Unravelling intraplate Cenozoic magmatism in Mongolia: Reflections from the present-day mantle or a legacy from the past?

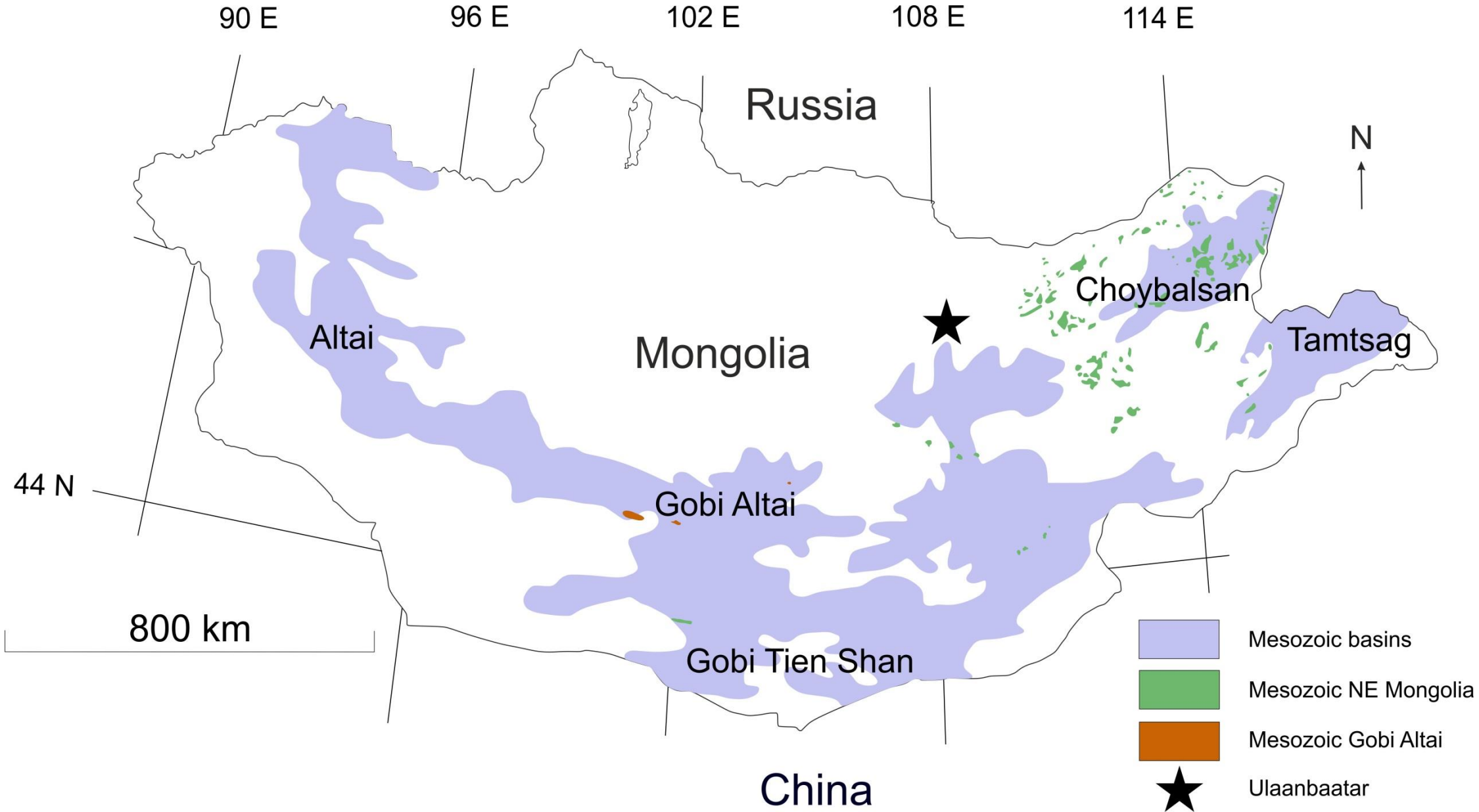


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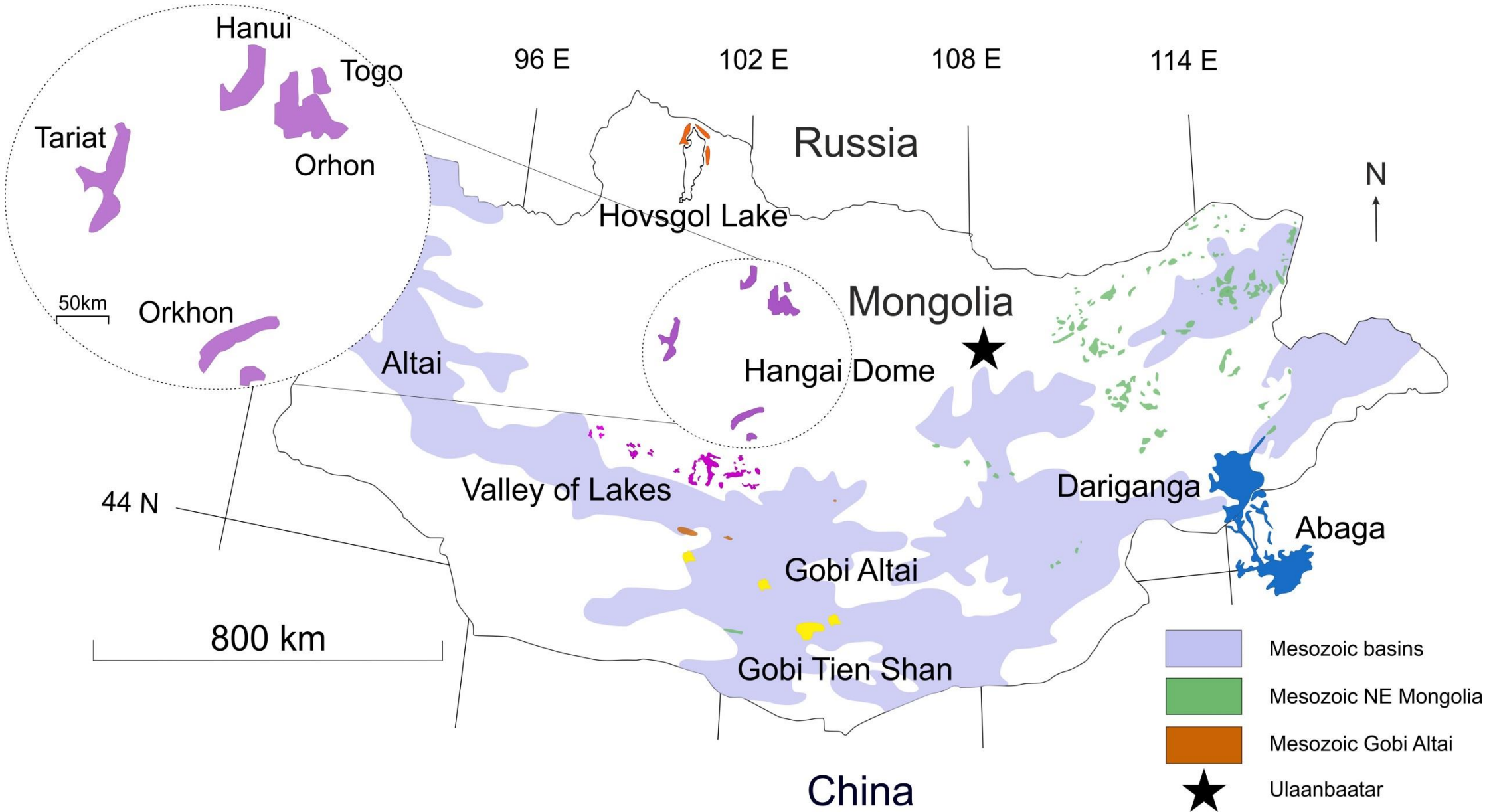
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Mesozoic magmatism (220-75Ma) vs…

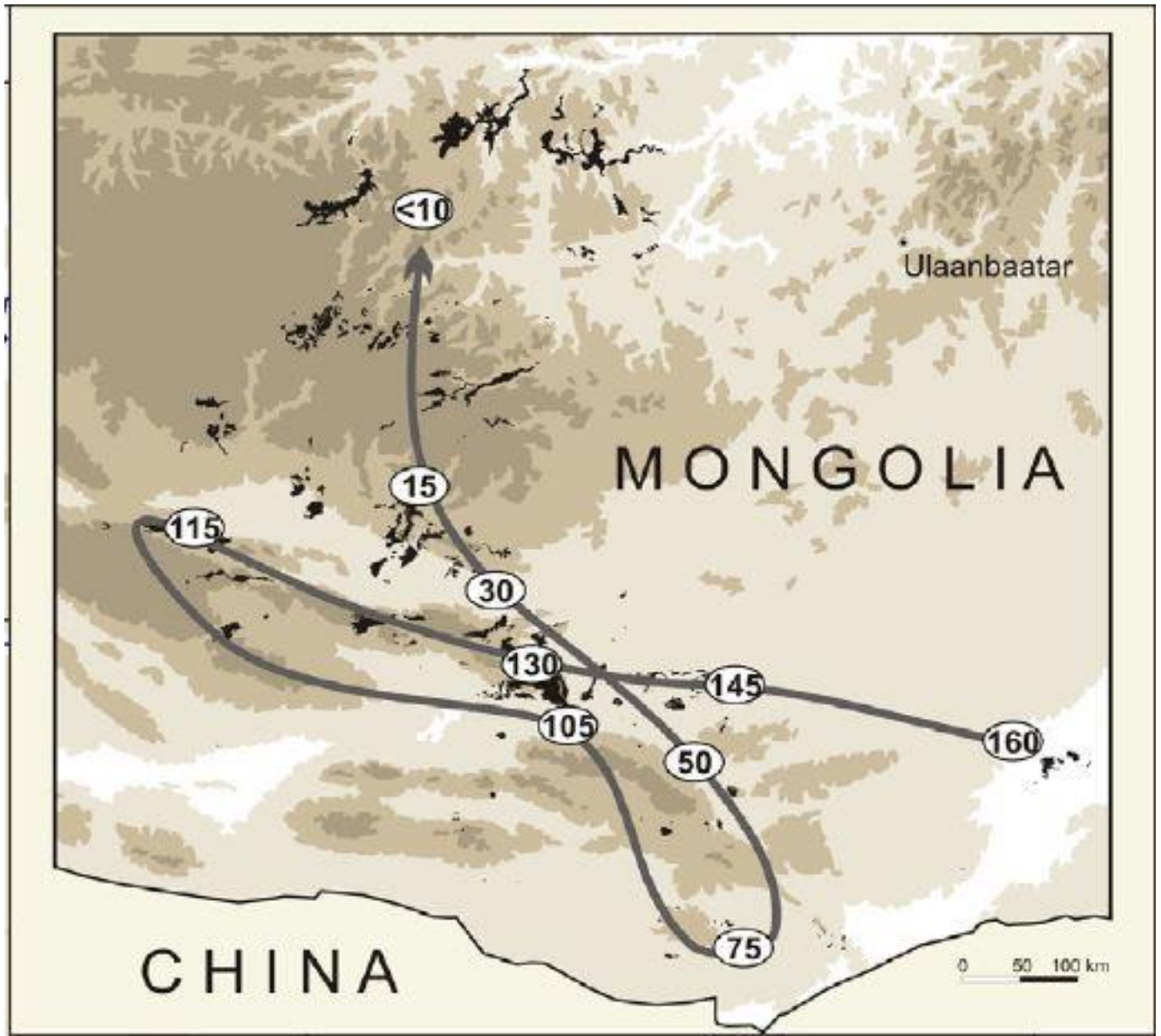


… Cenozoic magmatism (62Ma-present day)



Existing hypotheses

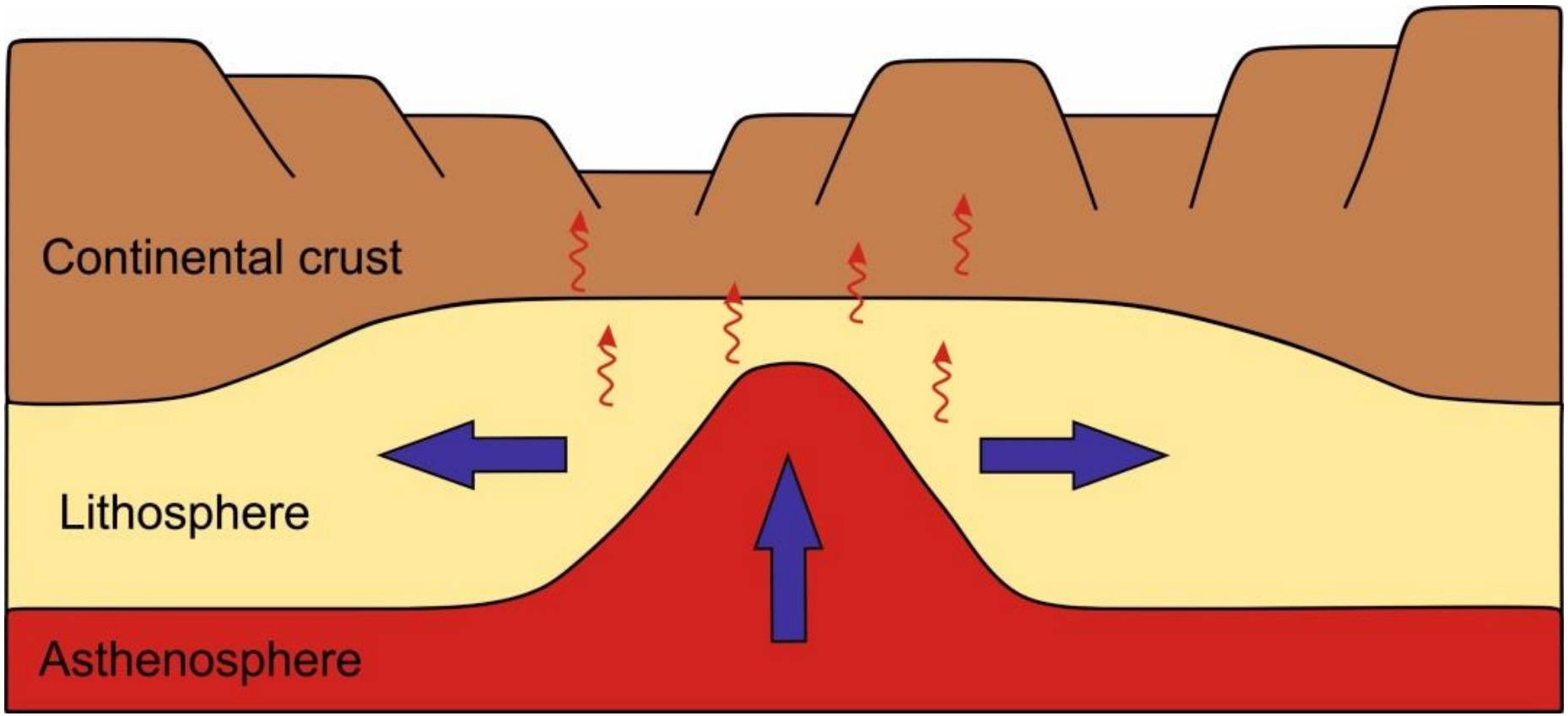
- Mantle plume
  (Logatchev, 1984; Zorin & Lepina, 1985; Windley & Allen, 1993)



Yarmolyuk et al., 2015

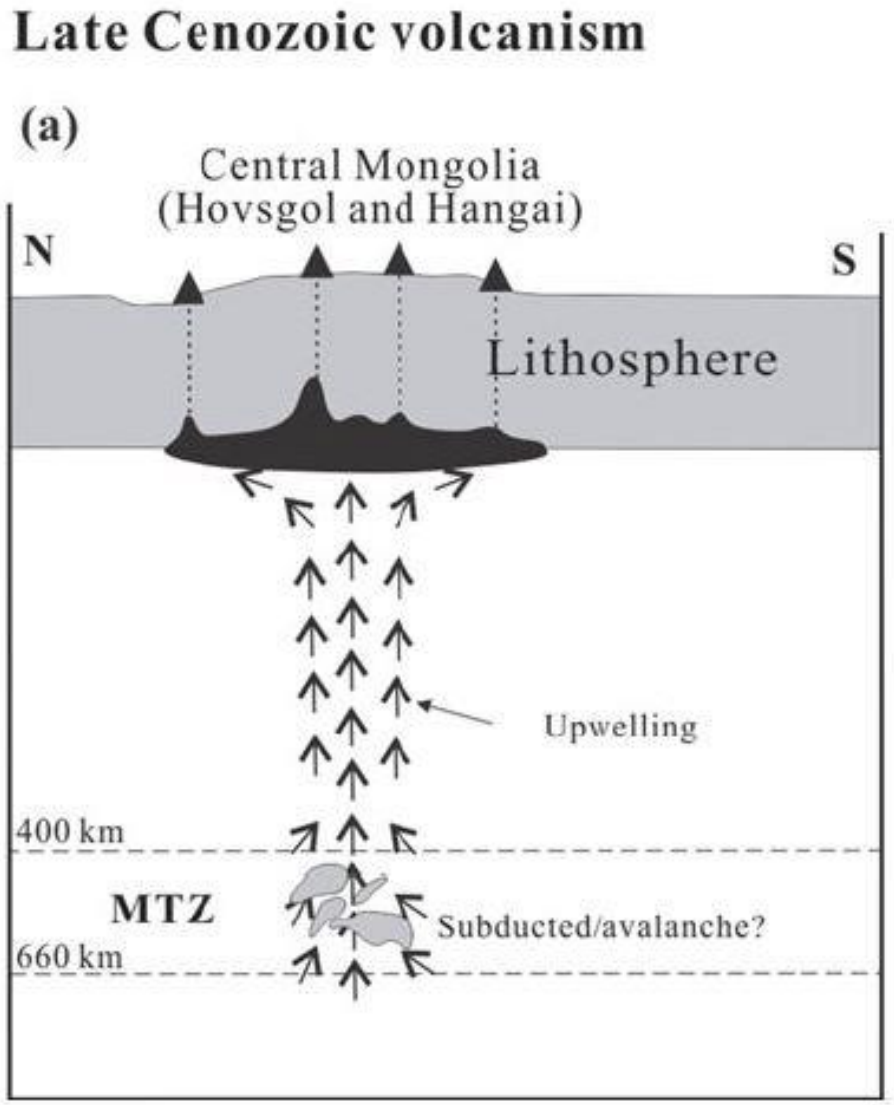
Existing hypotheses

- Mantle plume
- Lithospheric rifting or extension
  (Yarmolyuk et al., 1991)



Existing hypotheses

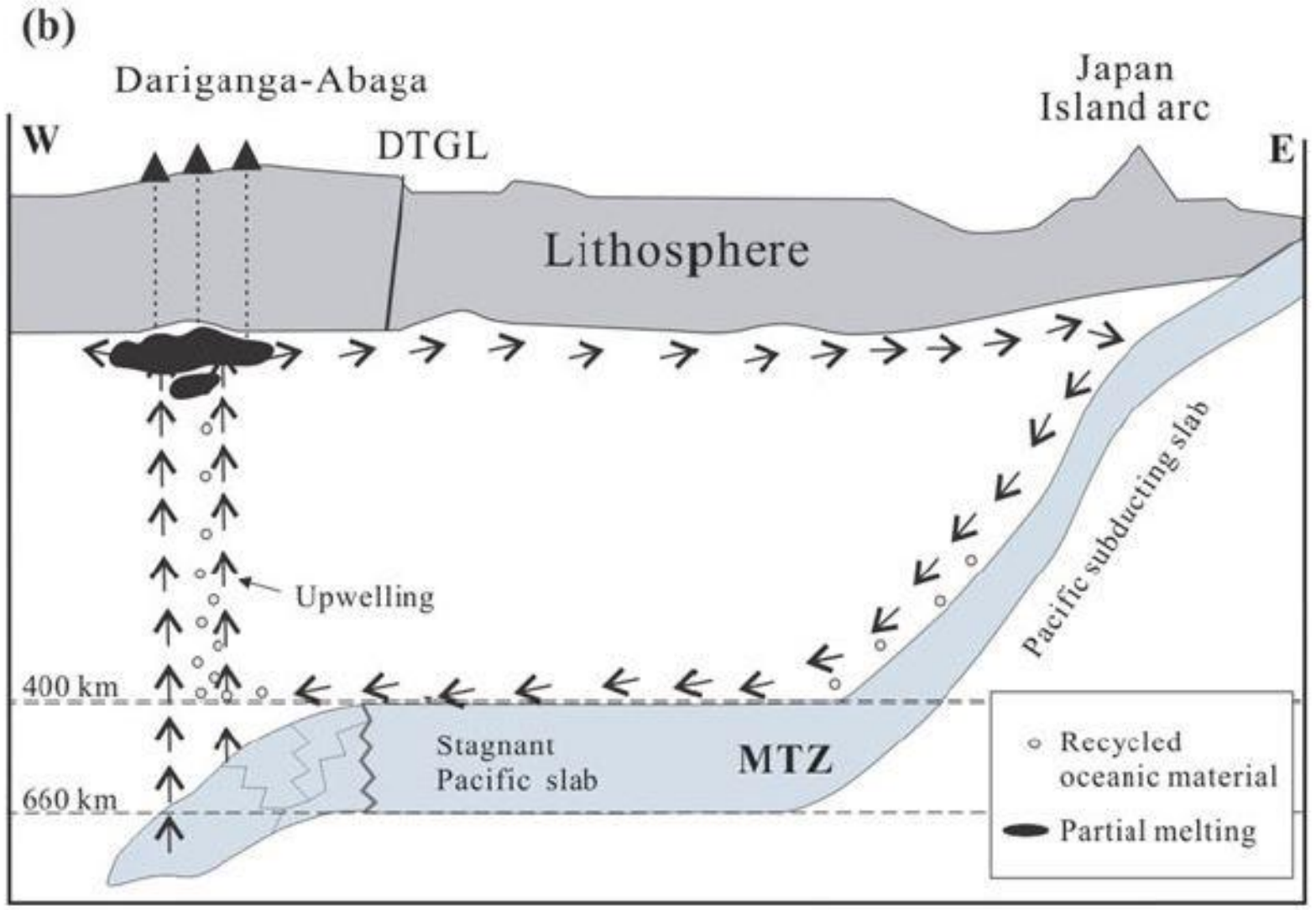
- Mantle plume
- Lithospheric rifting or extension
- Far-field effect of Indo-Asian collision (Khain, 1990)



Togtokh et al., 2018

Existing hypotheses

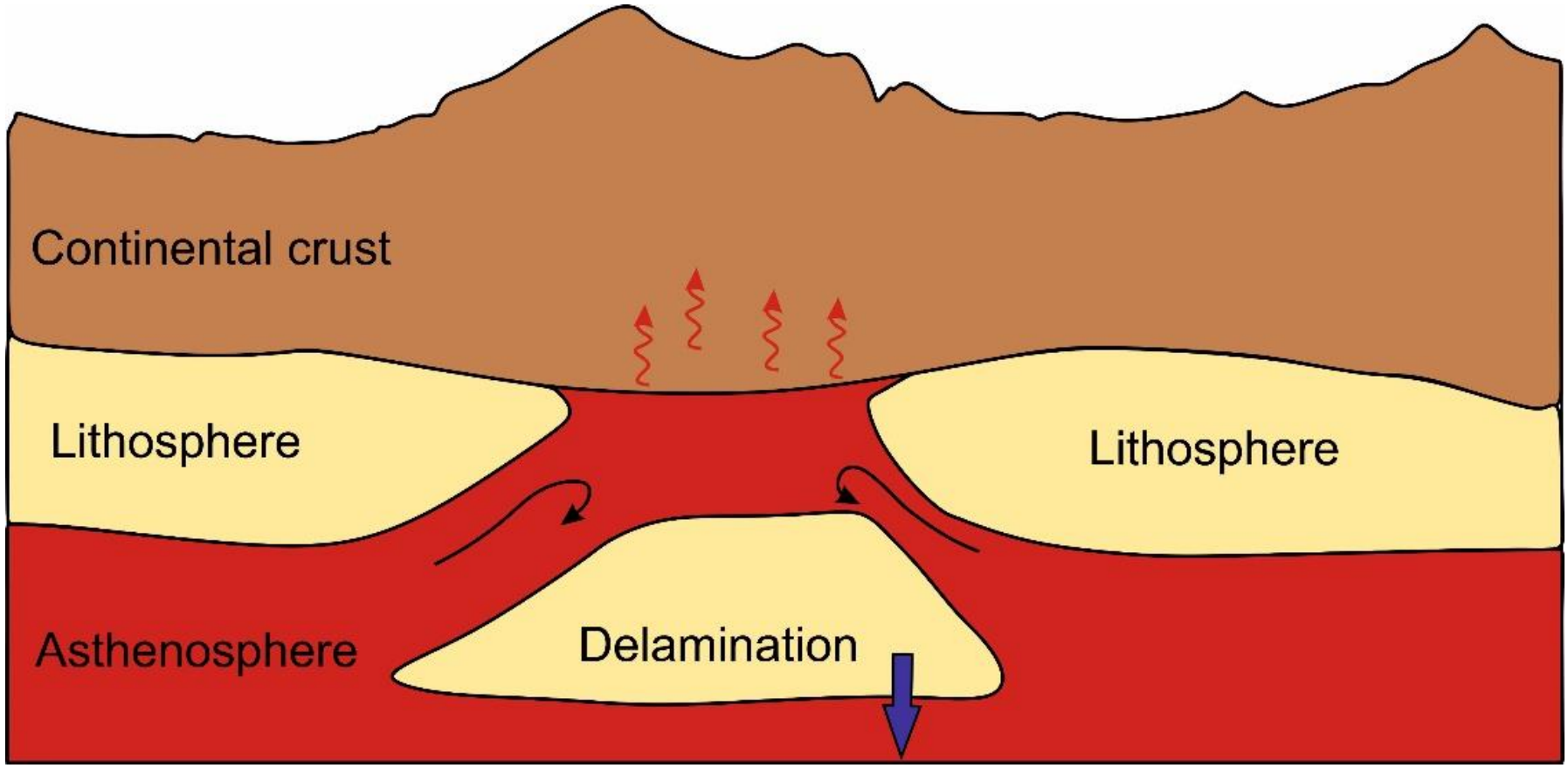
- Mantle plume
- Lithospheric rifting or extension
- Far-field effect of Indo-Asian collision
- Upwelling due to the Pacific plate subduction (Zhang et al., 2016, Togtokh et al., 2018)



Togtokh et al., 2018

Existing hypotheses

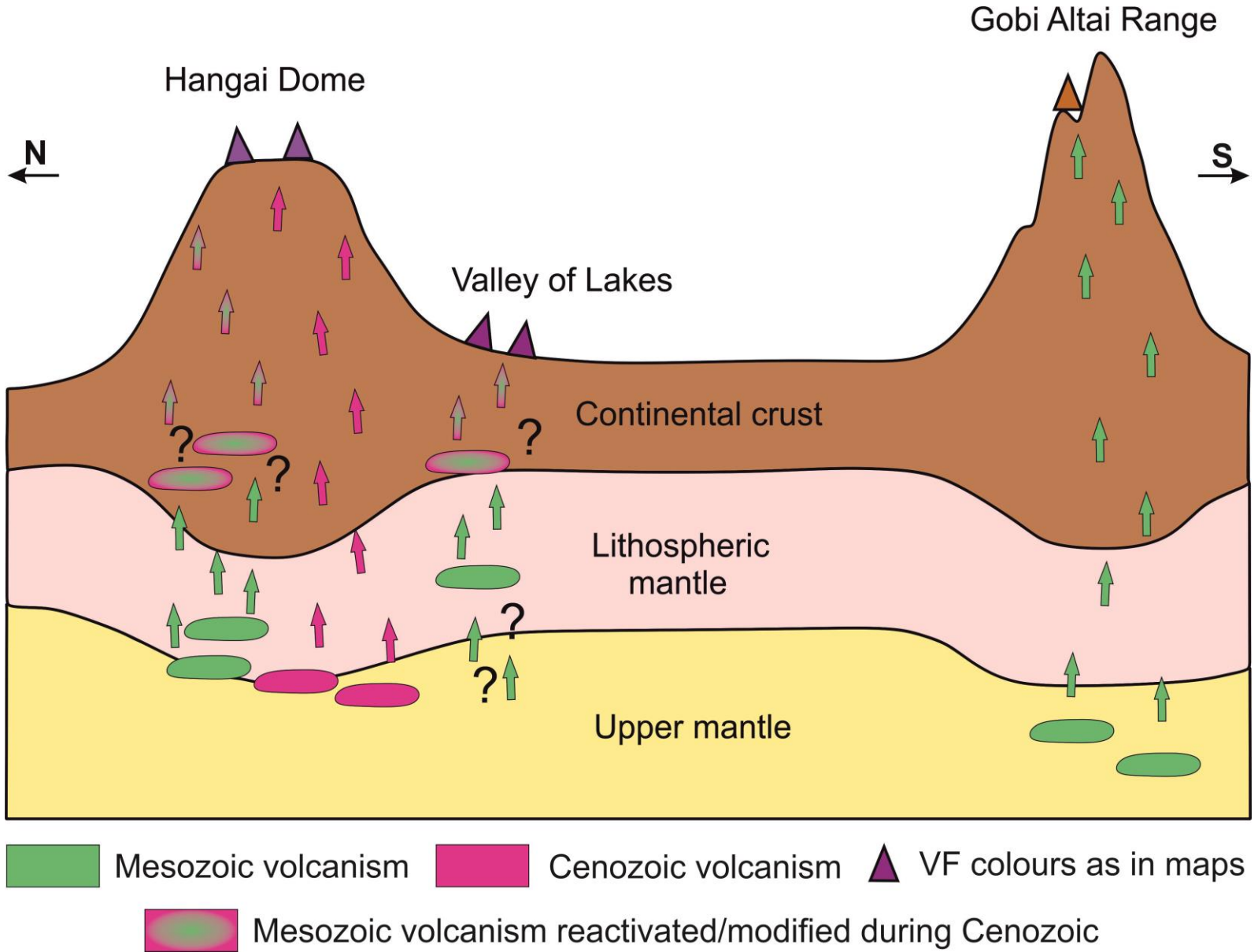
- Mantle plume
- Lithospheric rifting or extension
- Far-field effect of Indo-Asian collision
- Upwelling due to the Pacific plate subduction
- Delamination of the lithospheric mantle (Windley et al., 2010; Sheldrick et al., 2018)



Testing hypotheses – 1

- Central Mongolia – Hangai Dome and Valley of Lakes
- <u>Criteria:</u>

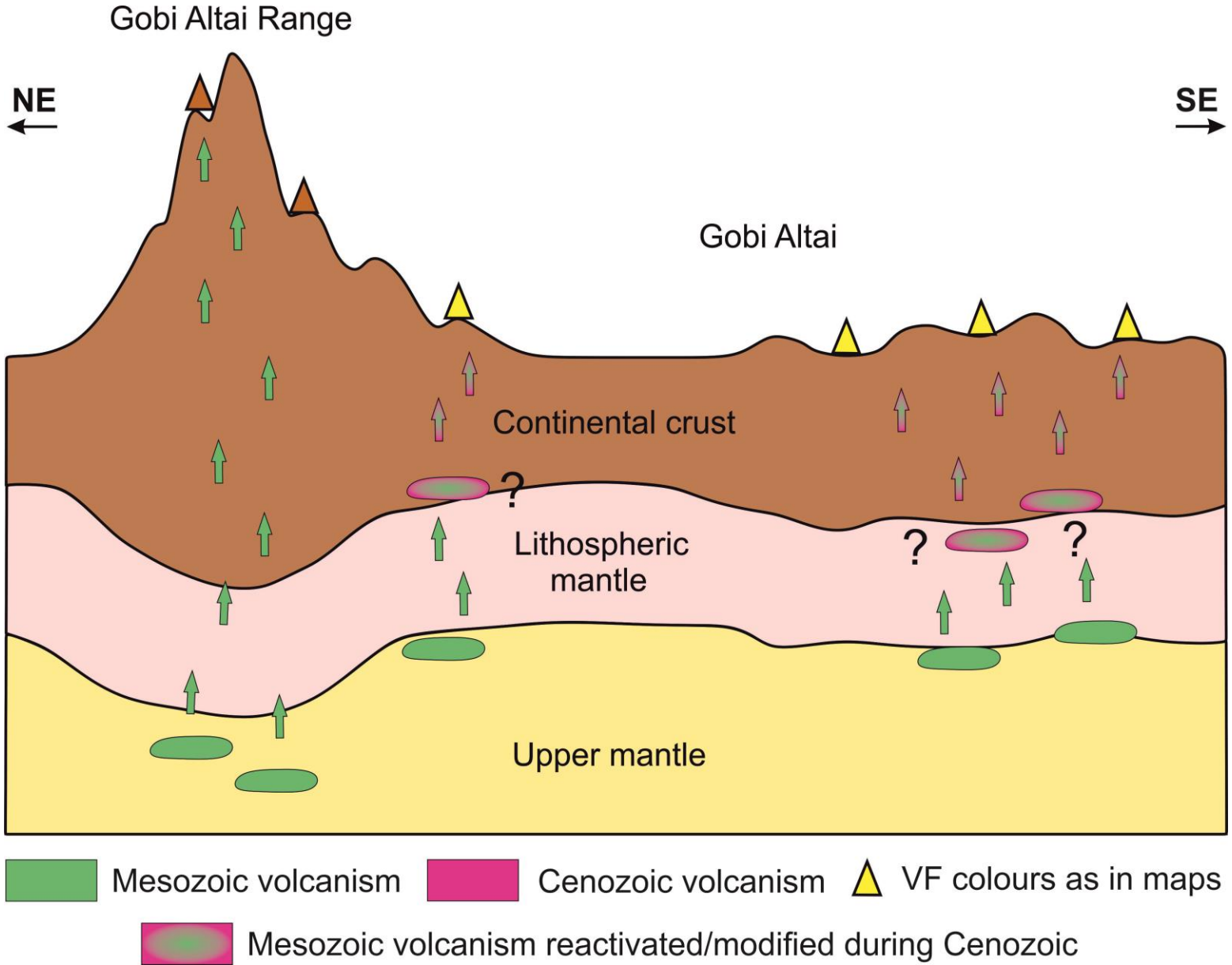
1. Mesozoic magmatism
2. Cenozoic magmatism
3. Extension
4. Uplift



Testing hypotheses – 2

- South Mongolia – Gobi Altai
- <u>Criteria:</u>

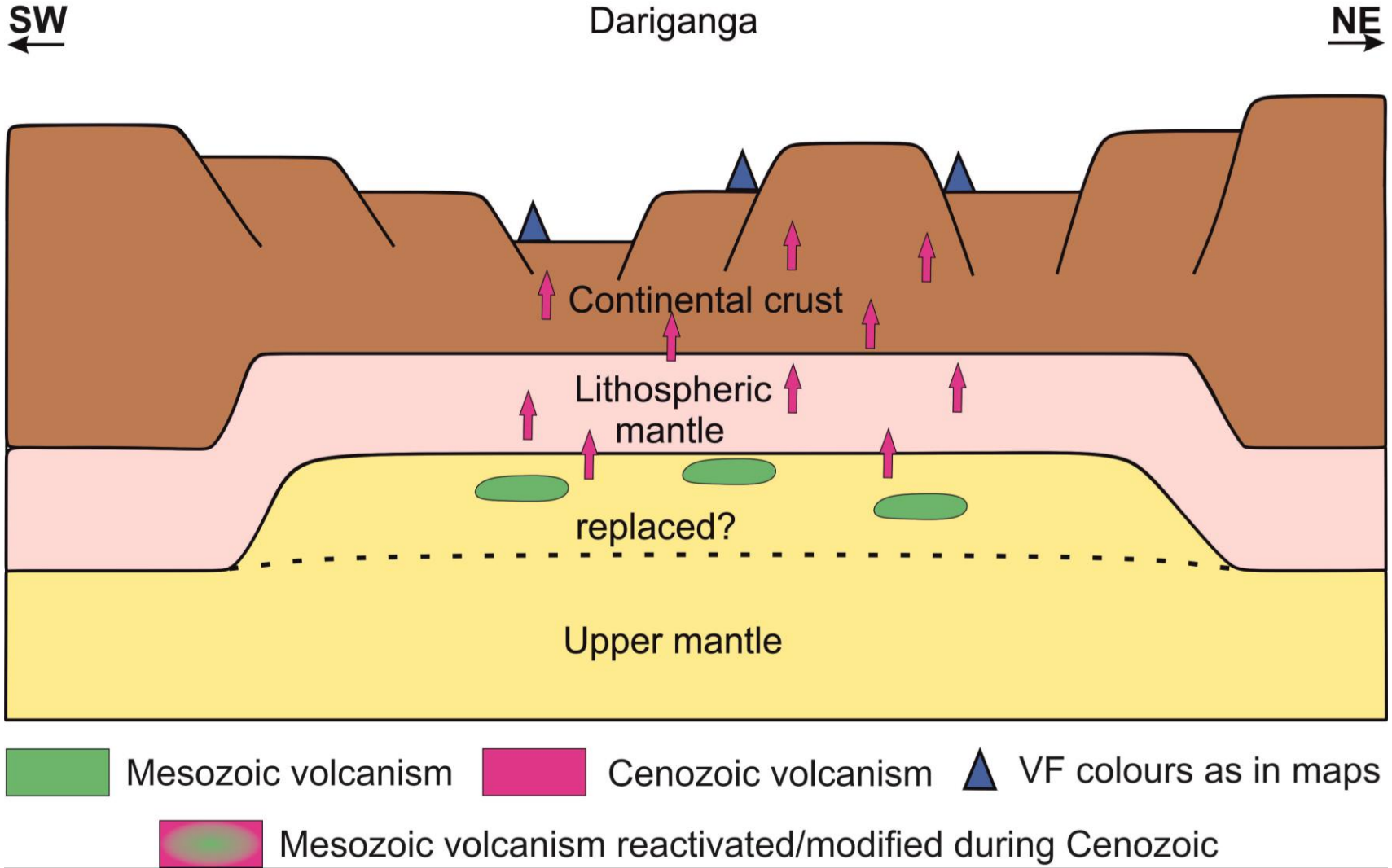
1. Mesozoic magmatism
2. Cenozoic magmatism
3. Extension
4. Uplift



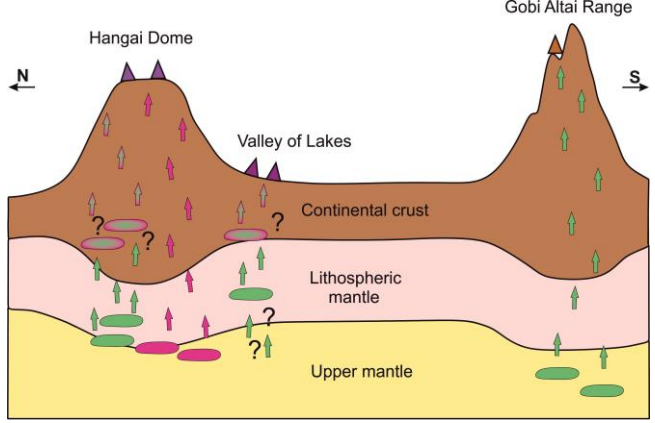
Testing hypotheses – 3

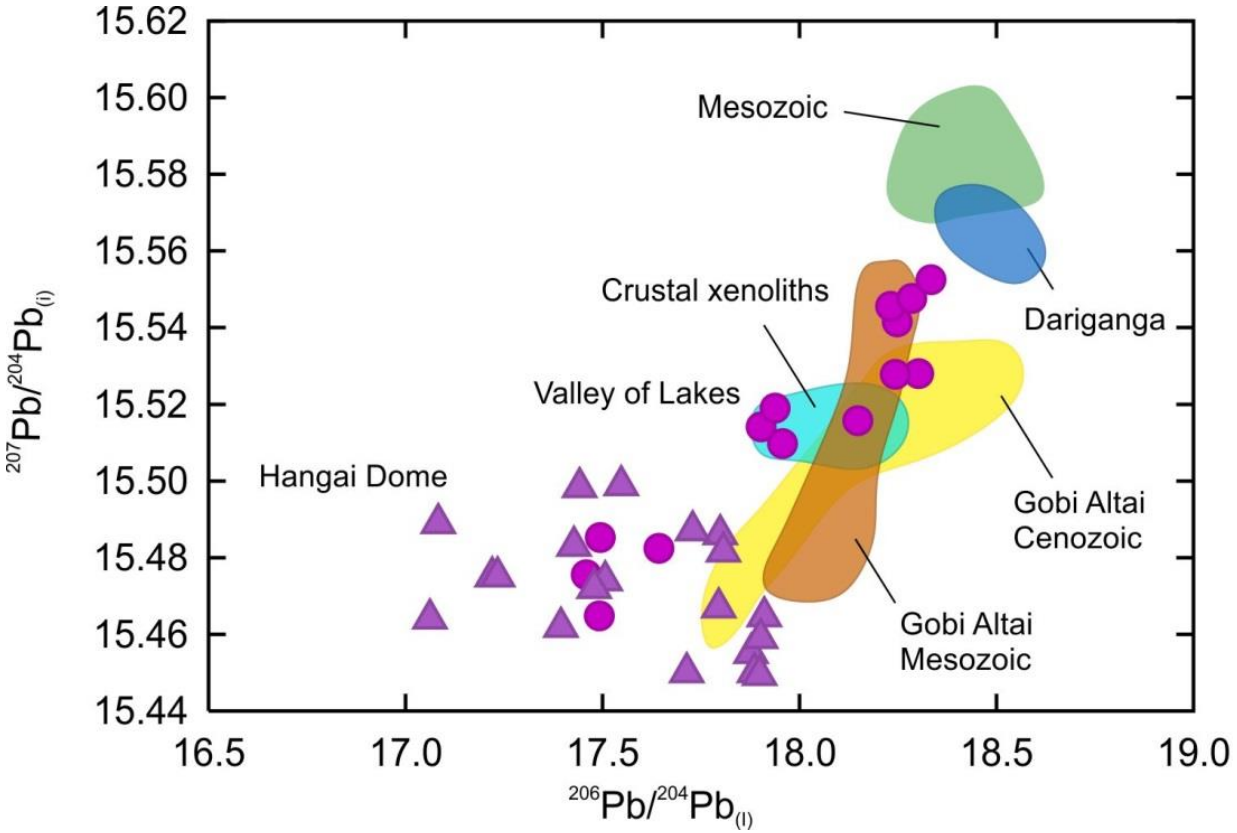
- SE Mongolia – Dariganga
- <u>Criteria:</u>

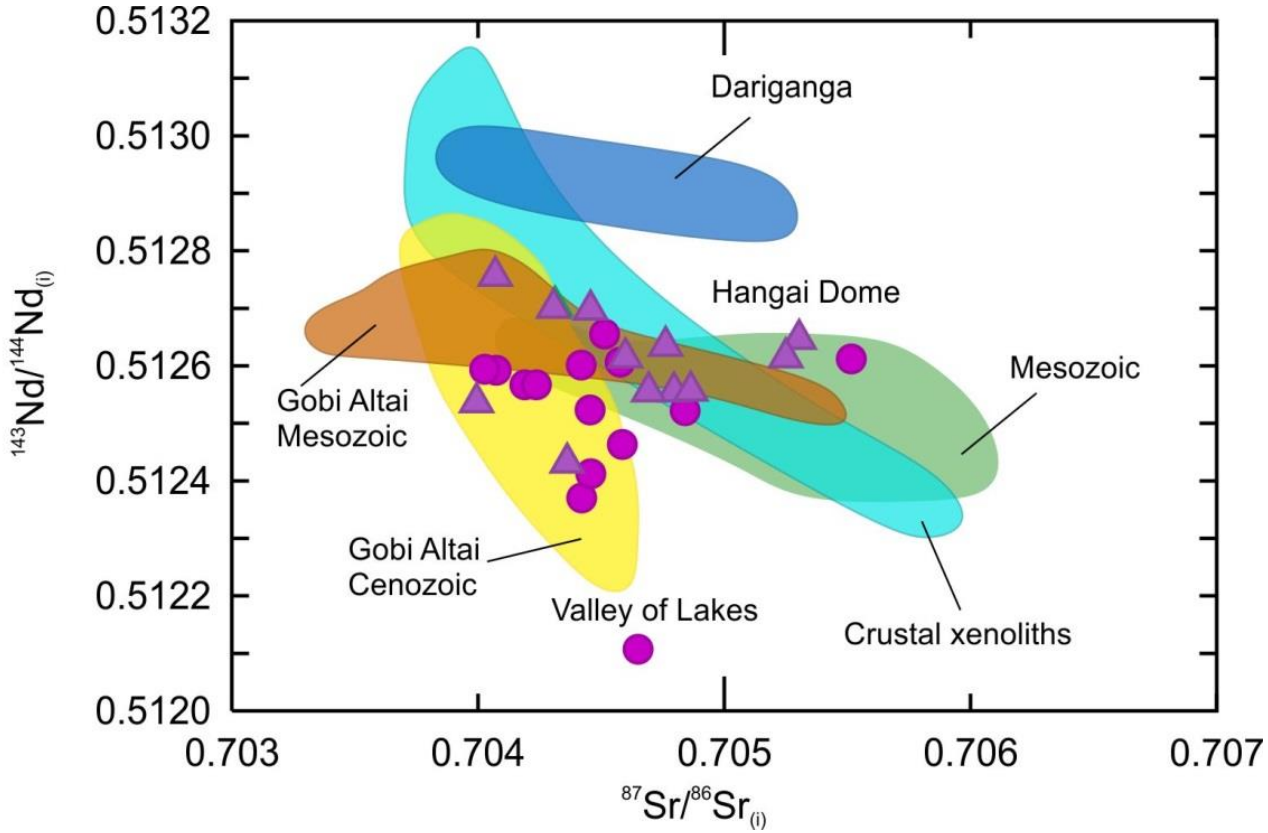
1. Mesozoic magmatism
2. Cenozoic magmatism
3. Extension
4. Uplift



Valley of Lakes & Hangai Dome



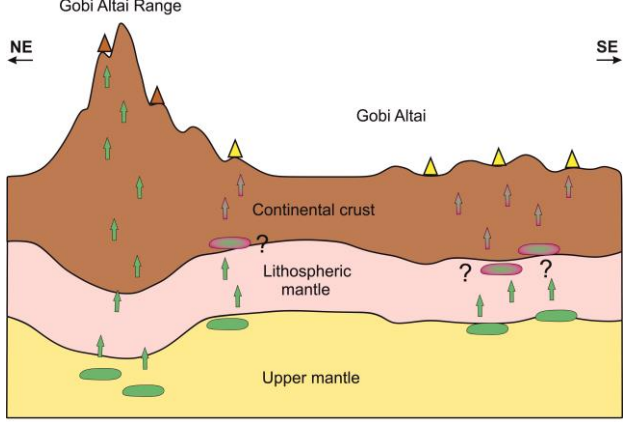


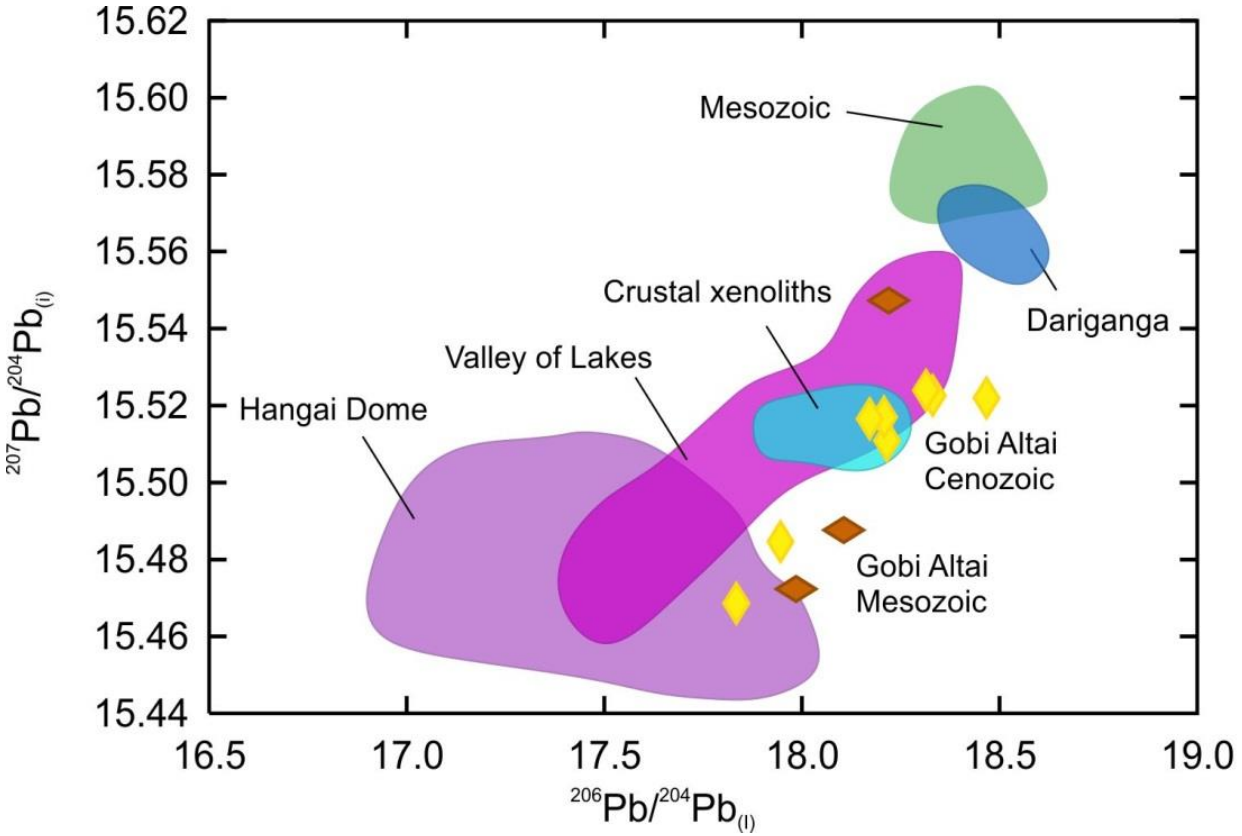


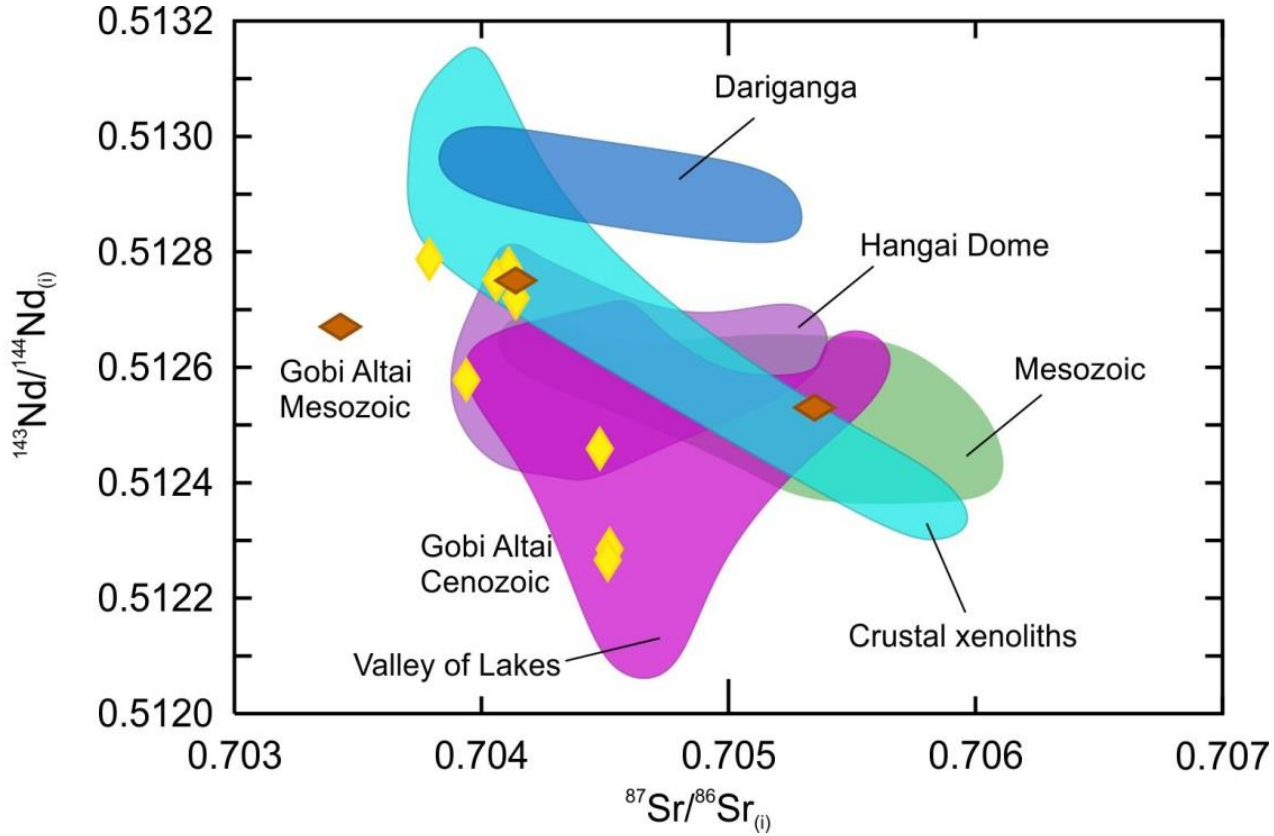
Values for **crustal xenoliths**: Stosch et al., 1995, **Mesozoic Gobi Altai**: Sheldrick et al., 2018; **Hangai Dome**: Barry et al., 2003; Hunt et al., 2012; **Mesozoic rocks**: Dash et al., 2015, Sheldrick – unpublished data

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Gobi Altai



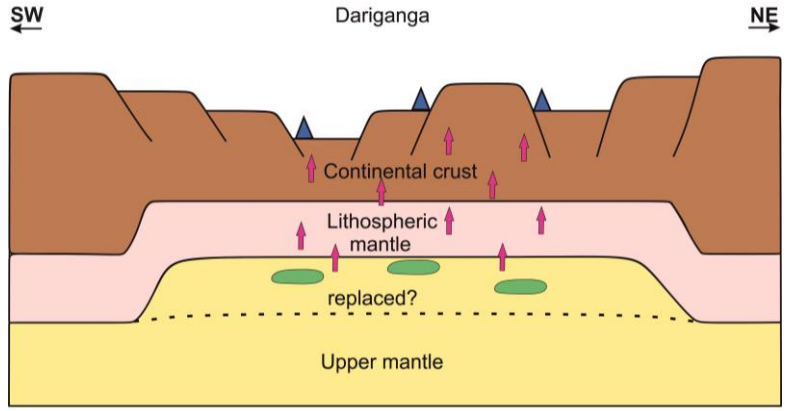


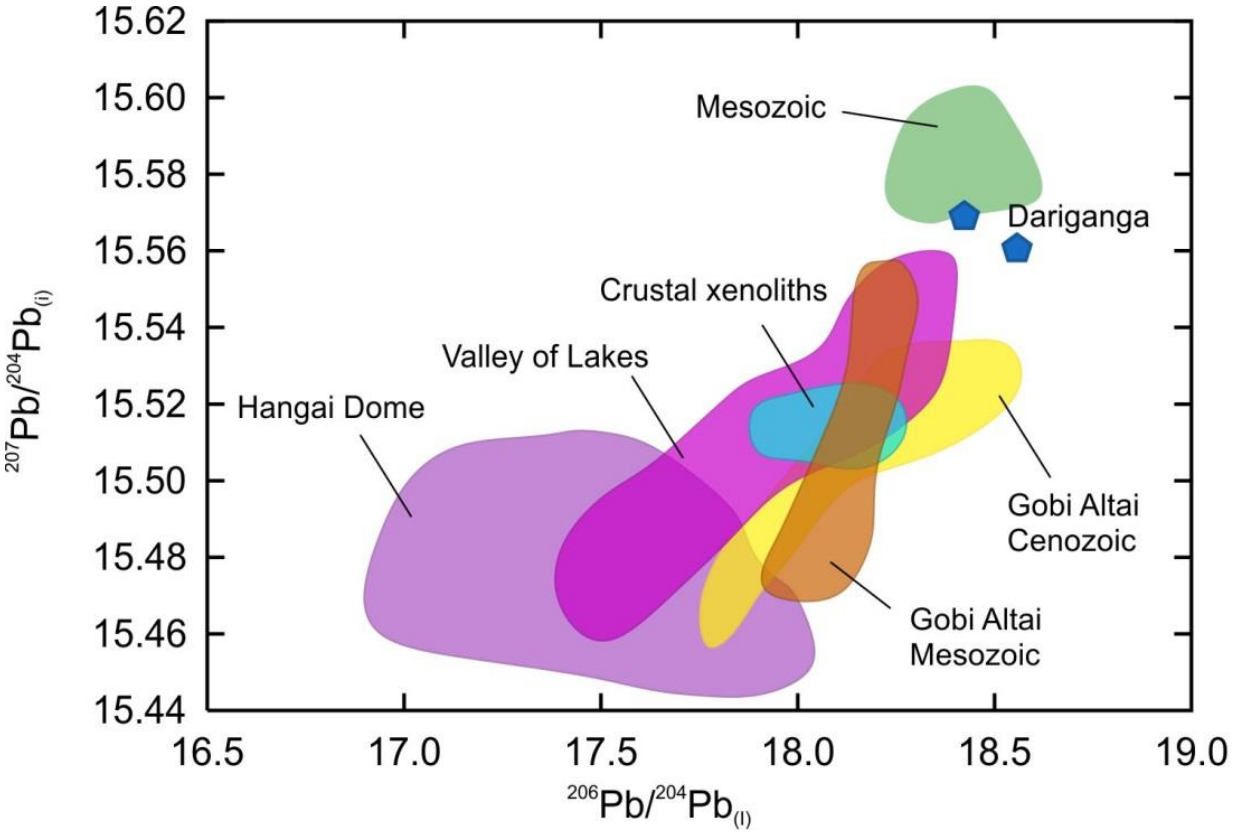


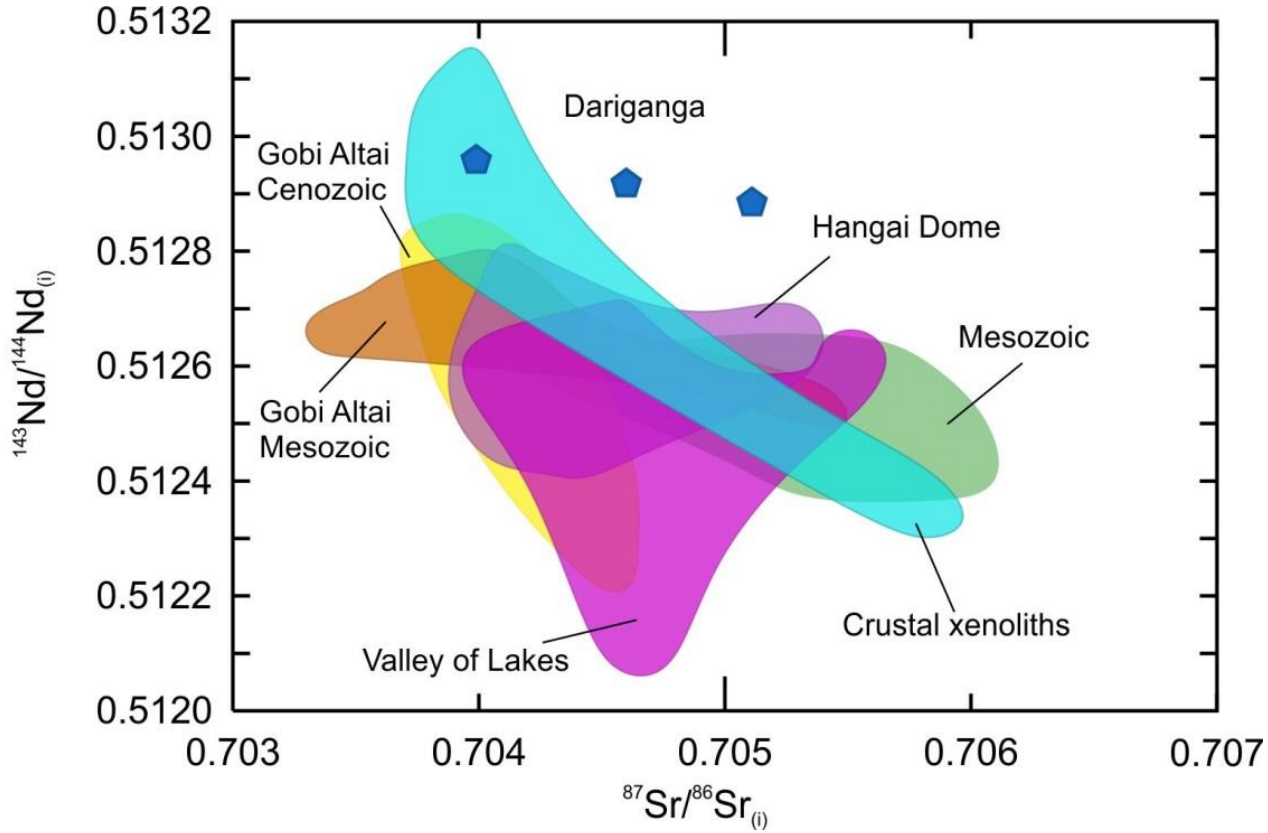
Values for **crustal xenoliths**: Stosch et al., 1995, **Mesozoic Gobi Altai**: Sheldrick et al., 2018; **Hangai Dome**: Barry et al., 2003; Hunt et al., 2012; **Mesozoic rocks**: Dash et al., 2015, Sheldrick – unpublished data

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Dariganga



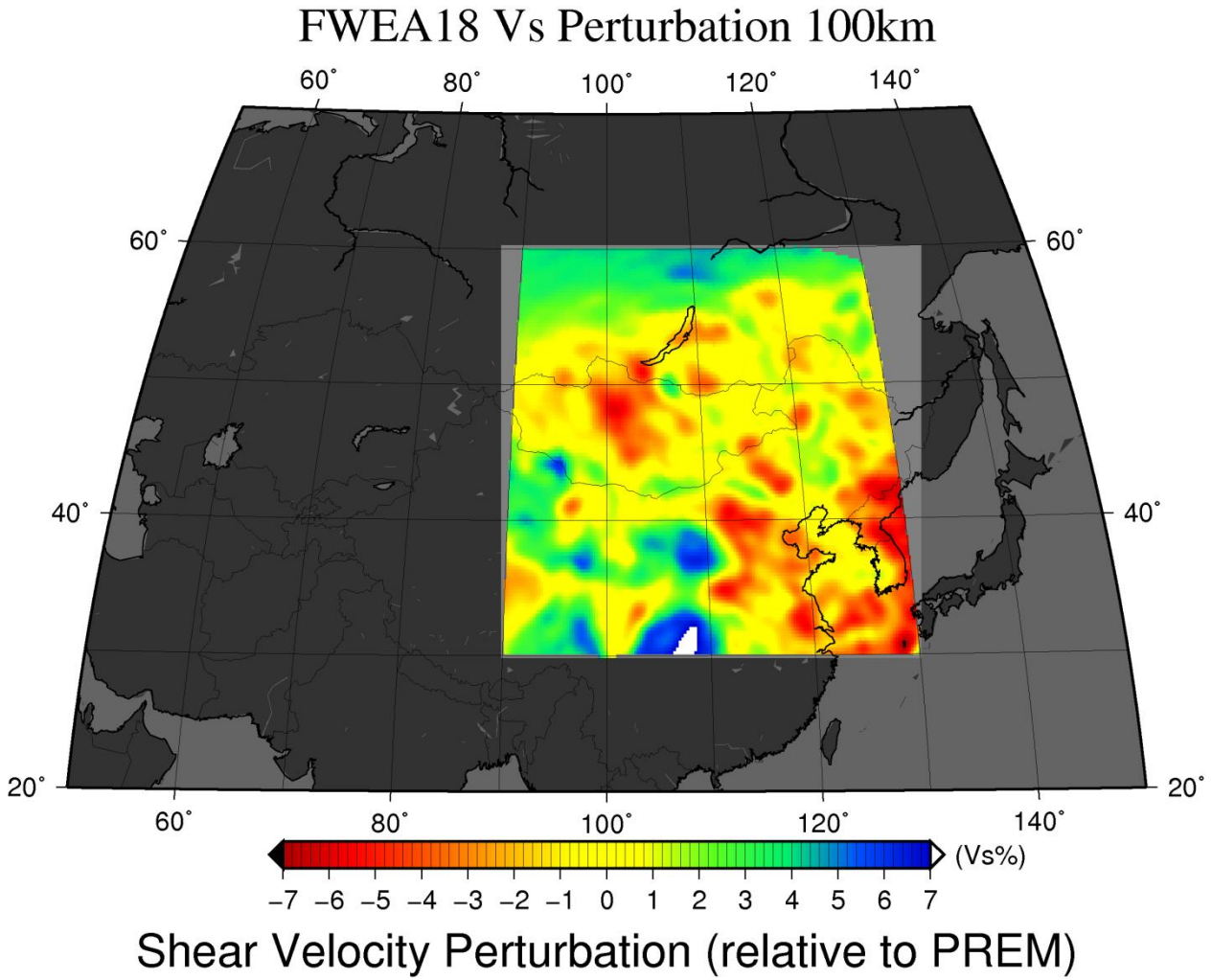


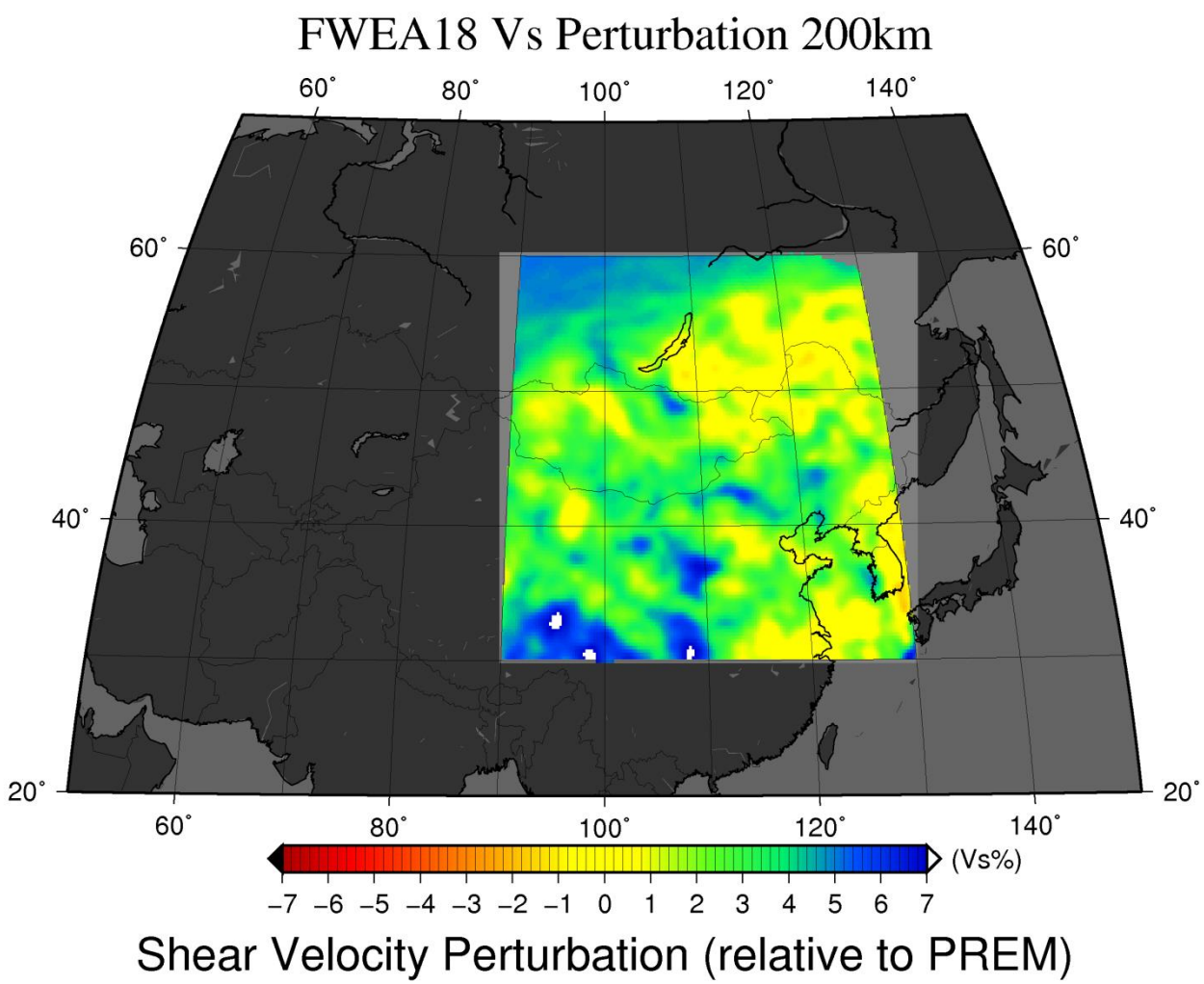


Values for **crustal xenoliths**: Stosch et al., 1995, **Mesozoic Gobi Altai**: Sheldrick et al., 2018; **Hangai Dome**: Barry et al., 2003; Hunt et al., 2012; **Mesozoic rocks**: Dash et al., 2015, Sheldrick – unpublished data

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Mantle tomography

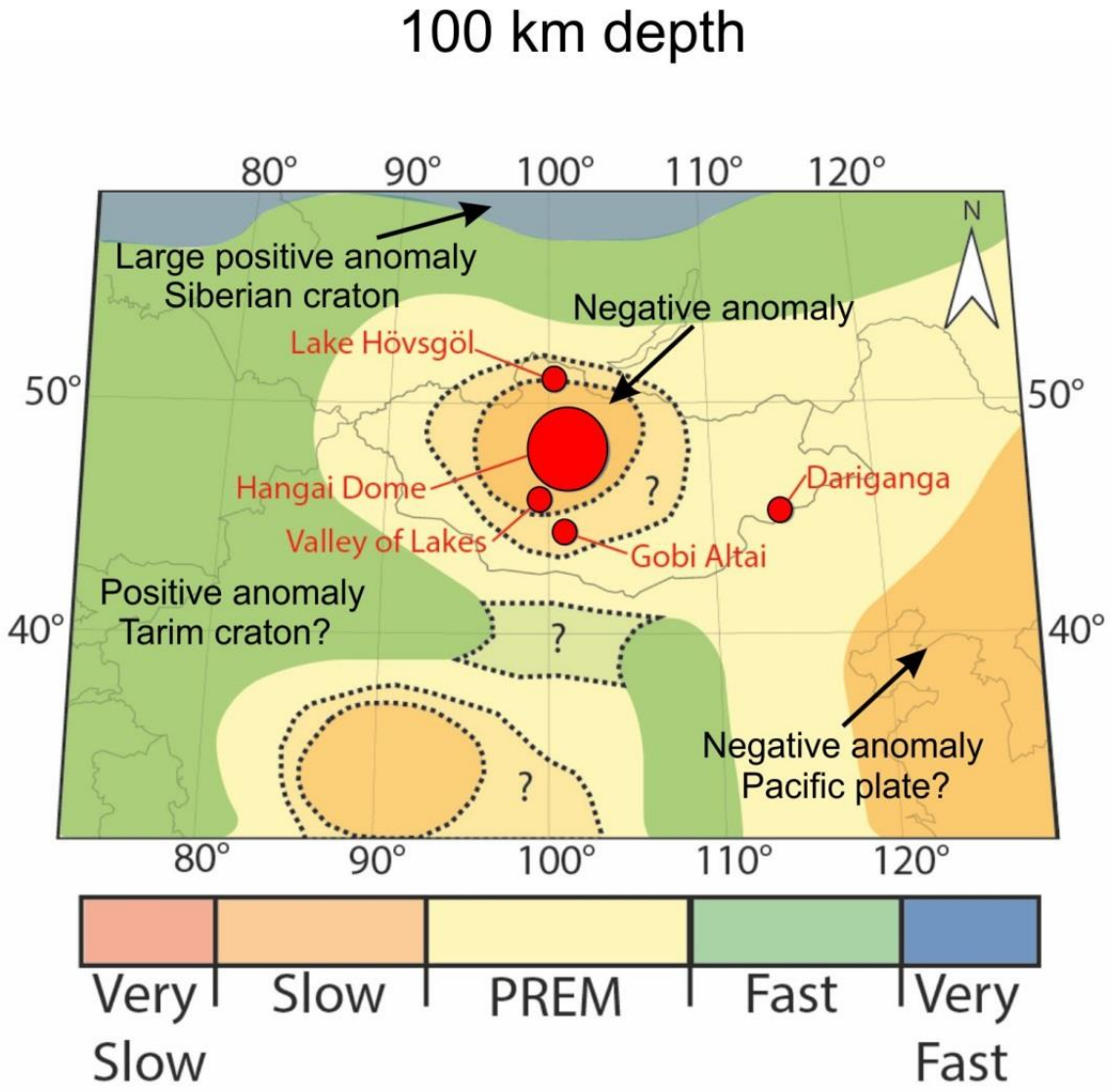


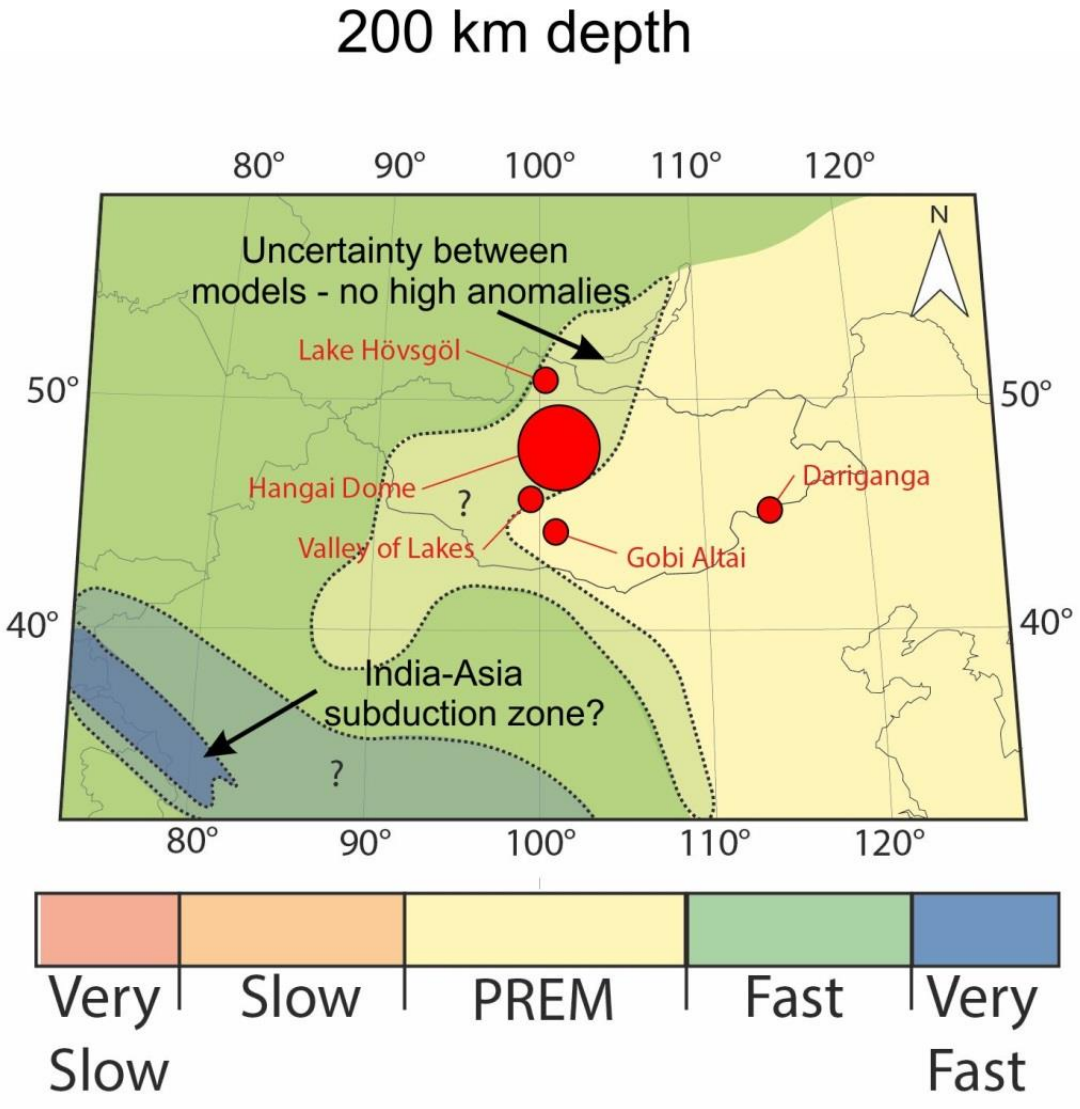


Regional data model; Reference model: PREM

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Mantle tomography





Based on averaged global data models; Reference model: PREM

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Discussion/next steps

- Valley of Lakes: samples trend from lithosphere-like (Mesozoic samples) to asthenosphere-like (Hangai Dome) – may reflect reactivation of Mesozoic melt during influx of new melt in the Cenozoic
- Gobi Altai Mesozoic and Cenozoic samples show similar source compositions – may reflect reactivation during Cenozoic
- Dariganga: modified crustal melts? Or reactivated melts from earlier event?
- Test with AFC and partial melting modelling to identify the individual source components for each volcanic field and their relationship
- Tomography → no deep mantle anomalies. Anomalies only at ~100 km depth (base of lithosphere)



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