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TECTONIC MAP OF PRE–MESOZOIC TERRANES IN THE CIRCUMATLANTIC PALEOZOIC OROGENS

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This c.1:5,000,000 map predicts Precambrian–Paleozoic terranes within circum–Atlantic Paleozoic orogens on a Permian palinspastic reconstruction (a closed Atlantic Ocean). The base map is a transverse Mercator projection with the Equator parallel to the long axis of the closed Atlantic. Different terranes have been identified on the basis of their age and tectonic setting. Several categories have been defined. These include: autochthonous and imbricated basement/miogeoclines, continental rises, oceanic lithosphere, oceanic sequences, magmatic arc complexes, periarc basins, trench complexes, disrupted terranes (tectonic melanges), metamorphic rocks with uncertain affinities, continental rocks with uncertain affitinies, and rifted continental rocks with uncertain affitinities. Post–accretionary cross–cutting plutons, overstep sequences, and accretionary diagrams are also shown.

The major cratonic terranes and associated miogeoclinal sequences around the margins of the circum–Atlantic Paleozoic orogens are structurally separated from magmatic arc and oceanic terranes, which occur in internal and structually uppermost parts of the various orogens. Disrupted terranes, maining comprised of ophiolitic material, oceanic and periarc rocks within a foliated matrix of miogeoclinal and continental rise affinites, generally occur along the margins of the major cratonic terranes. Precambrian rocks within the major cratonic terranes bordering the circum–Atlantic Paleozoic orogens display a wide range of age, including: Archean, Early Proterozoic and Middle Proterozoic (Grenvillian). These occur in Baltica, Laurentian and South American. Grenvillian–age basement is absent in northwest Africa. Continental terranes with Archean–Proterozoic basement are distributed throughout the circum–Atlantic cratonic terranes; as a result, basement age is in itself not a unique criteria for terrane definition and establishment of kinship. Late Precambrian terranes are limited to southeastern sectors of the map, including areas of western Europe, the British Isles, southeastern Appalachians, northwest Africa, and northern South American. These were accreted during Late Proterozoic – Early Paleozoic orogenic activity. These latter orogens developed within Precambrian rocks ranging in age from Archean to Middle Proterozoic. Their accretional activity overlapped the time span for the opening of Iapteus, and they likely originated in palinspatically separated oceanic realms. Magmatic arcs and periarc teranes are preserved in several Late Precambrian – Early Paleozoic orogens. This constrasts with their poor preservation in Paleozoic orogens. Because magmatic arcs are typically situated in upper plate structural positions, they would be expected to have been largely removed as a result of erosional processes operative following continental collision. Therefore, their preservation within the Late Precambrian – Early Paleozoic orogens suggests that such collisions likely did occur. Overstep sequences across Late Precambrian terranes locally developed into miogenoclines setting relative to the Paleozoic orogens.

Most of the Paleozoic, ophiolitic, magmatic arc and oceanic terranes in the circum–Atlantic Paleozoic orogens appear to have develped largely during the Cambrian–Ordovican, with relatively few terranes of Silurian–Carboniferous age. These are largely confined to western and central Europe. This suggest that Iapetus was esentially closed by the end of the Early Paleozoic. This is supported by the presence of distinct faunal provinces during the Cambrian–Ordovician. This was followed by establishment of cosmopolitan Silurian–Devonian fauna. Late Paleozoic orogenic activity was mainly of transpressive character along the vestiges of Iapetus. Convergence occurred within most Variscan orogenic settings. The scale of Late Paleozoic transcurrent and rotational movements are uncertain. Several widely divergent models have been proposed on the basis of contrasting paleomagnetic results.