QUANTITATIVE RECONSTRUCTIONS OF EARTH'S FIRST SUPERCONTINENTS

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It is likely that plate-tectonic processes have occurred throughout the last two billion years of Earth history, if not earlier. As long as continents are carried on the plates, they will eventually collide, building supercontinents. Whether or not supercontinents occur in regular cycles is one of the major questions of geodynamics, and it can be addressed by the quantitative tools of geo-historical time and space, geochronology and paleomagnetism. A global abundance of orogenic belts at ca.2.7 and 1.9 Ga suggests large-scale continental amalgamation at those times. Conversely, the interval between 2.5 and 2.2 Ga contains numerous mafic and bimodal volcanic provinces, suggestive of supercontinental breakup. At present, high-quality paleomagnetic data from rocks of these ages are sparse. Construction of apparent-polar-wander paths for all of the continents between 2.7 and 1.9 Ga, necessary but not sufficient for producing complete global paleogeographies, is a task that will likely occupy decades of dedicated work. Nonetheless, paleomagnetism of well dated rocks from key intervals may specifically test reconstructions proposed on geological grounds, such as Vaalbara and Ur. Recent paleomagnetic data from Paleoproterozoic rocks on the Superior, Karelian, Kaapvaal, and Pilbara cratons are indeed allowing some of the first quantitative tests of proposed models for Earth's oldest supercontinents.