NGAC; December 2019; Lightning talk

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State Geologist of Minnesota; Professor, University of Minnesota;
Mapping Committee Chair, Association of American State Geologists

2019 Synopsis of Three-dimensional Geological Mapping and Modelling at Geological Survey Organizations

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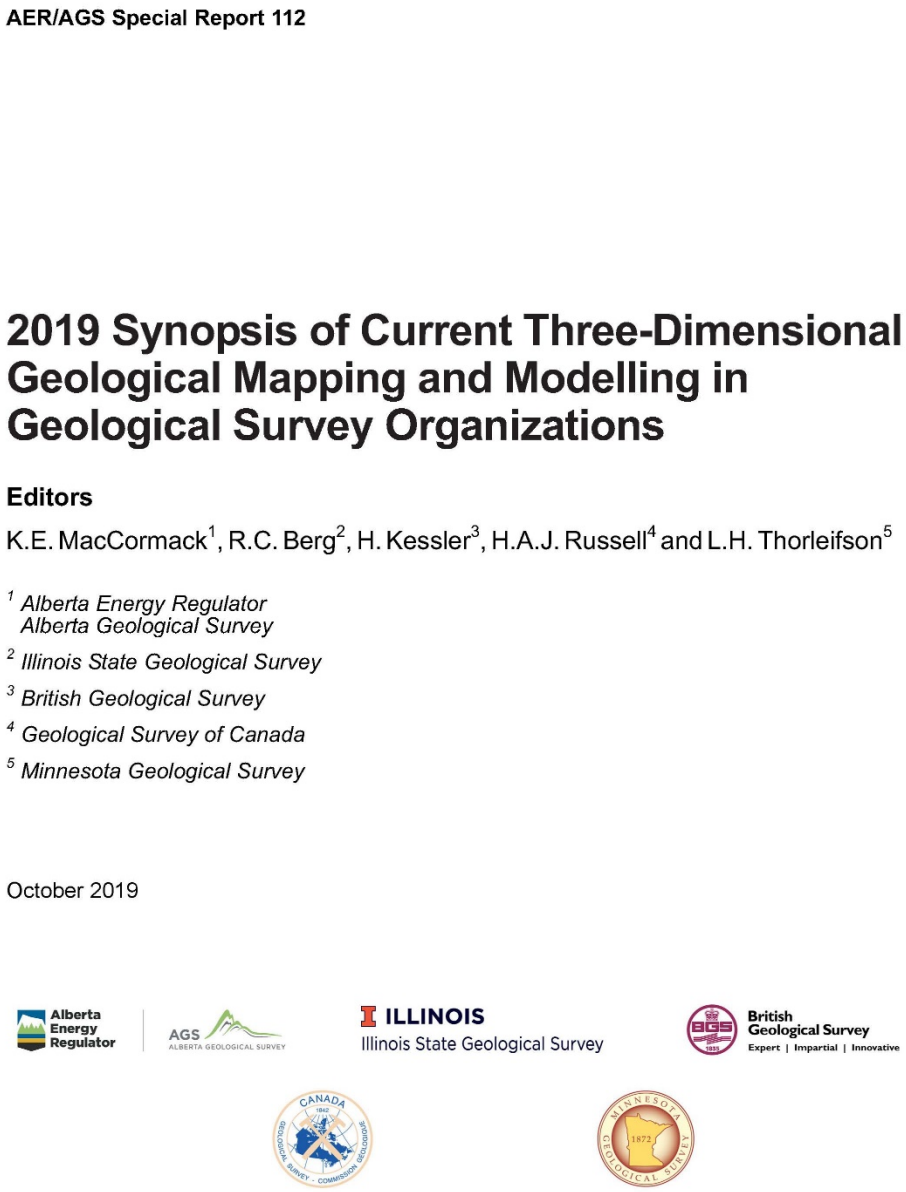
NATIONAL GEOSPATIAL ADVISORY COMMITTEE

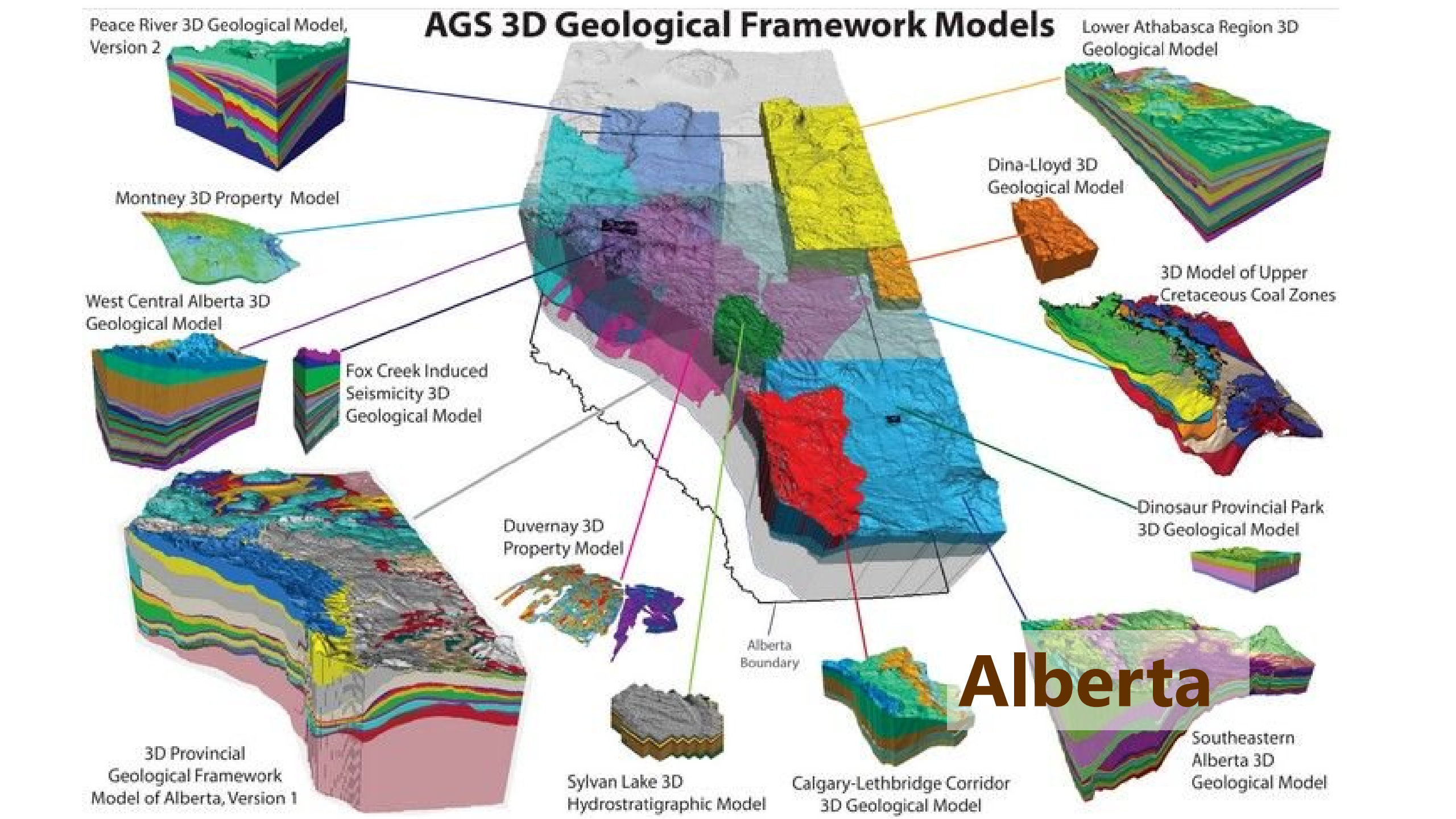


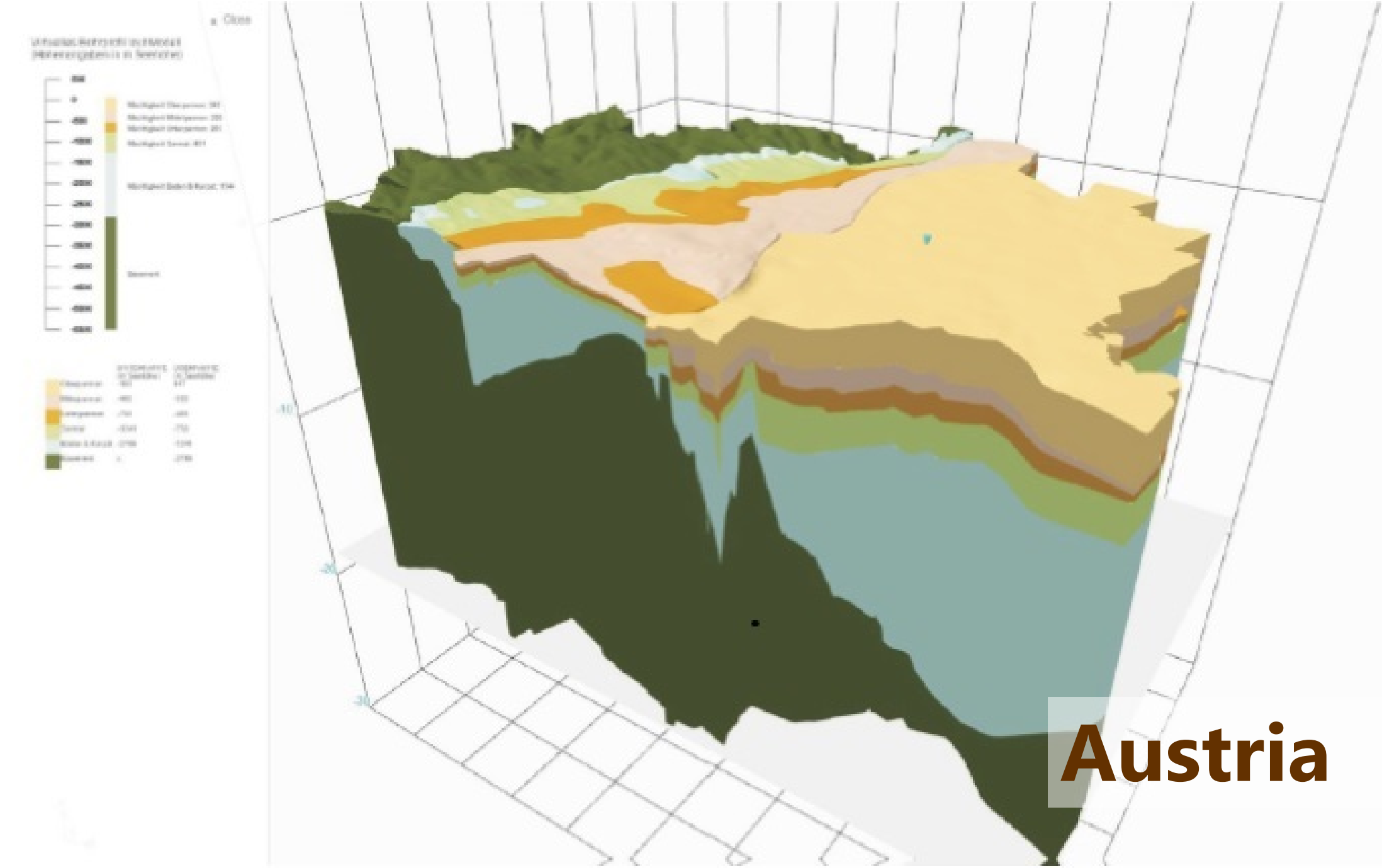
Free download:
https://ags.aer.ca/publications/SPE_112.html

- **How 22 surveys are developing 3D geospatial products**
- **Case studies highlight innovative approaches**
- **3D geology enhances communications with stakeholders, optimizes evidence-based decision-making, and improves understanding of geology**
- **Resulting models lead to enhanced public safety, and better delineation of surface and subsurface resources**

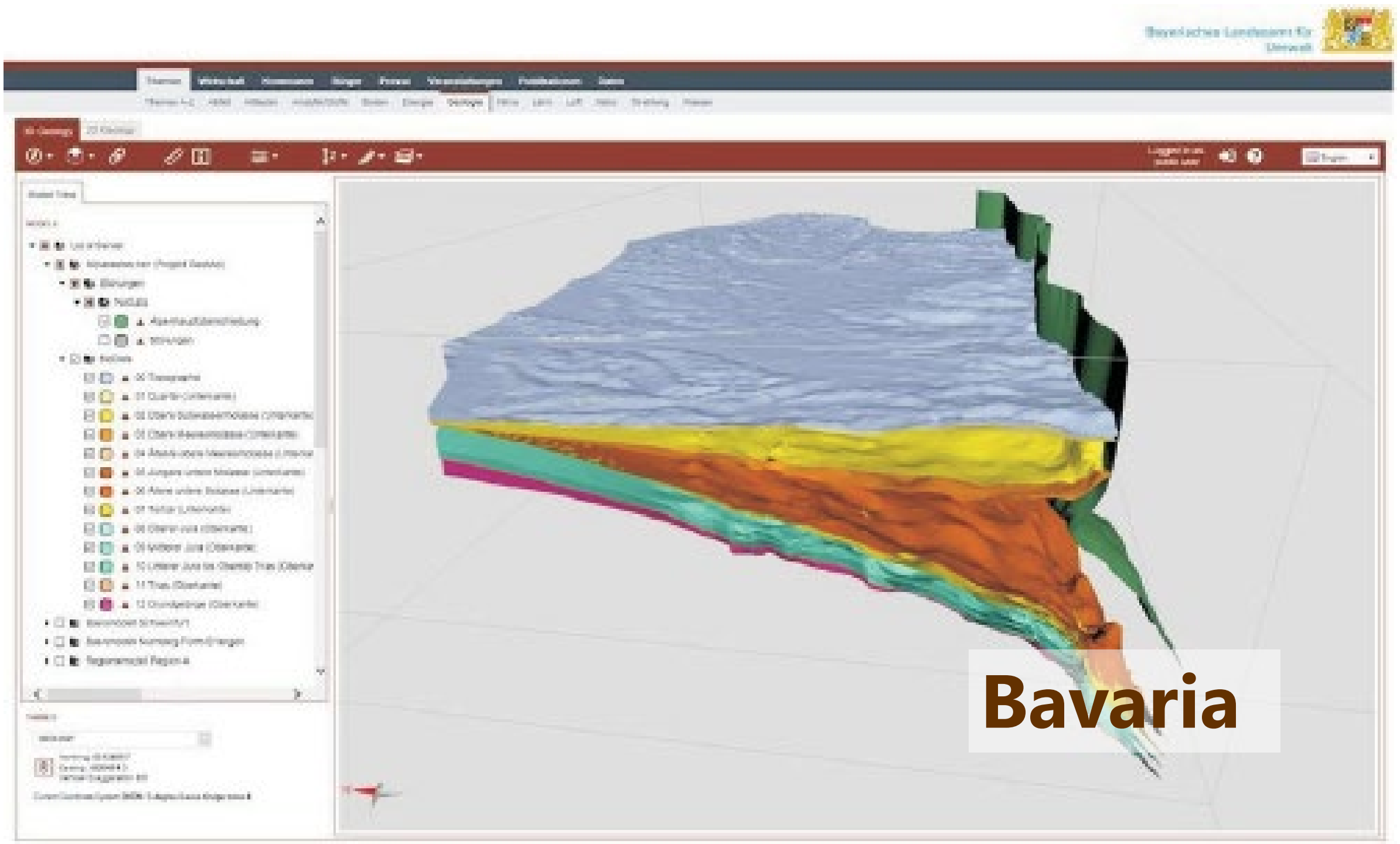
- Chapter 1 - Overview
- Chapter 2 - Background and Purpose
- Chapter 3 - Modelling Approaches
- Chapter 4 - Benefit-Cost Analysis
- Chapter 27 - Communicating 3D Geology to Stakeholders
- Chapter 28 - Global 3D Coordination Initiatives
- Chapter 29 - Future of 3D at Geological Survey Organizations
- Chapter 30 - Conclusions and Recommendations

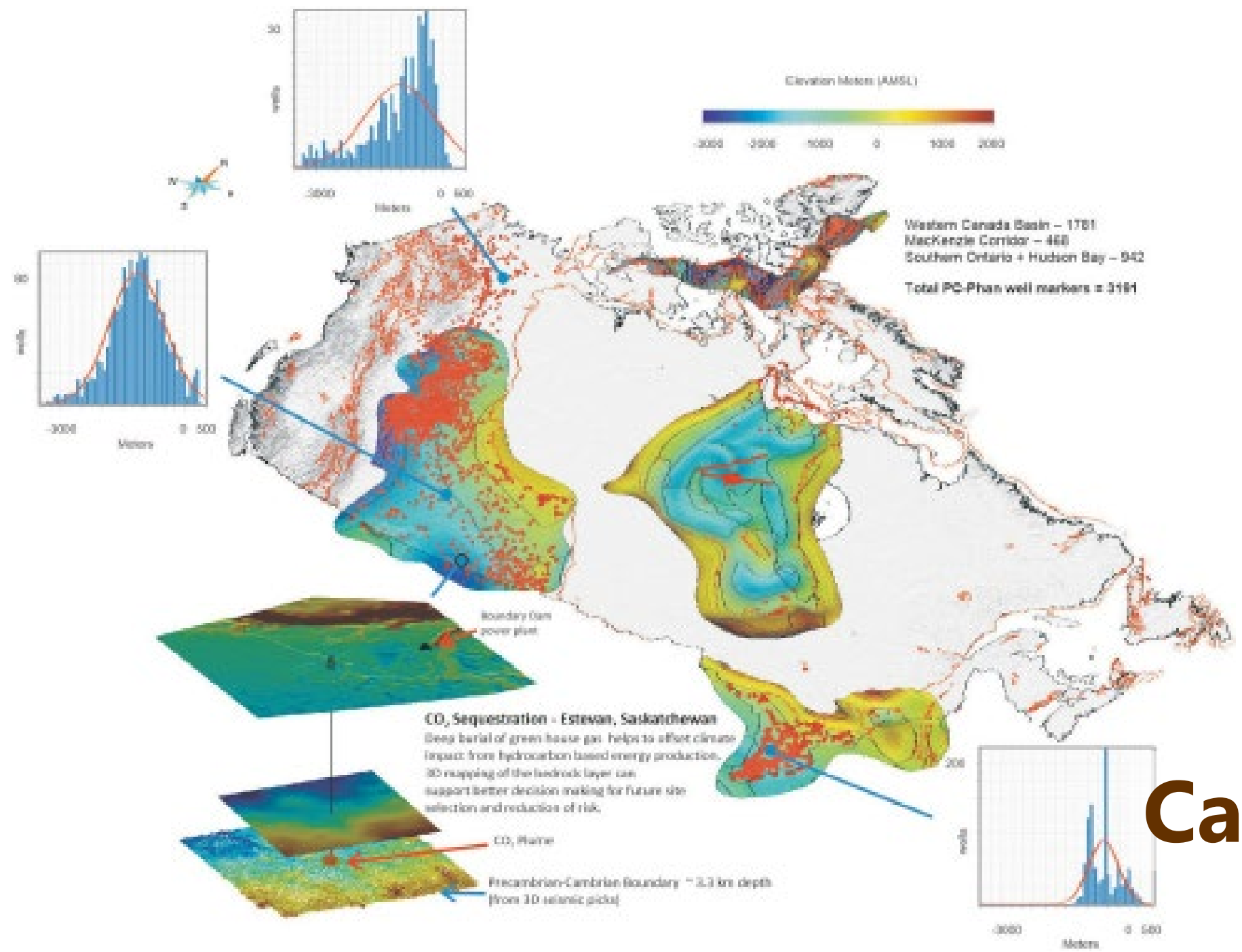
AGS 3D Geological Framework Models



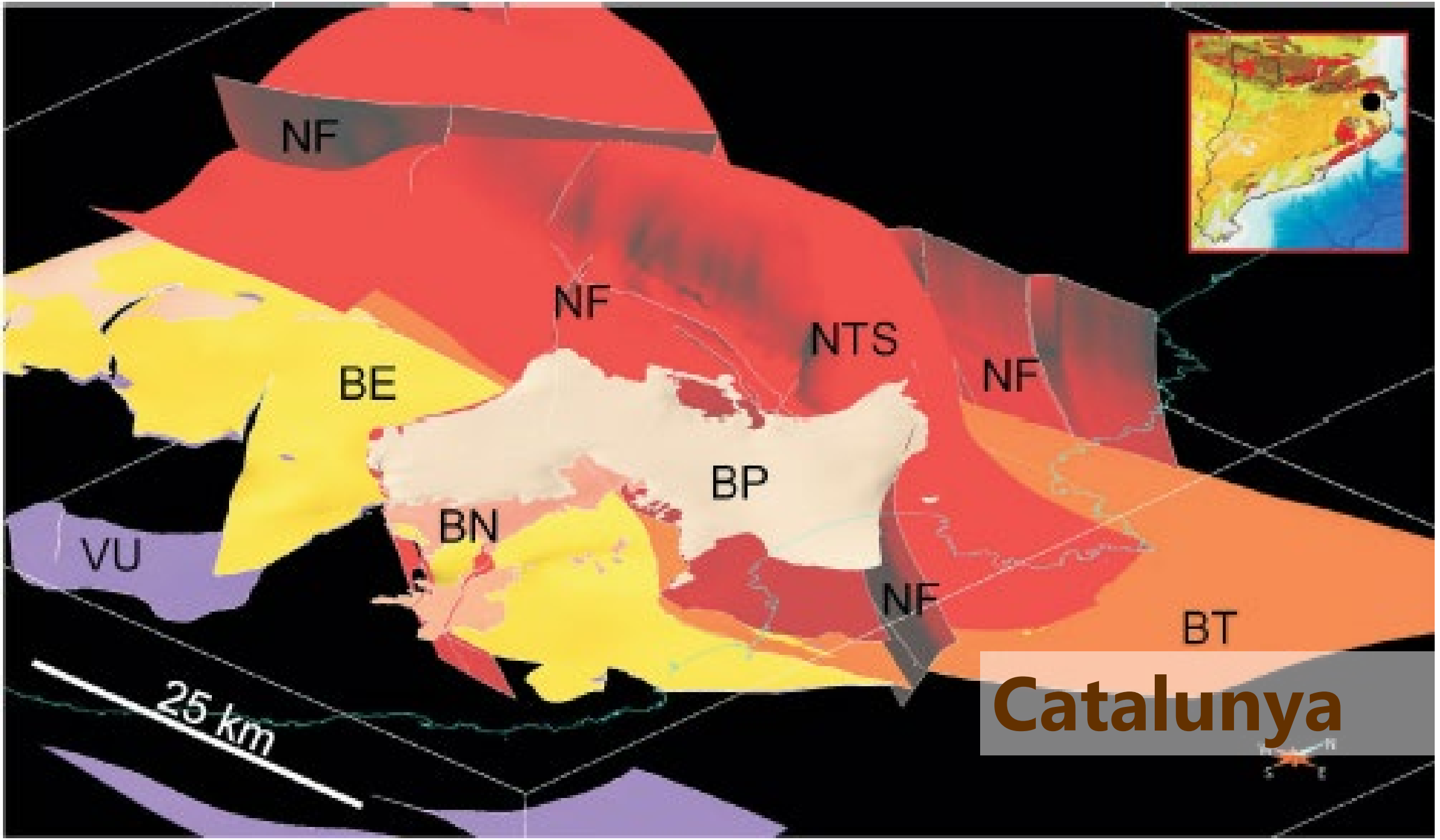


Austria

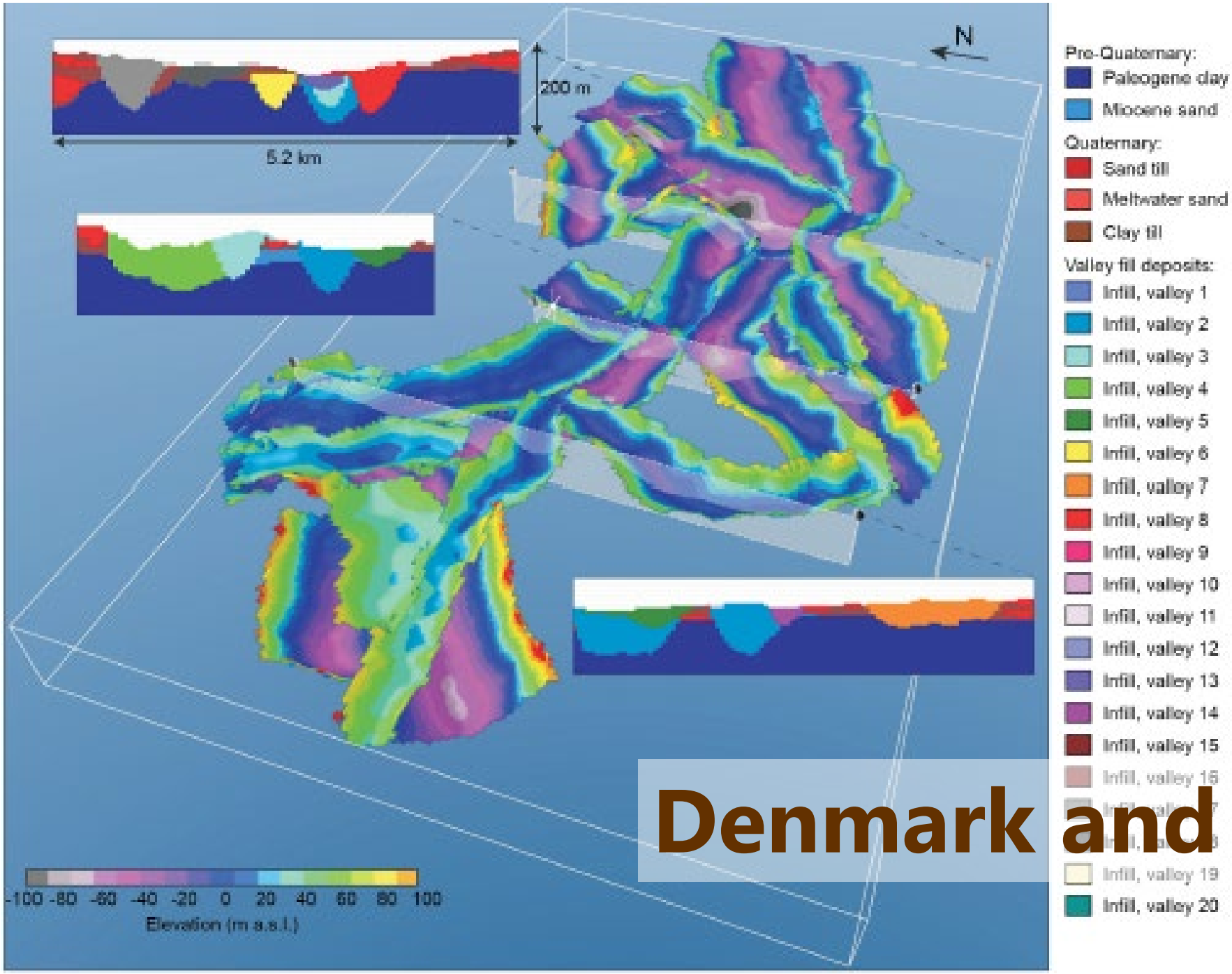

Bavaria


Elevation Meters (AMSL)
Western Canada Basin – 1781
MacKenzie Corridor – 468
Southern Ontario + Hudson Bay – 942
Total PC-Phan well markers = 3191
Meters
Meters
Meters
CO2 Sequestration - Estevan, Saskatchewan
Deep burial of green house gas helps to offset climate impact from hydrocarbon based energy production.
3D mapping of the bedrock layer can support better decision making for future site selection and reduction of risk.
CO2 Plume
Precambrian-Cambrian Boundary ~ 3.3 km depth
[from 3D seismic picks]

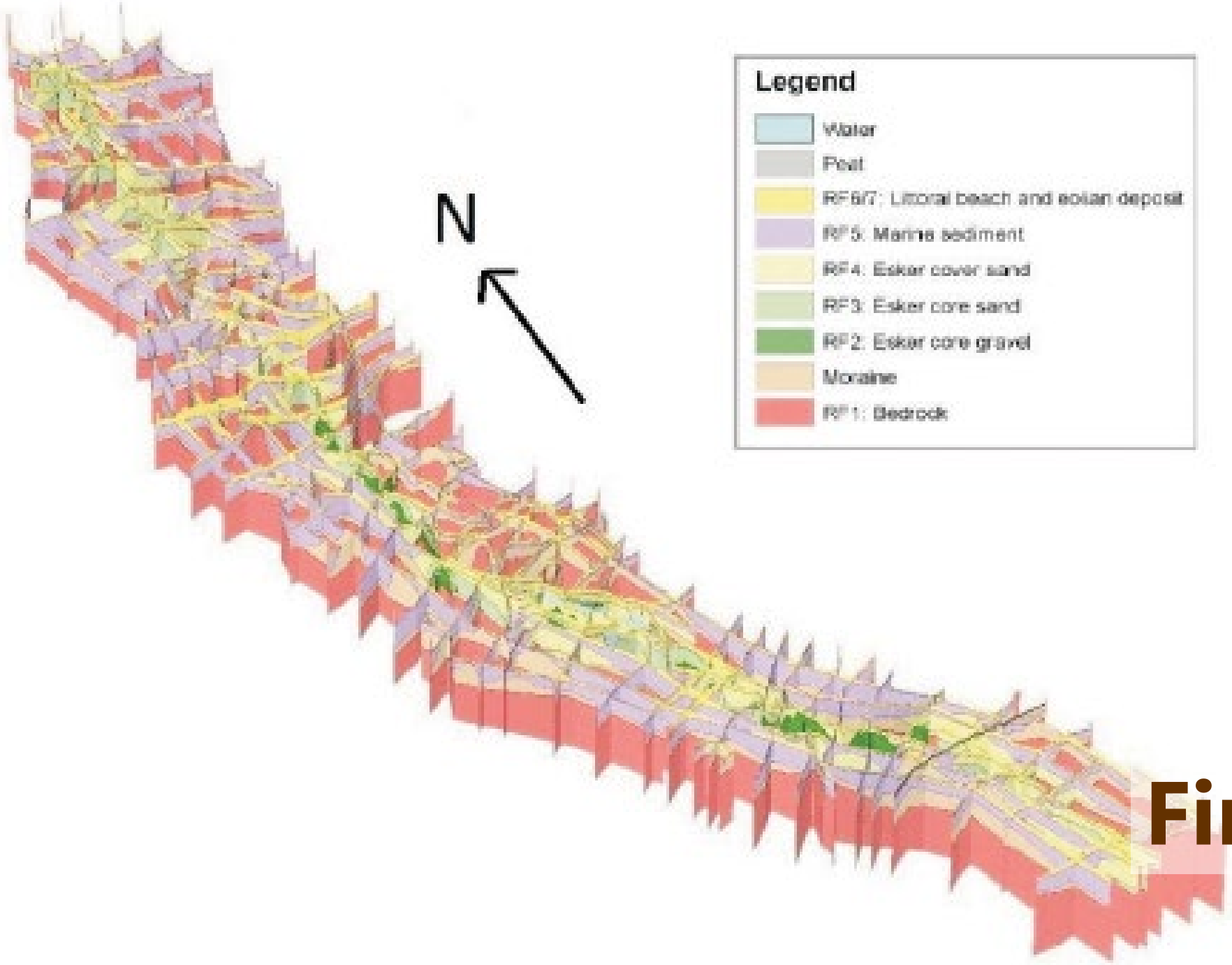
Canada


NF
NF
NTS
NF
BE
BP
BN
VU
NF
BT
25 km
Catalunya

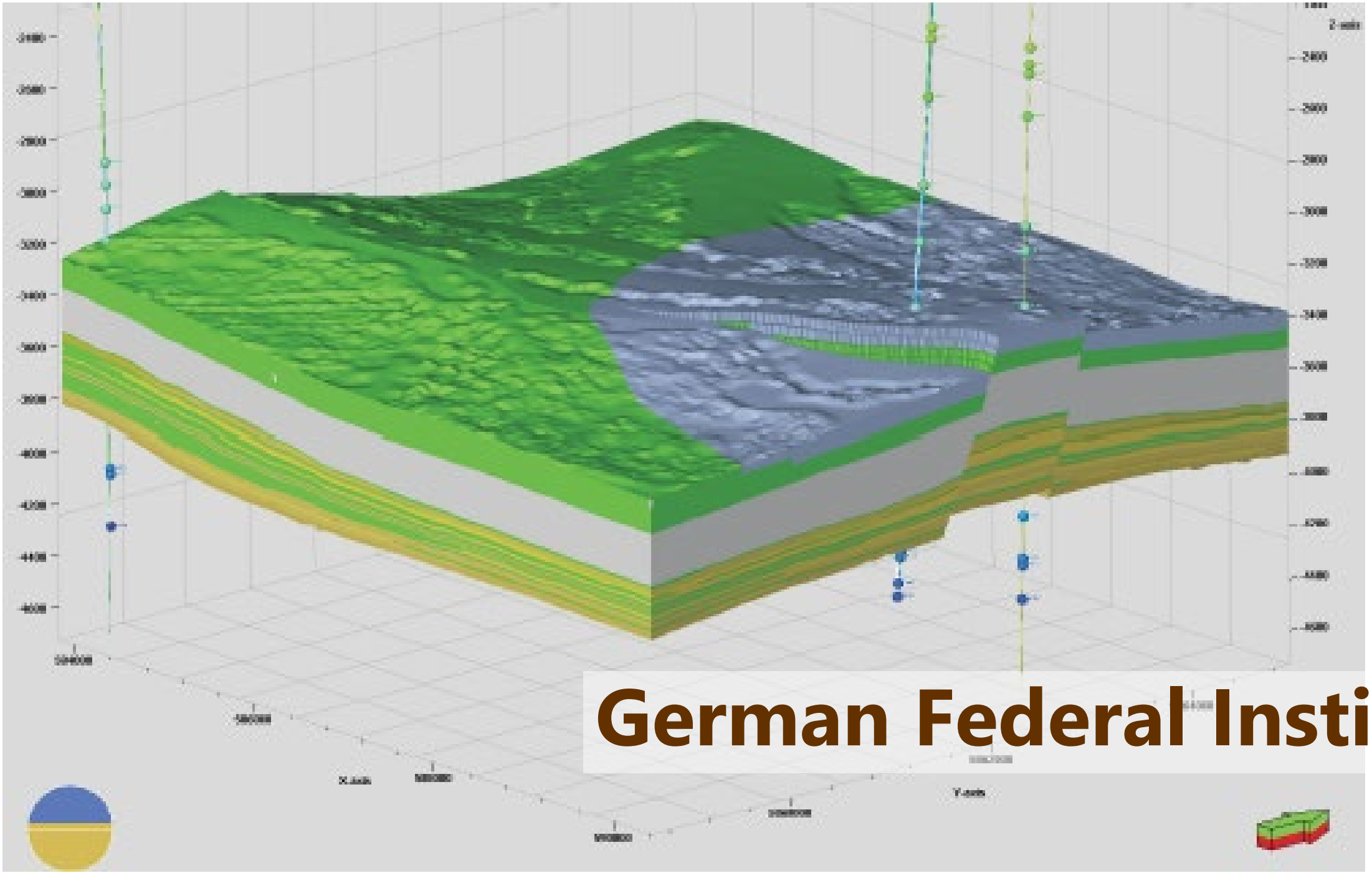
Czech Republic

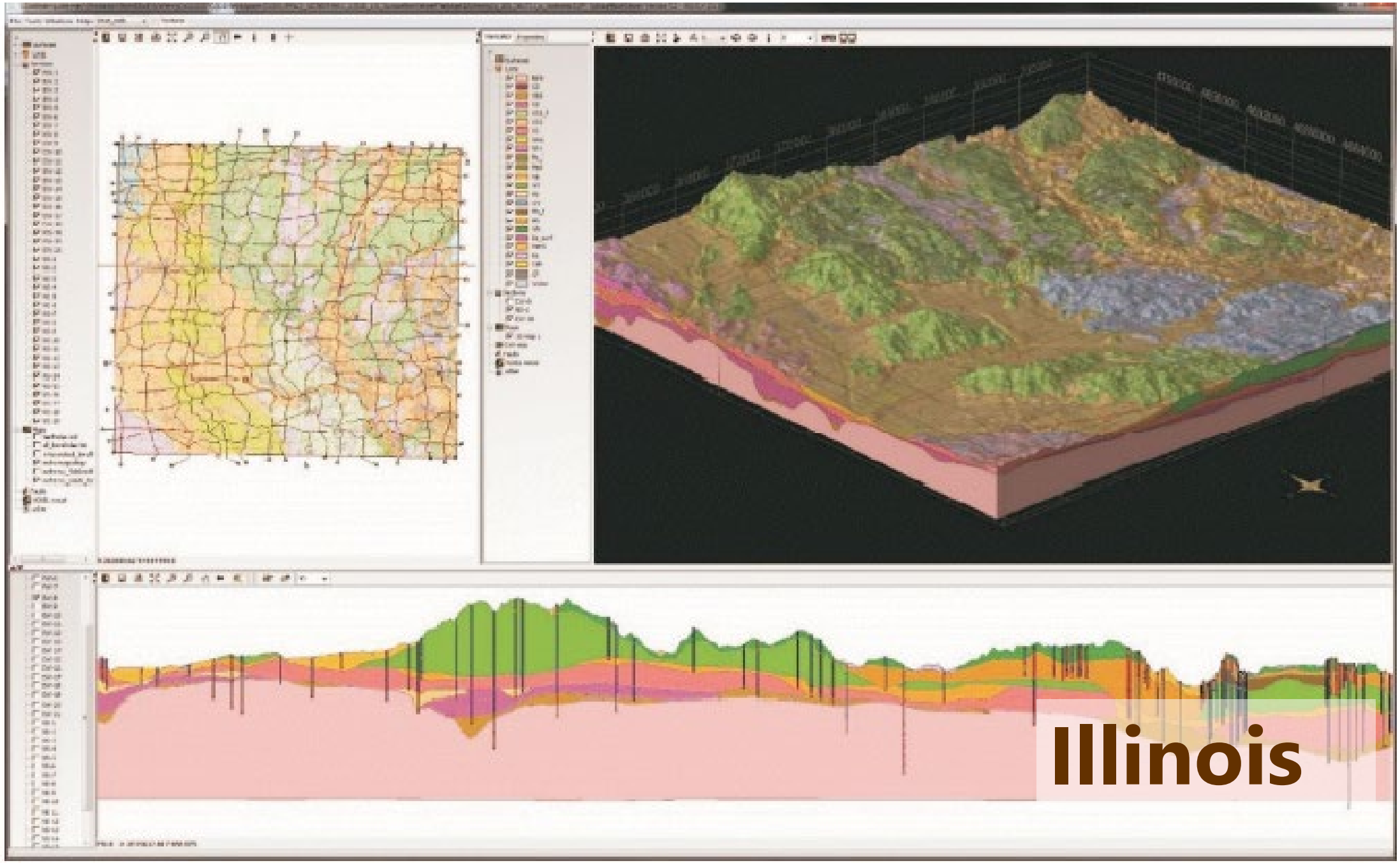


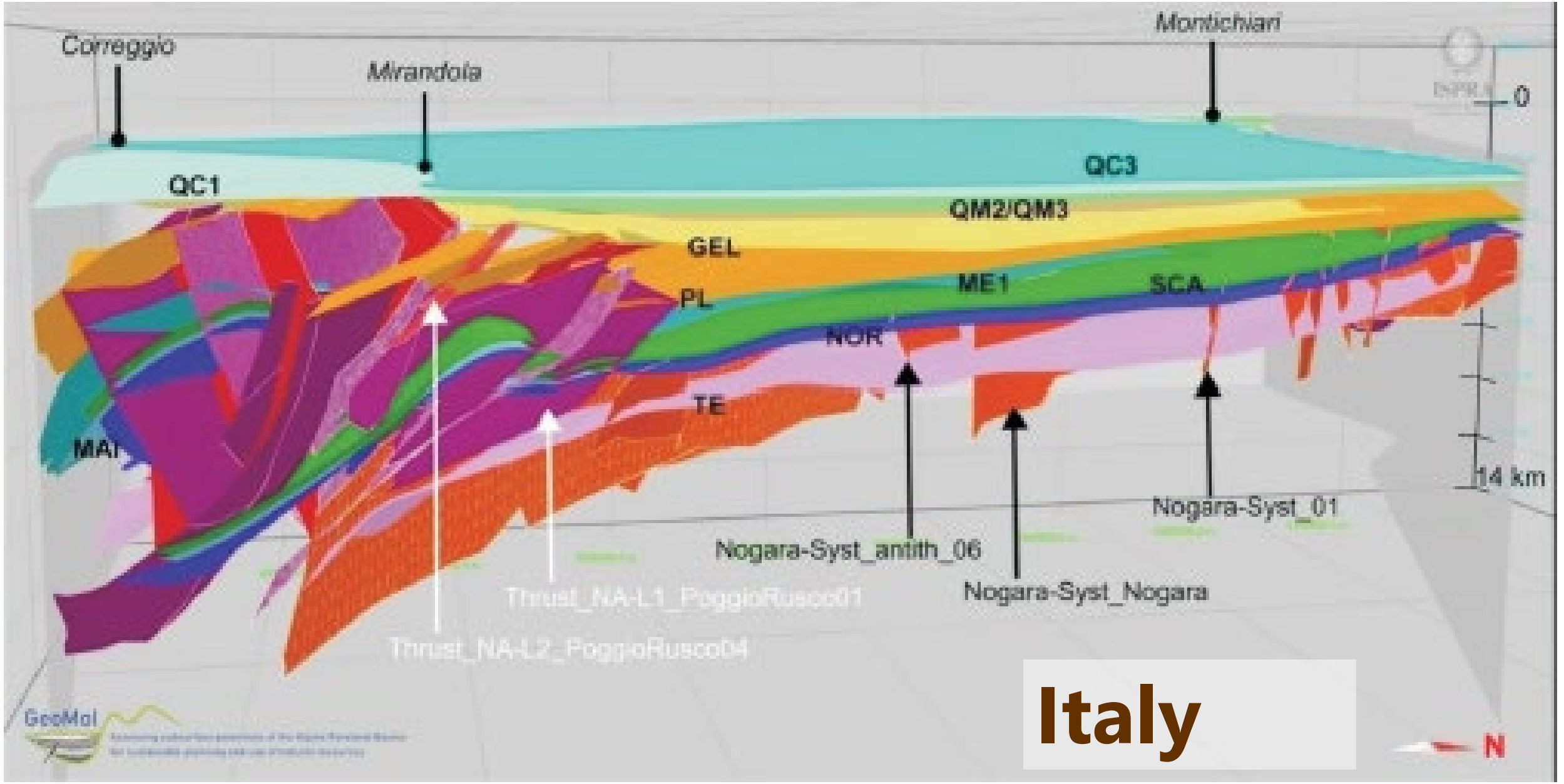
Denmark and Greenland

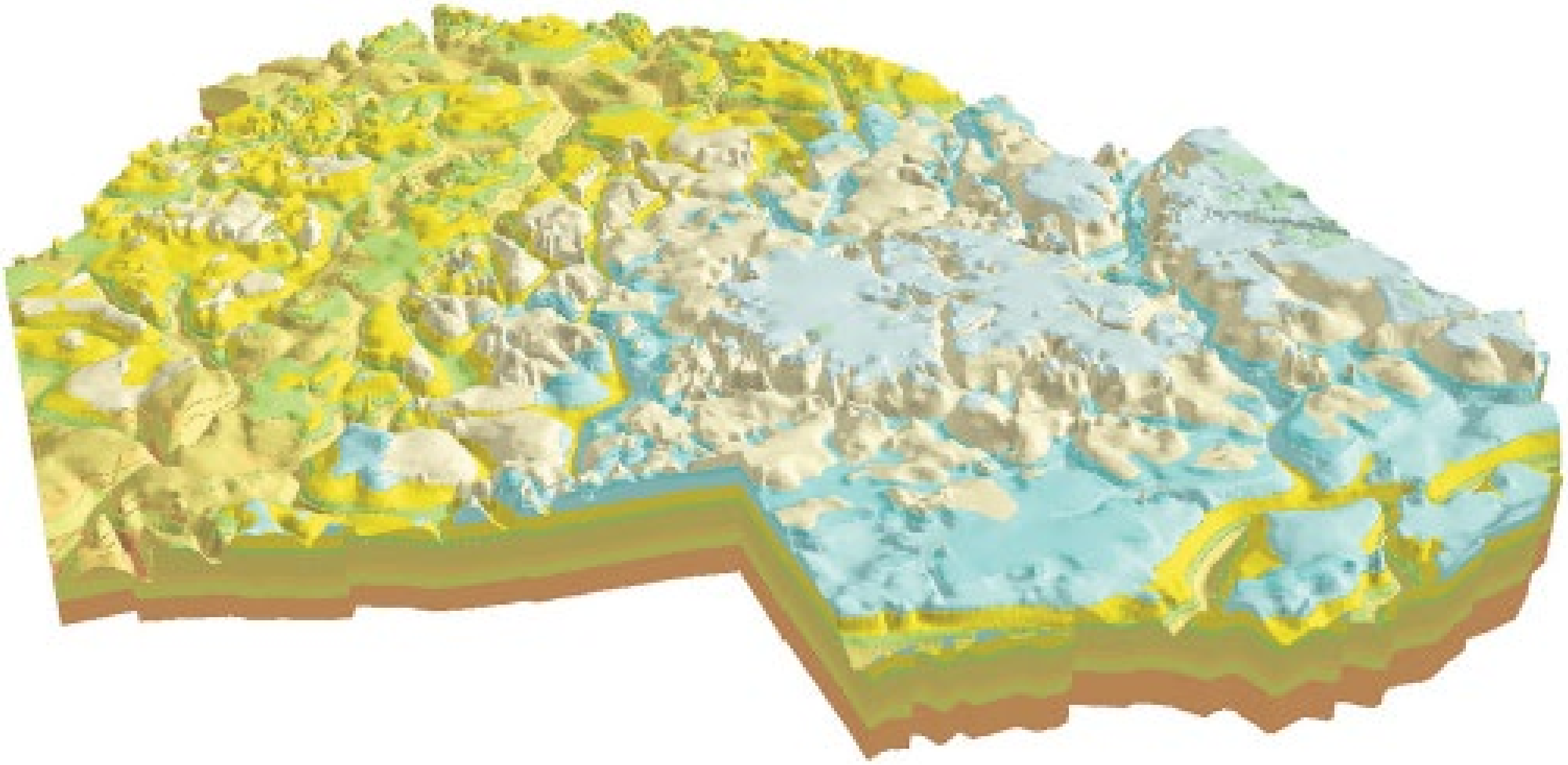

N
Legend
Water
Peat
RF6/7: Littoral beach and eolian deposit
RF5: Marine sediment
RF4: Esker cover sand
RF3: Esker core sand
RF2: Esker core gravel
Moraine
RF1: Bedrock

Finland

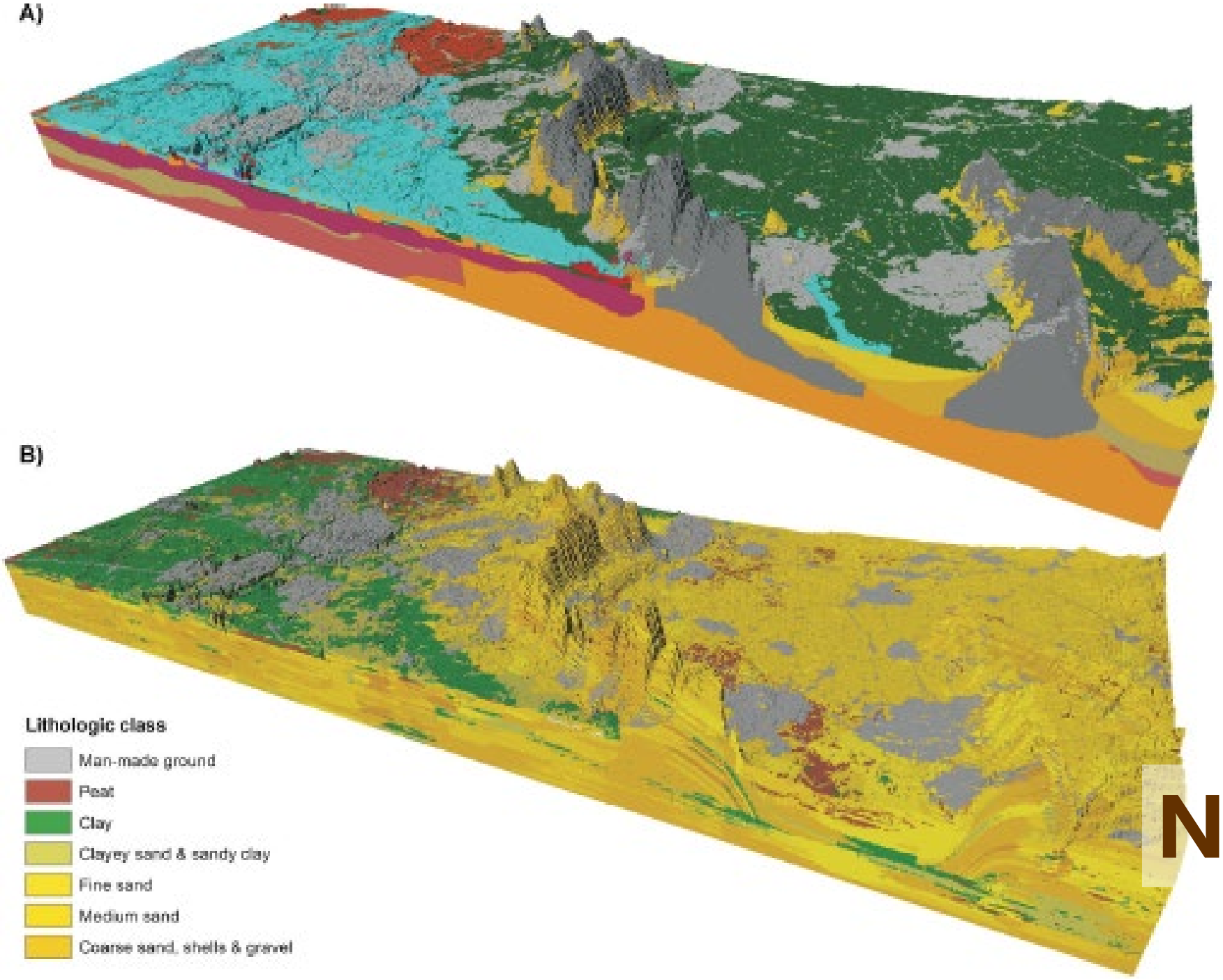

German Federal Institute


Illinois

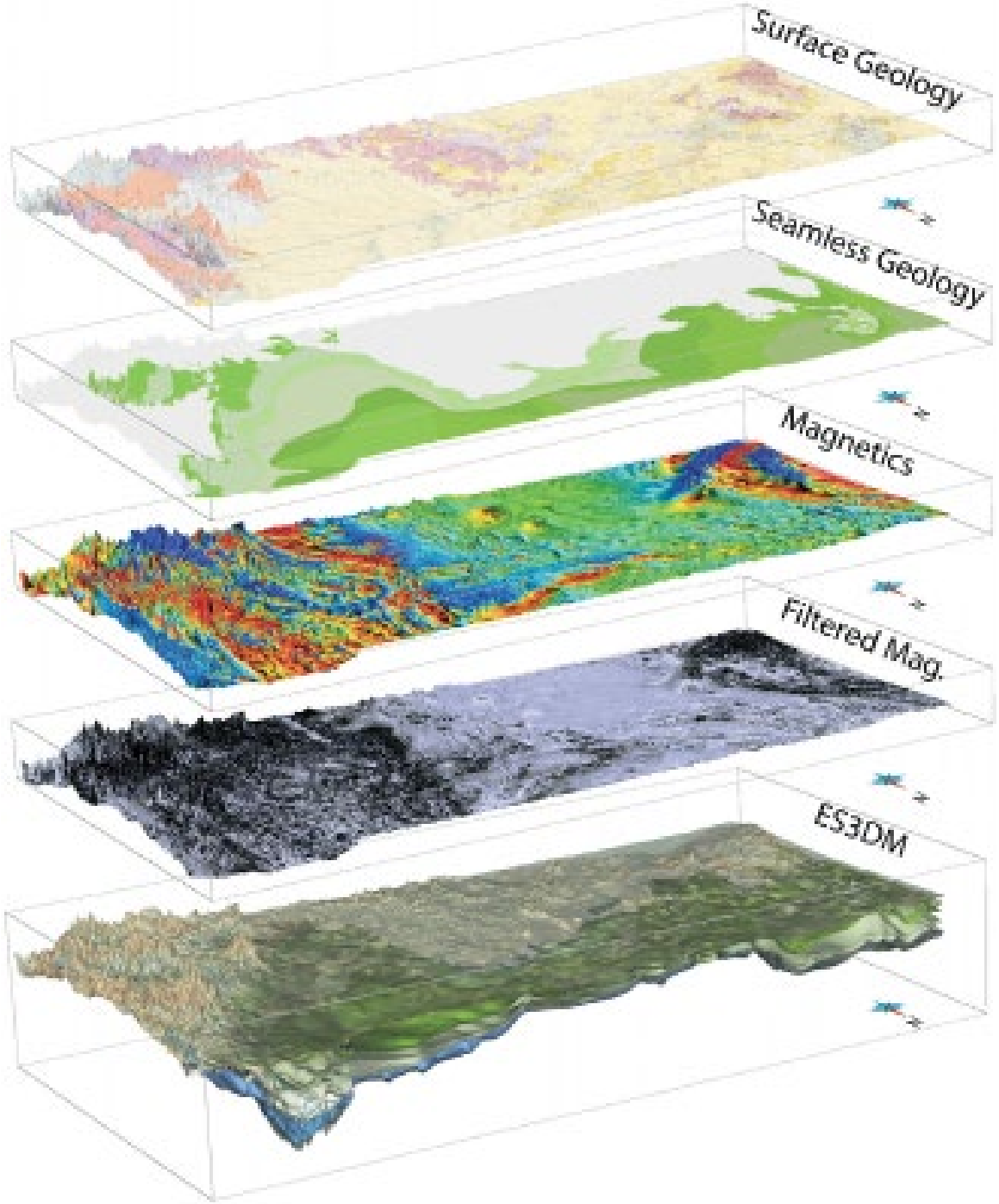

Correggio
Mirandola
Montichiari
0
QC1
QC3
QM2/QM3
GEL
PL
ME1
SCA
NOR
TE
MAI
14 km
Nogara-Syst_01
Nogara-Syst_anlith_06
Nogara-Syst_Nogara
Thrust_NA-L1_PoggioRusco01
Thrust_NA-L2_PoggioRusco04
GeoMol
N
Italy



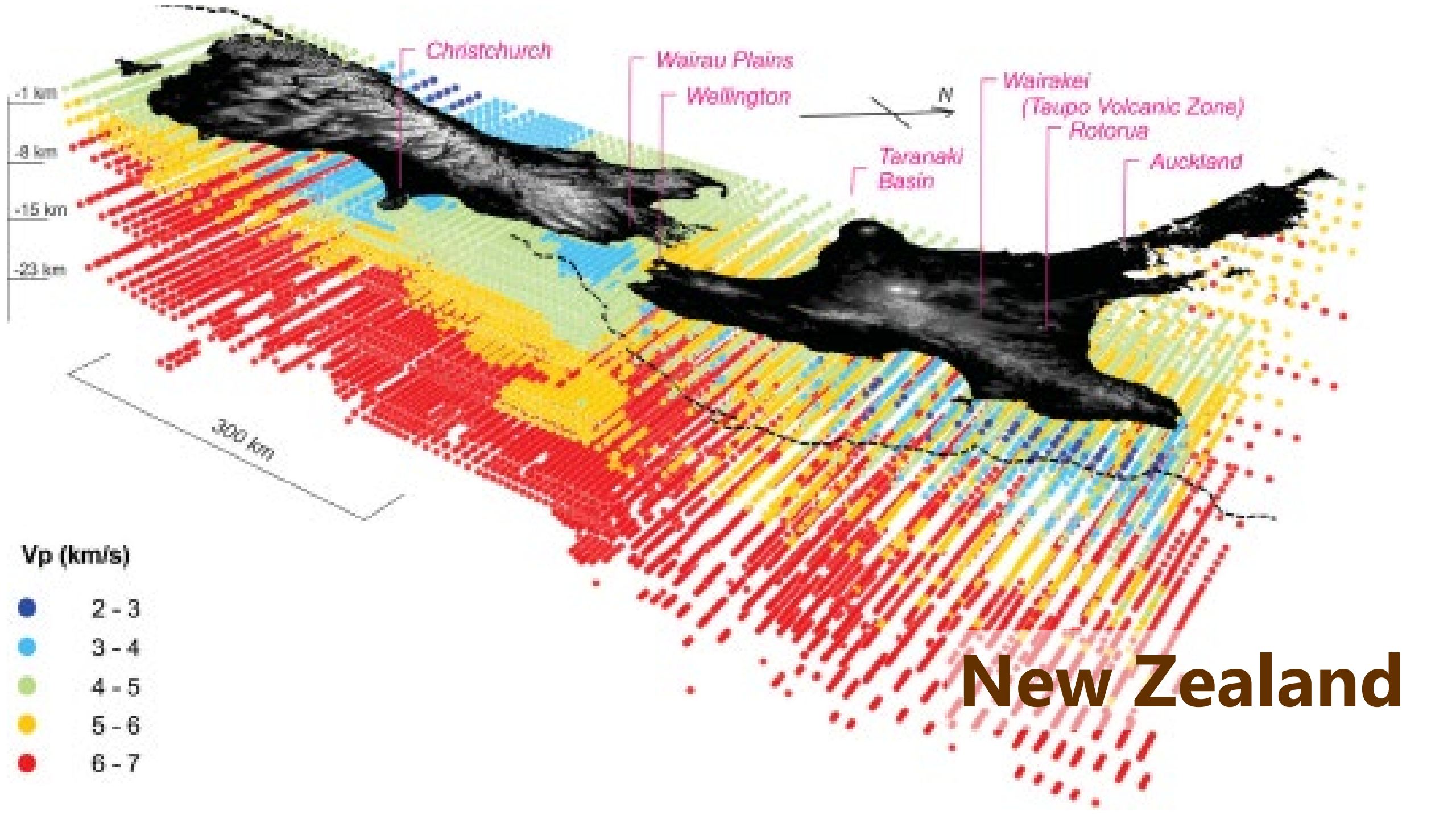
Minnesota

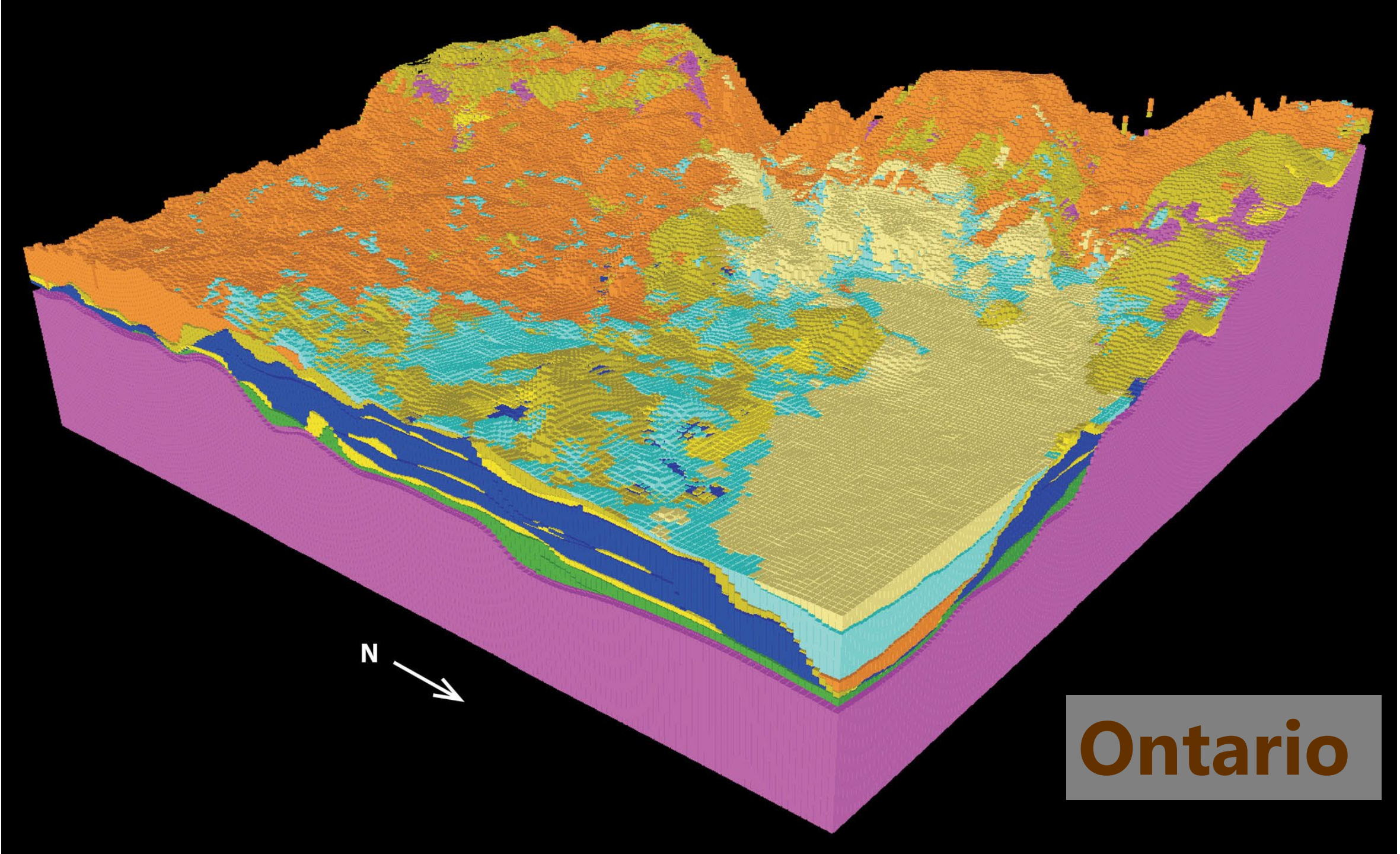


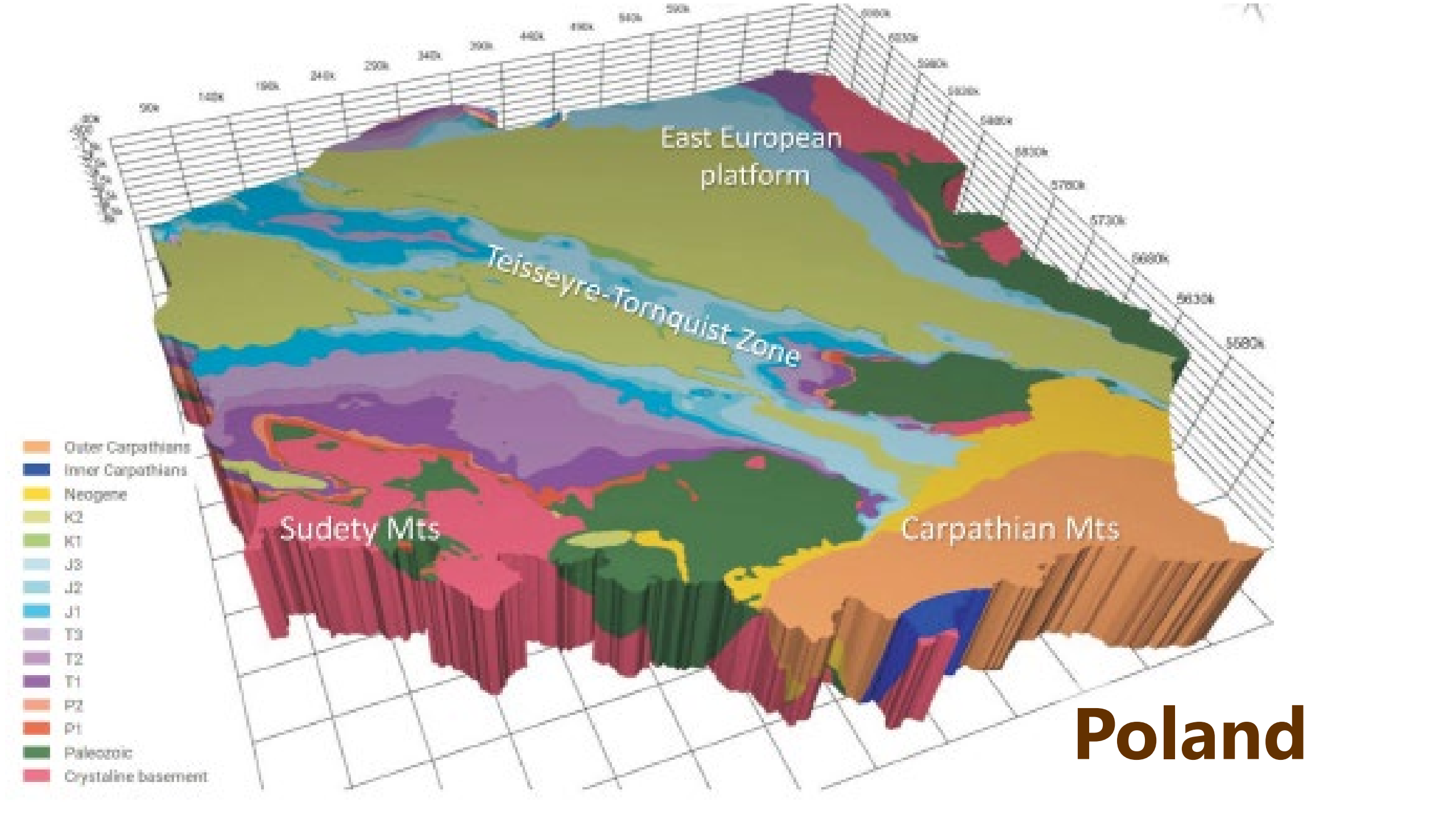
Netherlands



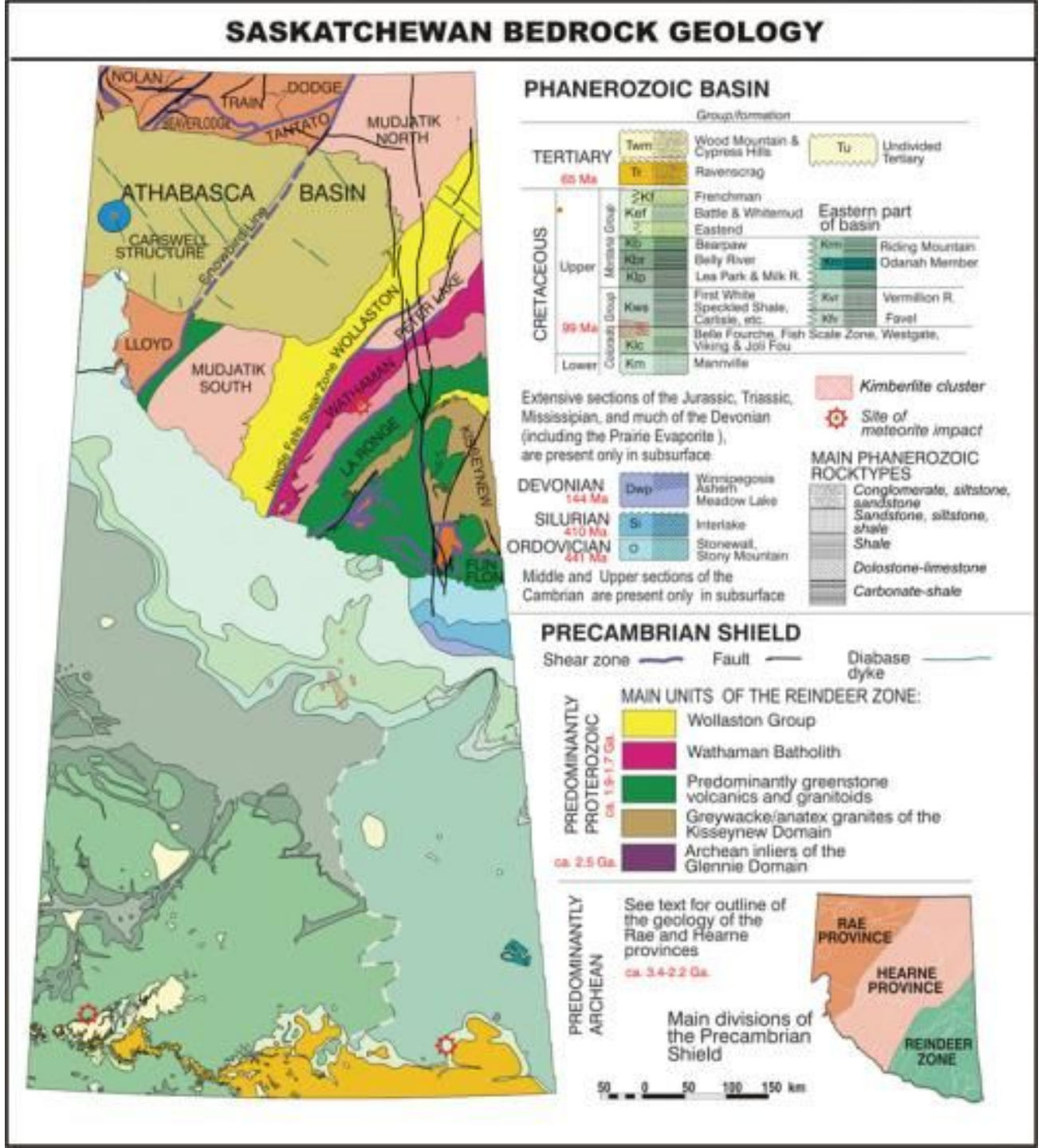
New South Wales


Christchurch
Wairau Plains
Wellington
N
Wairakei
(Taupo Volcanic Zone)
Rotorua
Taranaki
Basin
Auckland
-1 km
-8 km
-15 km
-23 km
300 km
Vp (km/s)
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
New Zealand


N
Ontario

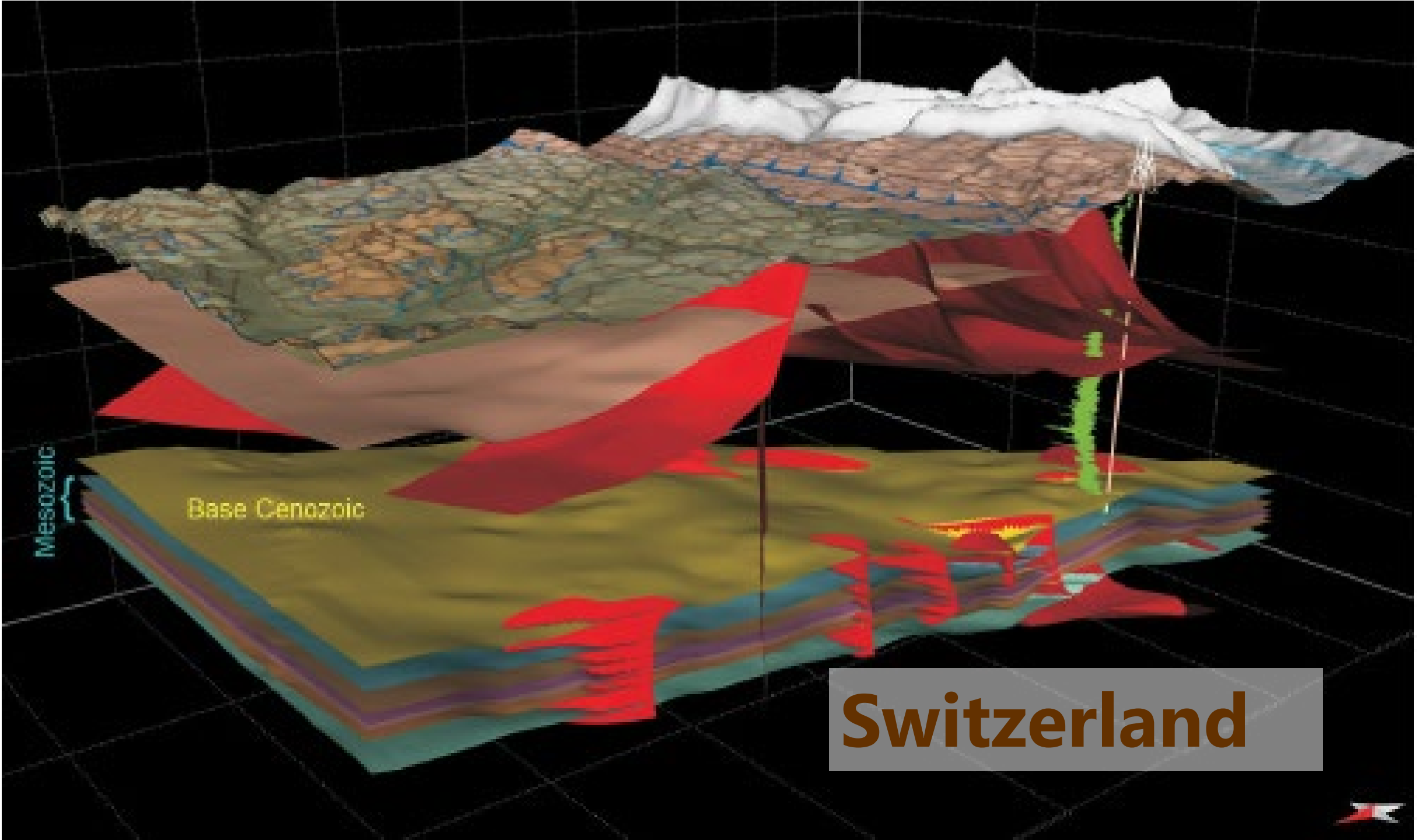

East European platform
Teisseyre-Tornquist Zone
Sudety Mts
Carpathian Mts
Outer Carpathians
Inner Carpathians
Neogene
K2
K1
J3
J2
J1
T3
T2
T1
P2
P1
Paleozoic
Crystaline basement

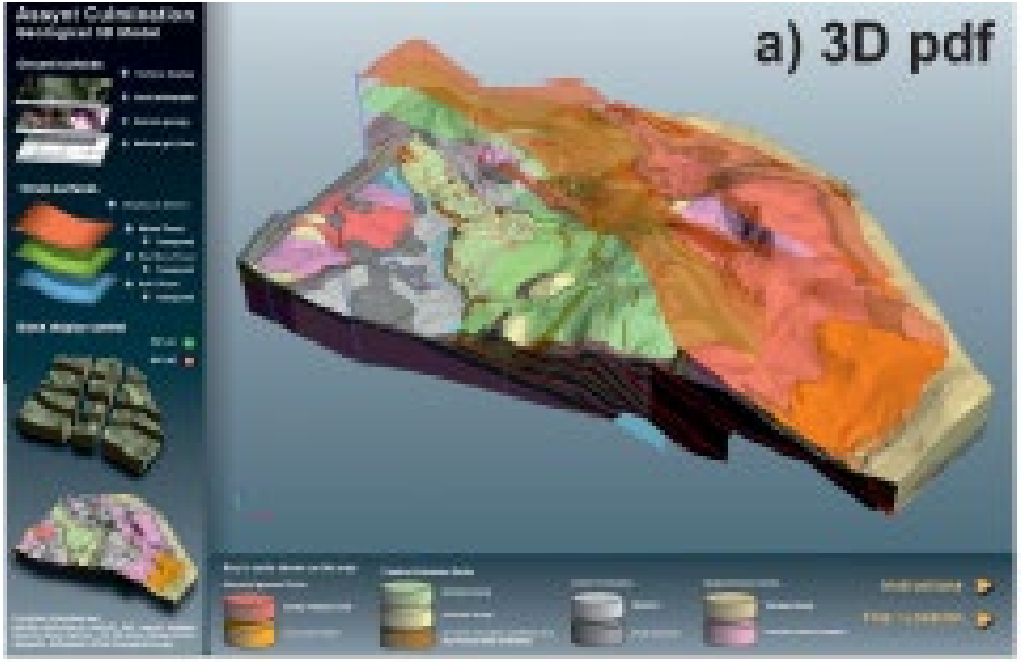
Poland

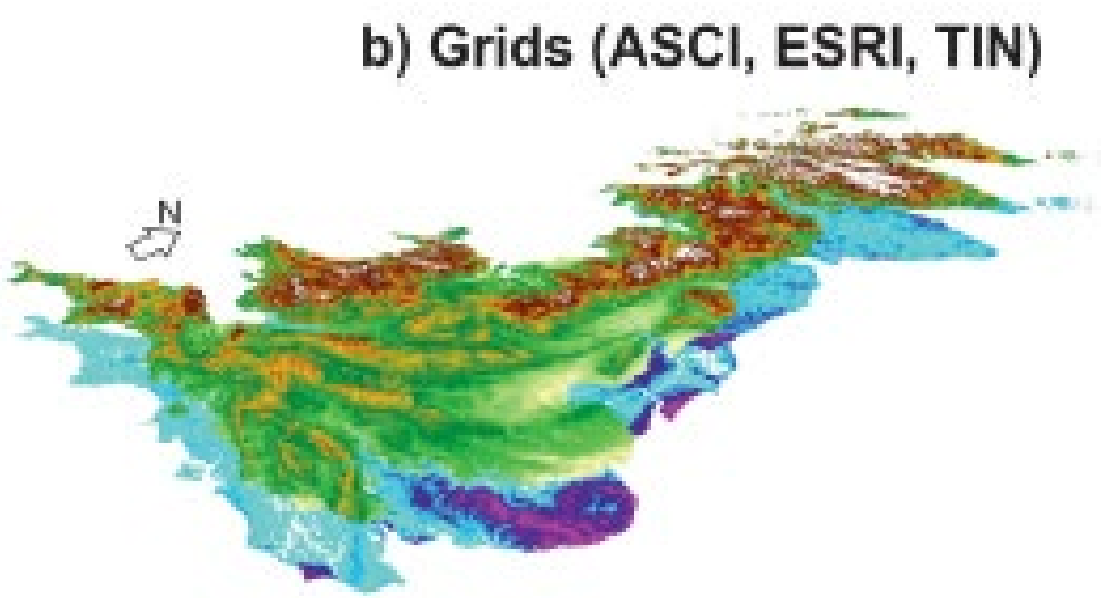


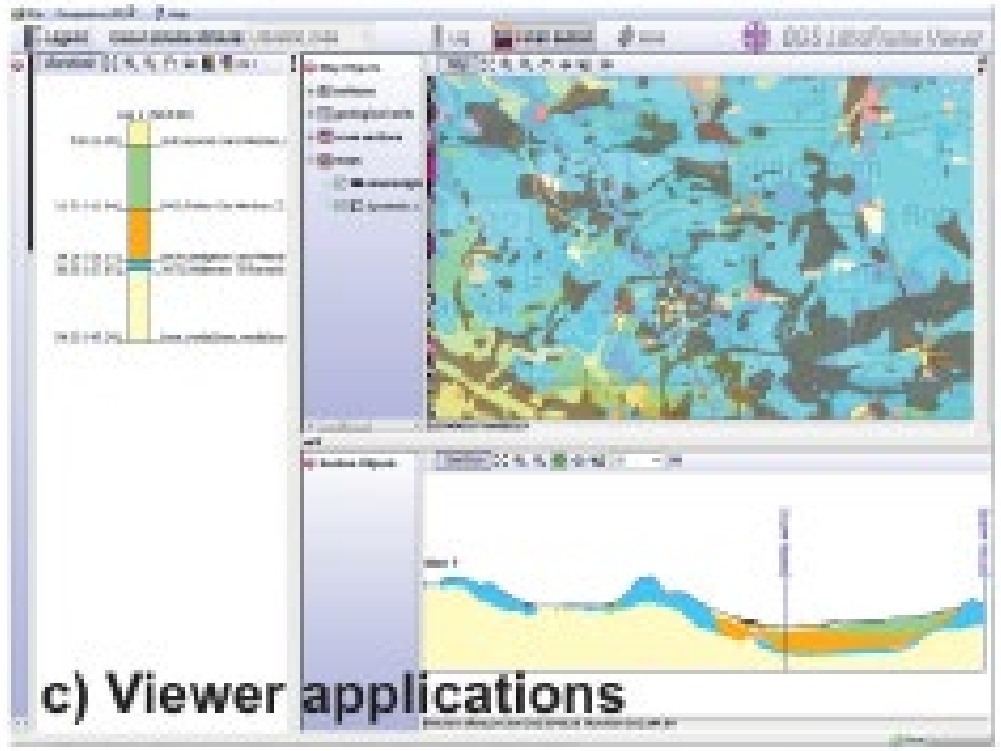
Saskatchewan

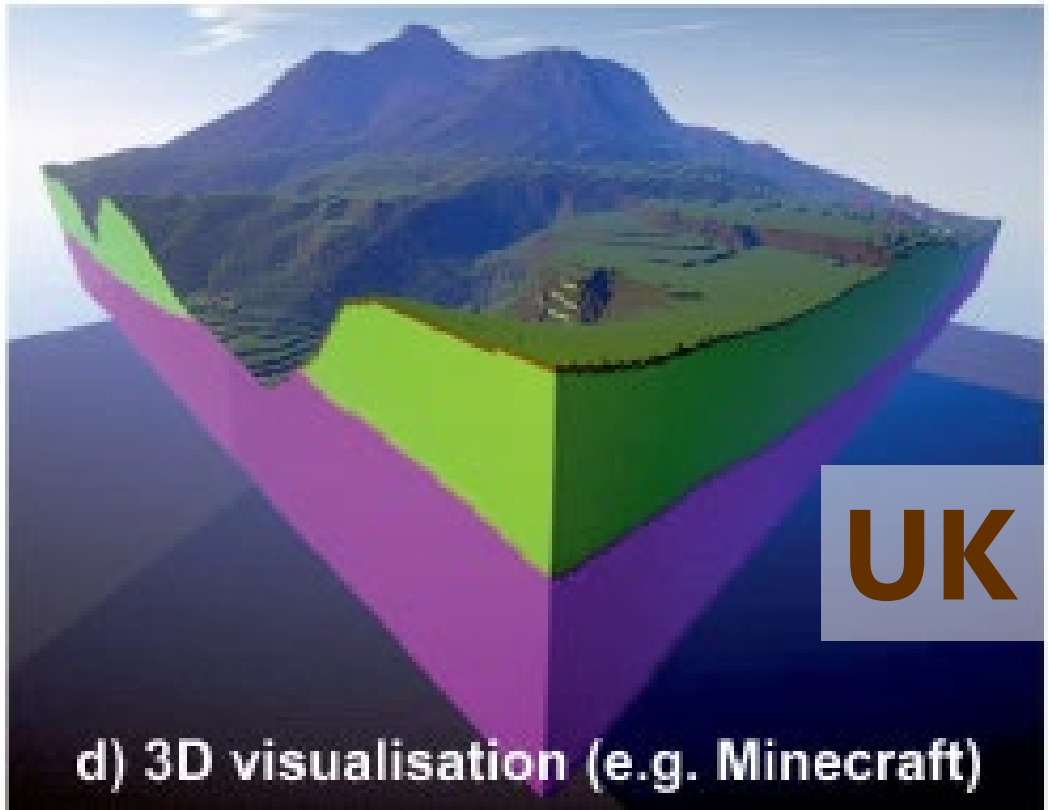

GEOLOGI | 3D
Sveriges berggrund
FEEDBACK
3D-PROJEKT
GENOMSKINLIGHET
Sweden


Mesozoic
Base Cenozoic
Switzerland


a) 3D pdf

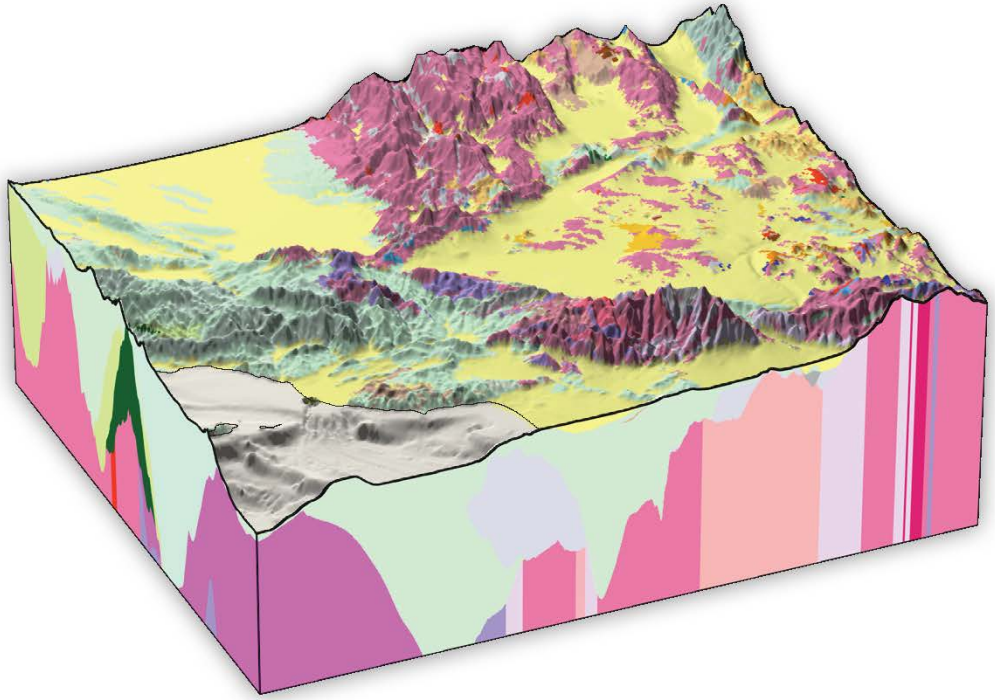

b) Grids (ASCI, ESRI, TIN)
N


c) Viewer applications


UK
d) 3D visualisation (e.g. Minecraft)

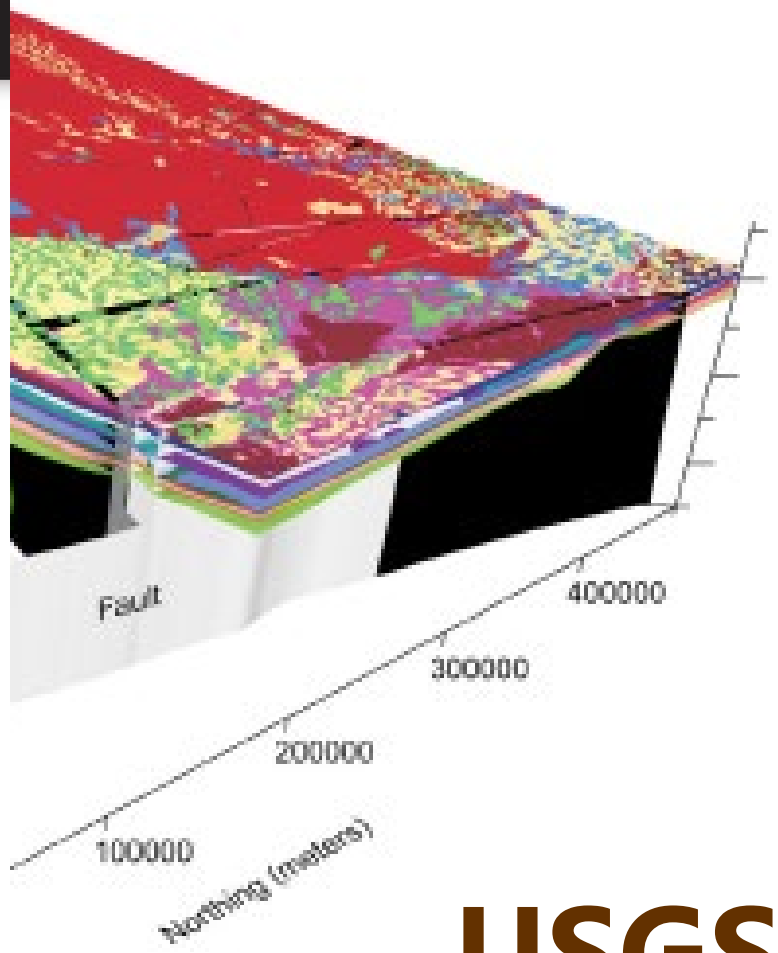
USGS
science for a changing world

3D Geologic Framework for Use with the U.S. Geological Survey National Crustal Model, Phase 1—Western United States



Open-File Report 2019–1081

U.S. Department of the Interior
U.S. Geological Survey



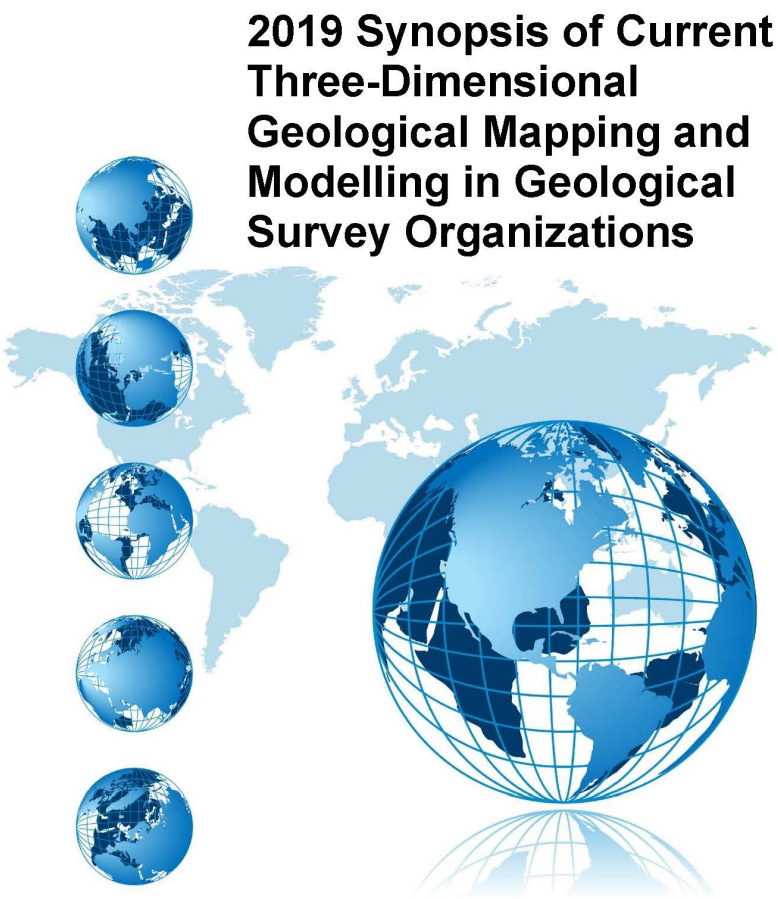
USGS

mal Conic Coordinate System

Cherokee Group
Atoka Group
Thirteen Finger lime
Morrow shale
Springer Fm
Woodford Shale
HuntonFML top
Sylvan Shale
Viola Fm
Simpson Group
Arbuckle Group
Precambrian

AER/AGS Special Report 112

Alberta Energy Regulator



AGS ALBERTA GEOLOGICAL SURVEY

- 3D geology is essential for management of energy, minerals, water, and hazards
- 3D geology is essential for infrastructure design
- 3D geology is essential for understanding the history of life, and the structure of our planet
- An emerging concept is Digital Twin
- A Digital Twin is a dynamic model of something that you are managing
- 3D geology is a digital twin of our landmass

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