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31st IGC, Rio de Janeiro, August 2000. General Symposium 4.2. Tectonic processes at passive margins. 11.00-1200, 16th Aug.

'Lithosphere extension' that isn't

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The upper crust of passive continental margins widely shows tectonic features characteristic of basement extension occurring at or soon after the time of ocean initiation. However the generation of young oceanic crust and mantle emplaces lots of hot material laterally against the continental lithosphere. The petrological effects of this lateral heat flush into the middle and lower continental crust are worthy of attention. In general, an upward displacement of the metamorphic facies boundaries is to be expected, implying some degree of dehydration and the upward migration of the resulting fluid.

Received petrological wisdom asserts that the water 'escapes from the system', so a net increase in column density is inferred. If, on the contrary, the water merely migrates to higher in the column it is readily shown that a major overall volume increase (several tens of % in the zone affected) and reduction of column density results. Moreover, that volume increase is achieved with a tiny fraction of the heat input that pure thermal expansion would require.

This makes non-unroofed deep crustal metamorphism potentially a major and sensitive player, both in epeirogeny and in horizontal displacements in the basement. The dilatation will especially affect the mid-crust, which receives the water/fluids from below. In a straight passive margin, along-strike dilatation will be inhibited, so the total dilatation will be partitioned between vertical and oceanward directions. Thus the mid-crust may be expected to extrude laterally oceanward. The resulting upper-crust tectonics are therefore to be seen as 'dilatation tectonics', not requiring extensional forces.