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A new global full-plate reconstruction model for Phanerozoic time

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A reliable reconstruction of global plate motions in deep geologic time provides a key surface boundary condition for studying planetary and climatic evolution. There are some major shortfalls in existing global plate motion models for the Phanerozoic, including the motion histories of the East-Southeast Asian continental fragments ($\sim$ 15% of total land area on Earth), contrasting amalgamation histories of Gondwana and Laurussia to form Pangea, and contradicting paleomagnetic and/or geological constraints. To help resolve these issues, we carefully evaluated paleopoles from the updated Global Paleomagnetic Database using the Van der Voo (1990) quality criteria. All detrital paleopoles were corrected for inclination shallowing, and only paleopoles with the quality factor Q >= 4 were adopted for further analyses. We also excluded paleopoles that were either locally rotated or remagnetized without clear age constraints. New apparent polar wander paths (APWPs) of Gondwana, Laurentia, Baltica, North China, South China and Tarim were computed using the modified running mean approach with the resulting APWPs weighted by age errors, A95 and Q of paleopoles. A new full-plate model was then built on a combination of our continental reconstructions and plate margin observations. Compared with existing models, our model more realistically presents the drift history of the East-Southeast Asian continents, featuring the collision between the North and South China blocks starting in the Permian and the suturing completing in the Jurassic, as indicated by both geological and paleomagnetic observations. Our model does not require the previously speculated Carboniferous dextral megashear between Gondwana and Laurussia which was mainly derived from paleomagnetic data without firm geological support.