

**Shaky grounds –
building a 3D model for the new Earthquake Hazard Map of Germany**

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Overview

Earthquake risk in Germany

→ Need for regulations for building structures

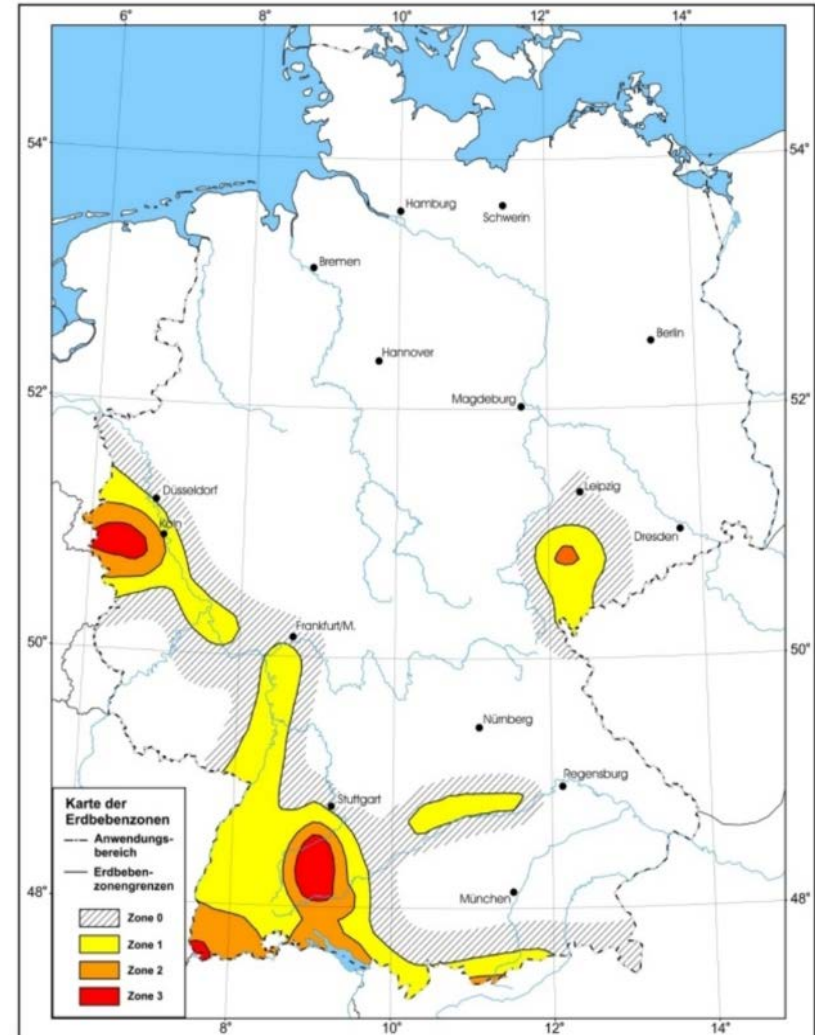
- Meeting of the standards committee for building of the DIN
- Decision to review the maps (earthquake zones + subsurface classes)

Review of old risk map

- Zones enlarged due to new definitions
- Higher resolution needed

Task for BGR:

- New map for subsurface classes based on 3D model
- Data from the GSO, compilation by BGR



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Geologic subsurface classes

Geologic subsurface classes

R („Rock“)

Areas without or with only thin sediments (mostly Quaternary), followed by hard rock with s-wave-velocities higher than 800 m/s.

T („shallow sediments or transition zone“)

Areas with up to 100 m sediments (mostly Quaternary), followed by hard rock with s-wave-velocities higher than 800 m/s.

or

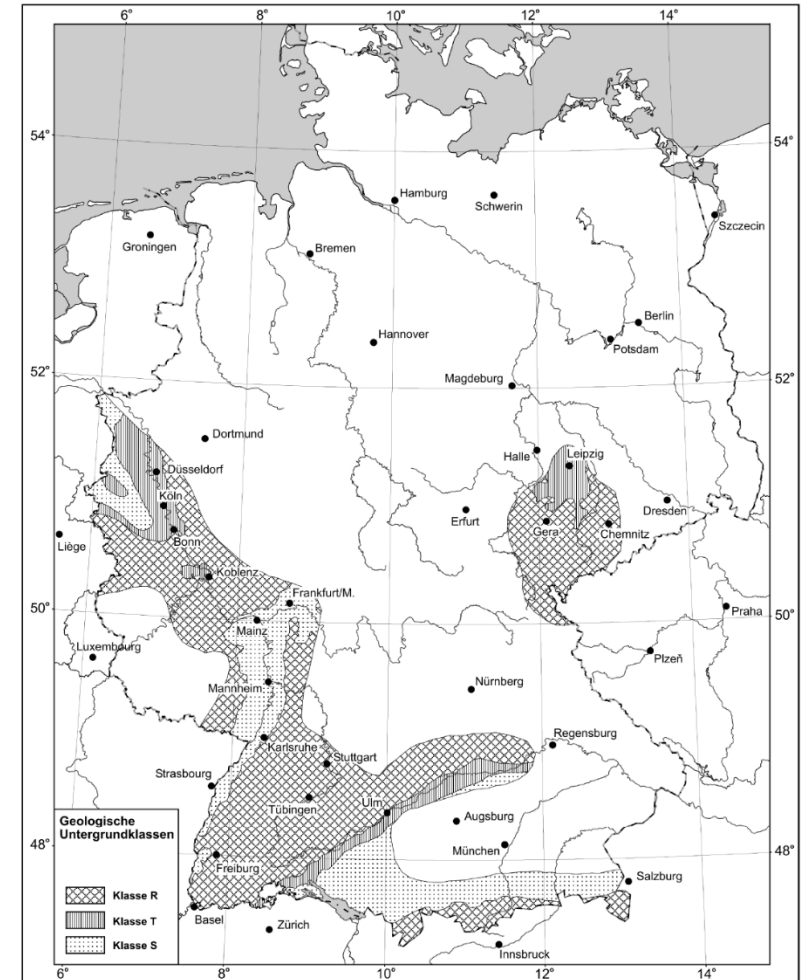
areas with up to 500 m thick Tertiary sediments without Quaternary cover. S-wave-velocities increasing with depth up to 1800 m/s. Velocity jump at the transition to hard rock up to more than 2000-2500 m/s.

S („deep sedimentary basins“)

Areas with more than 100 m sediments (mostly Quaternary) followed by hard rock with s-wave-velocities higher than 800 m/s

or

areas with more than 500 m thick Tertiary sediments without Quaternary cover. S-wave-velocities increasing with depth up to 1800 m/s. Velocity jump at the transition to hard rock up to more than 2000-2500 m/s.



Former map for geologic subsurface classes

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New model

3 horizons:

- earth surface,
- base Quaternary,
- base Tertiary)



Calculation of thickness in a 1000m raster

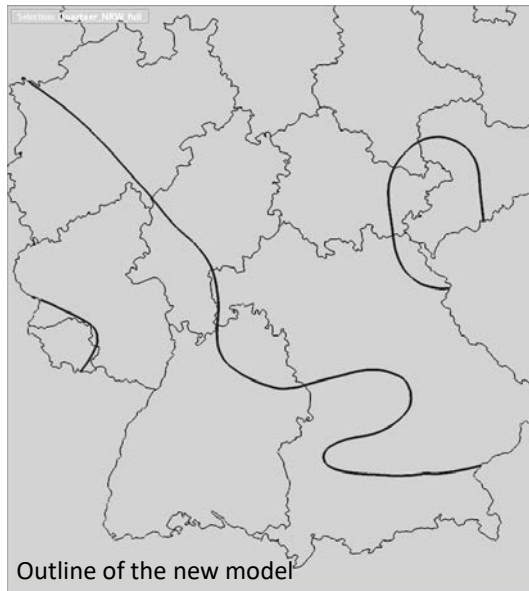


Definition of subsurface classes

- Subsurface class T: thickness $Q \leq 100\text{m}$, thickness $T \leq 500\text{m}$
- Subsurface class S: thickness $T > 500\text{m}$
- Subsurface class R: everything else



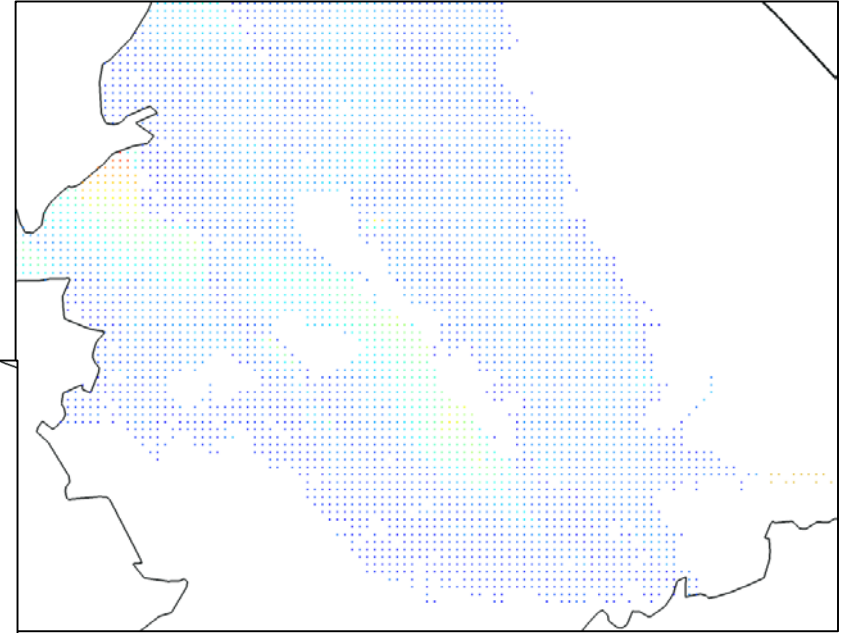
Plotting the subsurface classes as region on the DEM



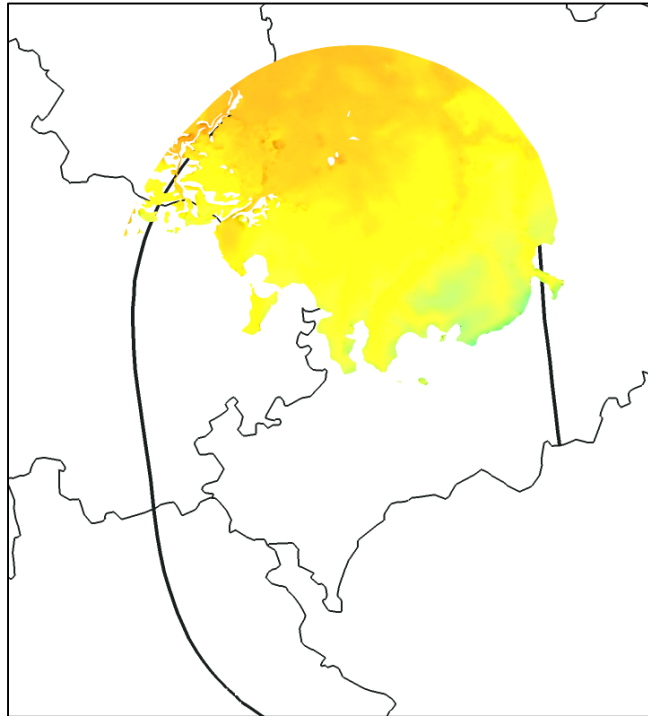
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Data by GSO

PointSet at 1000m spacing



Point data for base Quaternary in Nordrhein-Westfalen

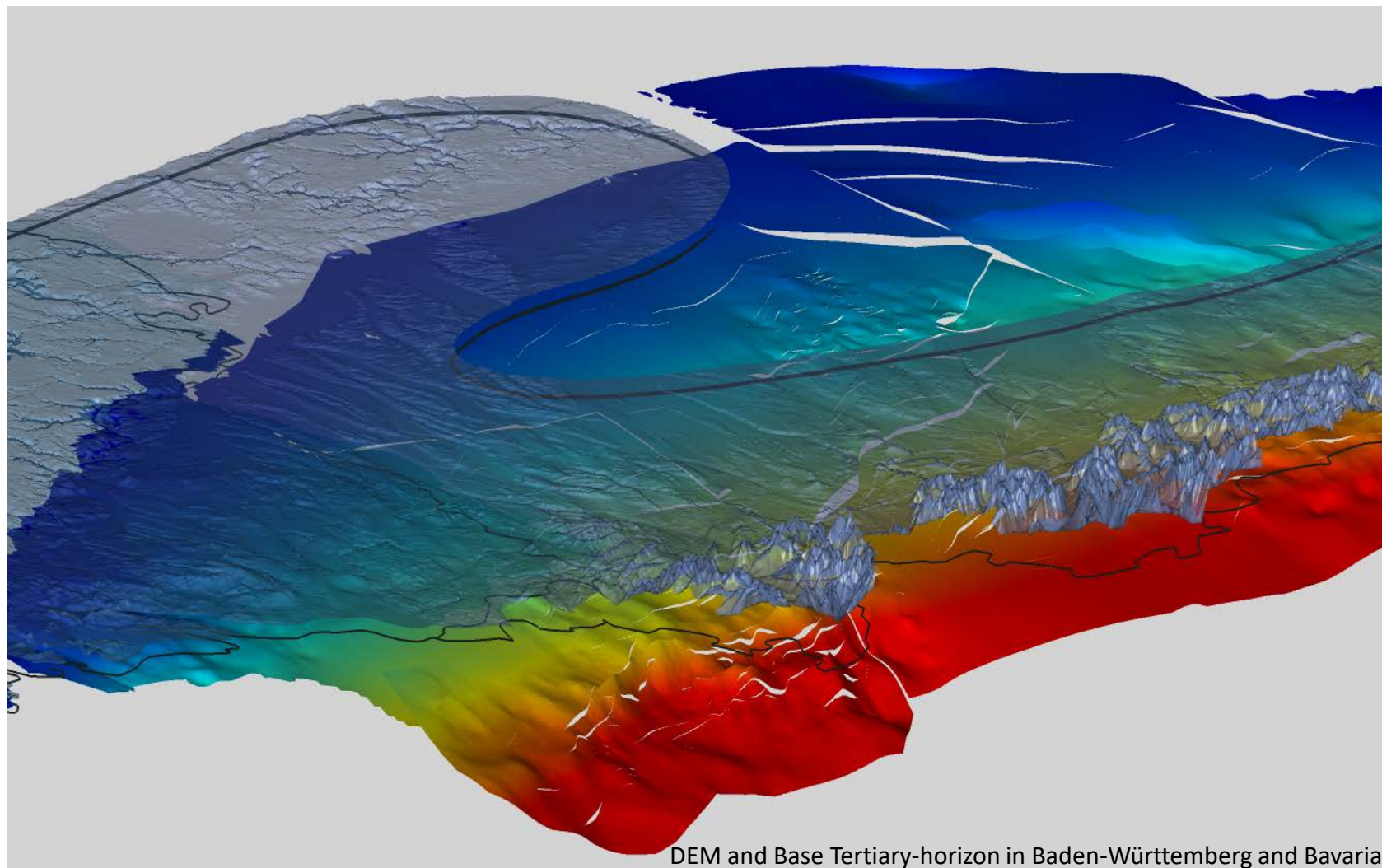


GoCAD ts-surfaces

Ts-surface for base Quaternary

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3D model



DEM and Base Tertiary-horizon in Baden-Württemberg and Bavaria

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Map of the subsurface classes

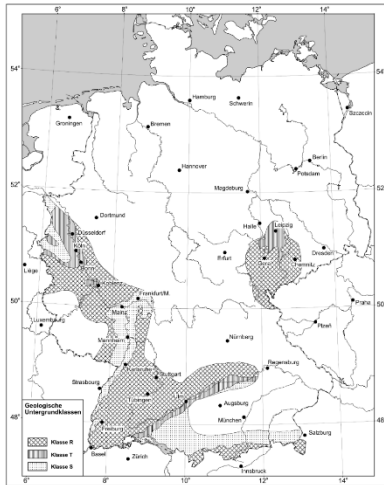
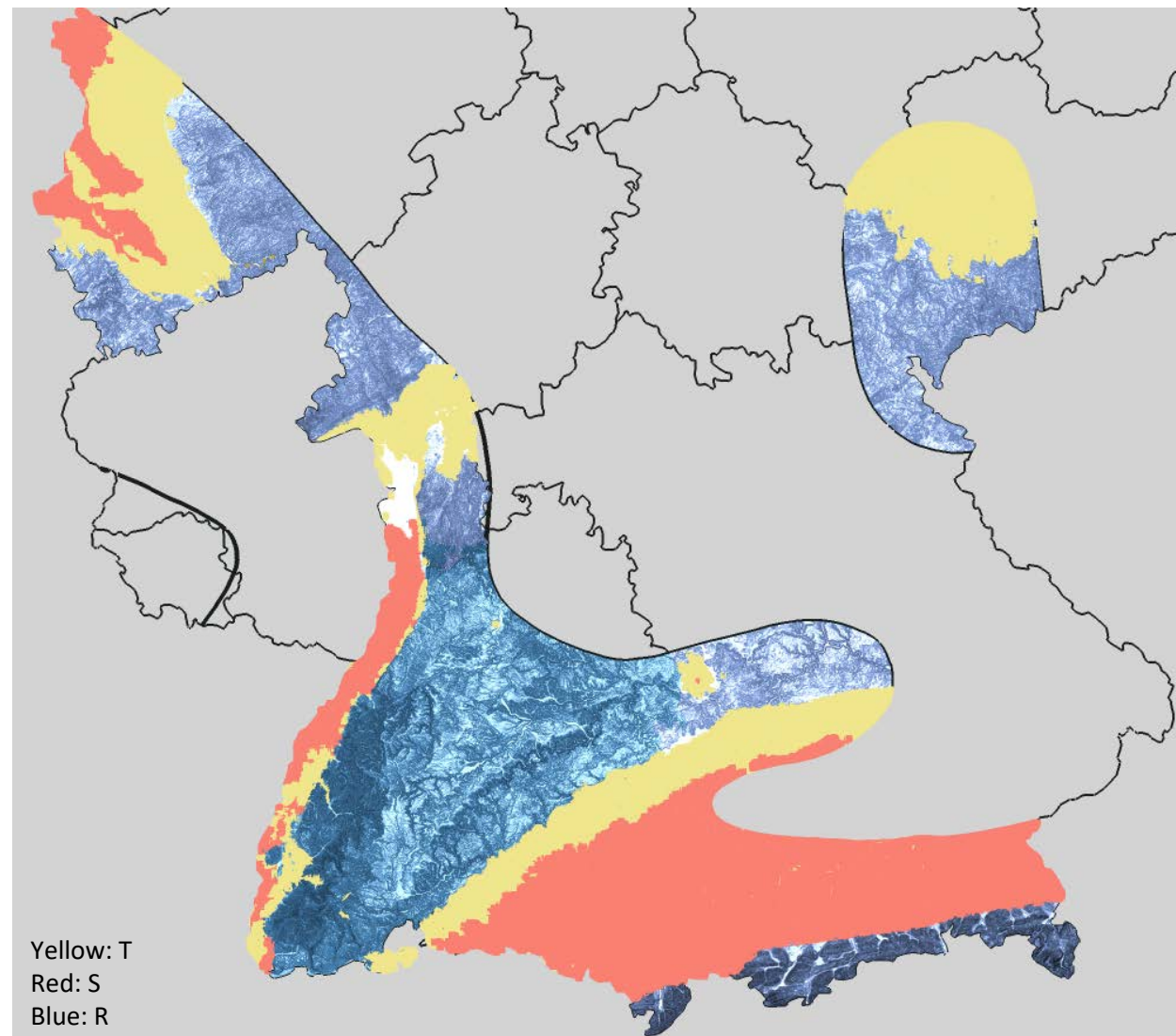


Bild 3 – Geologische Untergrundklassen in den Erdbebenzonen der Bundesrepublik Deutschland

One federal state is missing
(will be modeled next 2 years)

Open questions in the deep
alpine valleys (will be solved)

DEM will be delivered to the
cartography department



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Thank you for your attention

3D-Modell of the BGR headquarter in Minecraft