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TITLE: An updated digital model of plate boundaries

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ABSTRACT:

A global set of present plate boundaries on the Earth is presented in digital form. Most come from sources in the literature. A few boundaries are newly interpreted from topography, volcanism, and/or seismicity, taking into account relative plate velocities from magnetic anomalies, moment tensor solutions, and/or geodesy. In addition to the 14 large plates whose motion was described by the NUVEL-1A poles (Africa, Antarctica, Arabia, Australia, Caribbean, Cocos, Eurasia, India, Juan de Fuca, Nazca, North America, Pacific, Philippine Sea, South America), model PB2002 includes 38 small plates (Okhotsk, Amur, Yangtze, Okinawa, Sunda, Burma, Molucca Sea, Banda Sea, Timor, Birds Head, Maoke, Caroline, Mariana, North Bismarck, Manus, South Bismarck, Solomon Sea, Woodlark, New Hebrides, Conway Reef, Balmoral Reef, Futuna, Niuafo'ou, Tonga, Kermadec, Rivera, Galapagos, Easter, Juan Fernandez, Panama, North Andes, Altiplano, Shetland, Scotia, Sandwich, Aegean Sea, Anatolia, Somalia), for a total of 52 plates. No attempt is made to divide the Alps-Persia-Tibet mountain belt, the Philippine Islands, the Peruvian Andes, the Sierras Pampeanas, or the California-Nevada zone of dextral transtension into plates; instead, they are designated as orogens in which this plate model is not expected to be accurate. The cumulative number/area distribution for this model follows a power law for plates with areas between 0.002 and 1 steradian. Departure from this scaling at the small-plate end suggests that future work is very likely to define more very small plates within the orogens. The model is presented in four digital files: a set of plate boundary segments; a set of plate outlines; a set of outlines of the orogens; and a table of characteristics of each digitization step along plate boundaries, including estimated relative velocity vector and classification into one of 7 types (continental convergence zone, continental transform fault, continental rift, oceanic spreading ridge, oceanic transform fault, oceanic convergent boundary, subduction zone). Total length, mean velocity, and total rate of area production/destruction are computed for each class; the global rate of area production and destruction is $0.108 \text{ m}^2/\text{s}$, which is higher than in previous models because of the incorporation of back-arc spreading.

SOURCE: Geochemistry, geophysics, geosystems

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CONCEPTS: ['Geology', 'Plate tectonics', 'Seismology', 'Pacific Plate', 'Convergent boundary', 'Paleomagnetism', 'Subduction', 'Oceanography', 'Tectonics', 'Paleontology', 'Oceanic crust']