

Plate kinematic analysis (PKA) of the Eurasian Arctic region and western Siberia since about 750Ma; a first attempt, emphasizing formation of the basin geometries

Miles Osmaston (The White Cottage, Sendmarsh, Ripley, Woking, Surrey GU23 6JT, UK; email: miles@osmaston.demon.co.uk)

If a basin forms by the creation of intermediate crust (IC - see my other contribution) the amount of separation must be geometrically tenable, whereas a presumed extension of mature continental crust (MCC) has rarely been traceable across the plate. Thick plates provide boundary wall attachments that may interfere with IC isostasy until tectonically jolted ('failed arms'). During its very long-lived proneness to subside the IC floor may get folded, or an allochthon may be thrust over it (as in Paris Basin, on pre-Hercynian IC?), producing apparent 'basement'. Differing epirogenic behaviour of IC and its MCC margins can cause listric-type faulting but this is not extension if the toe has moved (rarely known), so 'breakup unconformities' may long post-date the real IC age.

In its PKA application to unravelling the Arctic from ~750Ma I find intimate kinematic relationships between Laurentia, Angara platform and Baltica, casting doubt that Baltica was elsewhere. Our starting assemblage has the Taimyr belt tight against Ellesmere Is. (minus the Franklinian Trough), with Pearya between them and with Severnaya Zemlya centred in the site of the future Sverdrup Basin and its Cambro-Ordo 'basement'.

Formation of the Pechora-S Barents area took place in 2 main steps; (a) an orthogonal separation of a (straightened) Novaya Zemlya-PayKhoy (NZ-PK) from the Varanger-Kanin-Timan belt; (b) a ~590km southwards motion (present coords) of Baltica relative to the northern Proterozoic strip of the N Urals. These motions of narrow strips of MCC require that they were part of another plate at the time. With the above-stated position of Angara-Taimyr this was the western edge of that craton, which has another bit of the Baikalian-Timan belt, thus completing the reassembly. The direction of the motion (a) is then seen again as the interdigitating separations forming the Minusinsk coal-basin system.

To achieve this fit to central Asia for the straight Uralian edge of Baltica, Kazakhstan must be partially restored into the proto-Junggar basin. Early dextral extraction is possible because the sinistral Irtysh fault runs through Carboniferous-topped IC created by that extraction. The original W part of Kazakhstan (before its ~90°CW disruption) lay in the PriCaspian Depression; the pre-528Ma Kokchetav subduction must have been later. Baltica disengaged by moving to NW, extracting the Polar Urals 'elbow' from Krasnoyarsk, causing the bending of northern NZ and perhaps opened the Khatanga trough.

These close interactions of Baltica and Angara show that the route of Iapetus' opening must have passed via the separations of Pearya (note its 481Ma ophiolite) from Ellesmere I. or from Taimyr, with the Verkhoyansk opening completing the Laurentian detachment. The Uralian motions (younger) are discussed briefly.

Evidently, PKA based on these principles yields new insights on Arctic evolution, possibly illuminating basin floor structures.