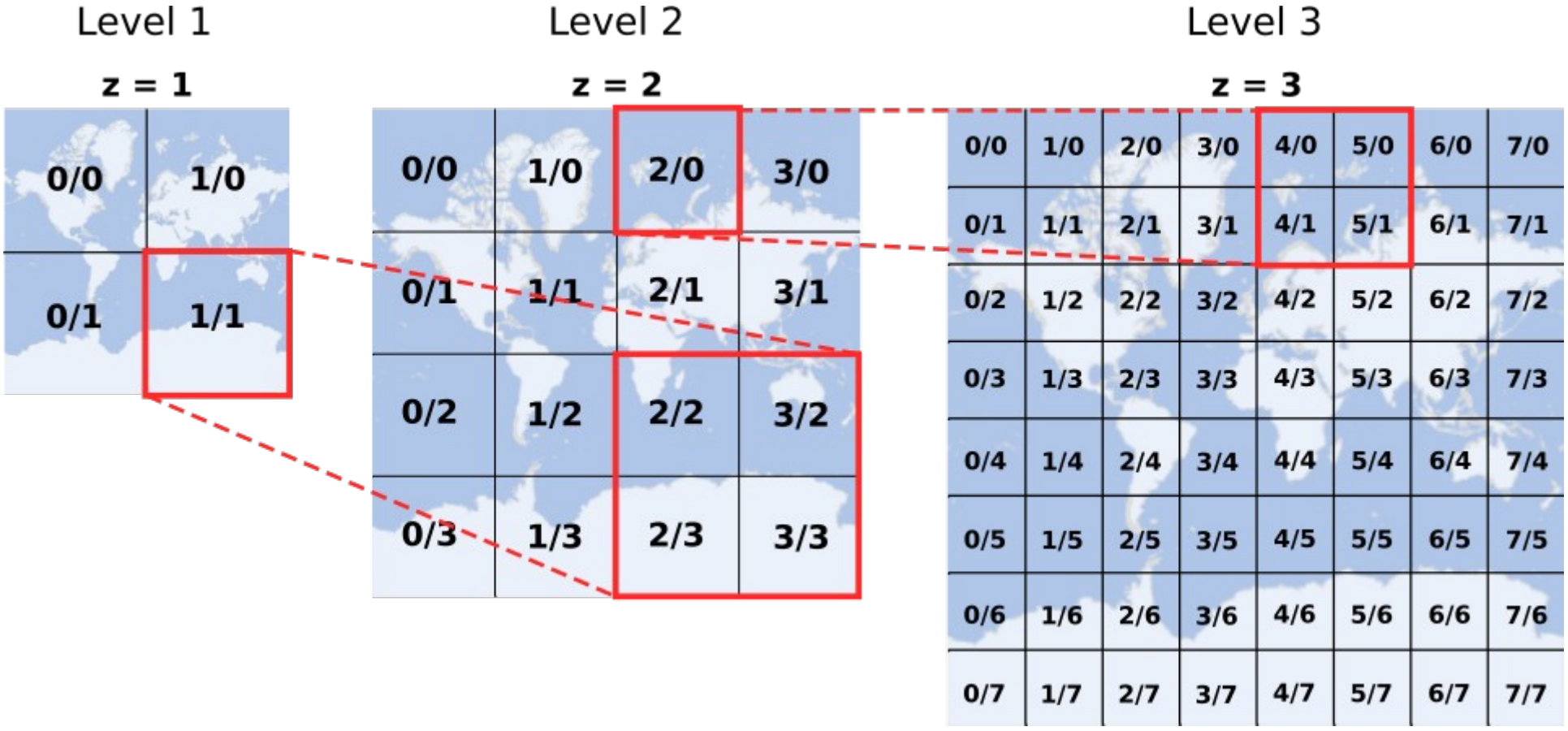
This document is licensed under a
Creative Commons Attribution 4.0 International License.
https://creativecommons.org/licenses/by/4.0/

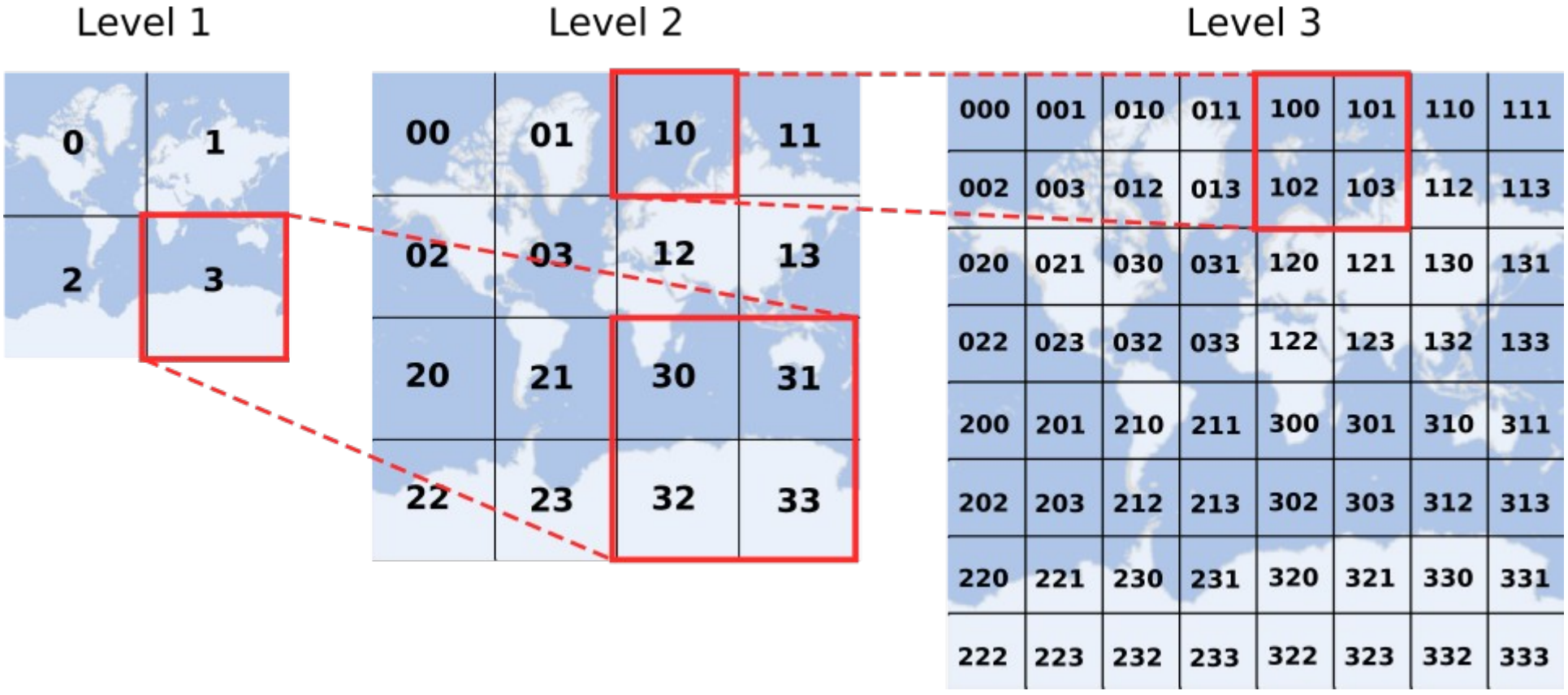

CRUTEM4 Dec 2021
1961-1990 LTM
Air Temperature Anomaly
degC
90N
60N
30N
0
30S
60S
90S
0
30E
60E
90E
120E
150E
180
150W
120W
90W
60W
30W
0
-8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8


A6
Παιχνίδι
Όρος
GFZ
Helmholtz-Zentrum
POTSDAM

# What is tile-based GIS?

- Grid based data GIS.
- But stored and represented as tiles.
- No storing of geospatial geometries are necessary.


Level 1
z = 1
0/0
1/0
0/1
1/1
Level 2
z = 2
0/0
1/0
2/0
3/0
0/1
1/1
2/1
3/1
0/2
1/2
2/2
3/2
0/3
1/3
2/3
3/3
Level 3
z = 3
0/0 1/0 2/0 3/0 4/0 5/0 6/0 7/0
0/1 1/1 2/1 3/1 4/1 5/1 6/1 7/1
0/2 1/2 2/2 3/2 4/2 5/2 6/2 7/2
0/3 1/3 2/3 3/3 4/3 5/3 6/3 7/3
0/4 1/4 2/4 3/4 4/4 5/4 6/4 7/4
0/5 1/5 2/5 3/5 4/5 5/5 6/5 7/5
0/6 1/6 2/6 3/6 4/6 5/6 6/6 7/6
0/7 1/7 2/7 3/7 4/7 5/7 6/7 7/7


Level 1
Level 2
Level 3
0
1
2
3
00
01
10
11
02
03
12
13
20
21
30
31
22
23
32
33
000 001 010 011 100 101 110 111
002 003 012 013 102 103 112 113
020 021 030 031 120 121 130 131
022 023 032 033 122 123 132 133
200 201 210 211 300 301 310 311
202 203 212 213 302 303 312 313
220 221 230 231 320 321 330 331
222 223 232 233 322 323 332 333

# What is tile-based GIS?

- Advantage: fast computing
- Constraint: Grid cell sizes differs over latitudes

```
CREATE TABLE tiles (
    quadkey VARCHAR(255) PRIMARY KEY,
    value FLOAT NOT NULL
);
```

# Visualization

Vector tiles from PostgreSQL PostGIS with **`ST_AsMVT`**

+ magic sauce with custom functions

# Functions

- **convert_xyz_to_quadkey**(x INTEGER, y INTEGER, z INTEGER)
- **convert_quadkey_to_xyz**(quadkey TEXT)

# Functions

- **convert_xyz_to_quadkey**(x INTEGER, y INTEGER, z INTEGER)
- **convert_quadkey_to_xyz**(quadkey TEXT)

- **generate_tiles_of_tiles_with_values(**
  z INTEGER, x INTEGER, y INTEGER, target_zoom_level INTEGER
  **)**

It’s showtime

# Thanks!

Code: https://github.com/pantierra/tilegis

Play with it: https://tilegis.centroi.de (during FOSS4G Europe)

Talk to me!