Online Supplementary Material for:

Linking metamorphism and plate boundaries over the past two billion years

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This file contains:

Supplementary methods

Supplementary Figs. S1-S10

Supplementary Table S1 (included as separate Excel spreadsheet)

Supplementary references

Supplementary Methods

The updated metamorphic database of Brown and Johnson (2019), which includes geographic locations central to each metamorphic occurrence (Table S1), was used in this study. Based on the geographic locations, plate IDs were assigned to each locality in GPlates (www.gplates.org). The Python library pyGplates was used to measure the shortest (great circle) distance from each locality to its nearest continental margin (in this study taken as a proxy for the nearest convergent plate margin). The continental margins here include terrane/craton outlines and coastlines. For each locality, the distance is calculated from that locality to the outline of the largest geological unit to which it is geologically related. For example, for the Trans-Hudson metamorphic localities the distances were measured to the nearest relevant craton (e.g., Superior, Hearne, etc.), as Laurentia was not consolidated at the time of metamorphism. Given the skewed distribution of the distances plotted in Figure 1A, which is confirmed in Figure 2, medians are reported instead of means. In Figure 3, the data are plotted using natural age groupings in relation to the supercontinent cycle. Figure 3A is the present day, Figure 3B is the reconstruction of Pangea according to Merdith et al. (2021), and Figures 3C and D are the reconstructions of Rodinia and Columbia, respectively, according to Li et al. (2019). For Figure 4, the continuous reconstructions of Merdith et al. (2021) were used to generate paleolatitudes of all localities for the past 1 Gyr. In Figures S1–8, we show reconstructions using shorter time bins than those used in Figure 3.

Figure S1. Metamorphic data older than 2200 Ma plotted on the 1600 Ma paleogeography reconstruction (Li et al., 2019). The black lines represent the distance being measured. The numbers indicate the event number in supplementary Table S1. Sahara is not constrained and is placed in an arbitrary position

Figure S2. Metamorphic data for the interval 2200 to 1600 Ma plotted on the 1600 Ma paleogeography reconstruction (Li et al., 2019). Sahara and South China is not constrained and are placed in arbitrary positions. Please refer to the caption of Figure S1 for other conventions.

Figure S3. Metamorphic data for the interval from 1600 to 1270 Ma plotted on the 1270 Ma paleogeography reconstruction (Li et al., 2019). Please refer to the caption of Figure S1 for other conventions.

Figure S4. Metamorphic data for the interval from 1270 to 750 Ma plotted on the 750 Ma paleogeography reconstruction (Li et al., 2019). Please refer to the caption of Figure S1 for other conventions.

Figure S5. Metamorphic data for the interval from 750 Ma to 600 Ma plotted on the 600 Ma paleogeography reconstruction (Li et al., 2019). Please refer to the caption of Figure S1 for other conventions.

Figure S6. Metamorphic data for the interval from 600 to 400 Ma plotted on the 400 Ma paleogeography reconstruction (Matthews et al., 2016). Please refer to the caption of Figure S1 for other conventions.

Figure S7. Metamorphic data for the interval from 400 to 200 Ma plotted on the 200 Ma paleogeography reconstruction (Matthews et al., 2016). Please refer to the caption of Figure S1 for other conventions.

Figure S8. Metamorphic data younger than 200 Ma plotted on the present day map. Please refer to the caption of Figure S1 for other conventions.

Figure S9. Stacked histogram of distance of metamorphic occurrences from the nearest inferred plate margin. A: All metamorphic occurrences where the distances were calculated to the most time-appropriate and nearest cratonic/continental margin. B: Metamorphic occurrences <1.0 Ga (a topological full-plate reconstruction is only available back to 1 Ga) where the distances were calculated to the nearest topological plate boundaries modelled by Merdith et al. (2021).

Figure S10. Paleolatitudes of metamorphic occurrences over the last 1 Gyr by T/P type. Note that the paucity of high-latitude data is attributable to the smaller surface area in such bins.

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