Electrical structure beneath the Hangai Dome, Mongolia, from magnetotelluric data

Hangai MT team

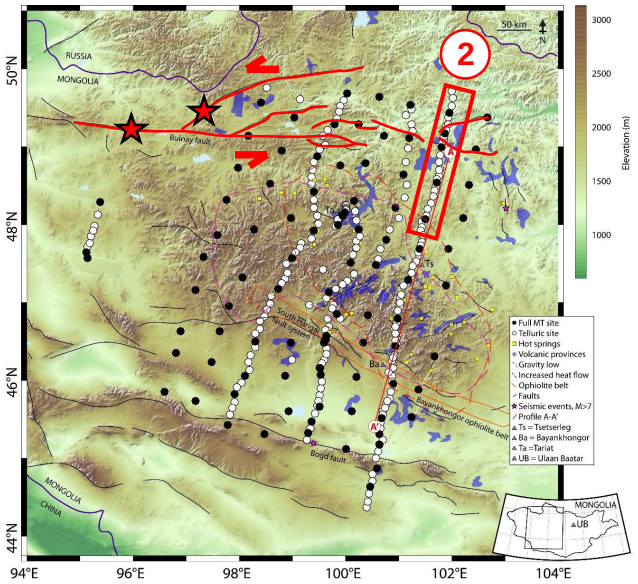
M. Comeau[1], J. Käufl[2], A. Kuvshinov [2], **M. Becken[1]**, J. Schmalzl[1], D. Harpering[1], R. Mann[1], J. Kamm[1], A. Grayver [2], N. Scha [2], S. Grazioli [2], D. Suoergel [2,] S. Demberel [3], U. Sukhbaatar [3], E. Batmagnai [3], S.Tserendug [3], T. Nasan-Ochir [3], S. Gantsogt [3], B.Eldev-Ochir [3], N. Nomuun [3], Batbileg [3]

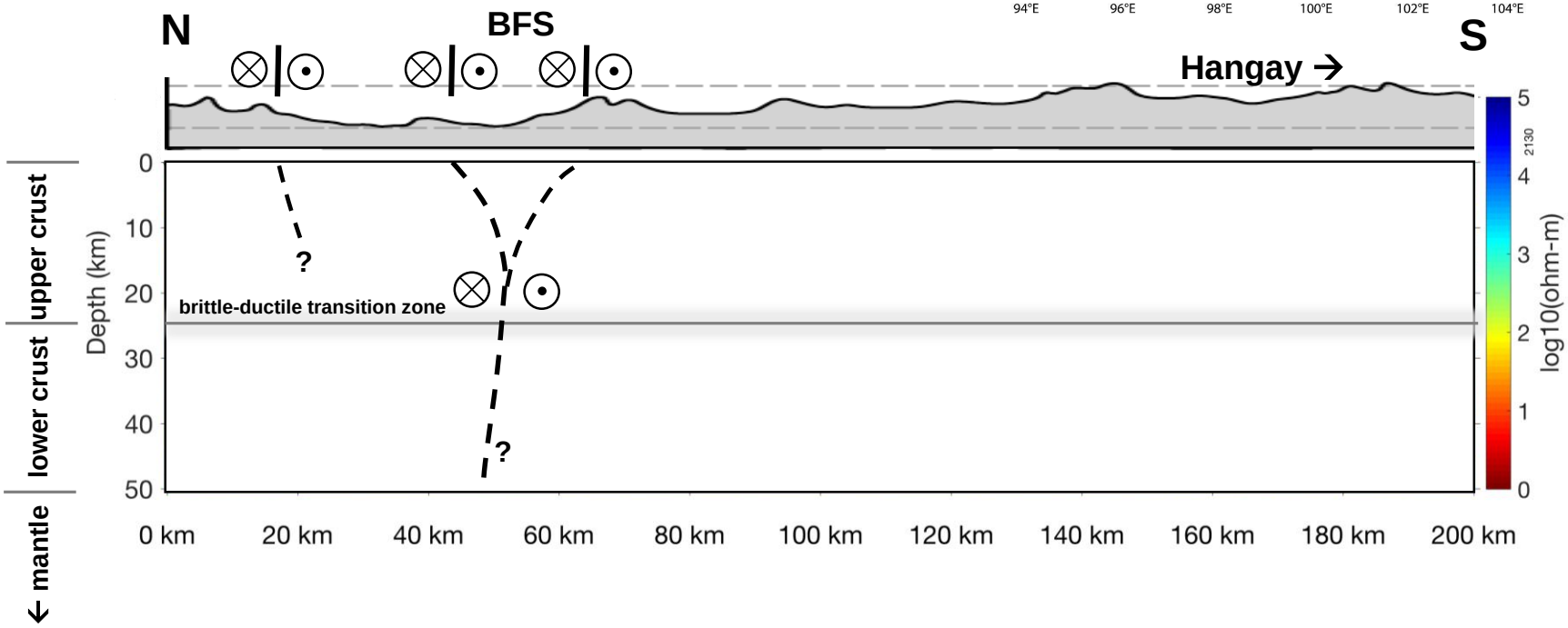
[1]WWU, Münster, Germany
[2]ETH, Zürich, Switzerland
[3]IAG, Mongolian Academy of Sciences, Ulaanbaatar, Mongolia

and the driver Tsagaansukh, Shatar, Bayarjargal

Bulnay Fault system (BFS)

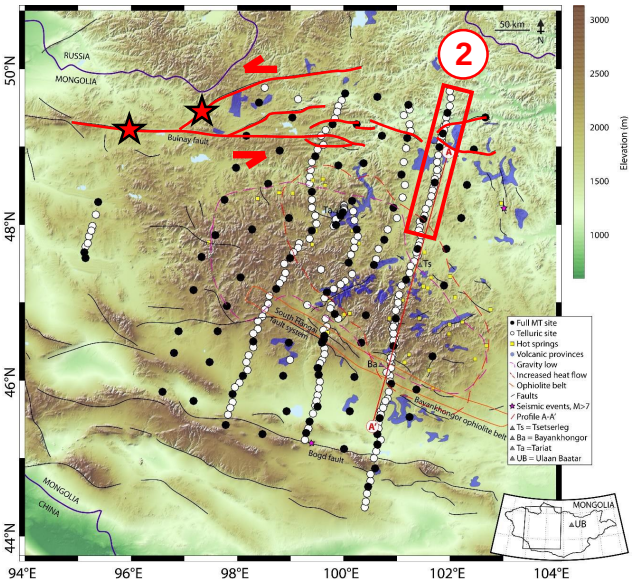
- Strike-slip fault system, capable of generating M8 earthquakes

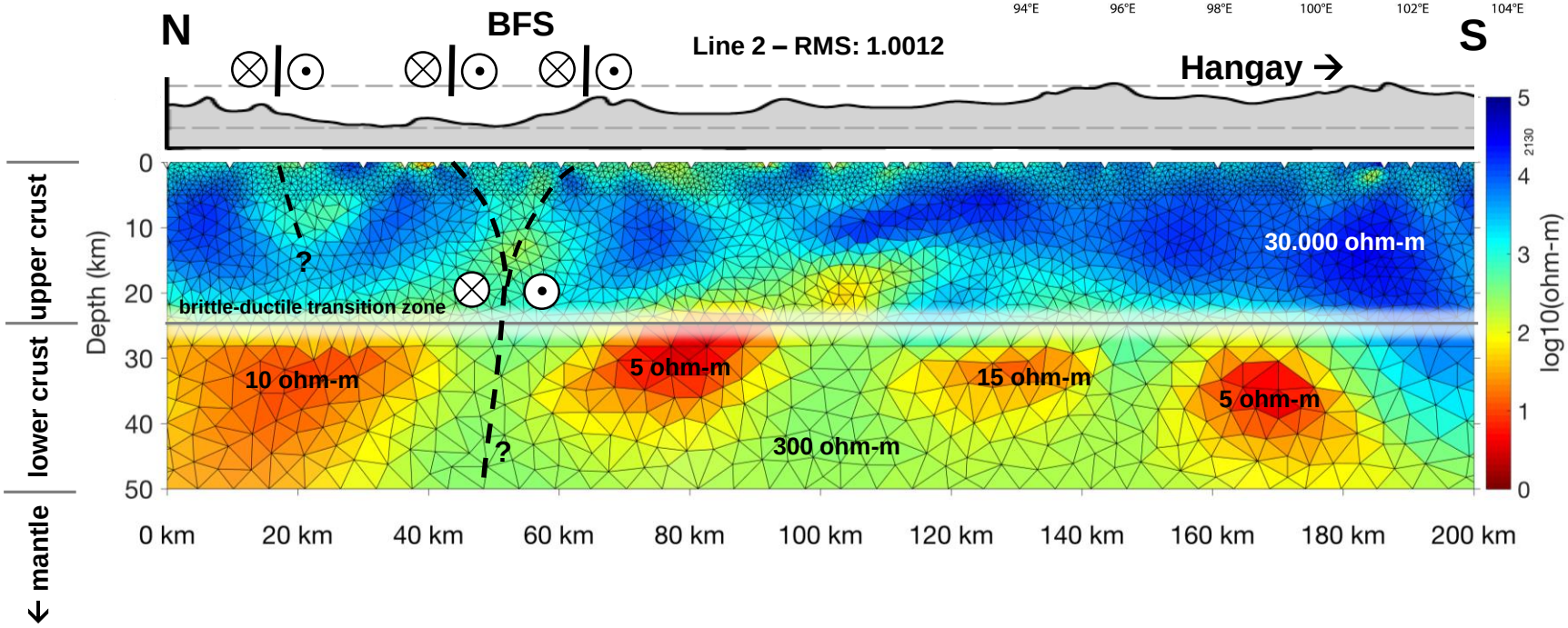




Bolnay Fault system (BFS)

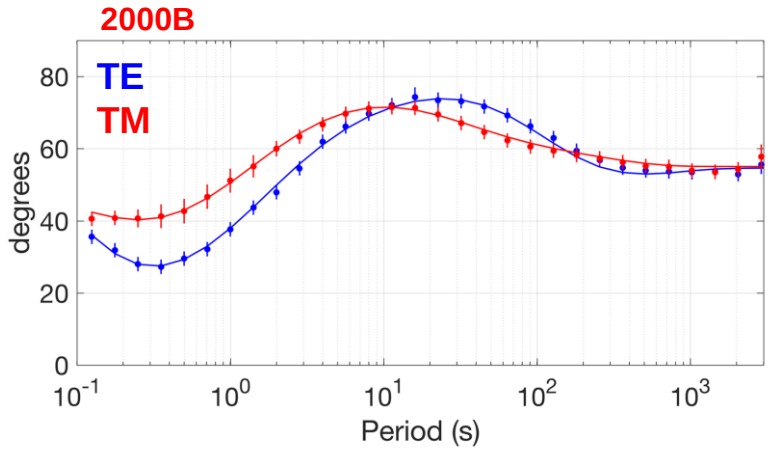
- Inversion model along Line 2 – northern section
  - adaptive FE code and Occam Inversion Mare2DEM (Kerry Key)
  - 1st run: same error floors, inversion to convergence
  - 2nd run: Invert additionally for static shift at 2/3 of sites
  - Misfit reduced to 1.0.

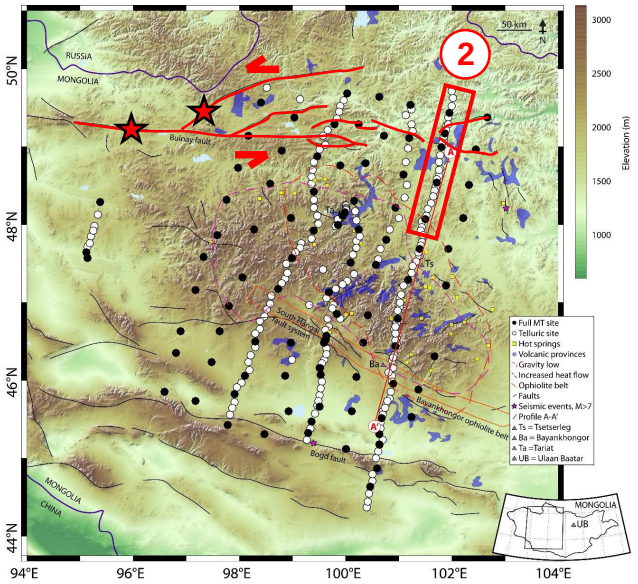


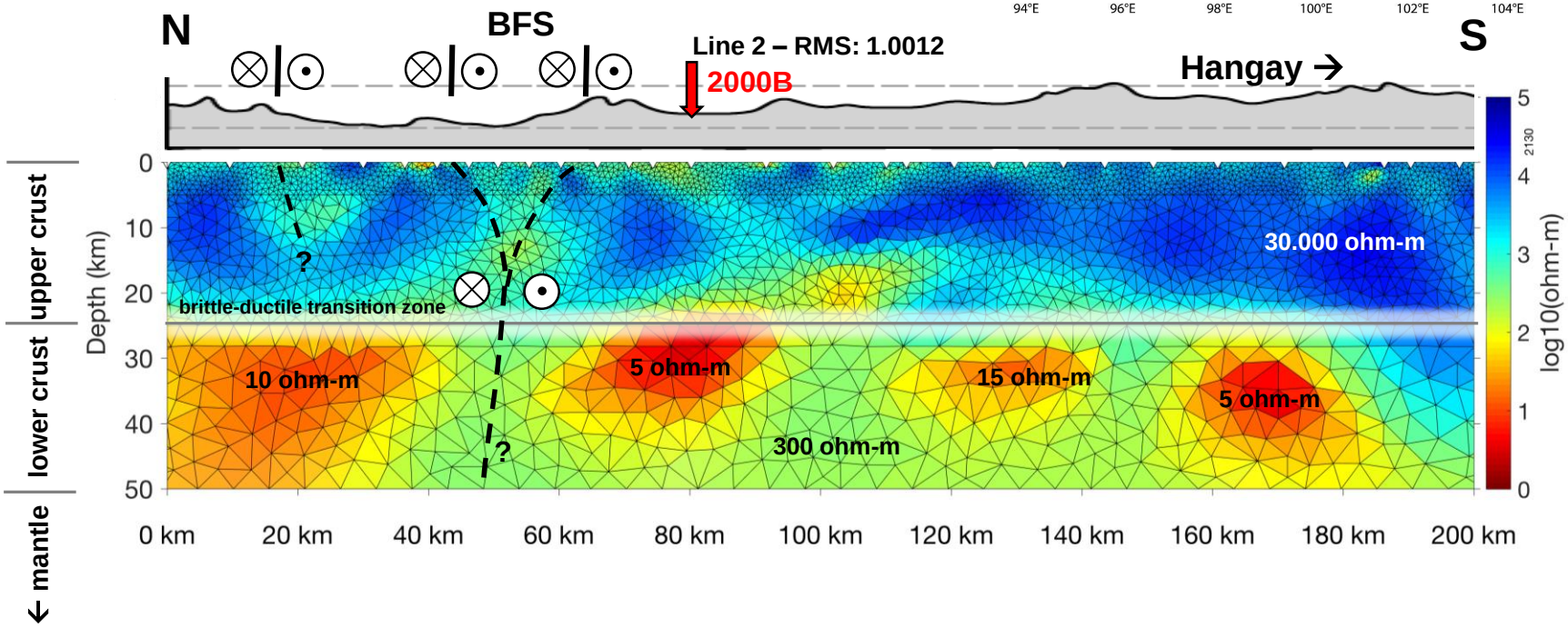


Bolnay Fault system (BFS)

- Inversion model along Line 2 – northern section







Bolnay Fault system (BFS)

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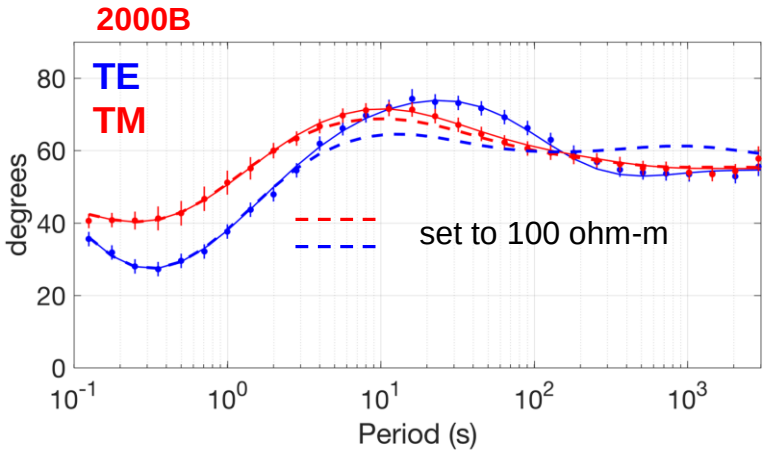

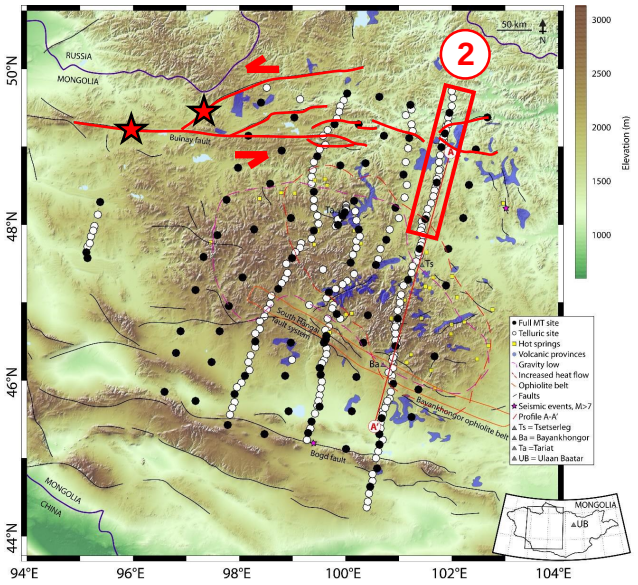

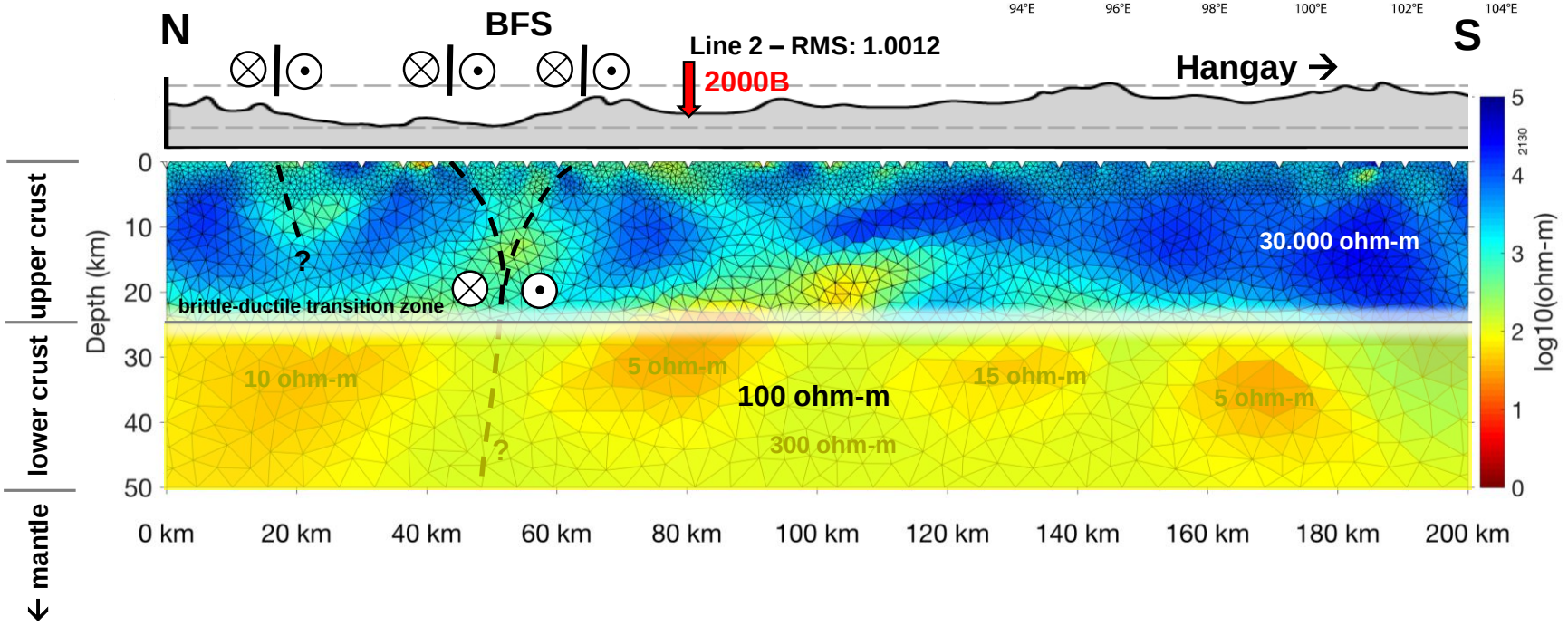

Bolnay Fault system (BFS)

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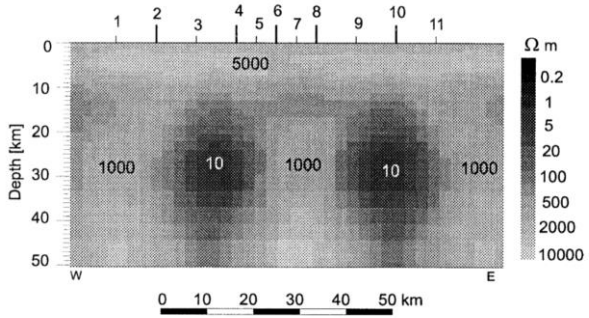
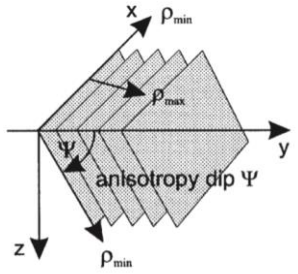
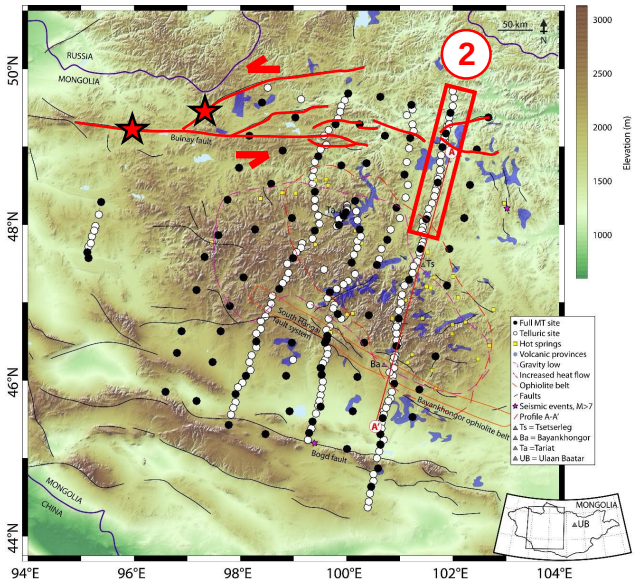
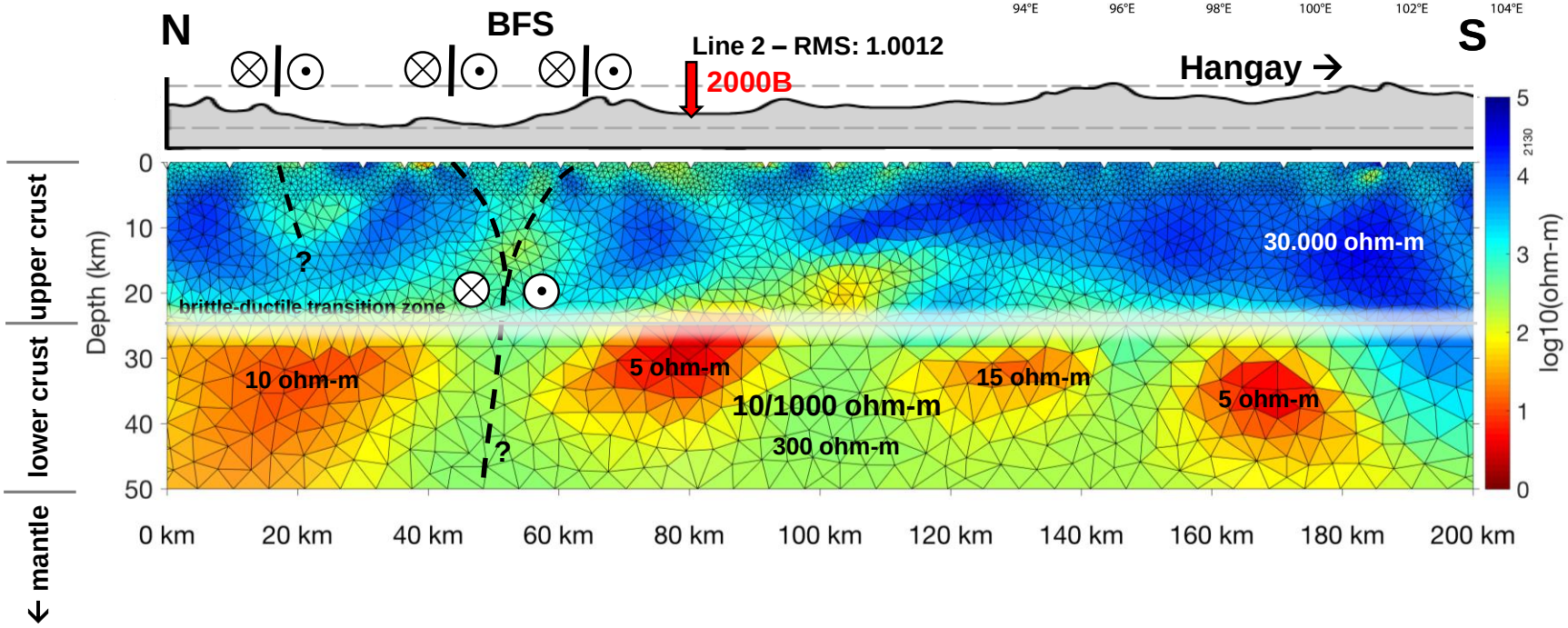


Figure 14. The 2-D inversion model for the 1-D model 3 (layer 1: 5000 Ω m and 10 km; layer 2: 2000 Ω m and 10 km; layer 3: a 60° dipping anisotropic half-space of 20/1000 Ω m). The anisotropy is recovered in the form of a sequence of vertical dykes. The anisotropy dip cannot be recovered.



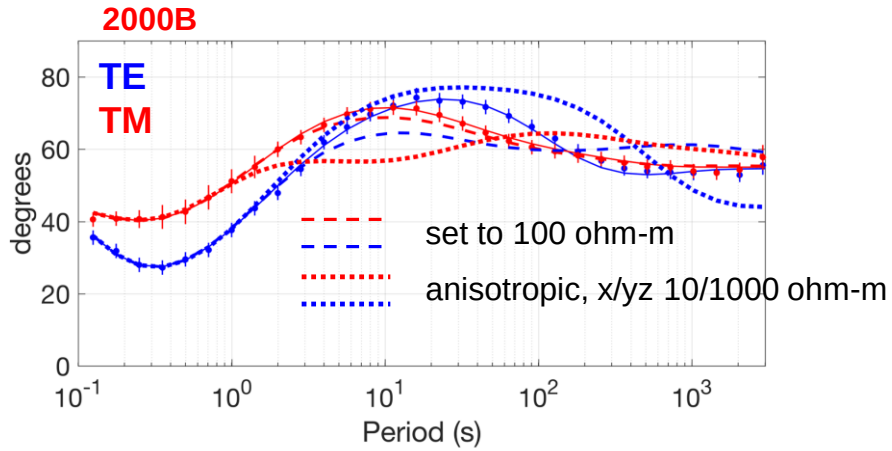
Effects of anisotropy on the two-dimensional inversion procedure. **(Heise and Pous, 2001).**

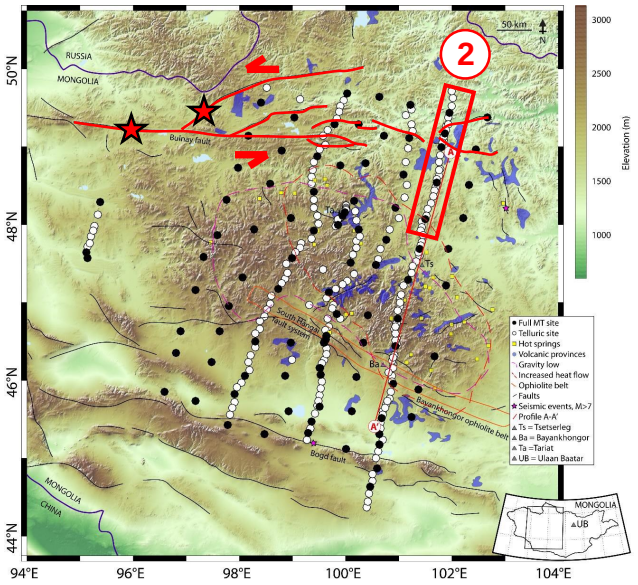


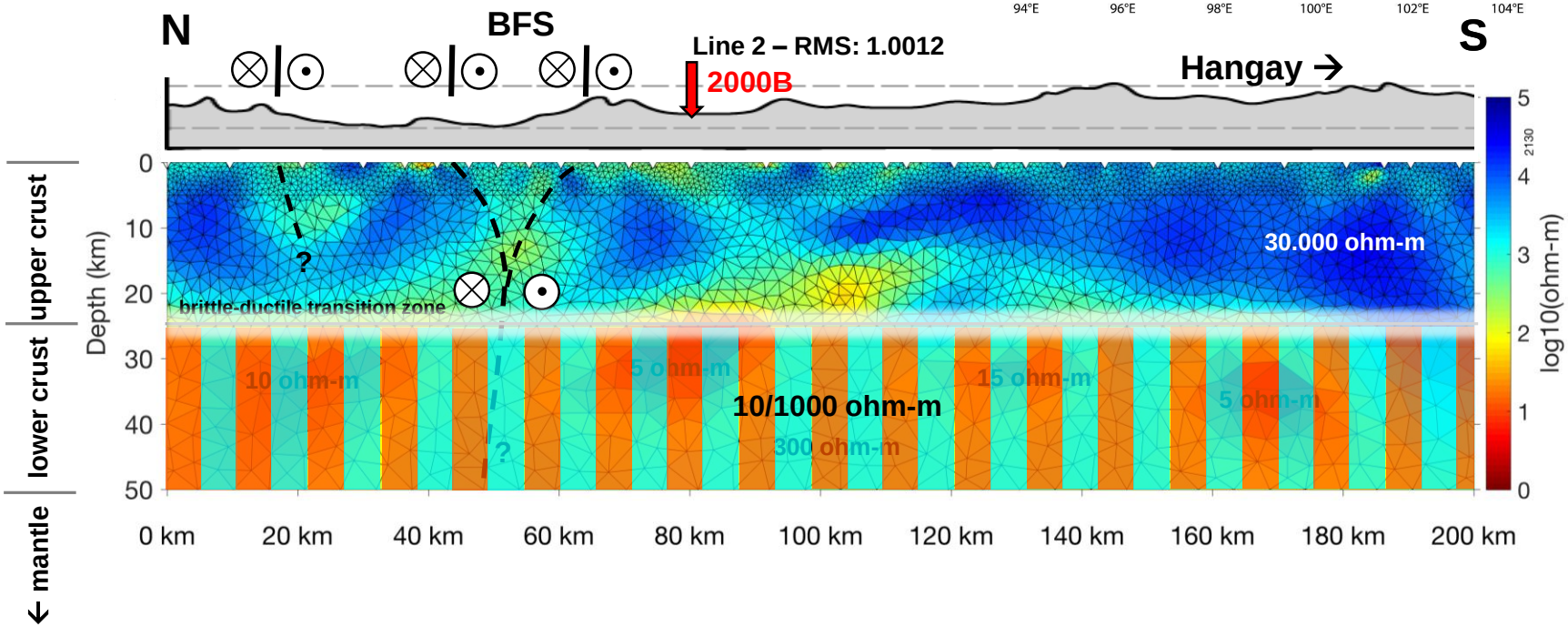


Bolnay Fault system (BFS)

- Inversion model along Line 2 – northern section







Bolnay Fault system (BFS)

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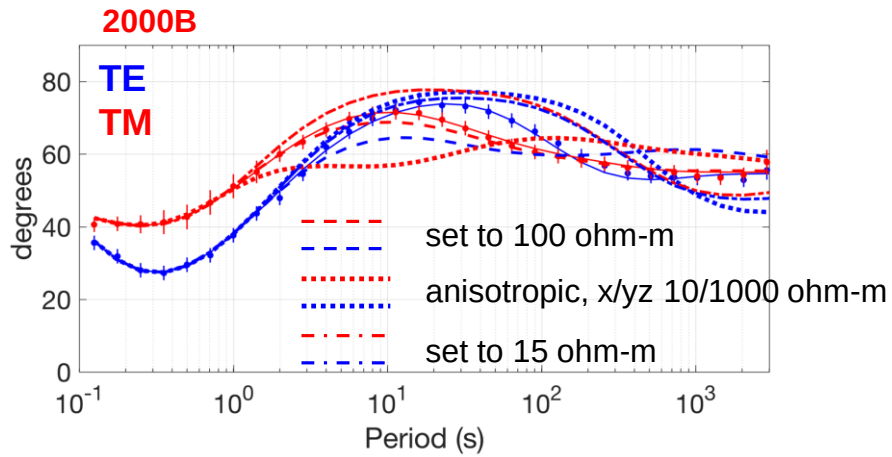
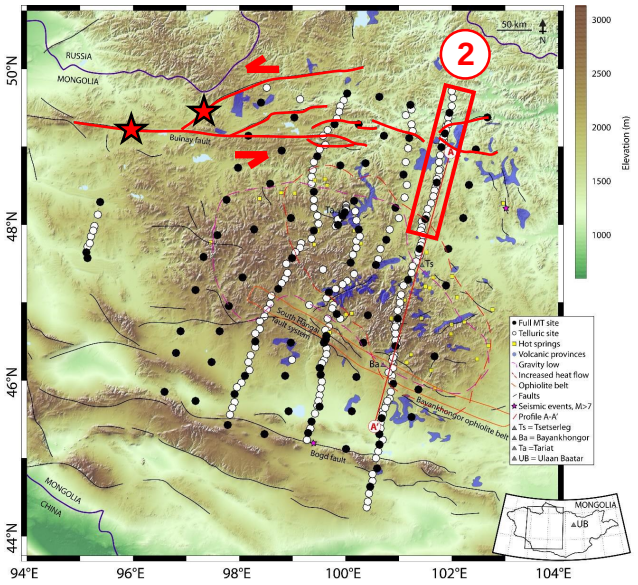
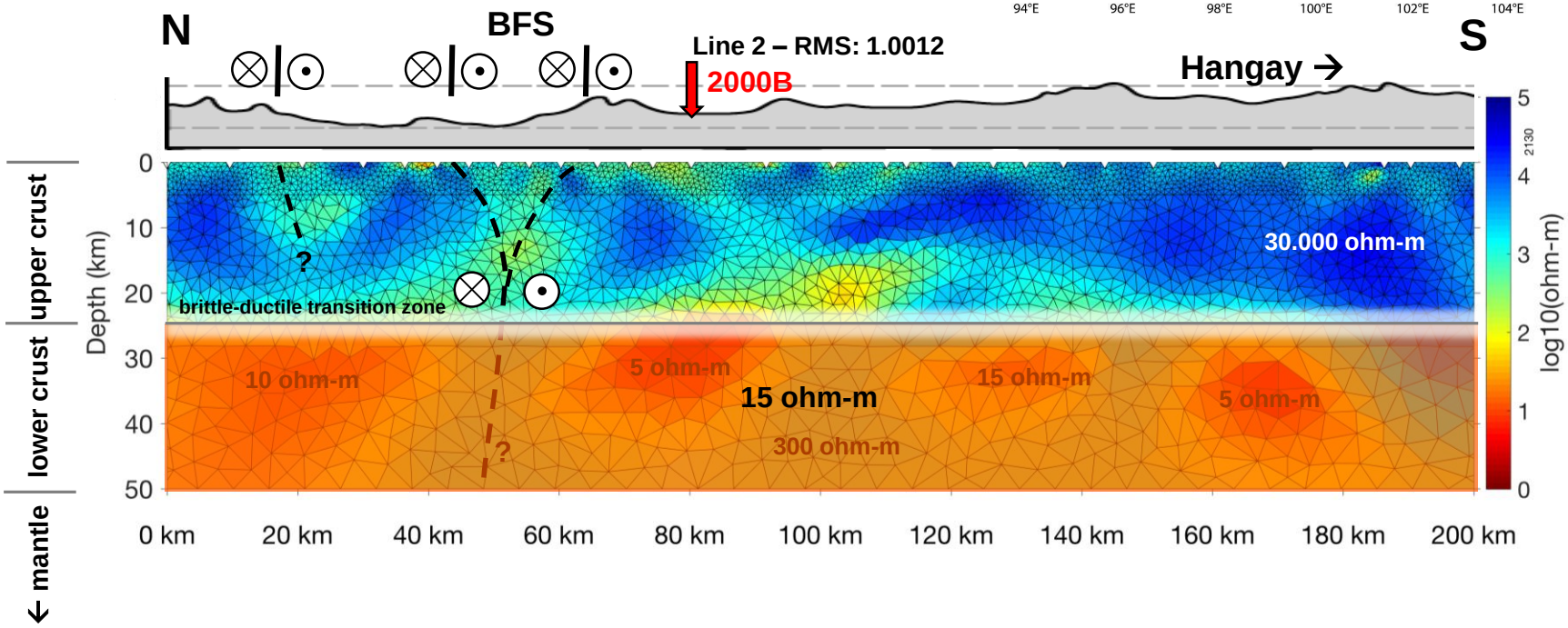
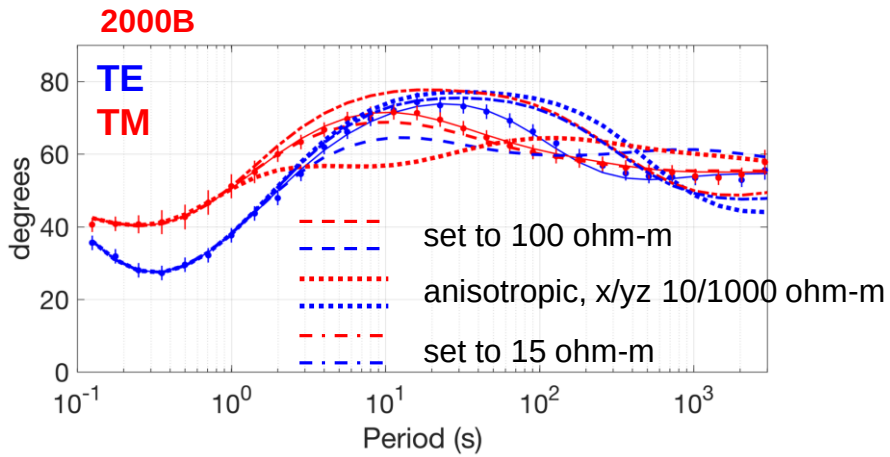


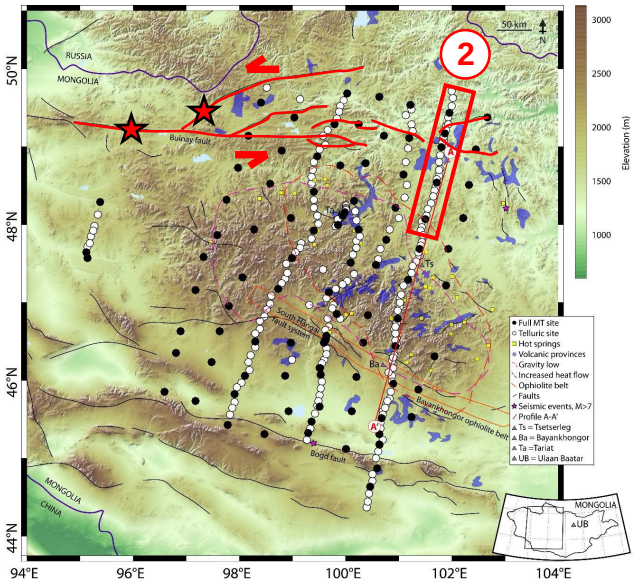


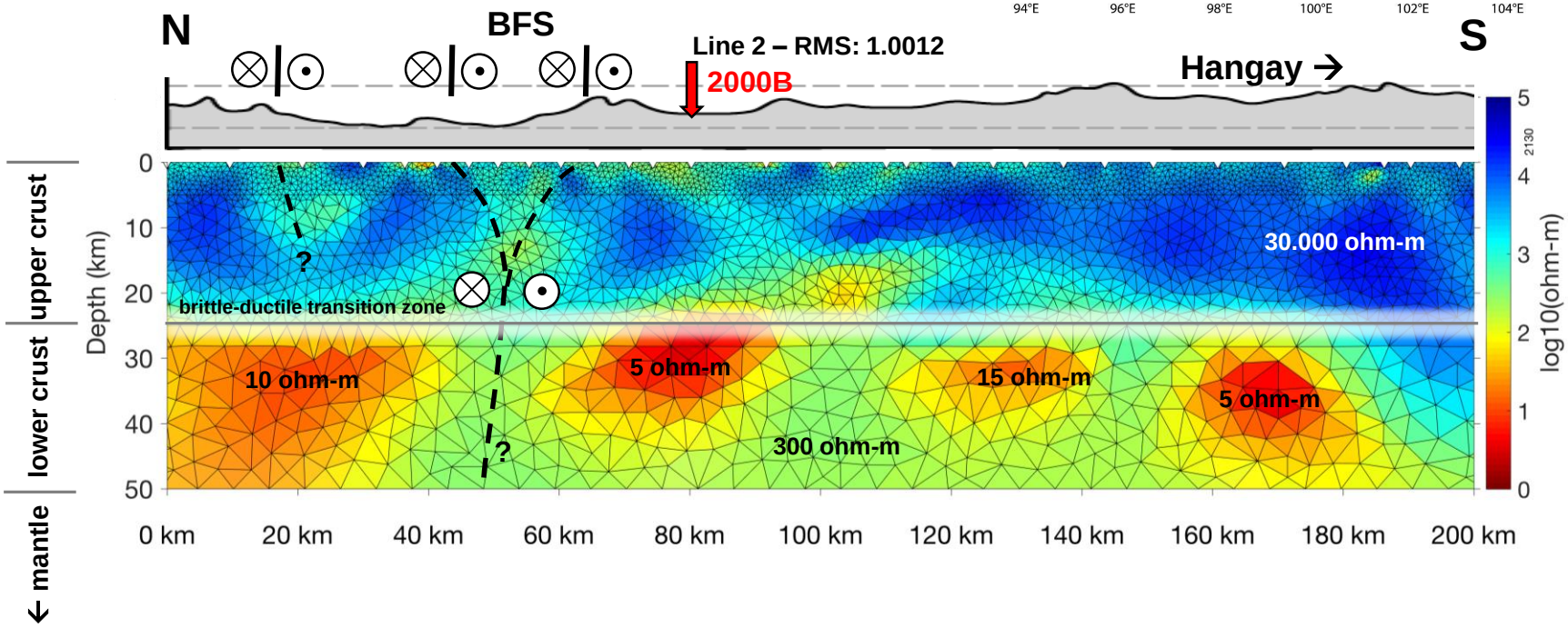


Bolnay Fault system (BFS)

- Inversion model along Line 2 – northern section



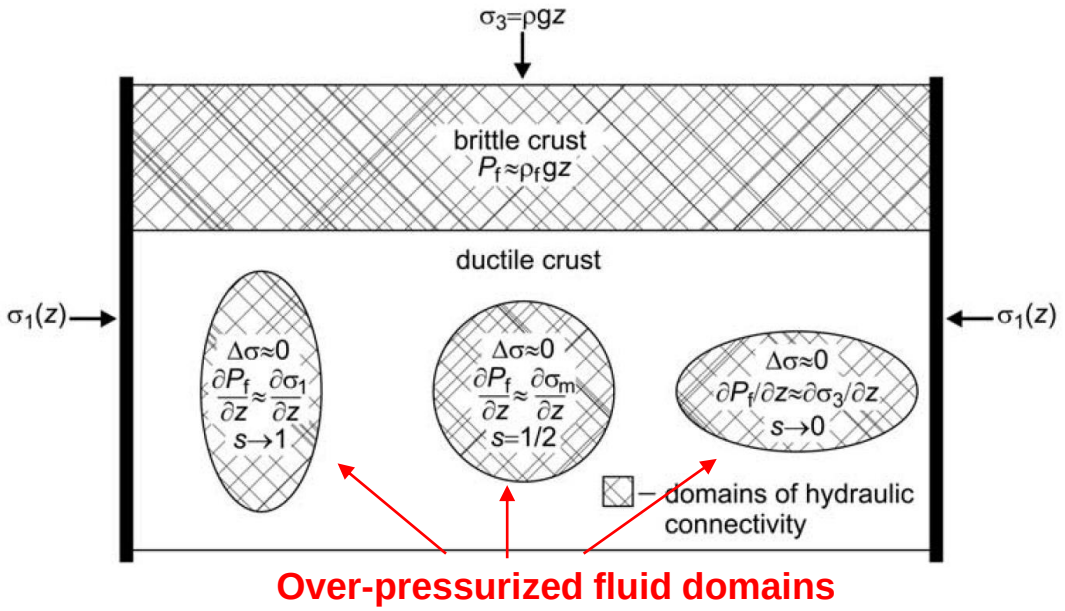




Fluids in the lower crust (compressional regimes)

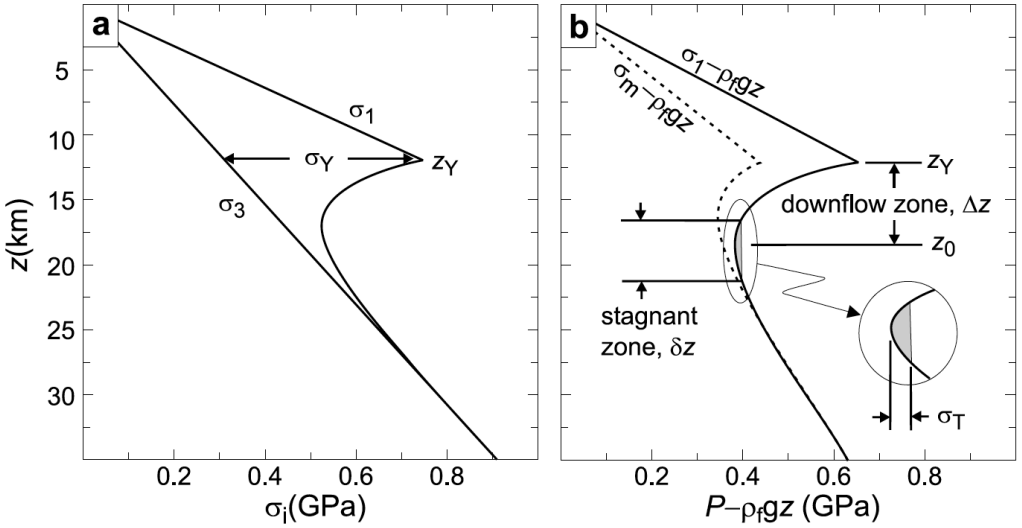
→ stalled in hydraulically connected zones below the brittle-ductile transition zone

Conceptual model →



→ stress profiles in the crust suggests negative vertical pressure gradient below BDTZ

Keeps fluids over-pressurized→



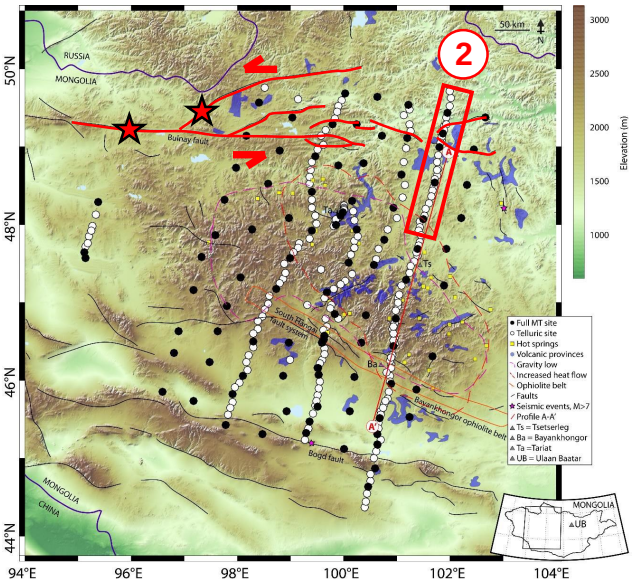
(Conolly and Podlachikov, 2008)

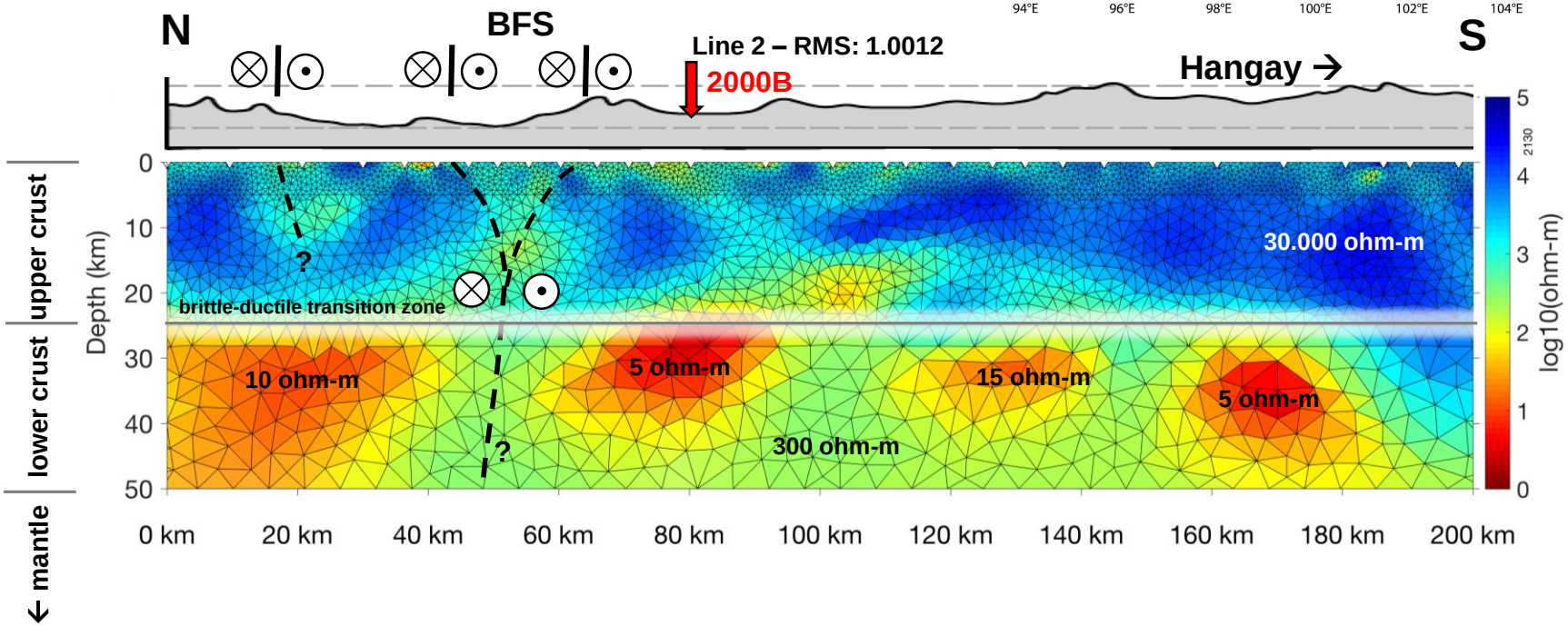
Bolnay Fault system (BFS)

- Inversion model along Line 2 – northern section

Preferred interpretation: interconnected zones of fluids in lower crust.

→ Weakening effect



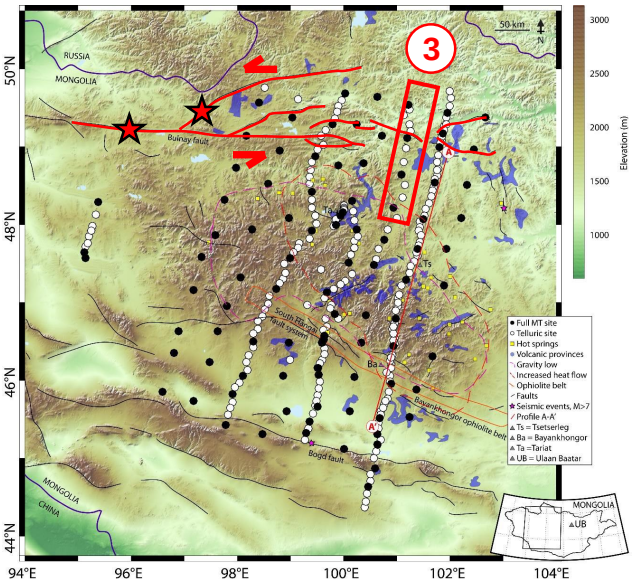


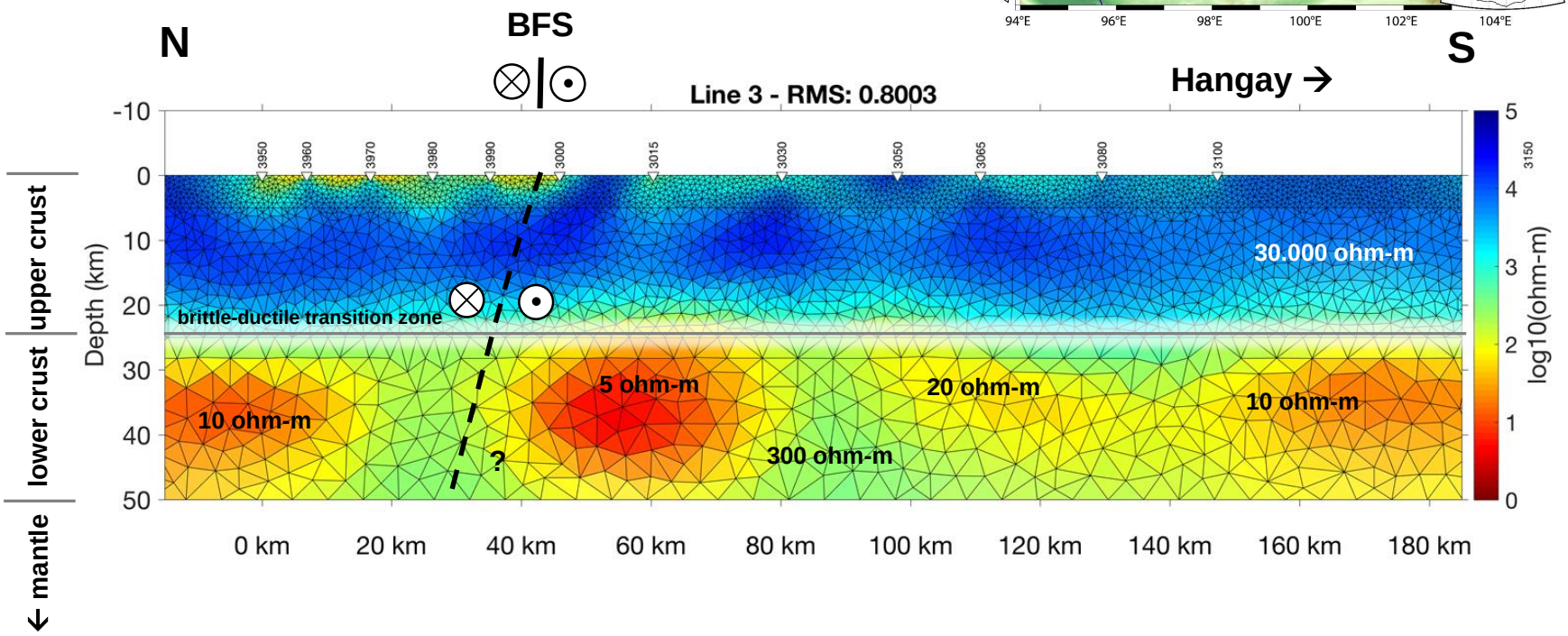
Bolnay Fault system (BFS)

- Inversion model along Line 3 – northern section

Preferred interpretation: interconnected zones of fluids in lower crust.

→ Weakening effect



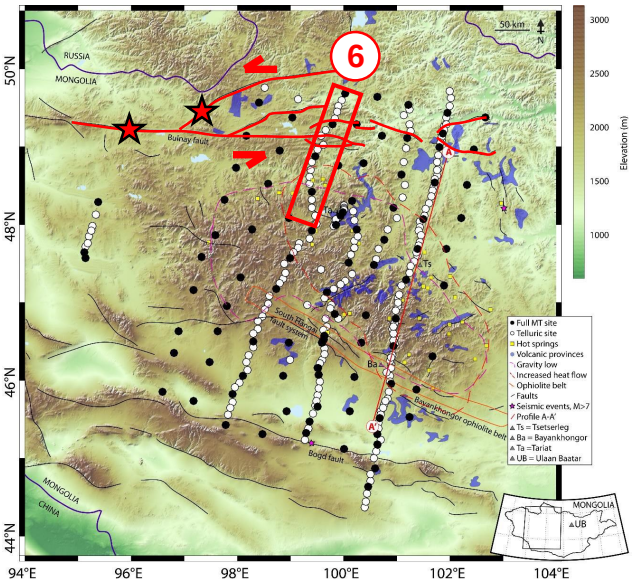


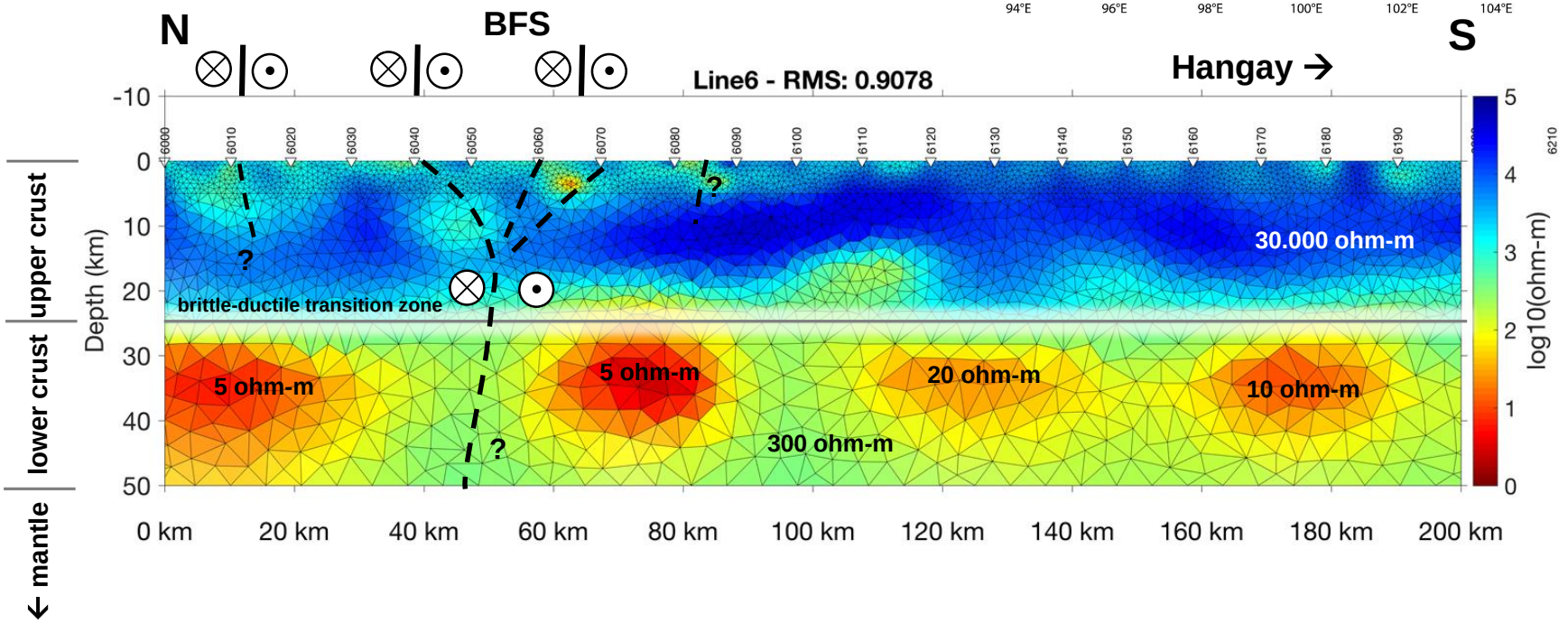
Bolnay Fault system (BFS)

- Inversion model along Line 6 – northern section

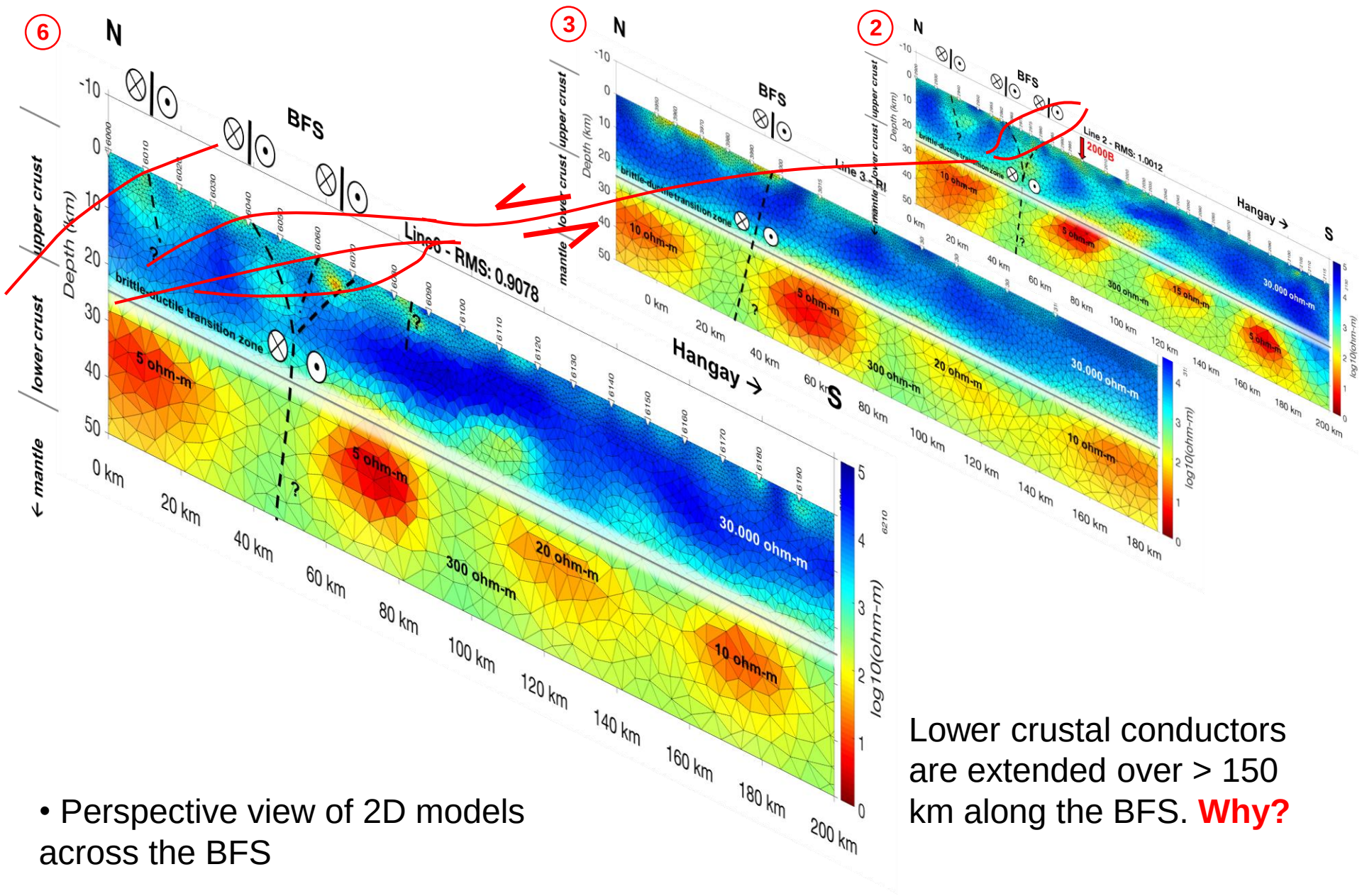
Preferred interpretation: interconnected zones of fluids in lower crust.

→ Weakening effect





Bolnay Fault system (BFS)



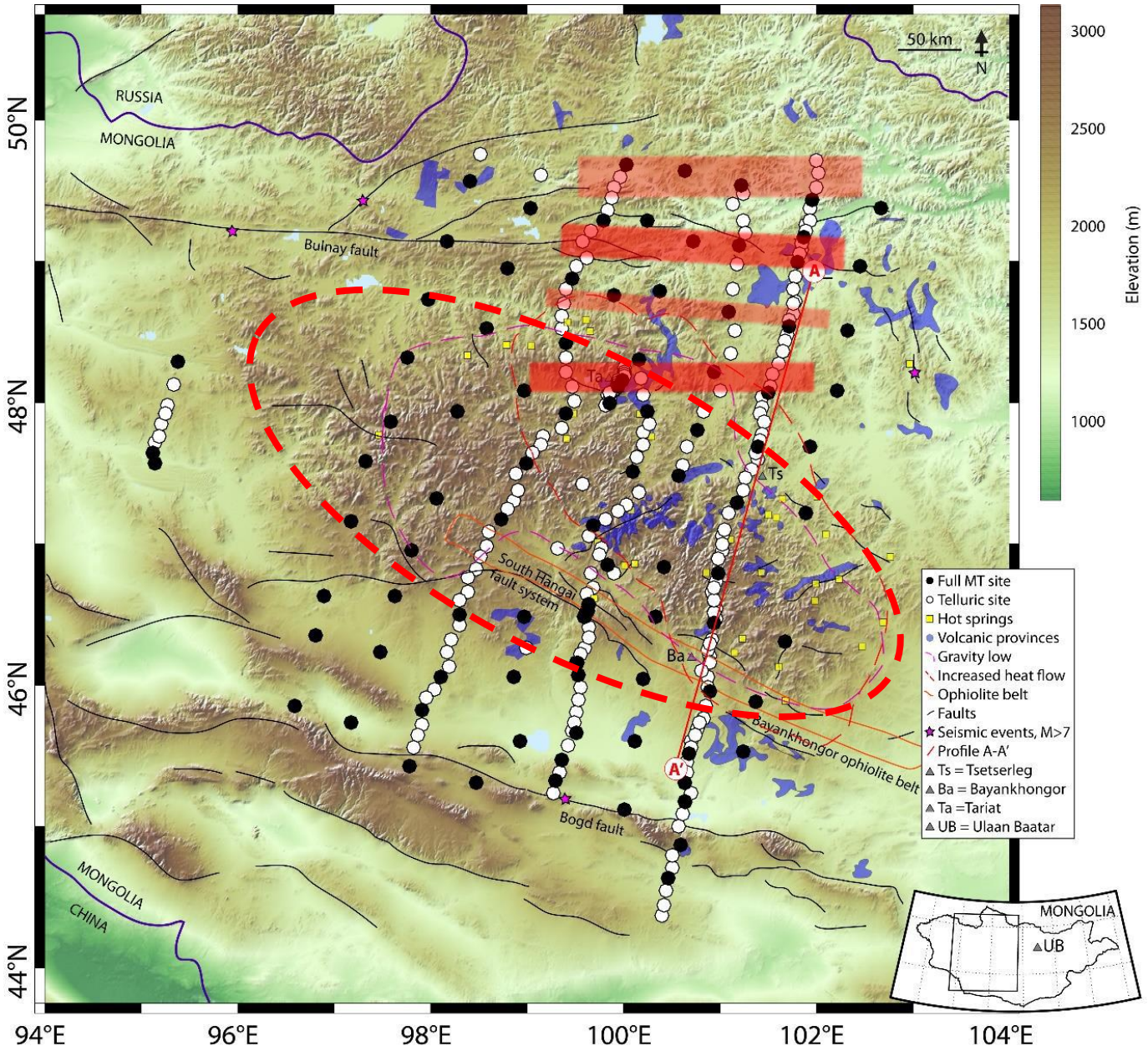
- Perspective view of 2D models across the BFS

Lower crustal conductors are extended over > 150 km along the BFS. **Why?**

MT Measurement Campaigns 2016 and 2017

- Lower crustal conductors are extended over > 150 km along the BFS.

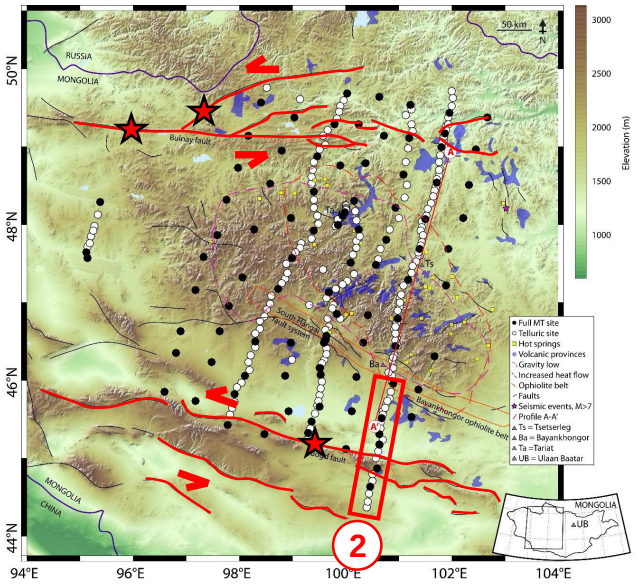
Why? Lower crustal Flow?

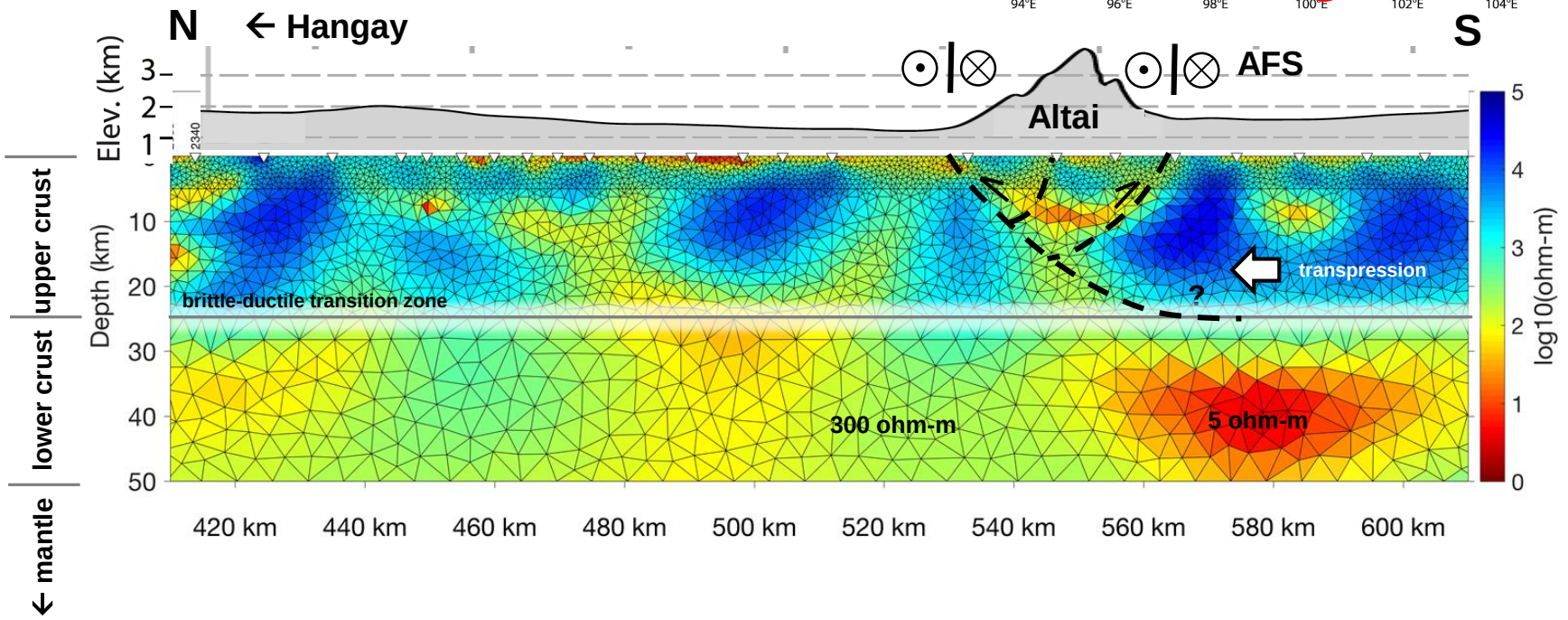


Gobi Altai system (GFS)

- Inversion model along Line 2 – southern section

→ Root of the transpressive Altai Mountain range (max. 4000 m asl)



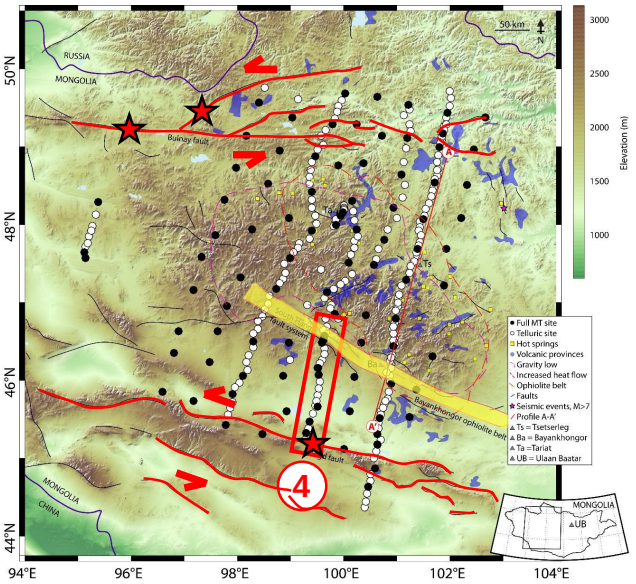


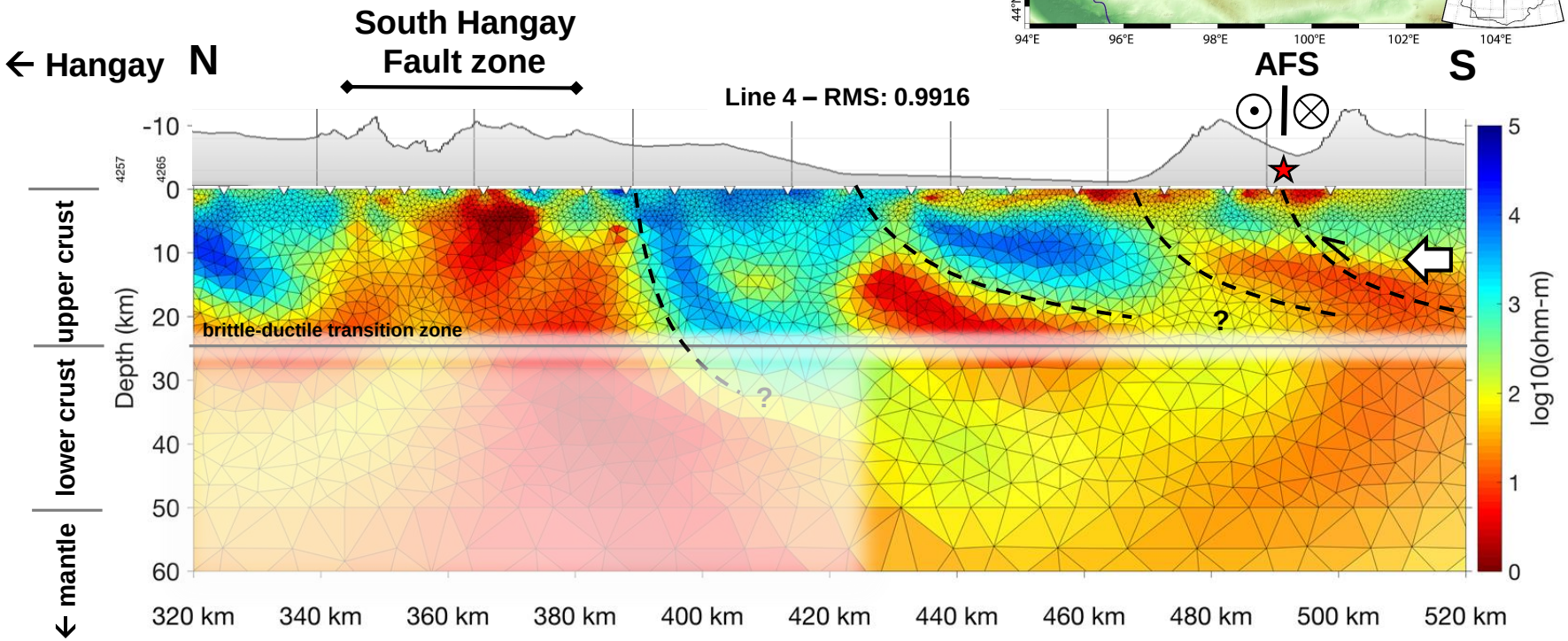
Gobi Altai system (GFS)

- Inversion model along Line 4 – southern section

→ Mid-crustal conductors at the GFS (historical M8 earthquake)

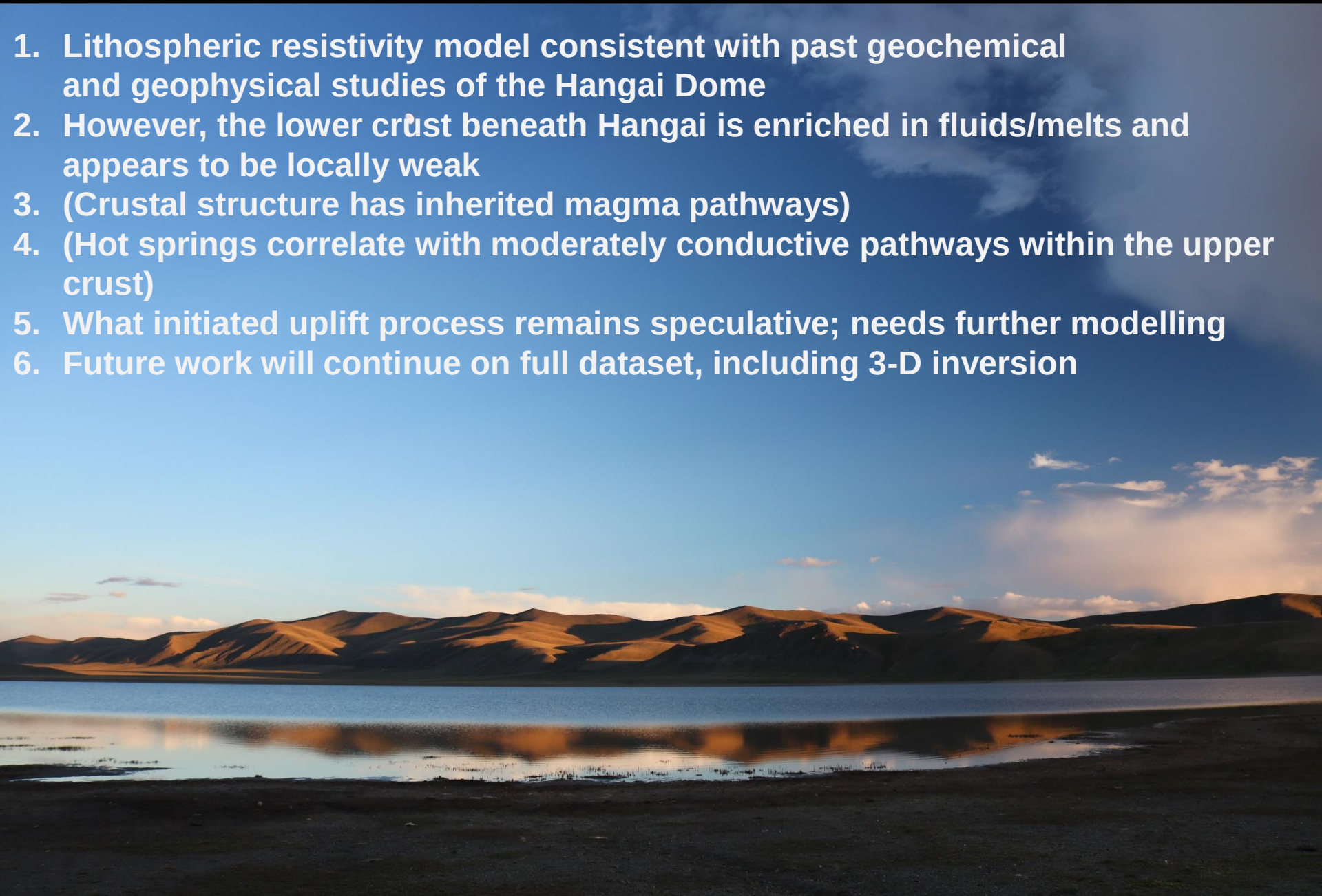
→ Bayankhongor Ophiolite Belt (SHFZ) is zone of crustal weakness (carries mineralizations)





Summary

1. Lithospheric resistivity model consistent with past geochemical and geophysical studies of the Hangai Dome
2. However, the lower crust beneath Hangai is enriched in fluids/melts and appears to be locally weak
3. (Crustal structure has inherited magma pathways)
4. (Hot springs correlate with moderately conductive pathways within the upper crust)
5. What initiated uplift process remains speculative; needs further modelling
6. Future work will continue on full dataset, including 3-D inversion



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Thank you for your attention!