The Power of 3D Real-Time Visualization in Atlases

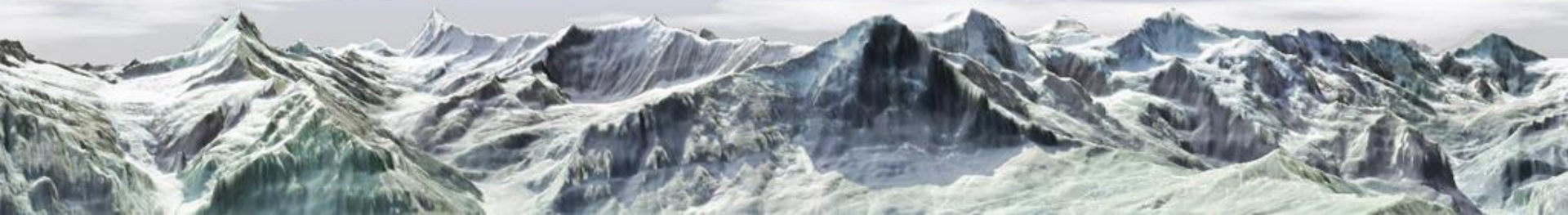## Concepts, Techniques and Implementation

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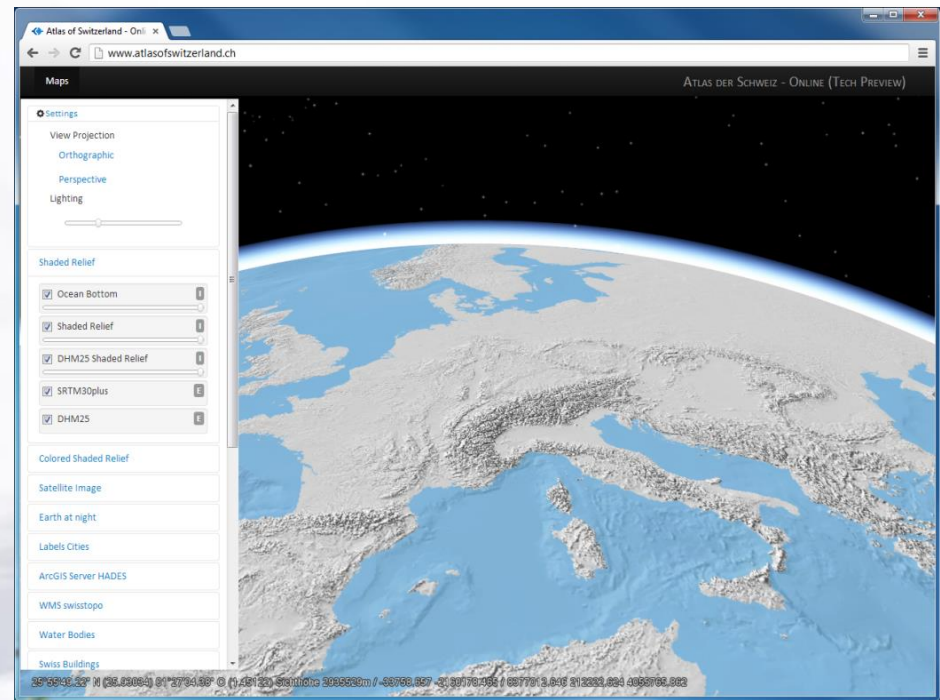Institute of Cartography and Geoinformation
ETH Zurich

Atlas of Switzerland
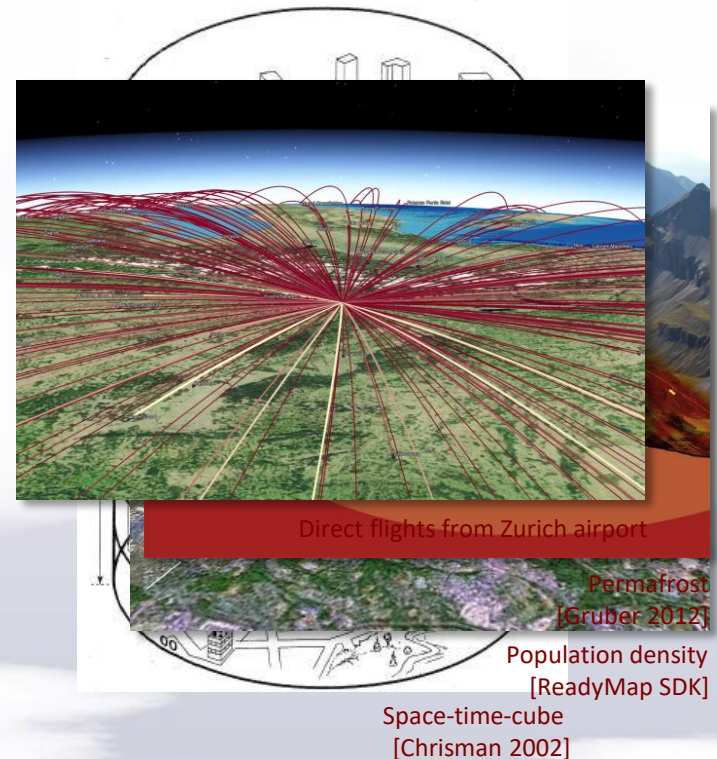
New version: 2014/15

- Virtual Globe

- Web-based

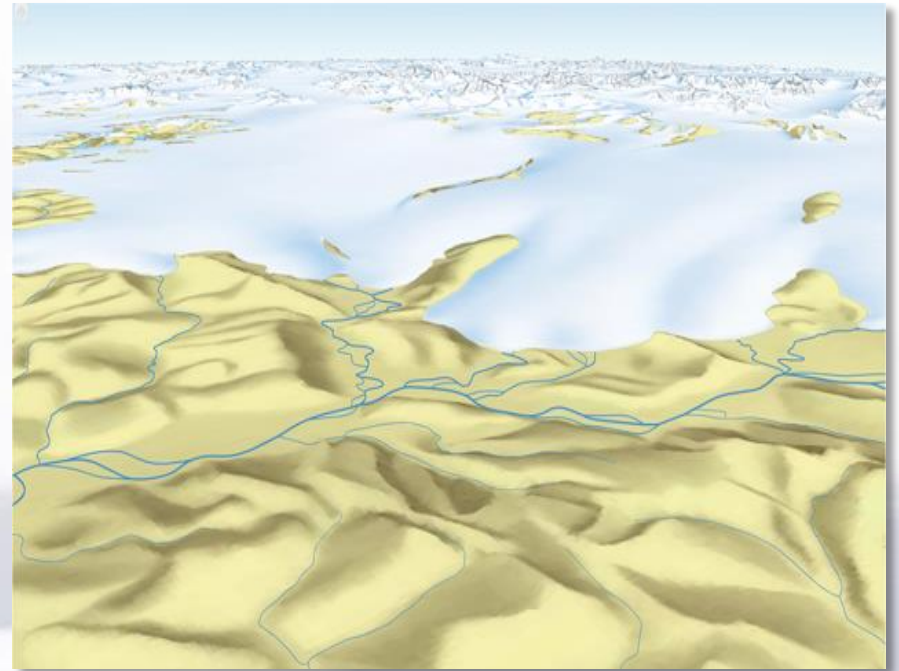- Reduced complexity

- Open standards

- **3D Cartography**

Atlas of Switzerland – Online (Prototype)

Advantages of 3D cartography

- Eye-catching

- Equals our natural perception

- Allows displaying features in the air or in the ground

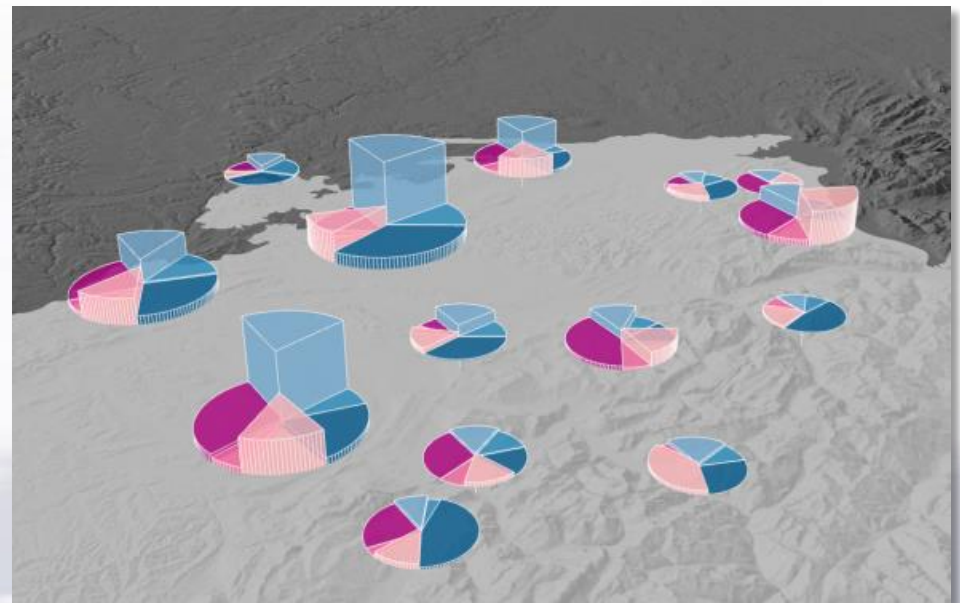- Third dimension can be used as visual variable for temporal and thematic data

Direct flights from Zurich airport

Permafrost
[Gruber 2012]

Population density
[ReadyMap SDK]

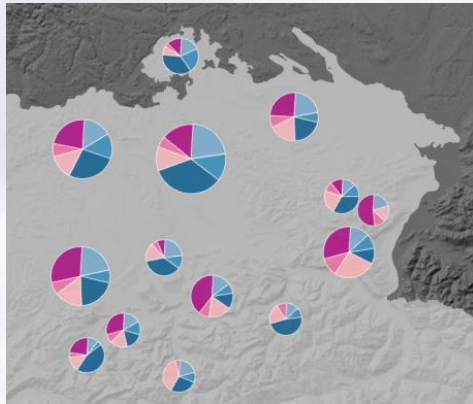Space-time-cube
[Chrisman 2002]
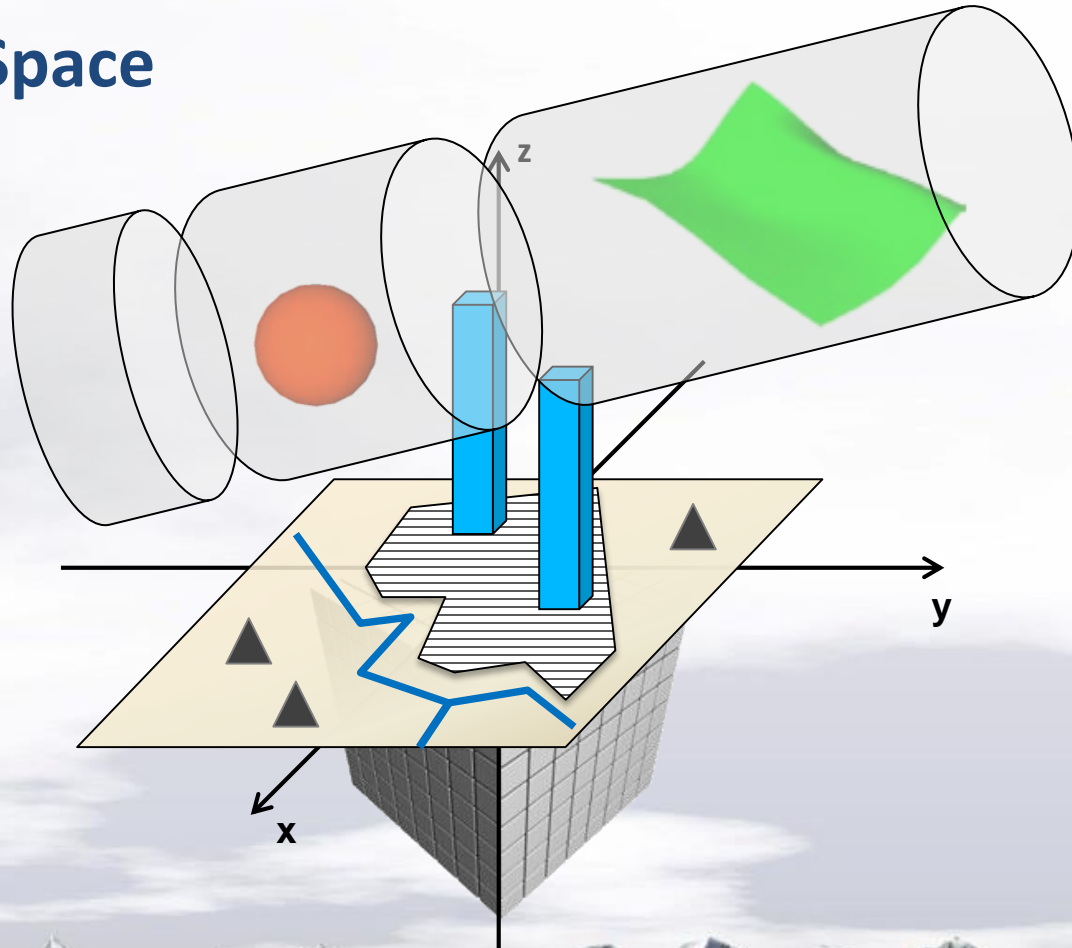
Fusion of 2D and 3D maps

Last Glacial Maximum in Switzerland

Fusion of 2D and 3D maps

Wood-fired heating systems in Swiss cantons

Mapping Space

Techniques for creating 3D maps

Abstraction　　Generalization　　Translation　　Rotation　　Scaling

Extrusion　　Anchoring　　Arrangement　　Surface properties　　Projection
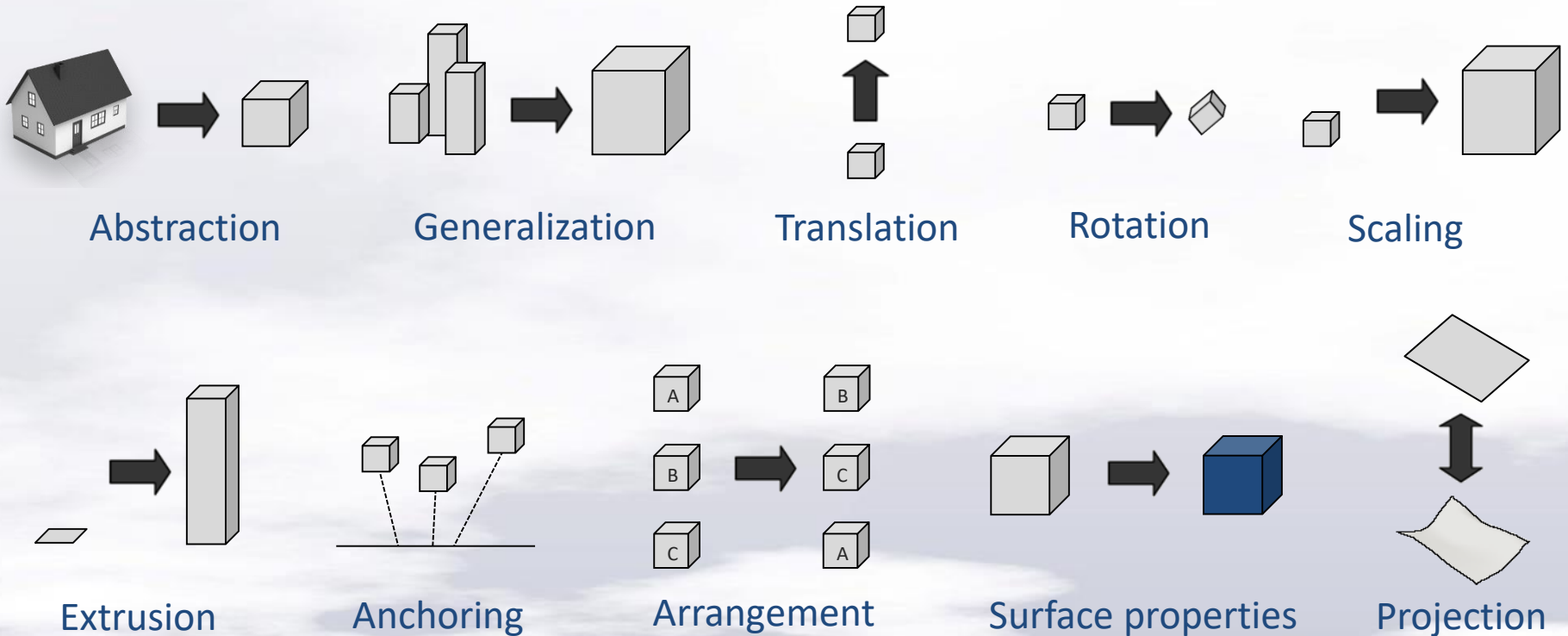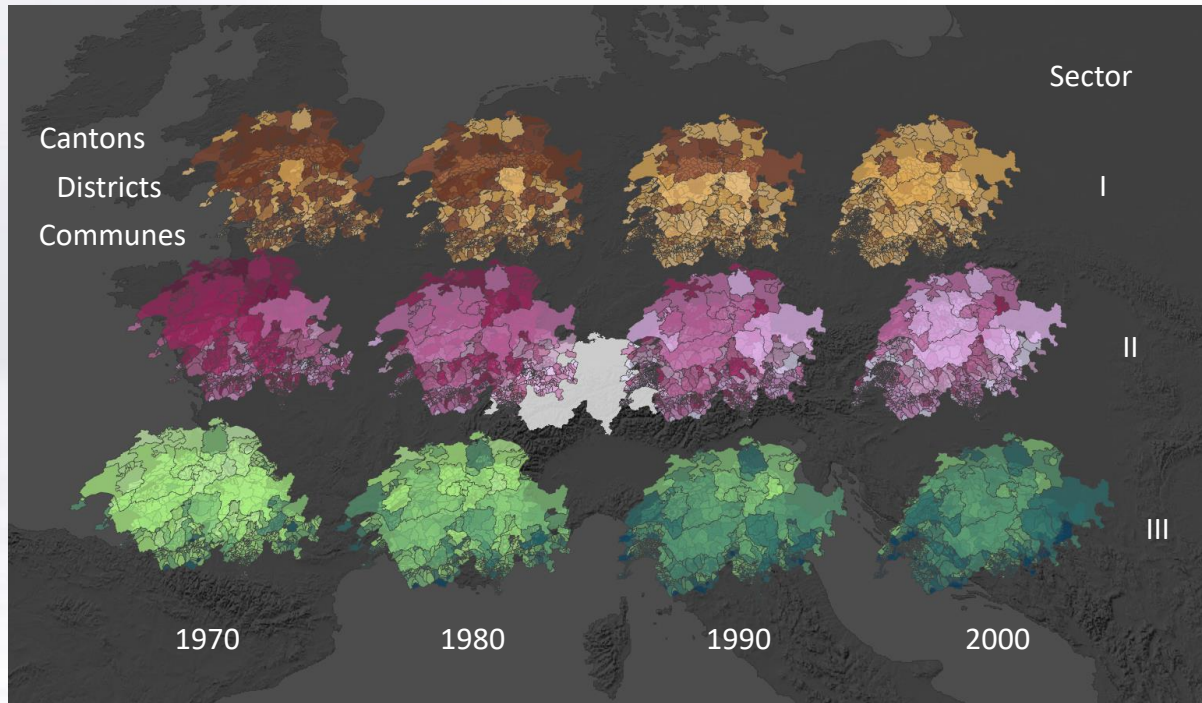
Example: Multi-layered choropleth map

Employment in the Primary, Secondary and Tertiary sector

Translation

Arrangement

Anchoring

Surface properties

Projection

Generalization

Abstraction

Demo: Point cloud map

Population density in Switzerland

46°44'34.73" N (46.74298) 08°16'11.51" O (8.26986) Sichthöhe 4490444m / 663522.008 -177201.280 / 7378189.748 1072398.347 7892563.733

osgEarth

- Virtual Globe toolkit (OpenSource)

- Implemented in C++, based on OpenSceneGraph (OSG)

Features:

- Real-time map rendering and navigation

- Custom digital elevation models

- Image overlays / Vector data / 3D objects

- Support of various GIS formats and services

- Annotations / Labeling

osgEarth Viewer

Data processing for creating 3D maps

- Data originates from the Atlas of Switzerland 3

- Geometries were preprocessed by Python scripts including ArcGIS and PostGIS functions (e.g. ST_Translate)

- Styling took place in osgEarth configuration files

Wrap up

- Advantages of 3D cartography for atlases

- Concepts: Map Fusion, Mapping Space

- Ten techniques for creating 3D maps

- osgEarth as a powerful Virtual Globe engine with 3D real-time visualization capabilities

- Exemplary 3D maps throughout the presentation

Thank you for your attention
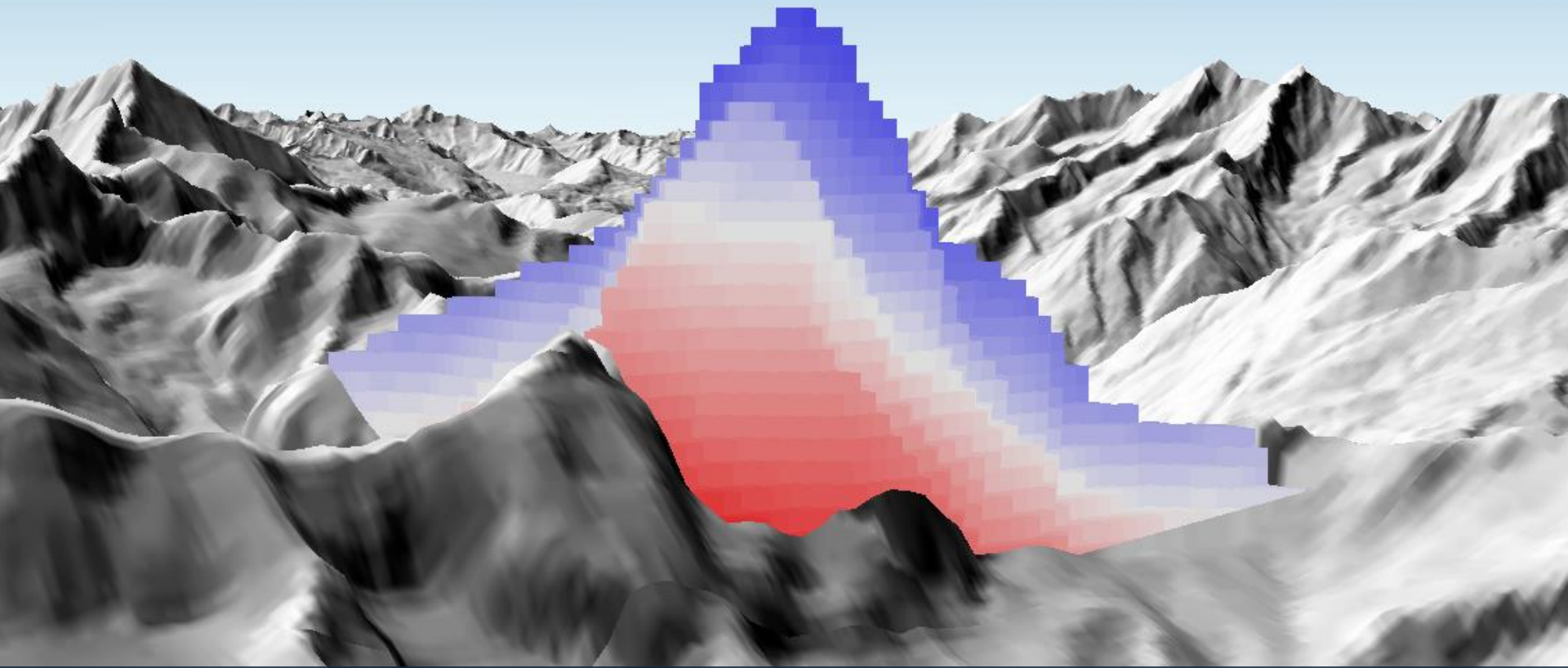
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