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Methods for Producing a Reliable APWP

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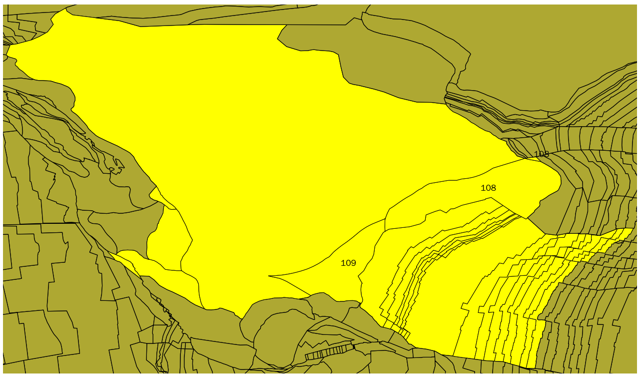

Figure 1. The Plate ID 101 polygons (yellow) with its children 108 and 109 (yellow with labels) used to constrain the 120–0 Ma data for North America.

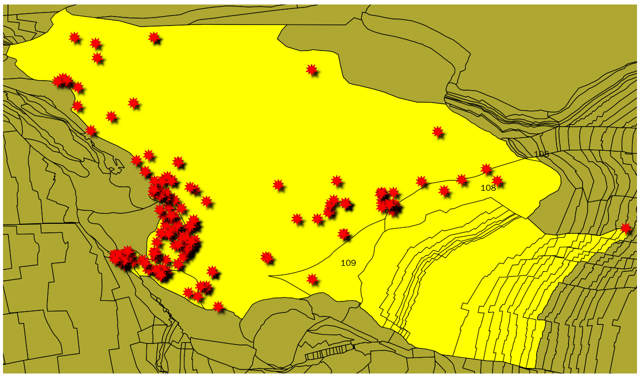

Figure 2. All the 120–0 Ma data constrained by the Plate ID 101, 108 and 109 polygons for North America.

1 SUPPLEMENTARY MATERIALS

1.1 How to Constrain Plate 101's Data

The data-constraining polygons are from the recently published plate model (Young et al. 2018) (Fig. 1). Plate ID 101 polygon in the recently published Plate Model (Young et al. 2018), including its children 108 (Avalon/Acadia block) and 109 (Piedmont block) polygons for 120–0 Ma, is used to select the sampling sites of the paleopoles for North America. According to the plate model rotation data (Young et al. 2018), 108 is fixed to 101 during the geologic period from Cretaceous to the present day. 109 is also fixed to 101 since about 300 Ma (Christeson et al. 2014). Then in order to be compared with the FHM (120–0 Ma) (Müller et al. 1993; Müller et al. 1999), the paleopoles with age ranging 120–0 Ma are further selected through constraining the lower magnetic age "LOMAGAGE $<=$ 120". In addition, the RESULTNO=6007 dataset should also be included according to a published plate kinematic model (McQuarrie & Wernicke 2006) (Fig. 3), although it is in the PlateID=178 polygon. In the end, 191 datasets in total are extracted (Fig. 2).

Also based on this model of southwestern North America since 36 Ma (McQuarrie & Wernicke 2006) (Fig. 3), part of the paleopoles constrained by the four small western terranes whose Plate IDs are also 101 in fact had gone through regional rotations and here are removed. However, the poles with age younger than 10 Ma located within the largest western 101 terrane (on the south of the smallest western 101 terrane; corresponding to the RANGE_ID=74 polygon in the model (McQuarrie & Wernicke 2006)) should be included. So finally 133 of the 191 datasets remain (Fig. 4). Spatially North American paleomagnetic data are mainly from the western and eastern margins of the plate.

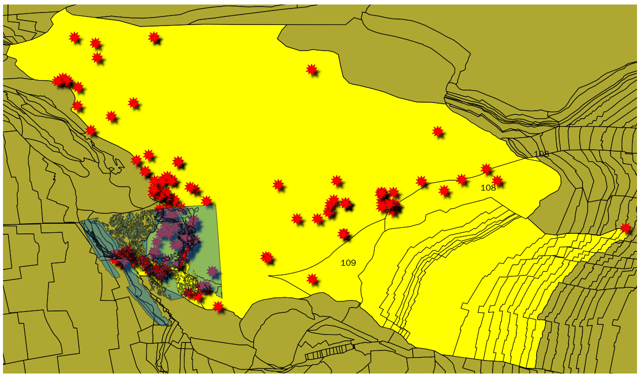

Figure 3. The west US polygons (blue) used to constrain the data that might be influenced by local tectonic rotations.

Figure 4. The final filtered datasets (red stars) for later analysis. Those poles that had been influenced by local tectonic rotations are shown as white dots.

Figure 5. The Plate ID 801 polygons (yellow) with its children 675 and 684 (yellow with labels) used to constrain the 120–0 Ma data for Australia.

1.2 How to Constrain Plate 801's Data

Plate ID 801 polygon in the recently published Plate Model (Young et al. 2018), including its children 675 (Sumba block) and 684 (Timor block) polygons for 120–0 Ma (Fig. 5), is used to select the sampling sites of the paleopoles for Australia (Fig. 6). According to the plate model rotation data (Young et al. 2018), 675 and 684 are fixed to 101 during the geologic period from c.145 Ma to the present.

On the southeast of the main Australia plate (the largest polygon in Fig. 5), there is a triangle-shaped polygon 850 (Tasmania block) which is fixed to 801 since c.100 Ma according to the (Young et al. 2018) rotation data. With that attribute, 805 contributes more data younger than c.100Ma for the later analysis. Ultimately the final 97 extracted datasets is shown in Fig. 7.

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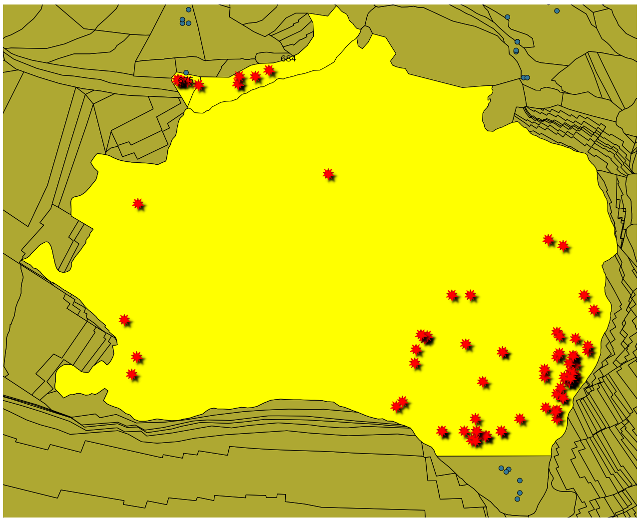

Figure 6. All the 120–0 Ma data constrained by the Plate ID 801, 675 and 684 polygons for Australia.

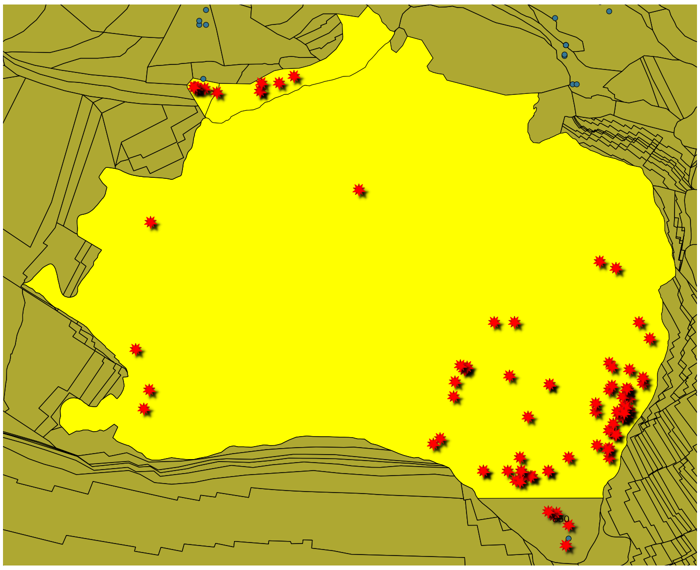

Figure 7. The final filtered datasets (red stars) for later analysis on Australia. The Plate ID 850 helps increase the amount of qualified datasets for 100–0 Ma.

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- 44

1.3.0.1 Special cases 55

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