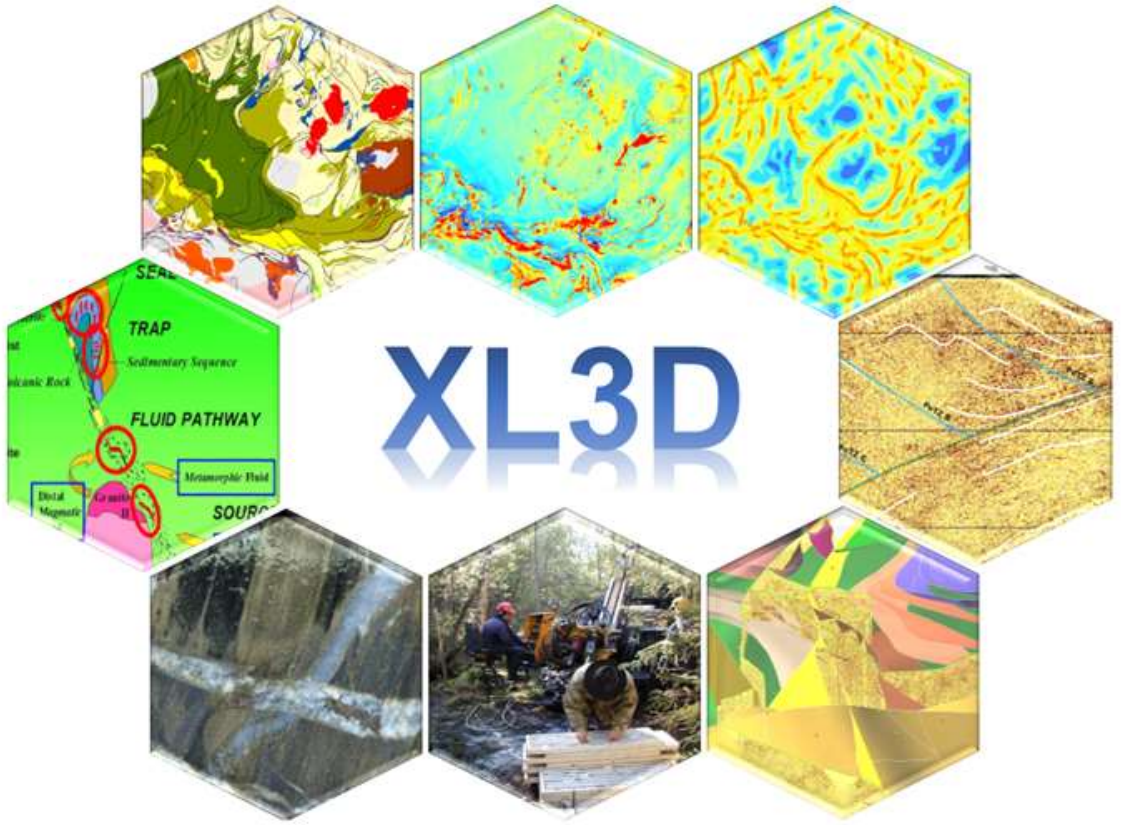


Geological 3D modelling – what did we learn?

LAPLAND 3D – XL3D PROJECT WEBINAR 17.6.2020 - Tuomo Karinen

GTK

Programme for Sustainable Growth and Jobs

Leverage from the EU 2014–2020

European Union
European Regional Development Fund

STUDY AREA

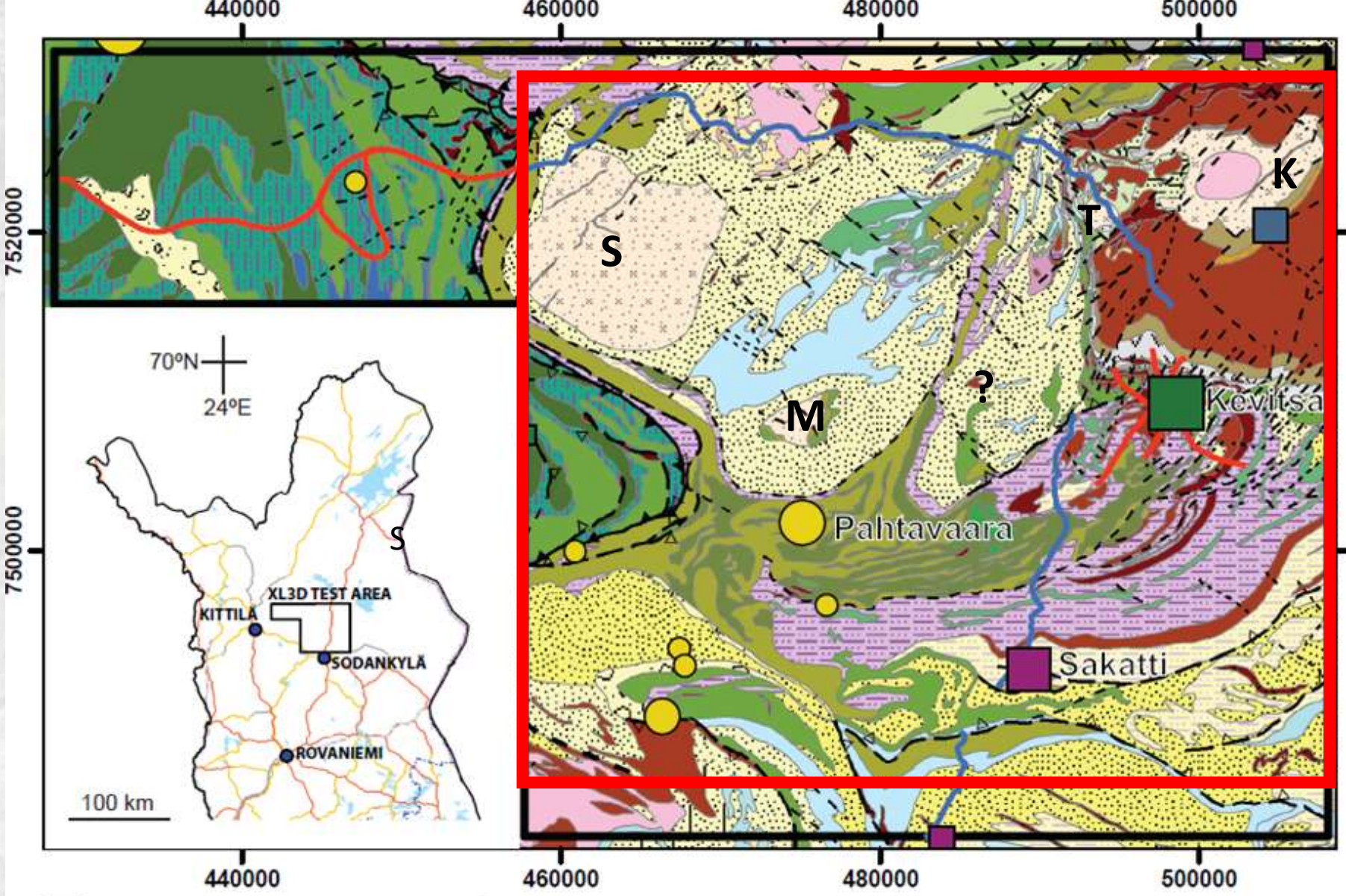
Key points:

-Basement topography*

-Stratigraphy

-Structures

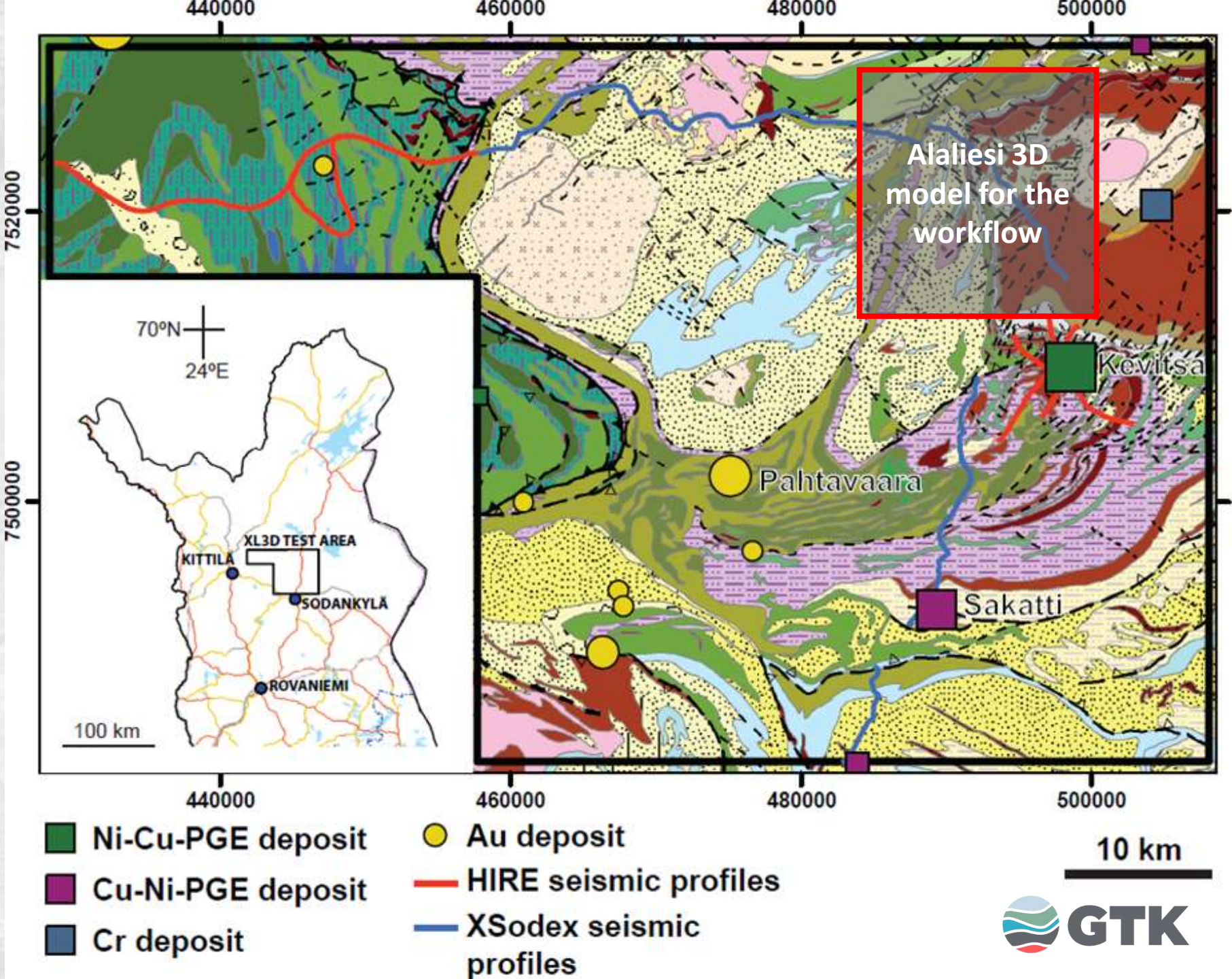
*Basement domes:
S=Soasjoki, M=Möykkelmä, T=Tojottama, K=Kiviaapa, ? = anonymous



STUDY AREA

Alaliesi area:

-For the workflow



…about building a regional scale 3D models:

It is generally required that a 3D model is in harmony with existing data, but during regional model construction **it is also important to consider the geological evolution** of the study area.

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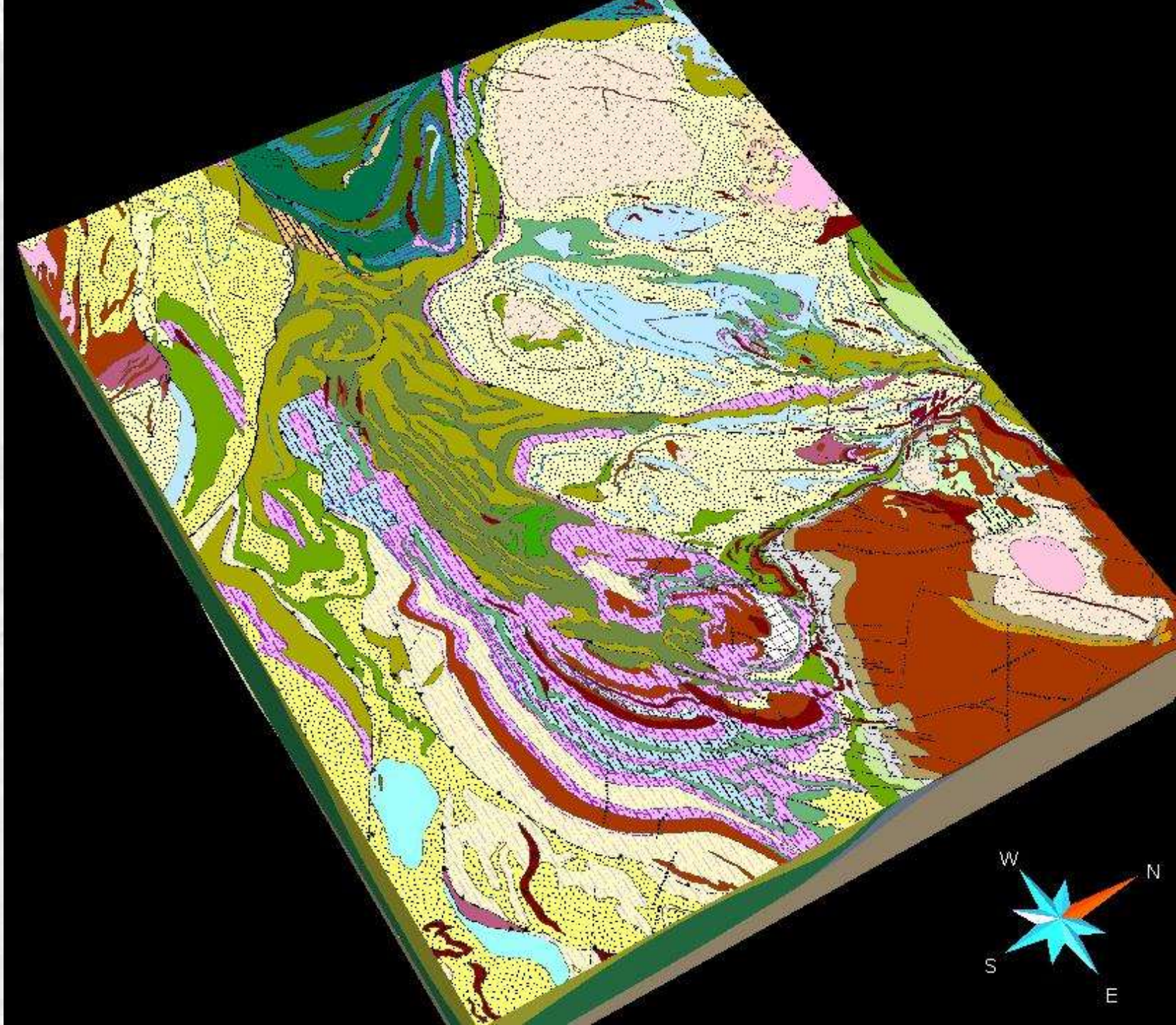
REGIONAL MODEL

- View of the geological map from SE

Modelled elements

- Tectonic zones
- Nattanen suite intrusion
- Kittilä suite
- Sattasvaara formation
- Kevitsa intrusion
- Matarakoski formation
- Sodankylä group
- Kuusamo group
- Koitelainen intrusion
- Salla group
- Basement complex



REGIONAL MODEL

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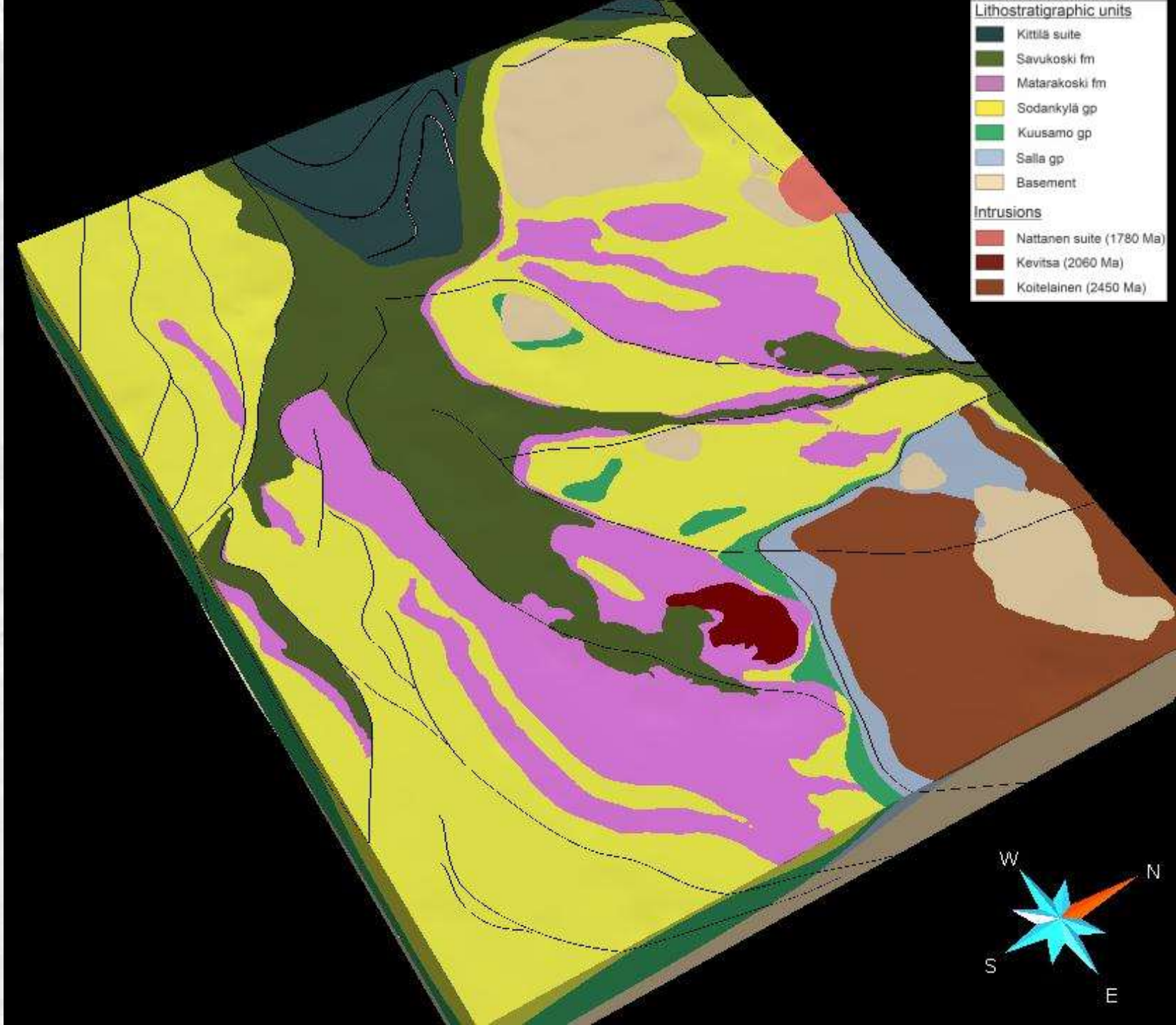

REGIONAL MODEL

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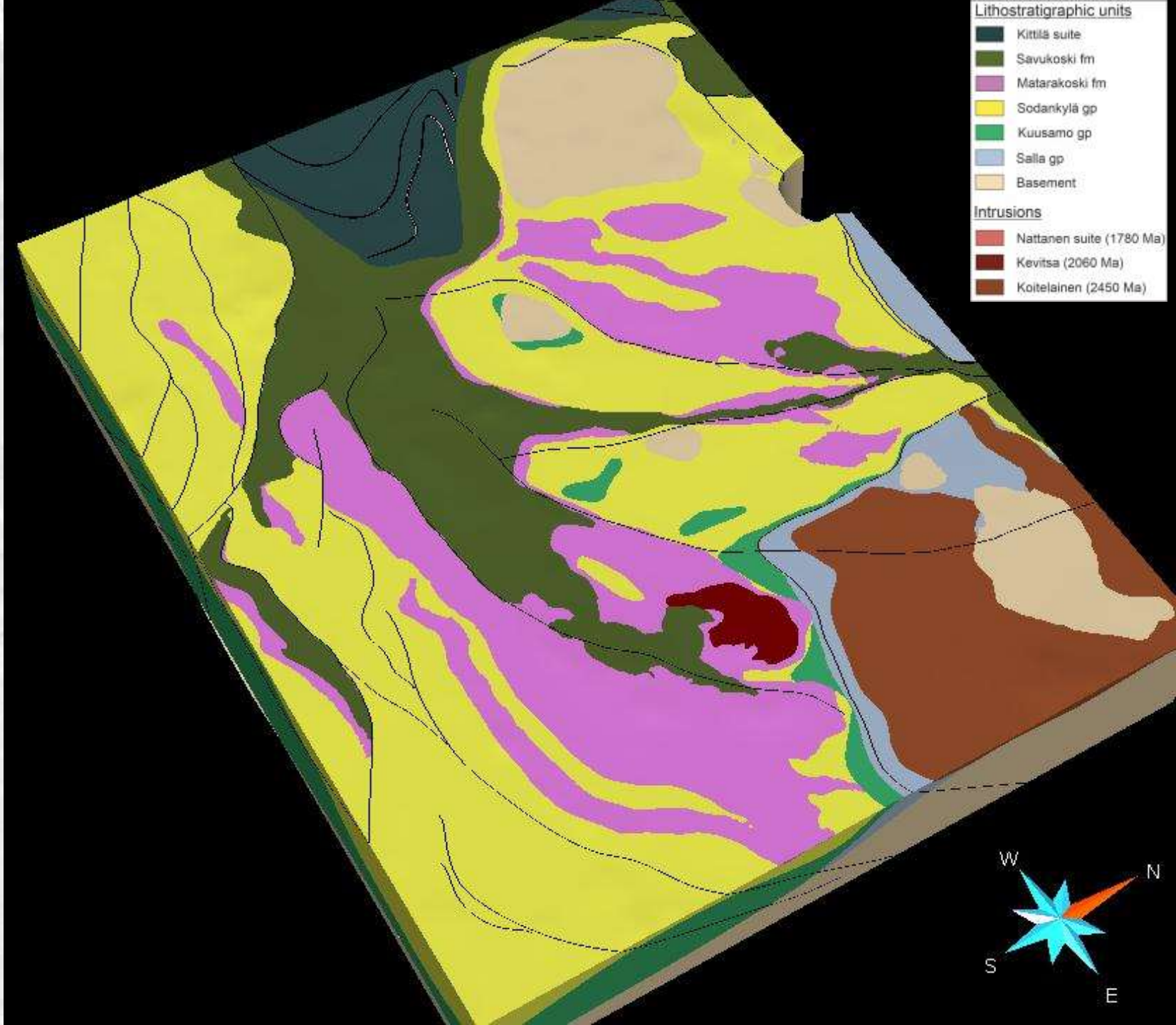

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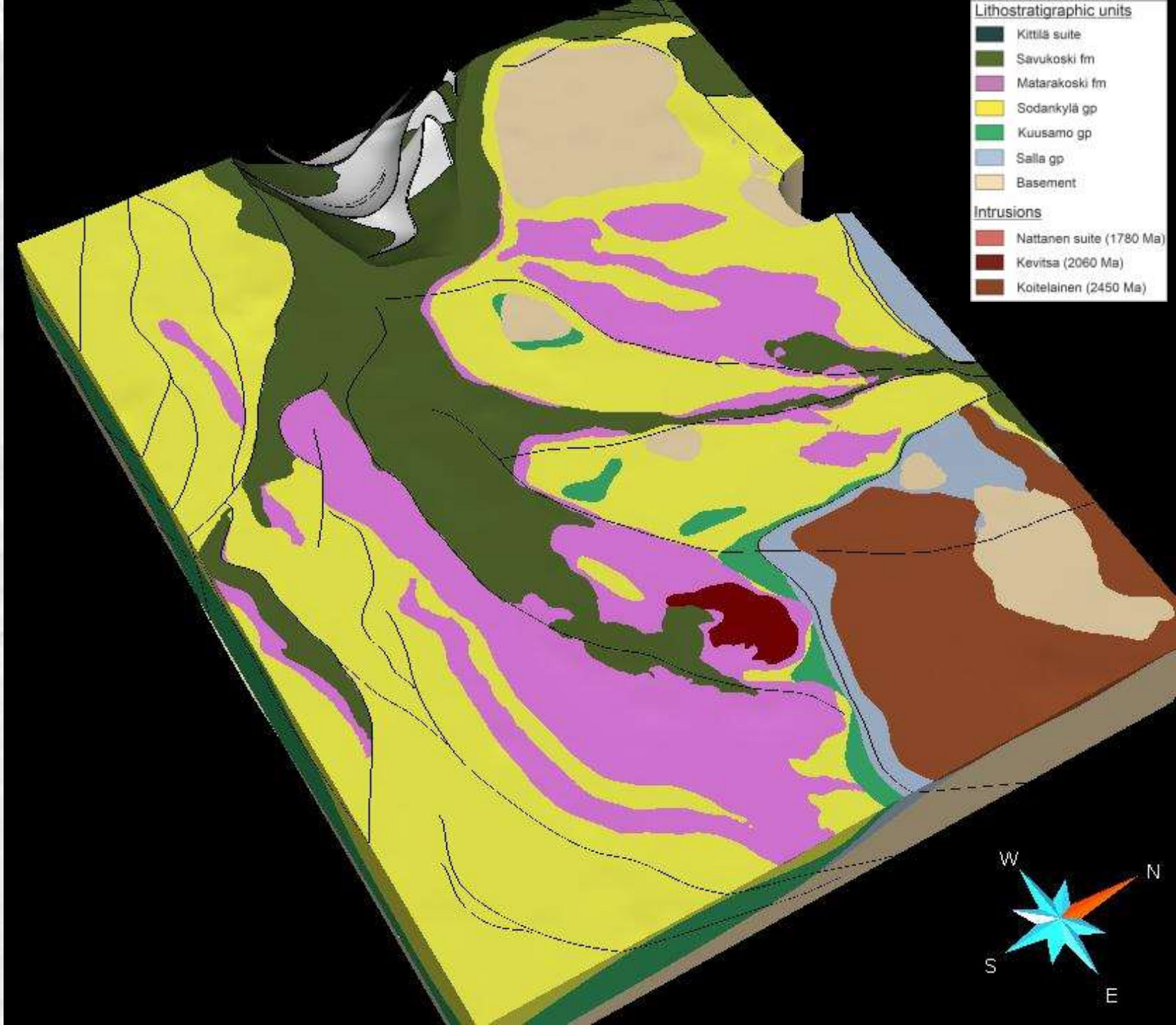

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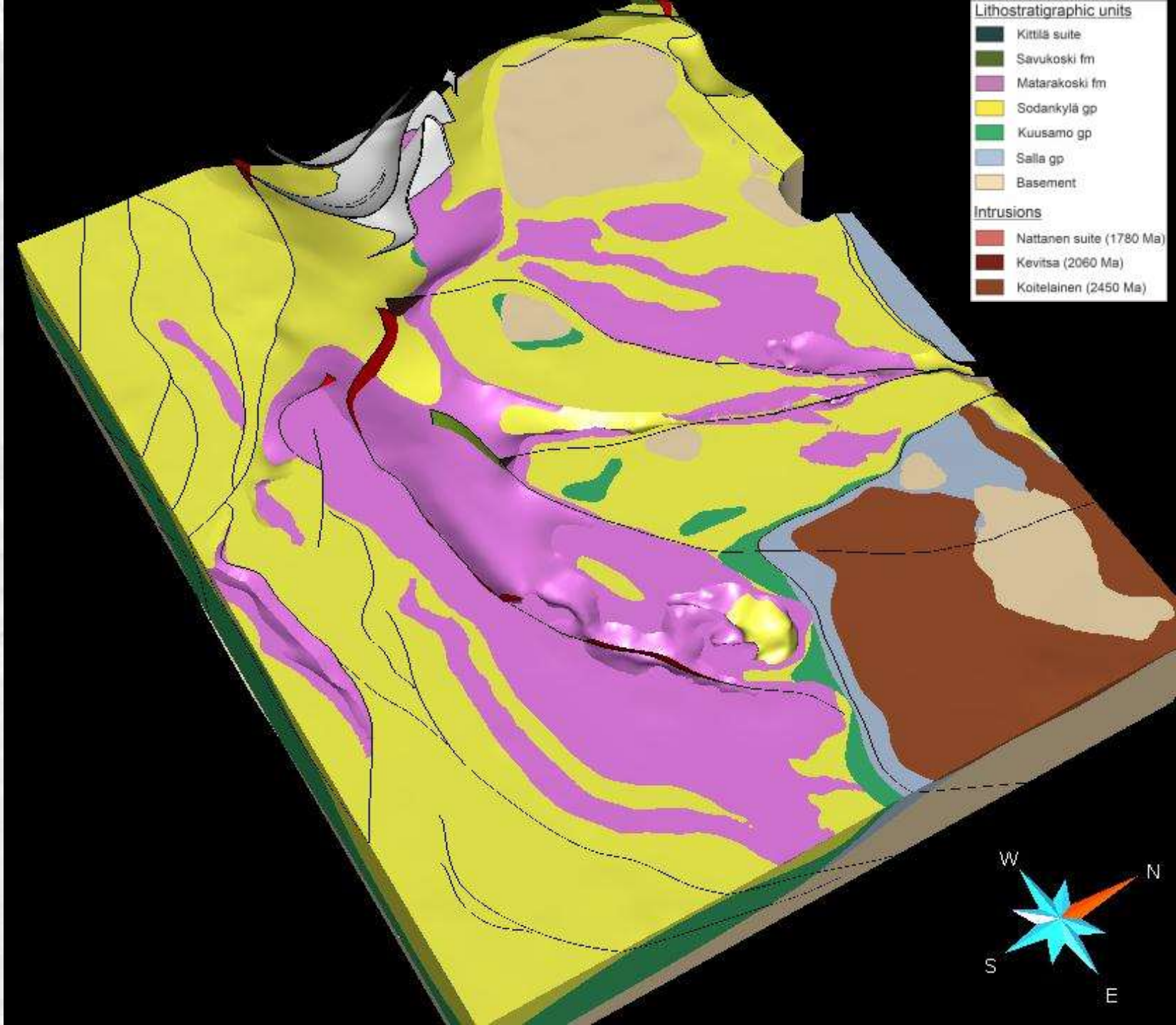

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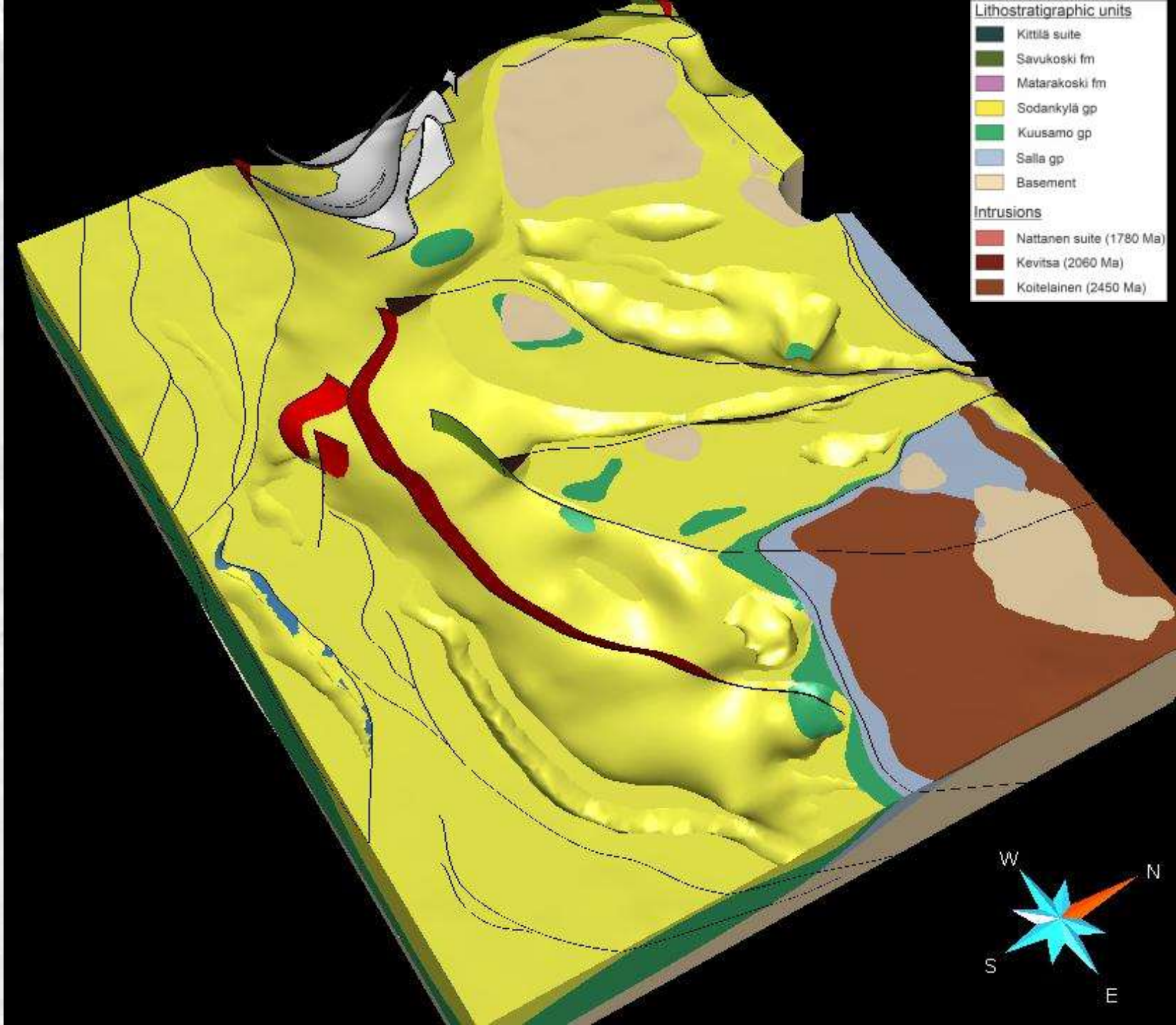

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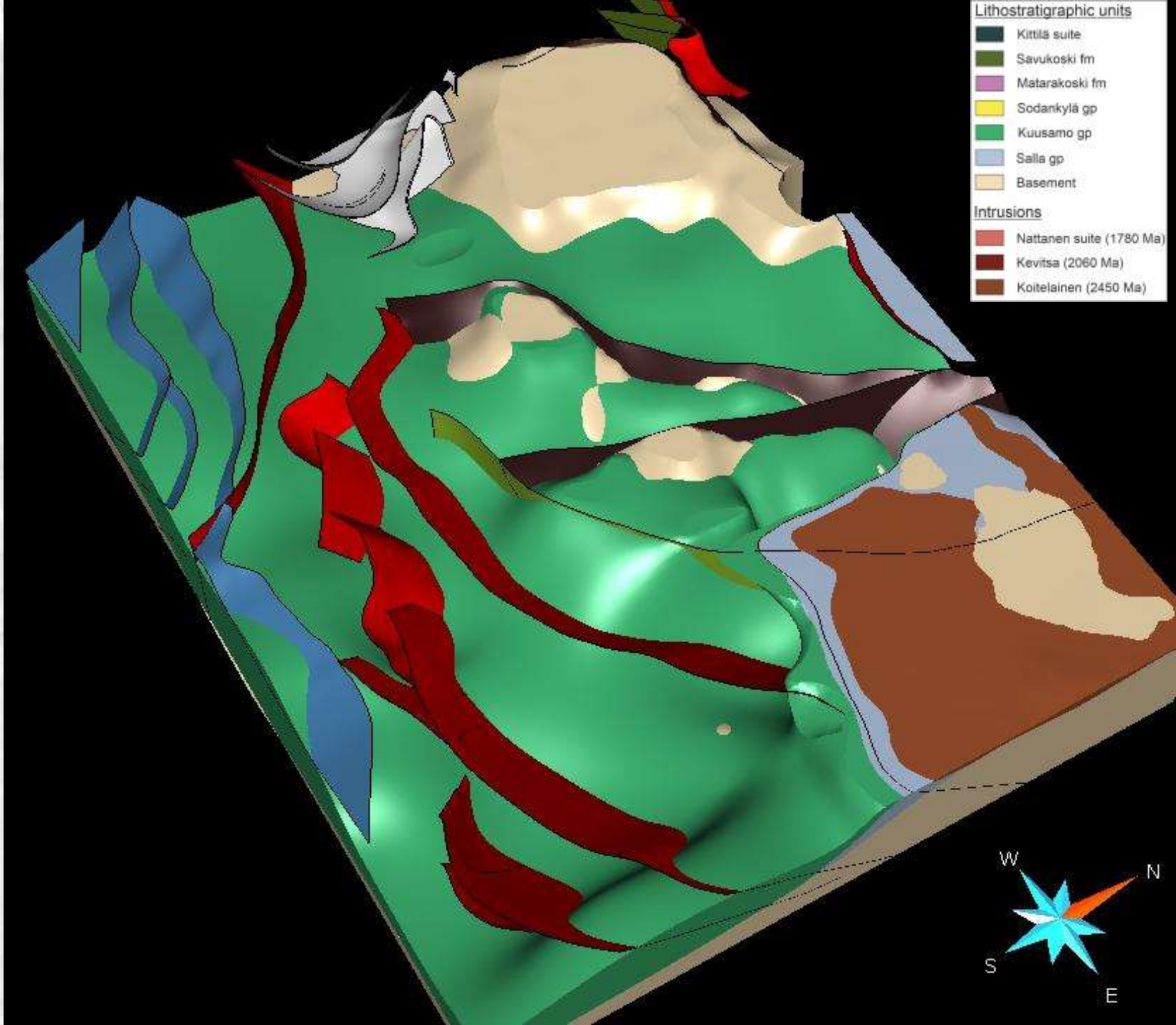

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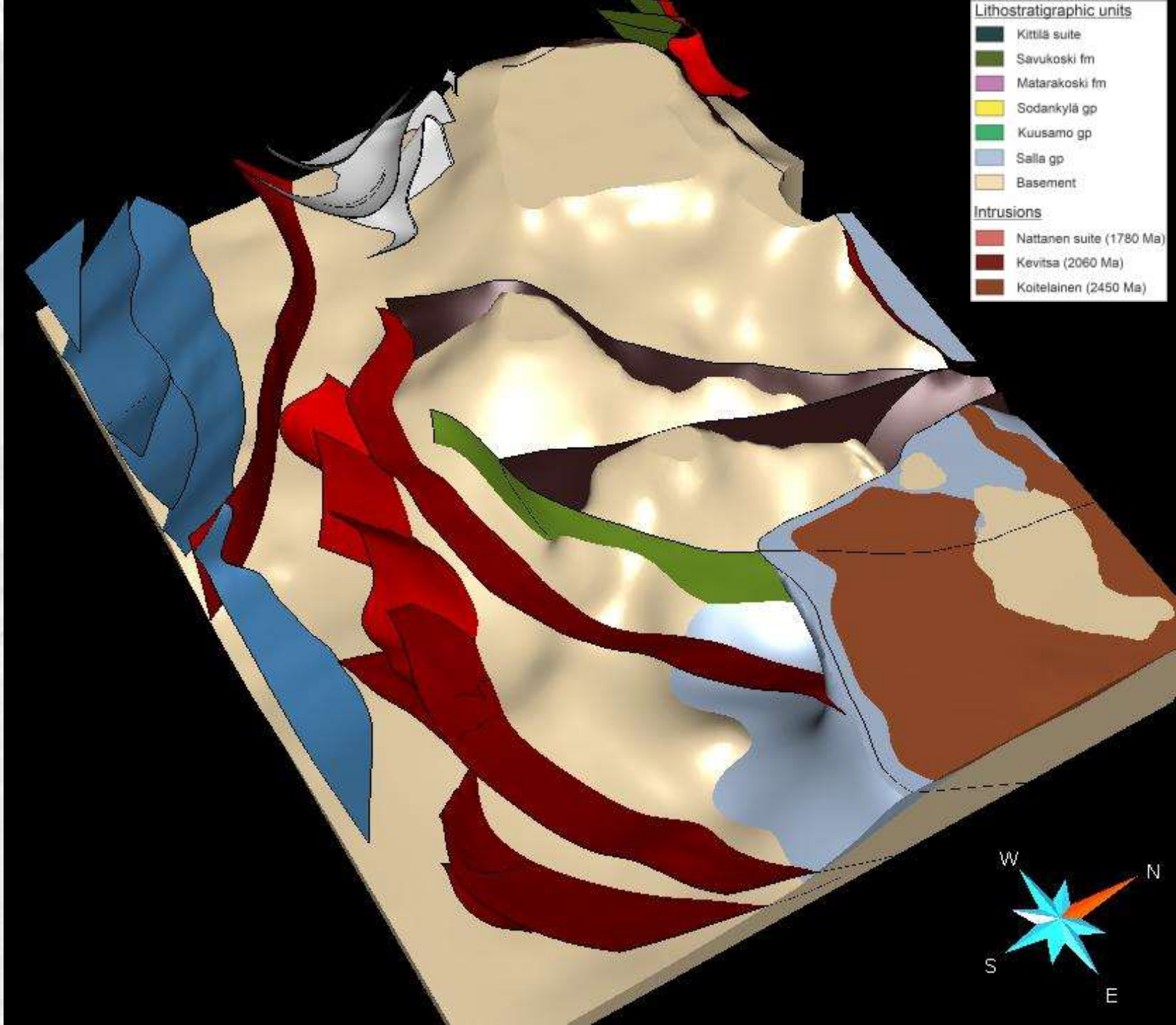

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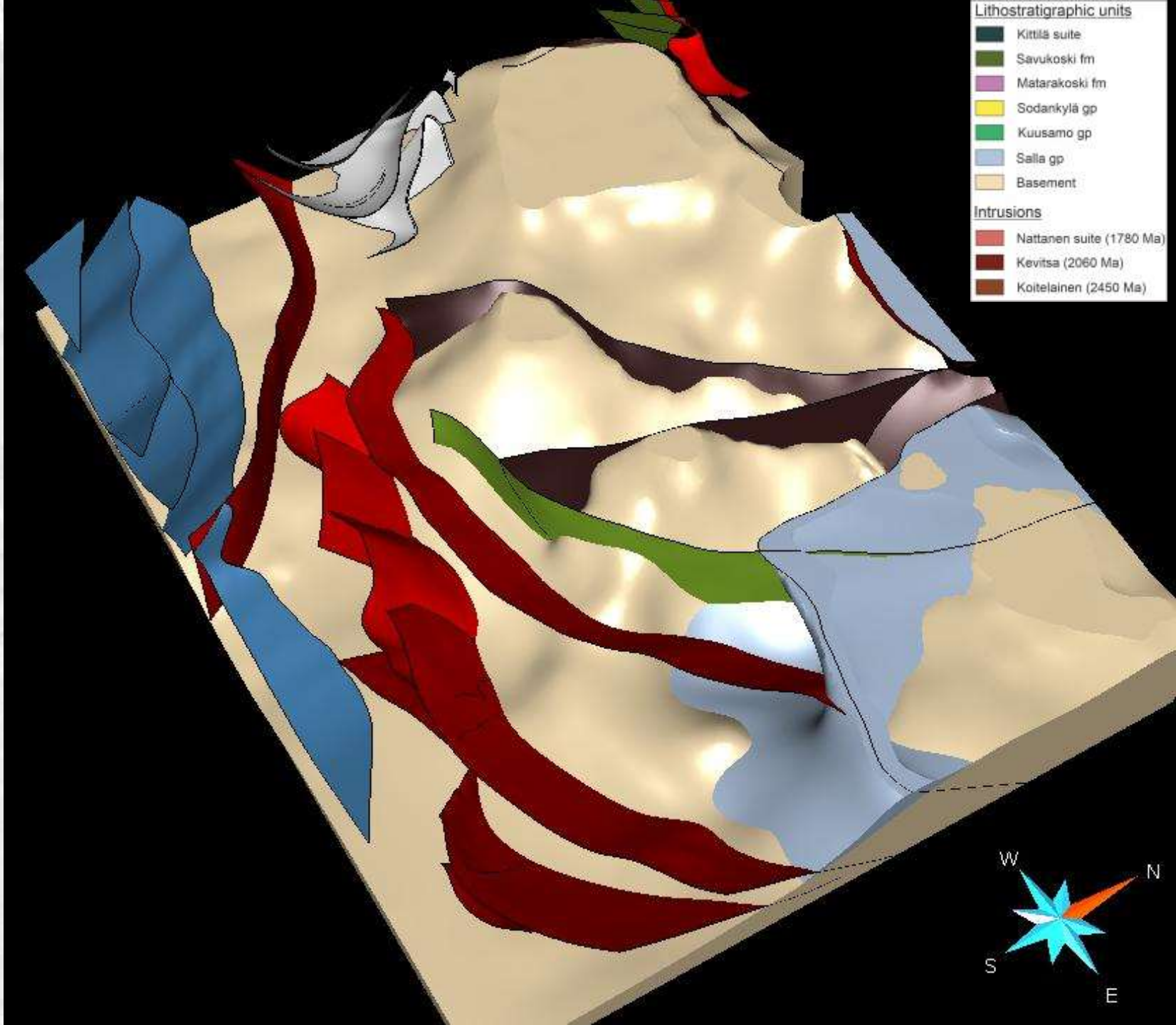

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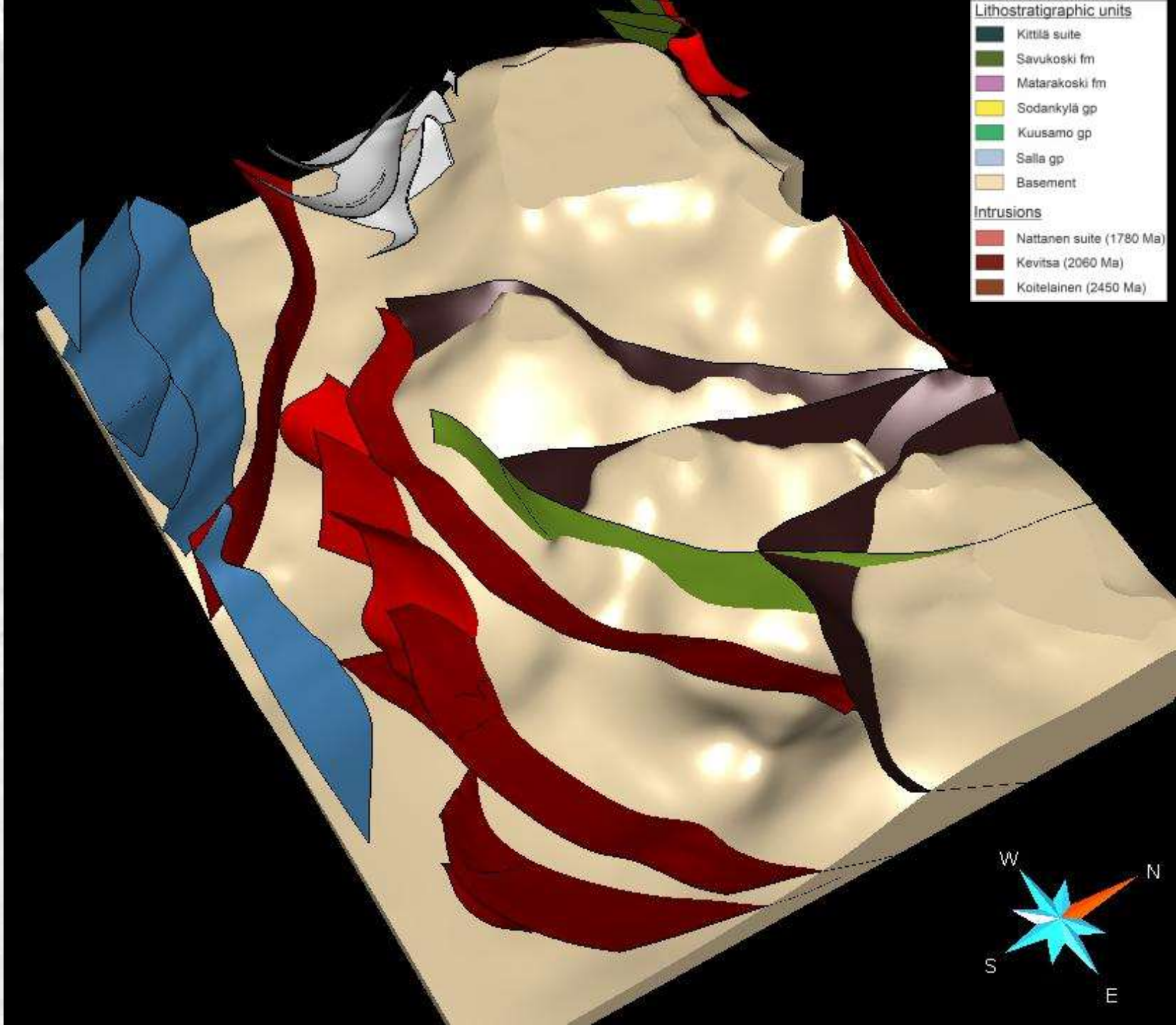


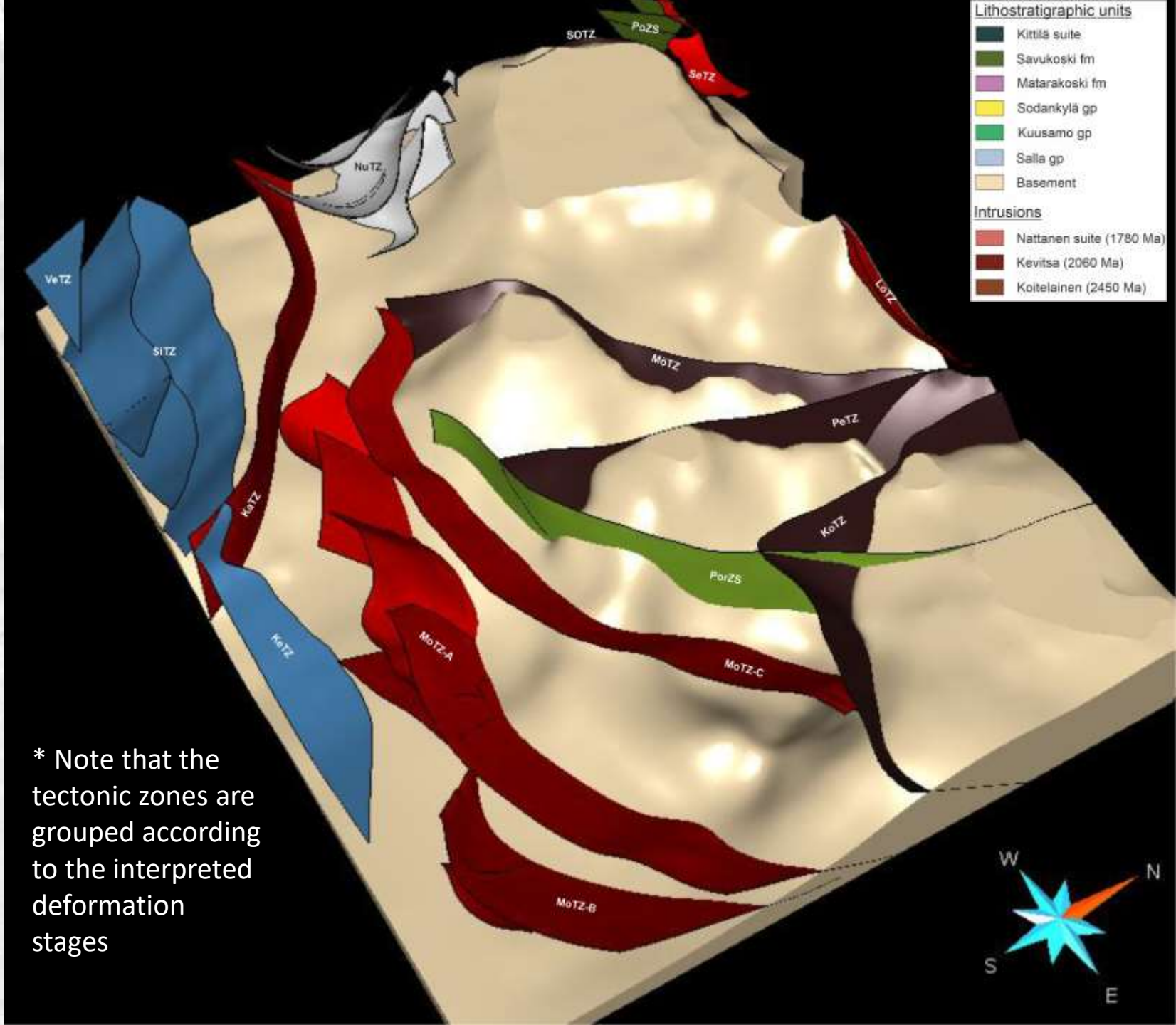
REGIONAL MODEL

Modelled elements

- Tectonic zones

Abbreviation	Name	Surfaces
KaSZ	Kaarestunturi shear zone	1
KeTZ	Kelujärvi thrust zone	1
KoTZ	Koitelainen thrust zone	1
LoTZ	Lokka thrust zone (1-2)	2
MoTZ-A	Moskuvaara thrust zone A	5
MoTZ-B	Moskuvaara thrust zone B	2
MoTZ-C	Moskuvaara thrust zone C	1
MöTZ	Möykkelmä thrust zone	1
NuTZ	Nuttio thrust zone*	3
PeTZ	Peurasuvanto thrust zone	1
PorSZ	Porkkaus shear zone	1
PoSZ	Porkonen shear zone*	2
SeTZ	Seurukarkea thrust zone*	2
SiTZ	Sirkka thrust zone	3
SoTZ	Soasjoki thrust zone	1
VeTZ	Venejoki thrust zone	1

*From the 3D-model of Niiranen (2015)

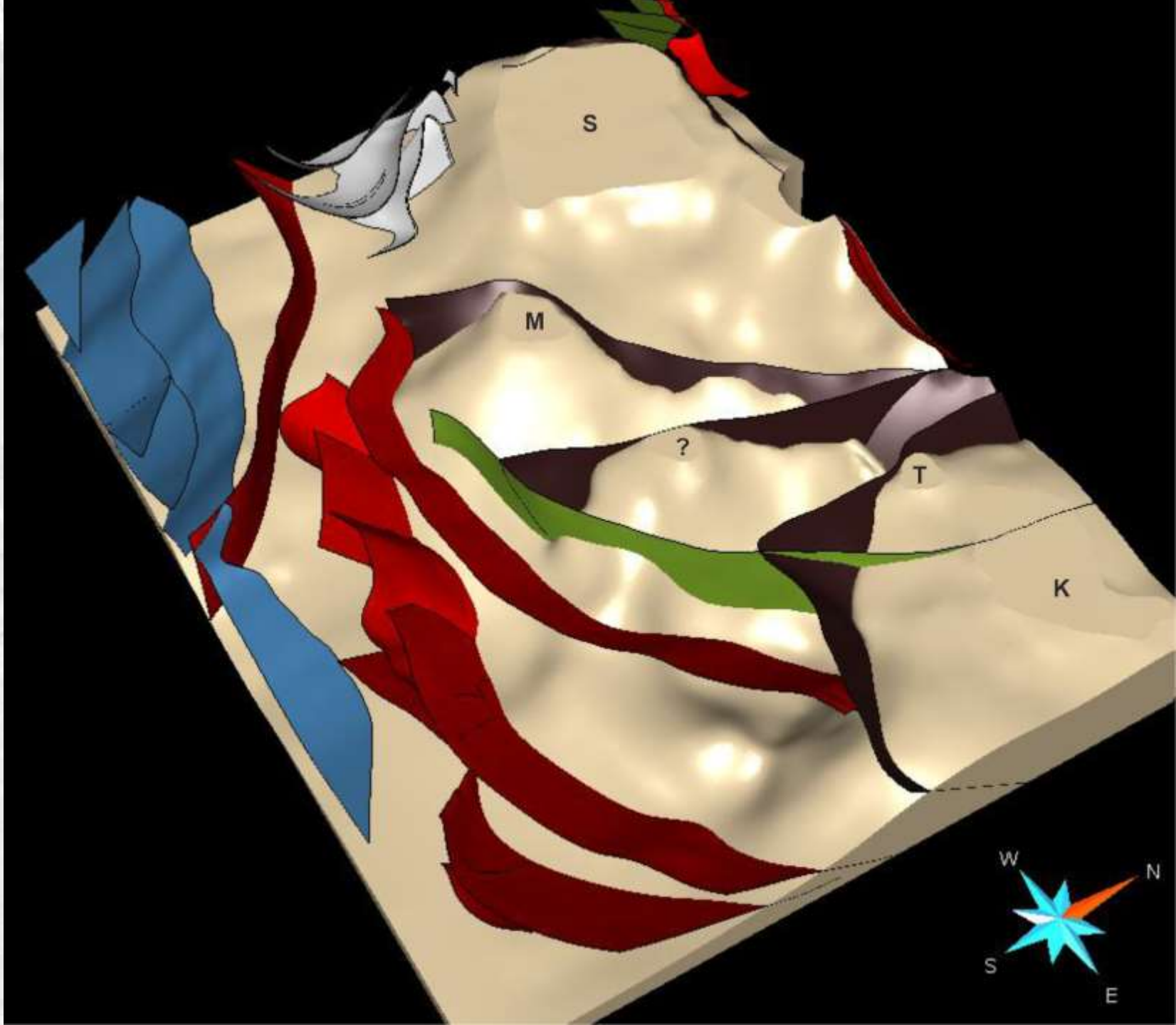


* Note that the tectonic zones are grouped according to the interpreted deformation stages

REGIONAL MODEL

The basement domes are due to thrusting in reverse faults

Basement domes:
S=Soasjoki
M=Möykkelmä
T=Tojottama
K=Kiviaapa
? = anonymous



REGIONAL MODEL

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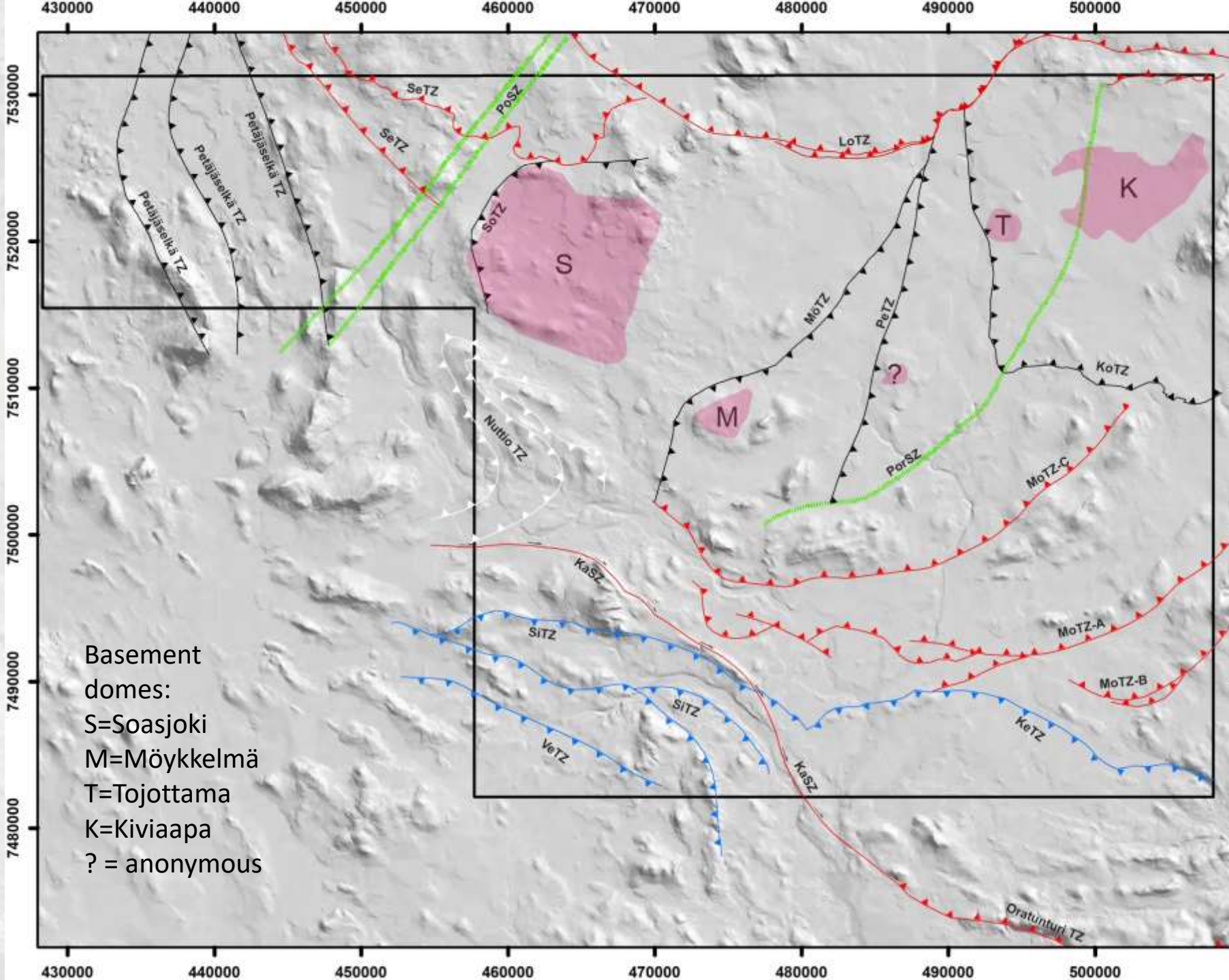

A CLOSER LOOK OF THE ALALIESI AREA

Modelled elements

- Tectonic zones

Abbreviation	Name	Surfaces
KaSZ	Kaarestunturi shear zone	1
KeTZ	Kelujärvi thrust zone	1
KoTZ	Koitelainen thrust zone	1
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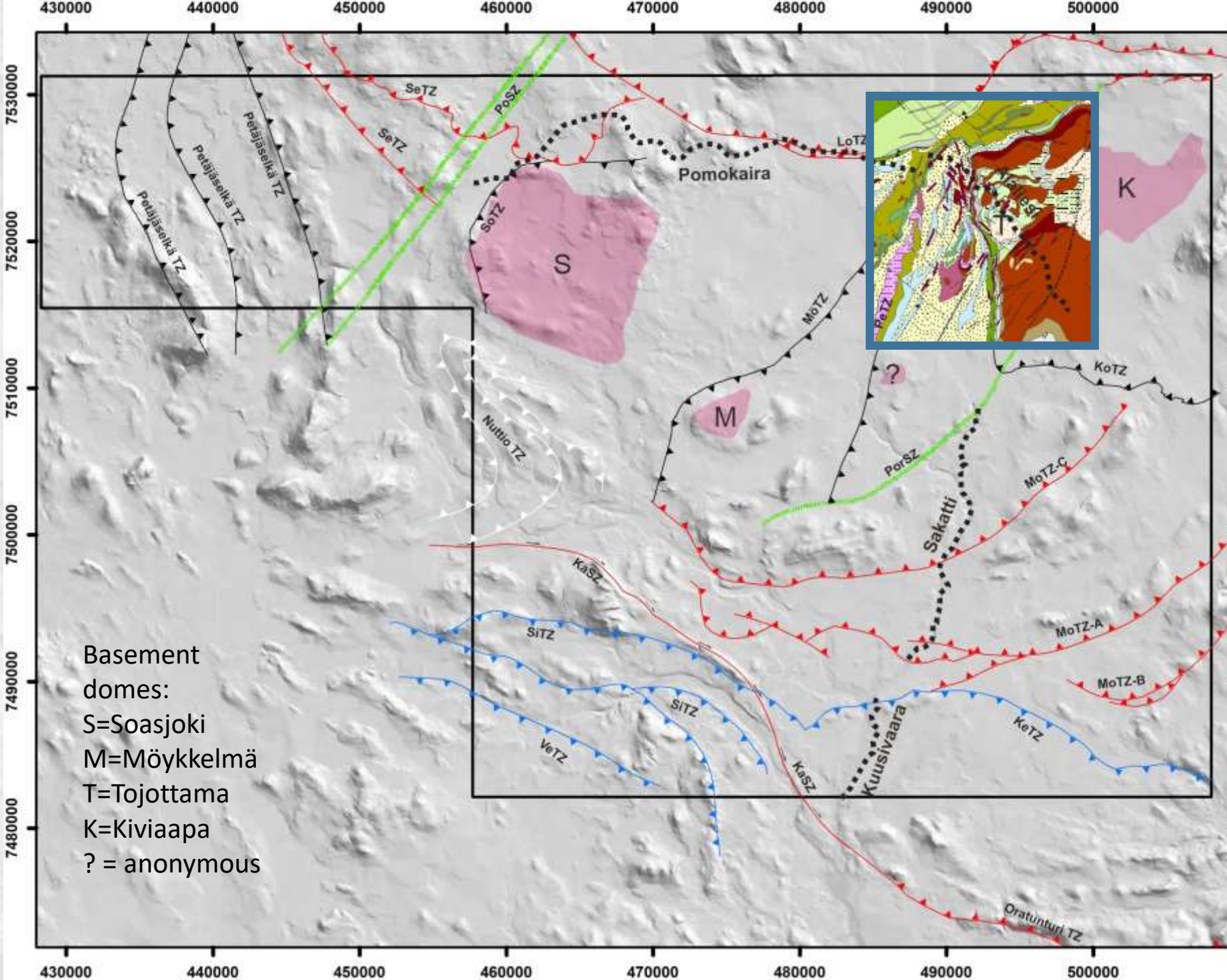
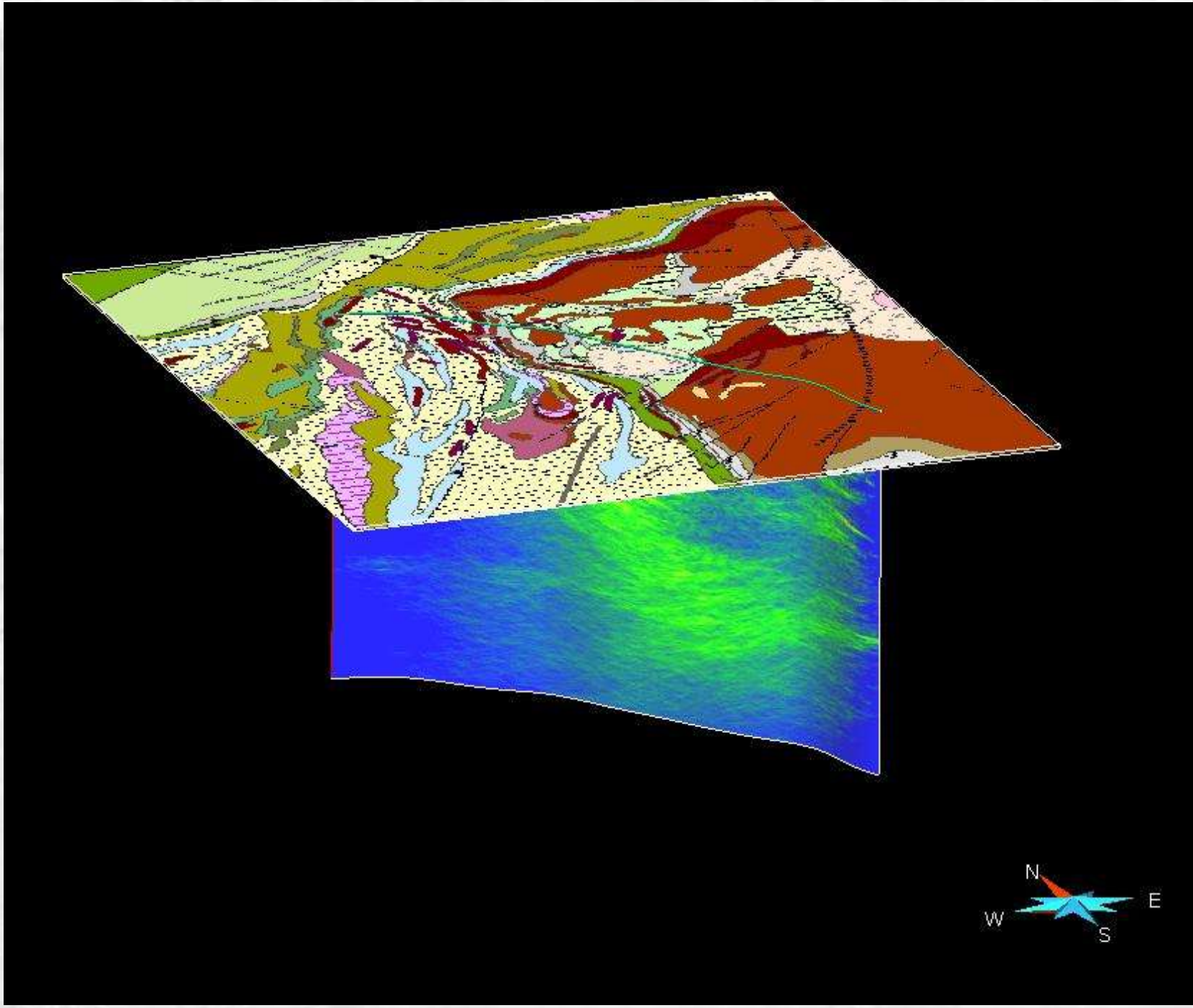


ALALIESI MODEL

- View of the reflections from the survey made along the Alaliesintie (CBFVM processed data)



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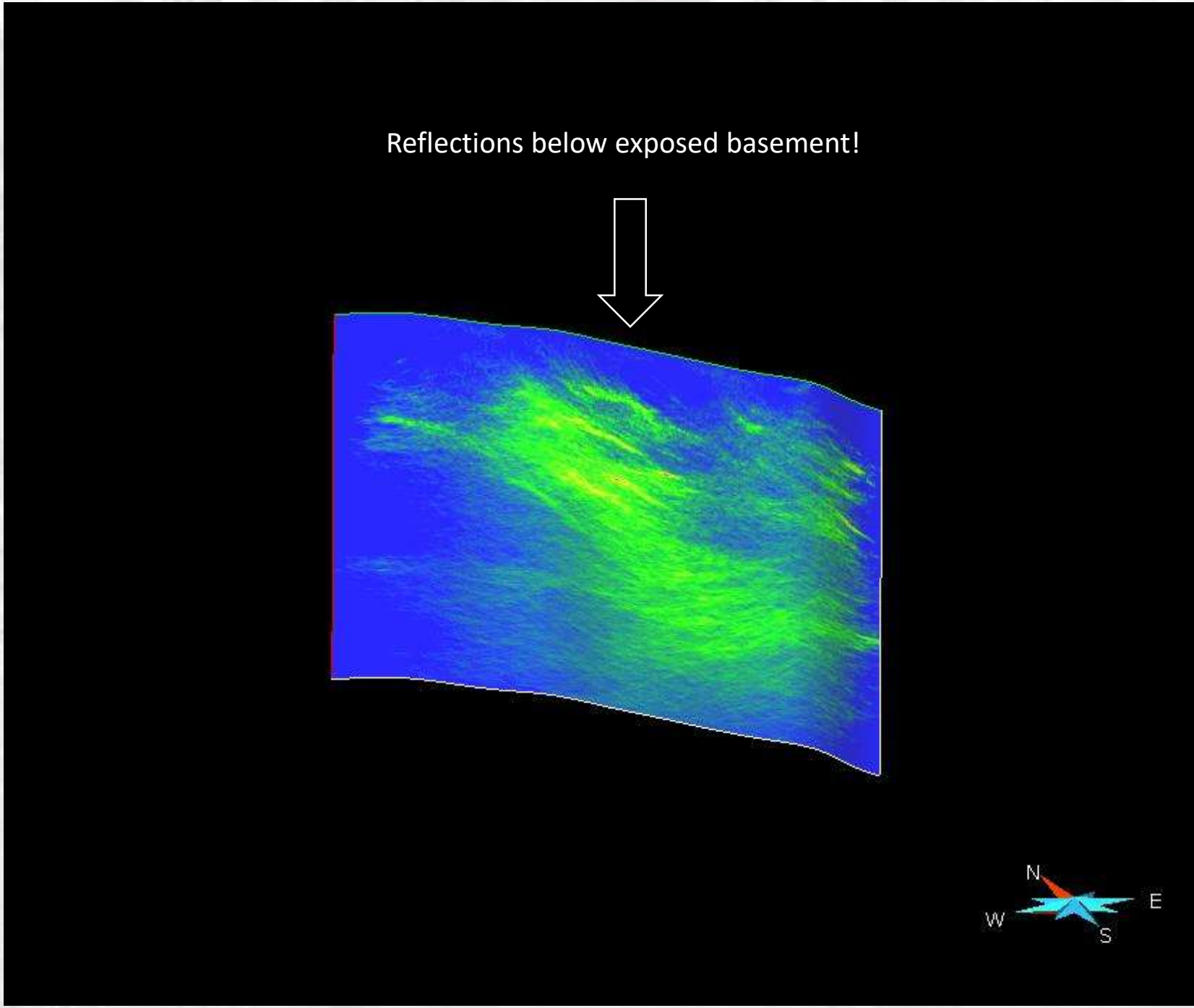

ALALIESI MODEL

- View of the interpreted lithologies on the Alaliesintie profile

Modelled elements:

- Tectonic zones
- Sattasvaara formation
- Matarakoski formation
- Sodankylä group
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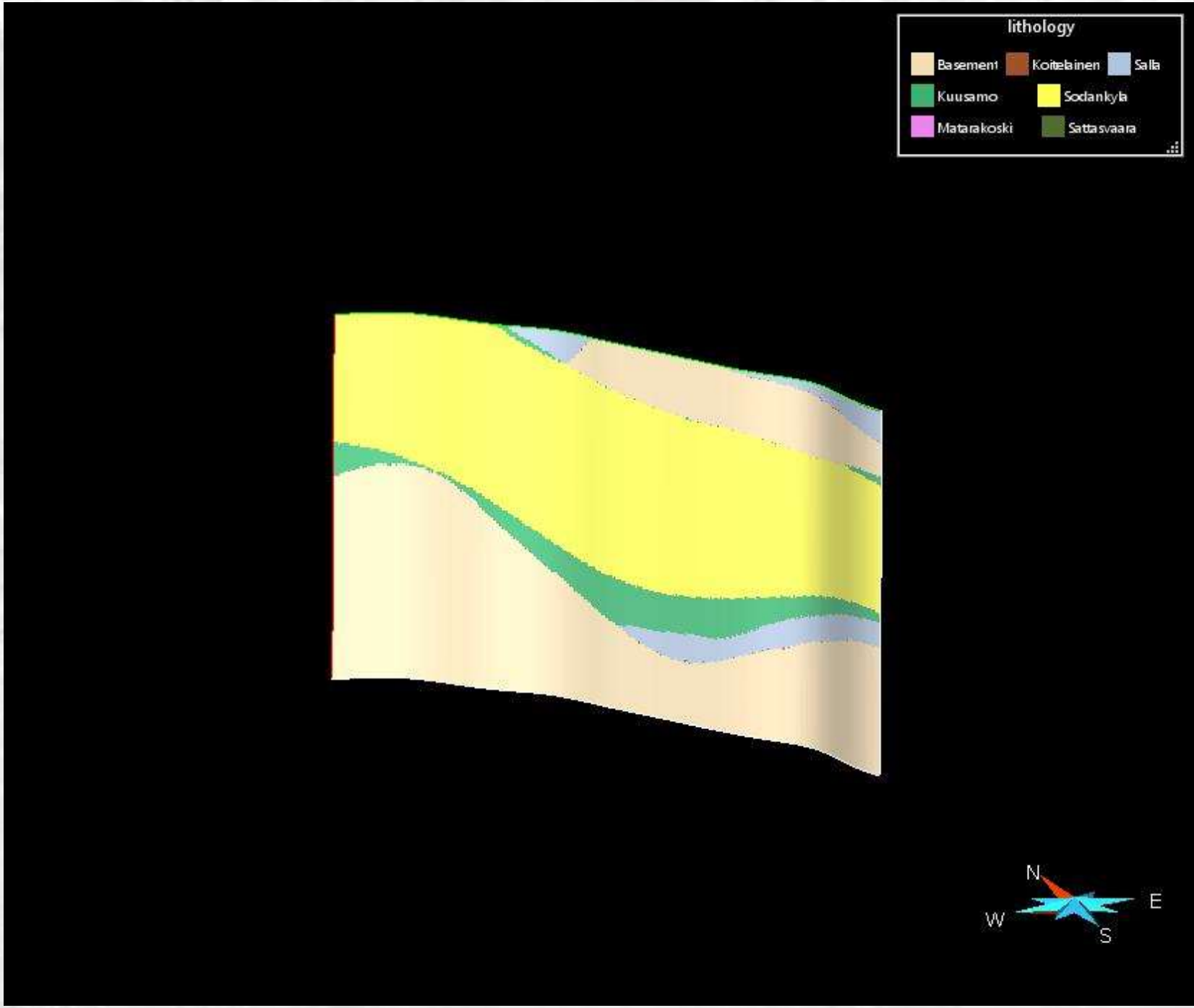
- Salla group
- Koitelainen intrusion
- Basement complex



ALALIESI MODEL

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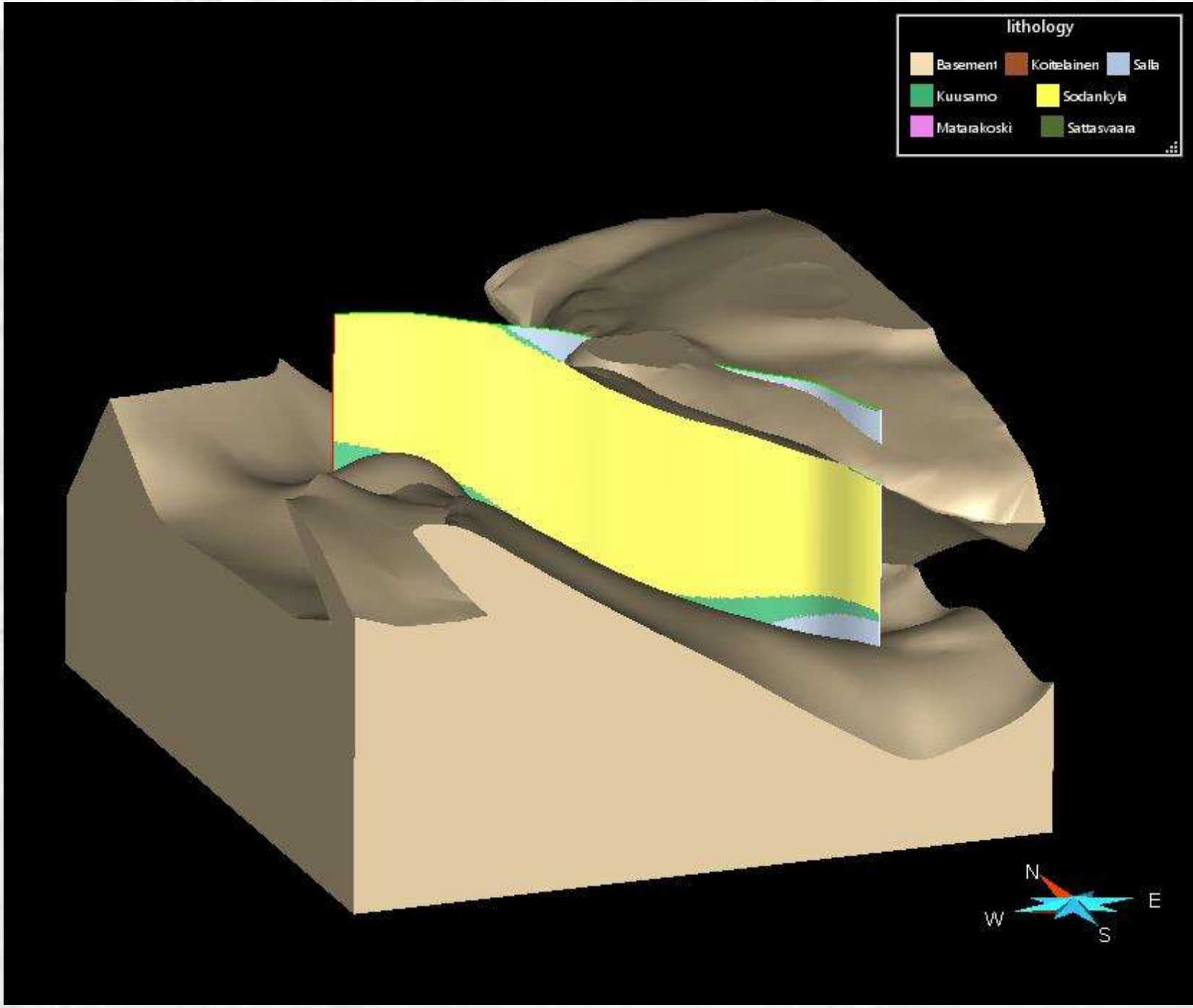

ALALIESI MODEL

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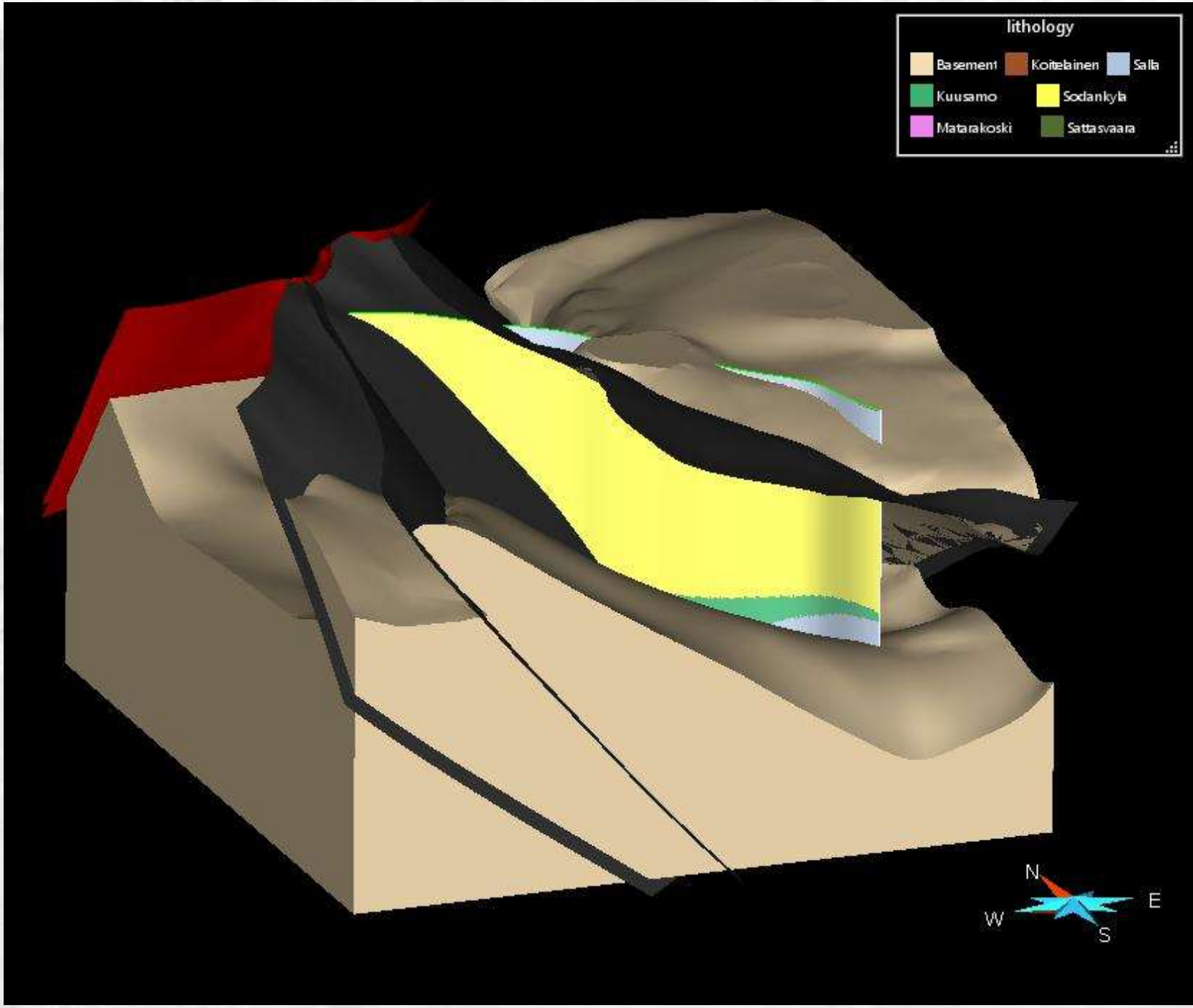

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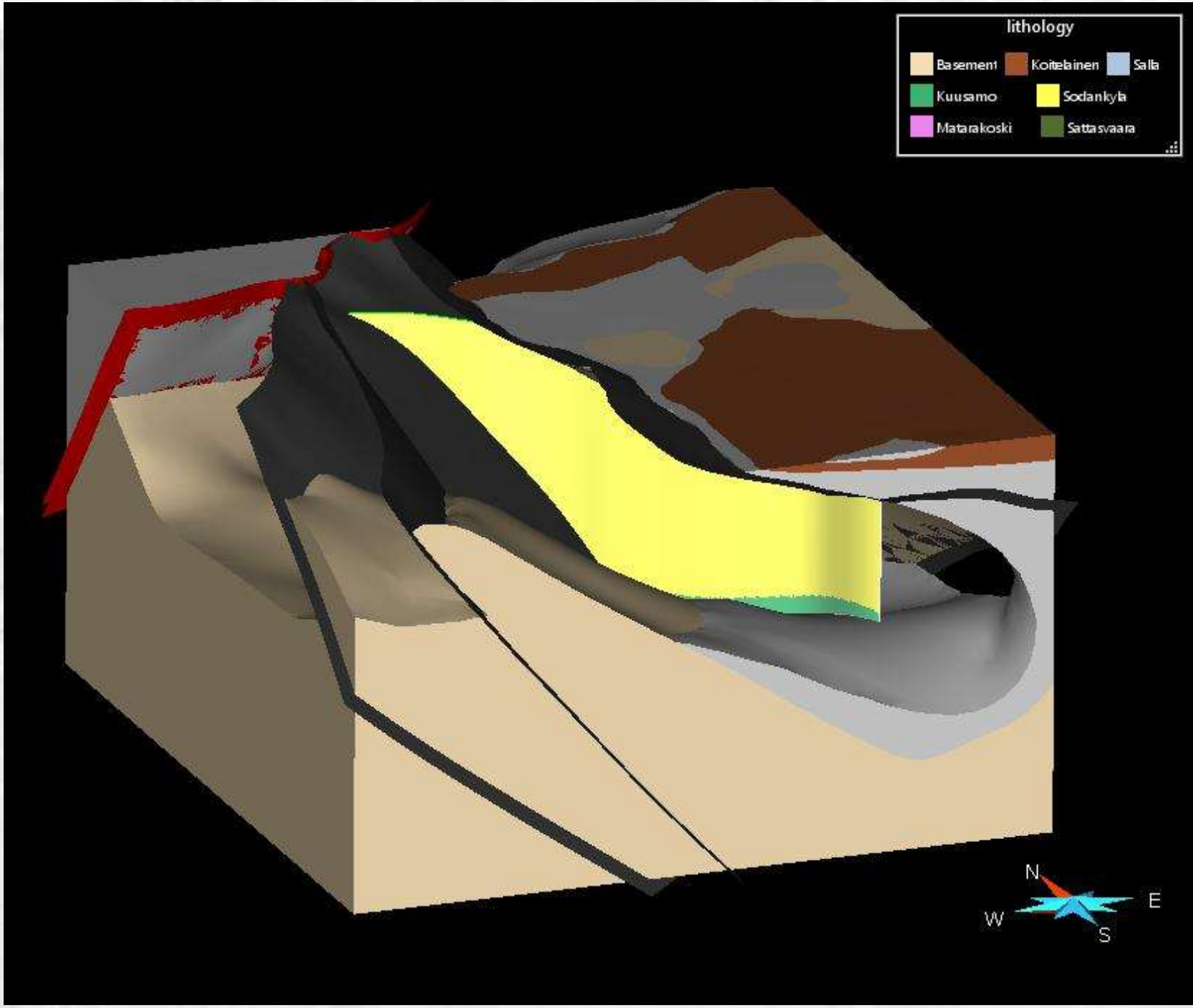

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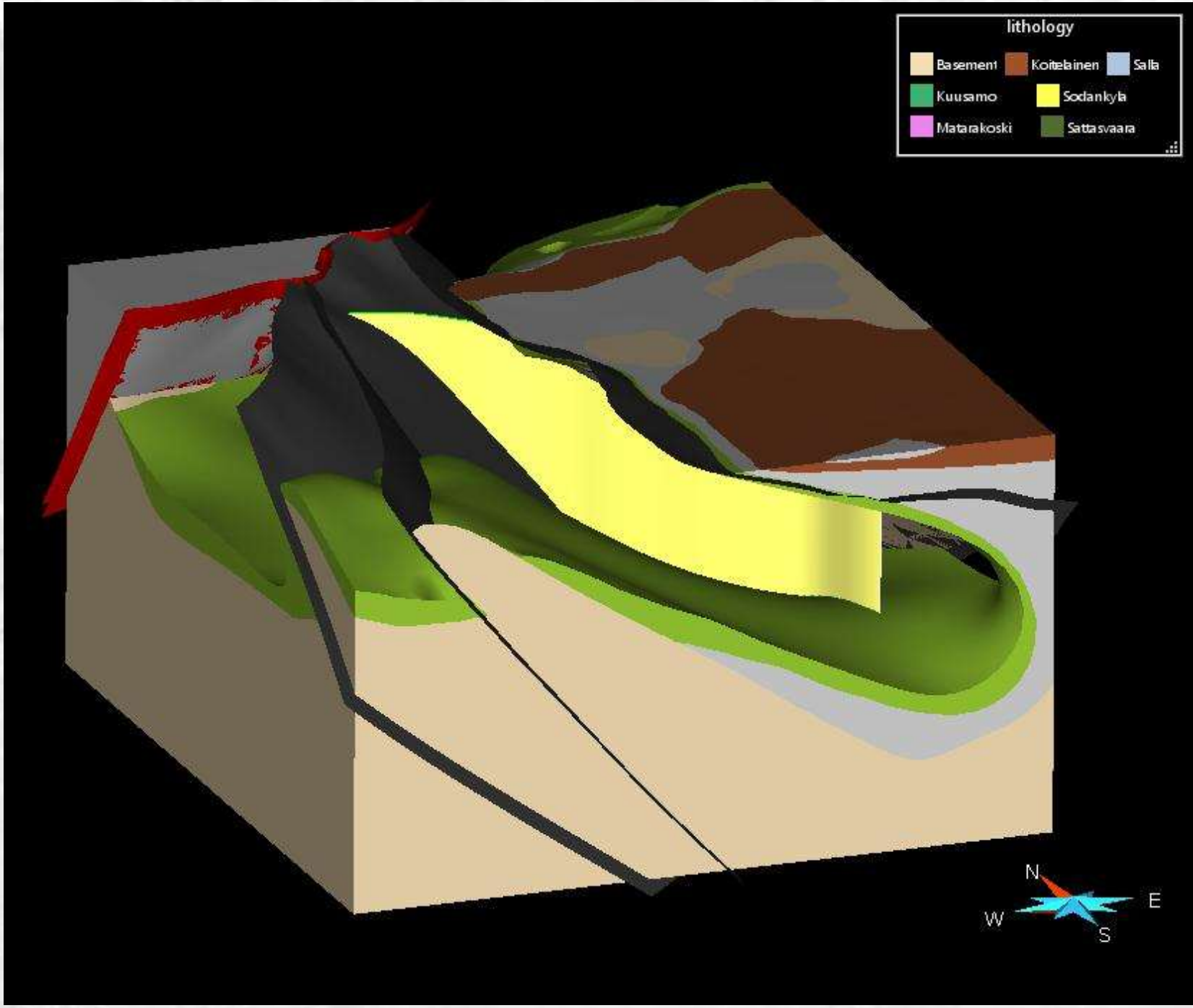

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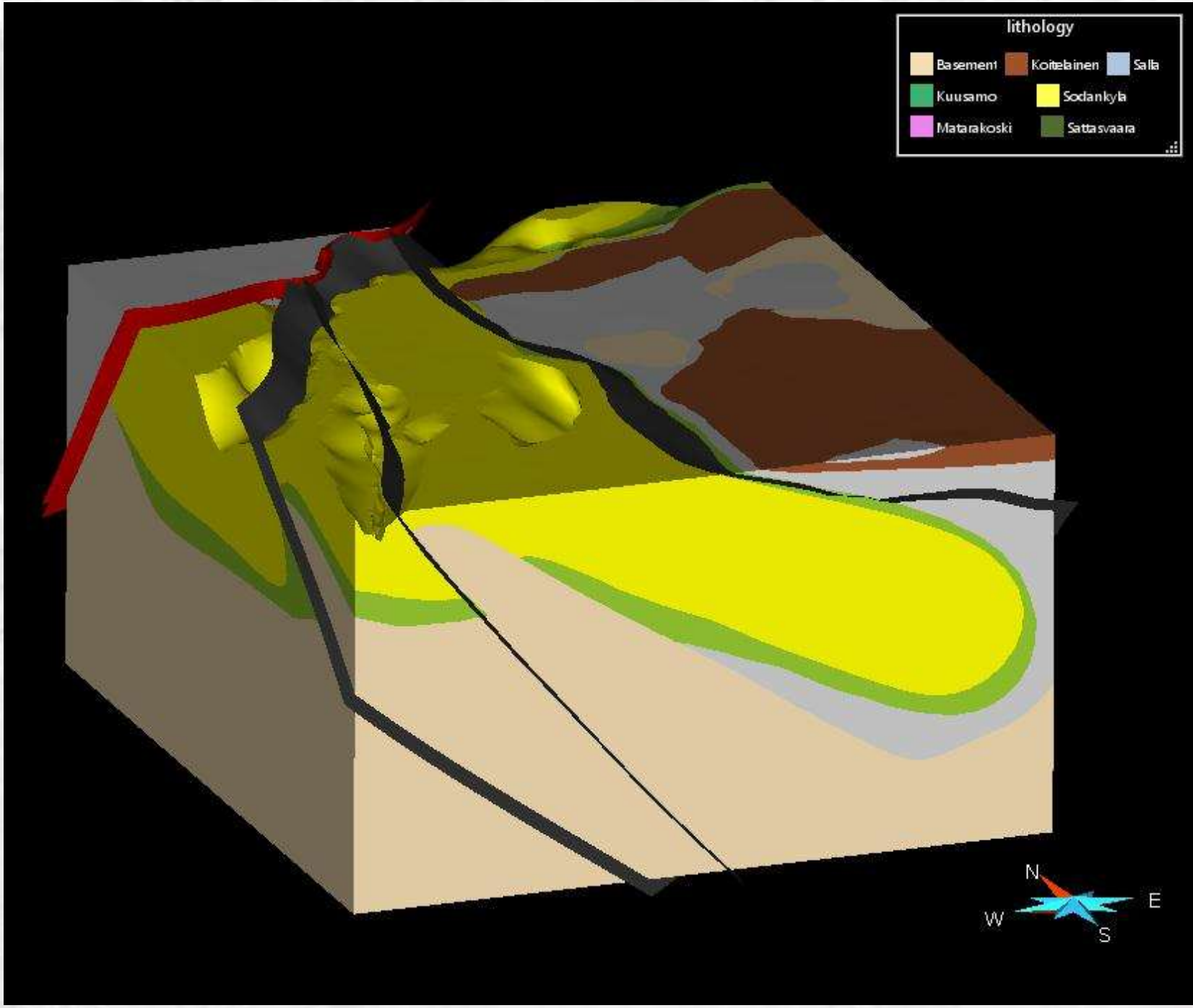

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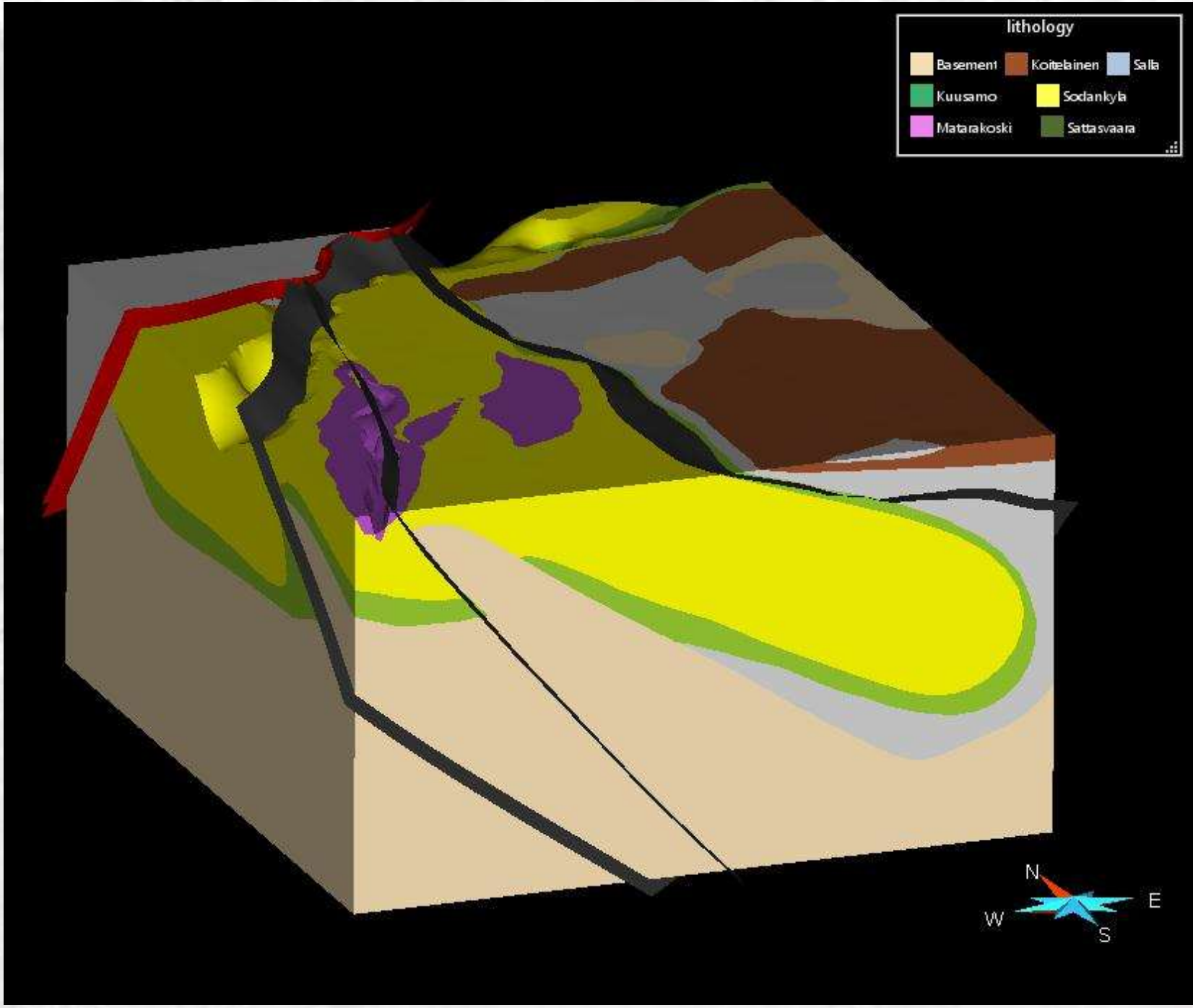

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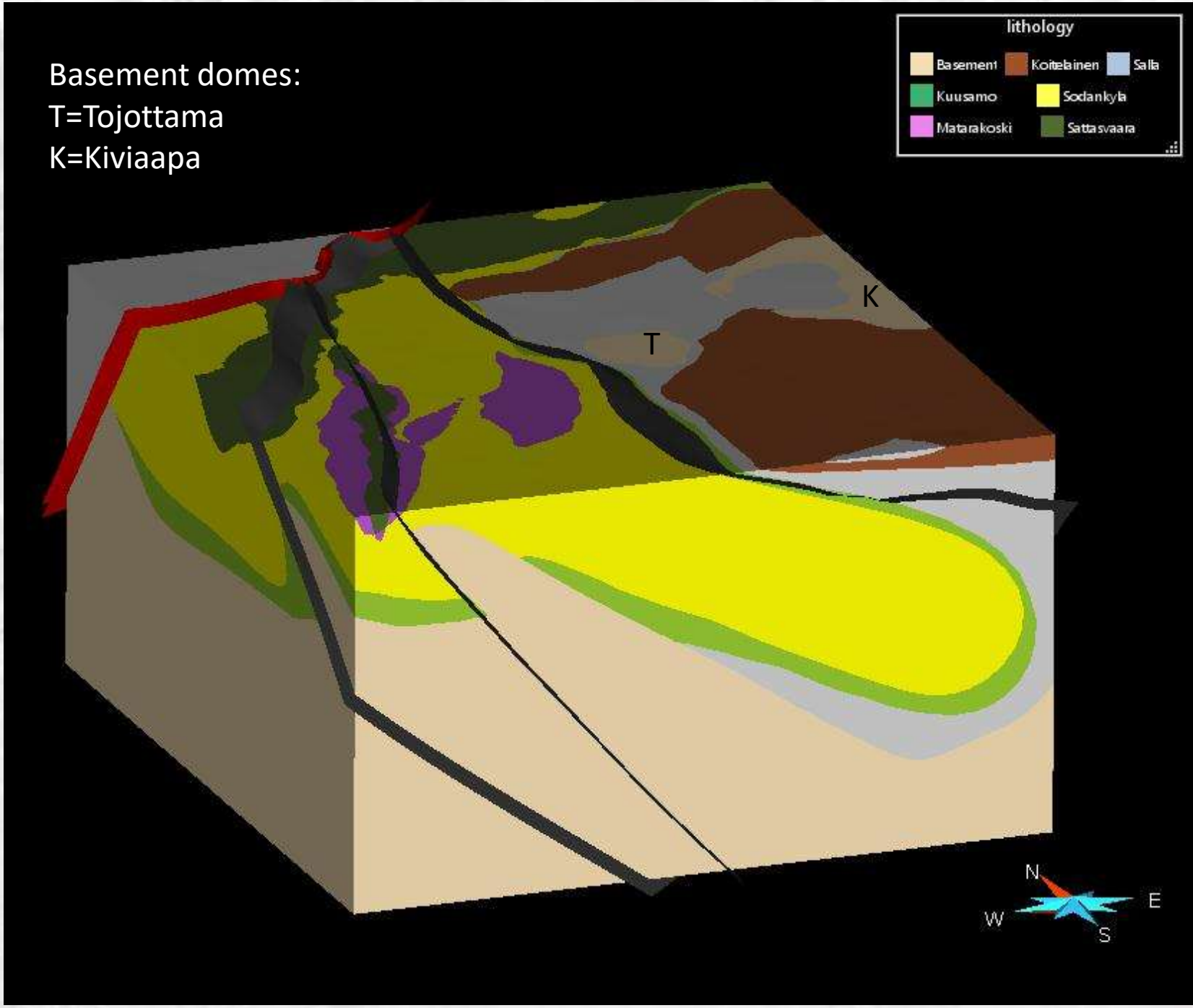

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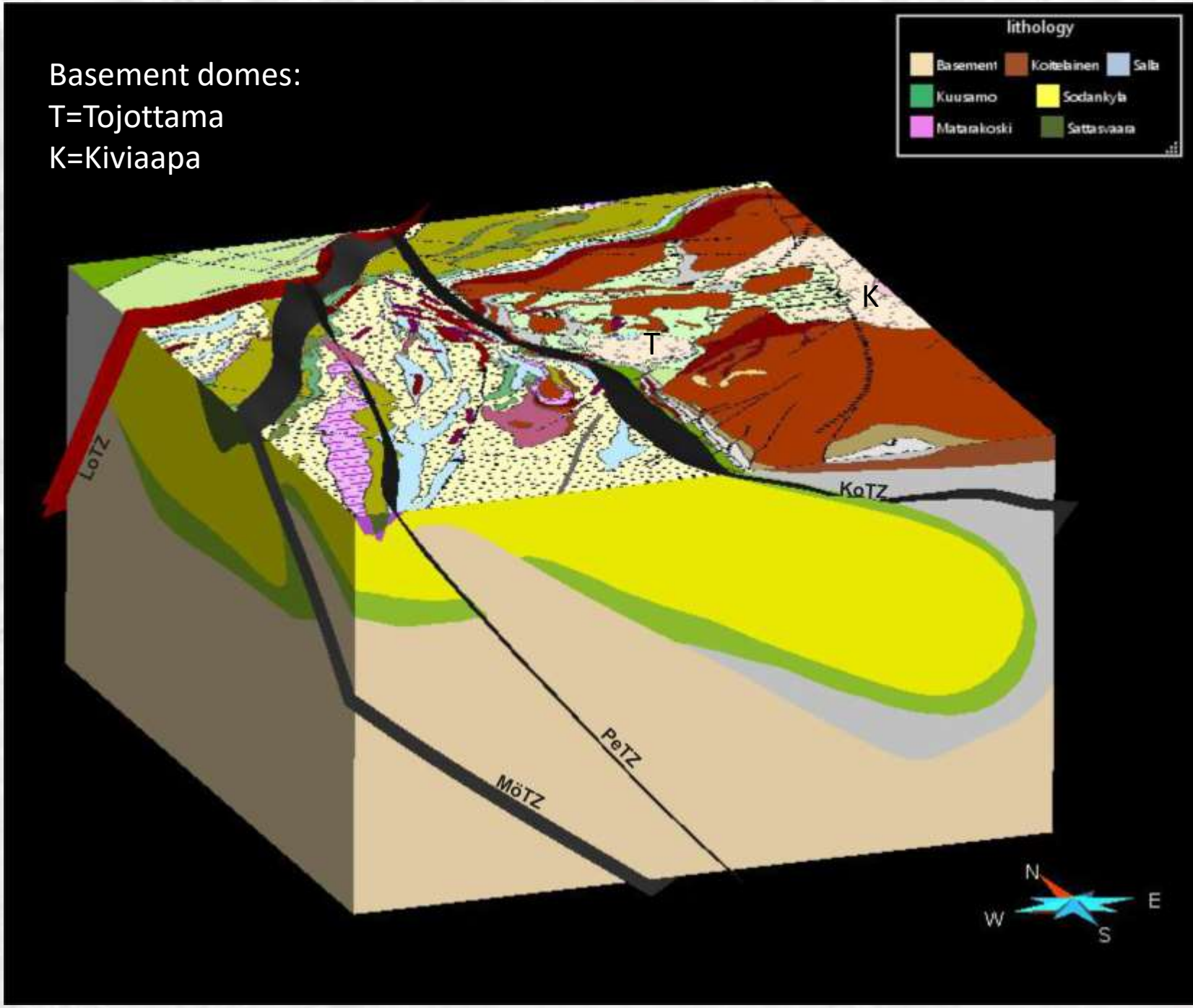
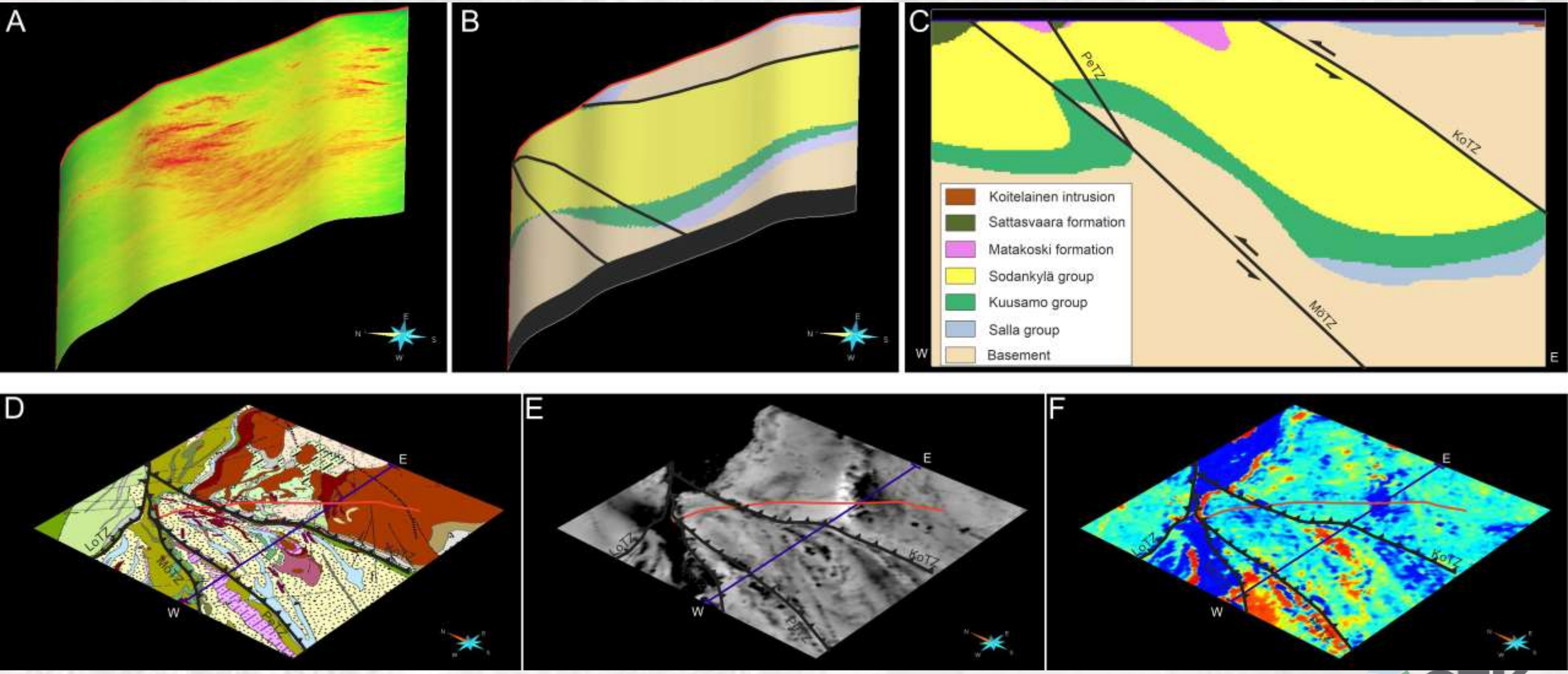


ALALIESI MODEL

Interpreted 3D sections of the Alaliesi area. A) The CBFVM processed seismic reflection survey profile, B) Geological interpretation of the seismic survey profile, C) Geological interpretation along E-W trending cross section. The locations of the reflection seismic survey profile (red) and E-W trending cross section is shown in the geological (D), aeromagnetic (E) and aeroelectromagnetic (F) map.



A CLOSER LOOK OF THE SEISMIC SURVEYS IN SOUTH

Modelled elements

- Tectonic zones

Abbreviation	Name	Surfaces
KaSZ	Kaarestunturi shear zone	1
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KoTZ	Koitelainen thrust zone	1
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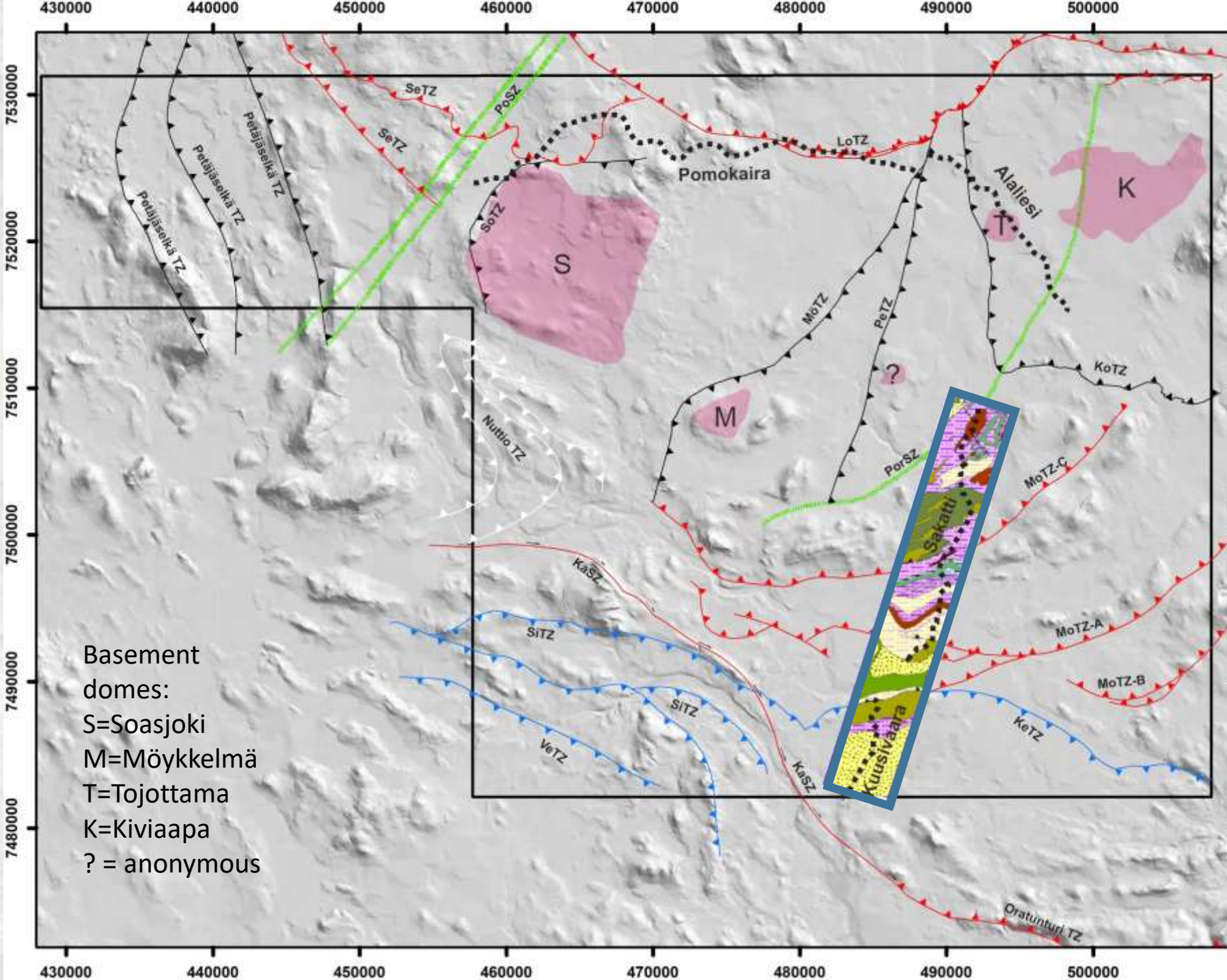
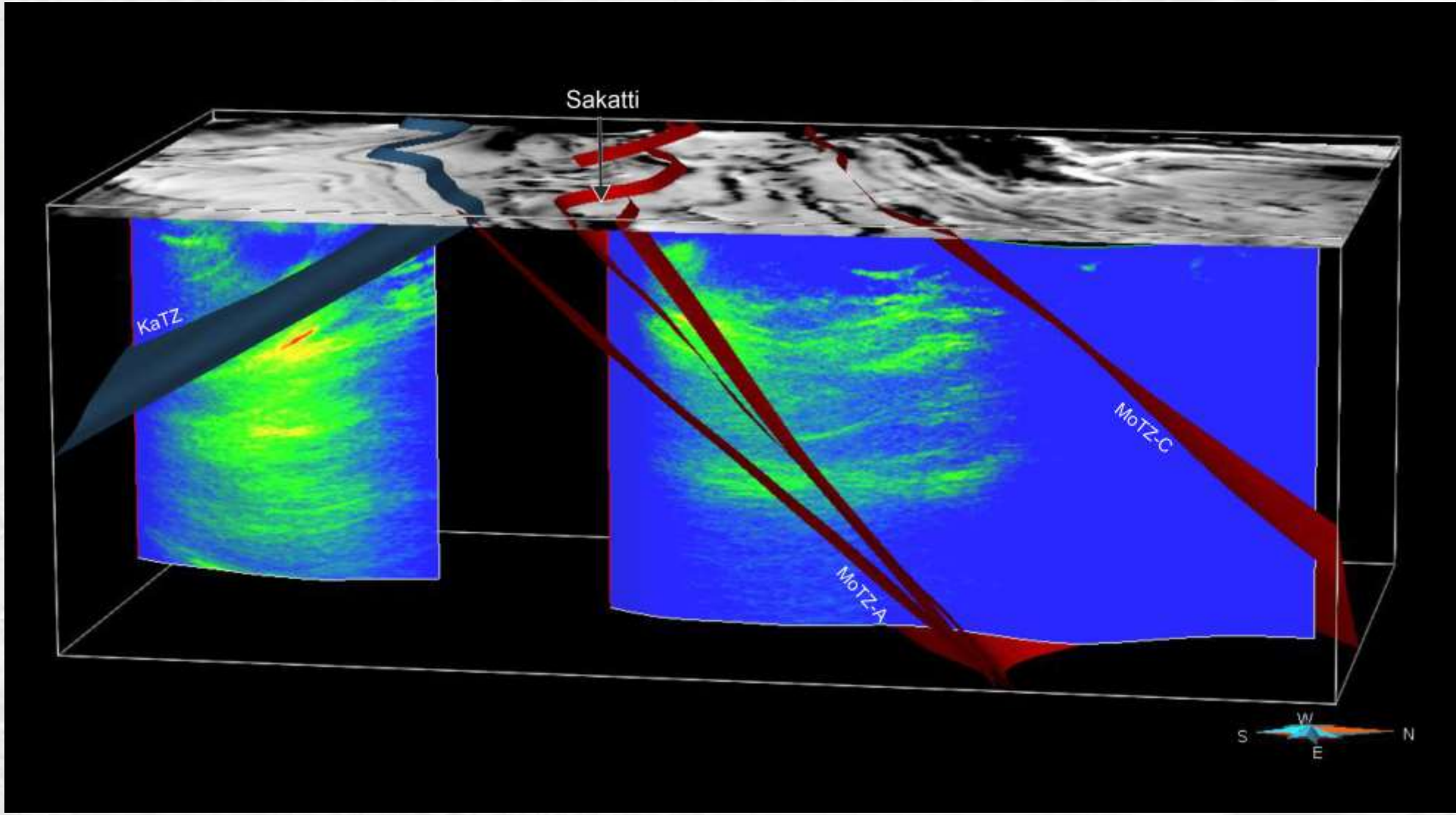


SEISMIC SURVEYS OF KUUSIVAARA AND SAKATTI

The Sakatti and Kuusivaara seismic surveys reveal both south and north dipping reflections.

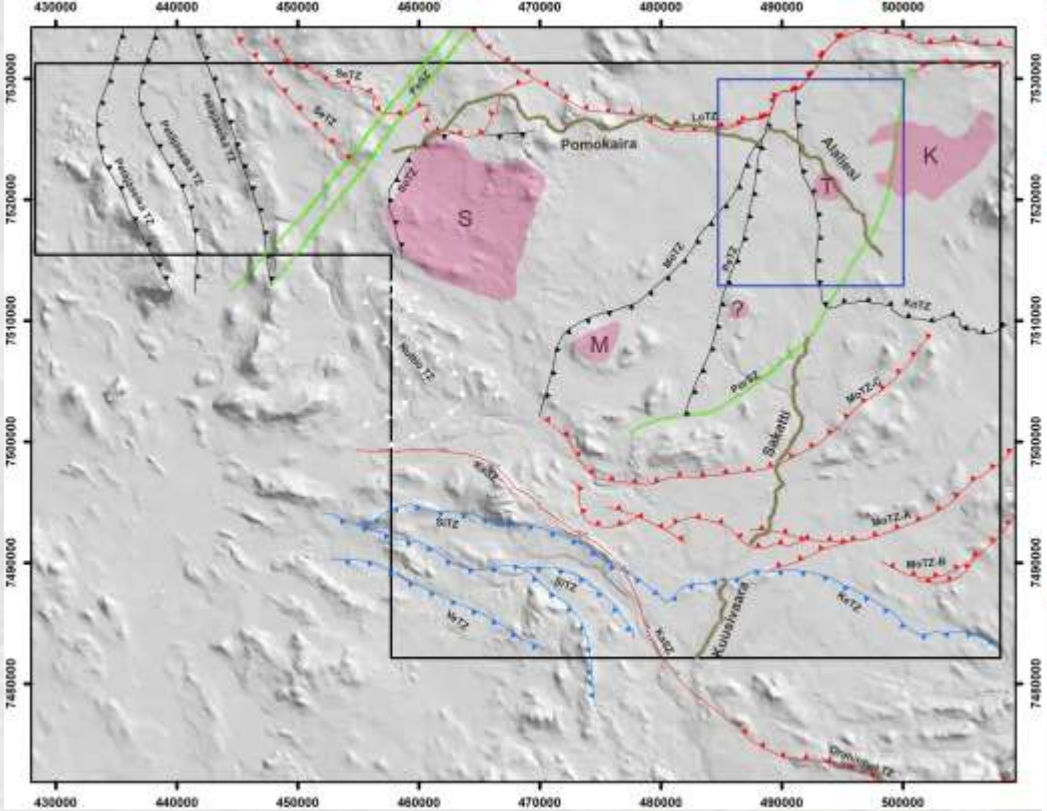
They have been interpreted to be due to folding and overthrusting in two oppositely directed thrust systems

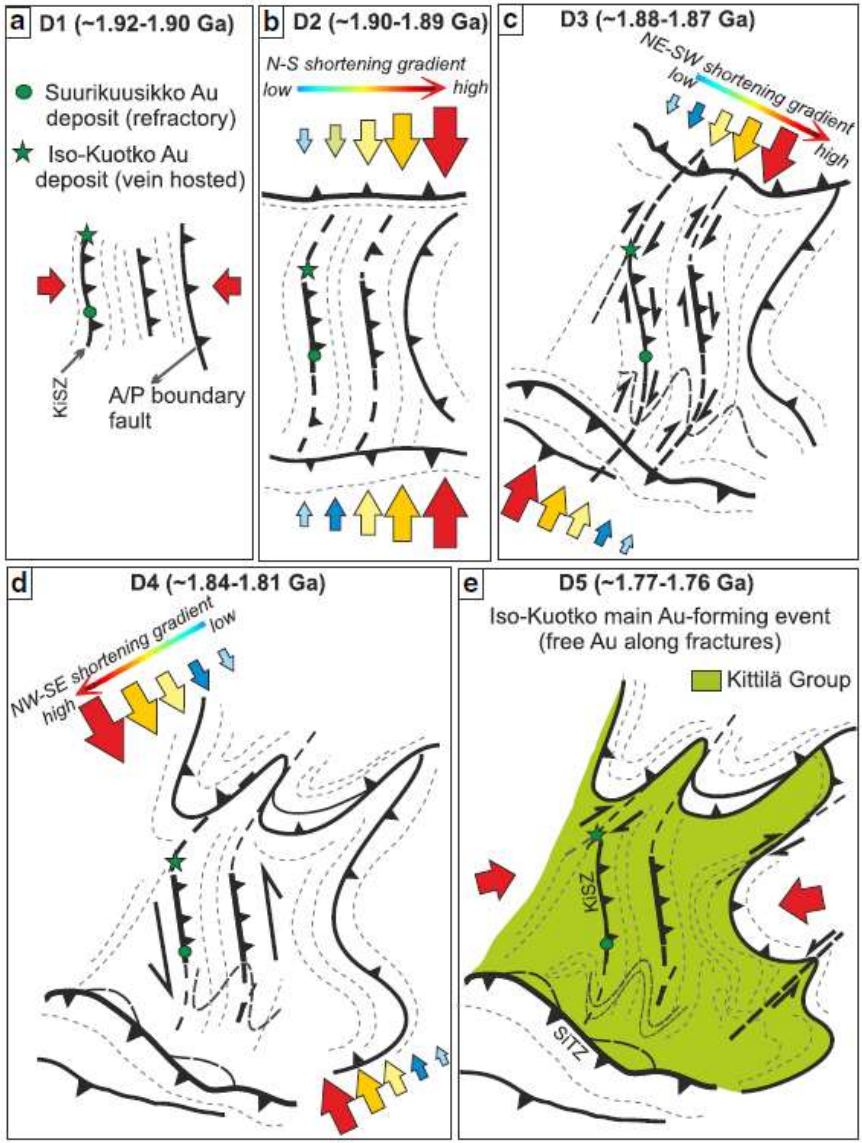
Note the location of Sakatti!



CONLUSION

The structural interpretation presented here suggests that the deformation history in the study area was predominantly controlled by thrust tectonics at least in three deformation phases.





- Black thrusts compares to D1 of Sayab et al. 2019
- Blue thrust = D2
- Red thrusts = D3

Sayab, M. et al. 2019. A succession of near-orthogonal horizontal tectonic shortenings in the Paleoproterozoic Central Lapland Greenstone Belt of Fennoscandia: constraints from the world-class Suurikuusikko gold deposit. Mineralium Deposita https://doi.org/10.1007/s00126-019-00910-7

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Project web pages: http://projects.gtk.fi/XL3D

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THANK YOU

tuomo.karinen@gtk.fi

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