

EGU21-8581

<https://doi.org/10.5194/egusphere-egu21-8581>

EGU General Assembly 2021

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Superdivergence of the Atlantic Ocean and Superconvergence around the South China Sea: A Comparison

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Under the influence of the three global tectonic systems of the Paleo-Asian, Pacific and Tethyan dynamic systems, East Asia underwent diverse assemblies of many minor plates, blocks, micro-blocks or micro-plates after the Triassic. We refer to these assemblies as super-convergence related to the Supercontinent Amersia over the subsequent 300 Ma. Three cratons in China – the North China, South China and Tarim blocks – form the center of this super-convergent region. The peak of the super-convergence event is the Yanshannian Movement, which occurred in the Jurassic. This was related to the breakup of the Supercontinent Pangea and the assembly of the future Supercontinent Amersia (Pangea Ultima).

Opening of the South China Sea Basin in the Cenozoic is thought to have been driven by two tectonic systems, the western Pacific Subduction Zone and the Neo-Tethyan Collision-Subduction System. Its tectonic setting is different from that of the North Atlantic. Since 16 Ma, the Cenozoic South China Sea has been closing in the tectonic setting of the circum-East Asian subduction system. Closing of the South China Sea Basin indicates the initial assembly of the Supercontinent Amersia. Tomographic images show the Pacific slab in the mantle transition zone is broken into many mantle micro-blocks and developed later than 30 Ma although its ages are 90 - 130 Ma. This indicates the super-convergence must be driven by powerful forces that fragment the single large-scale oceanic plate.

The Atlantic Ocean has been opening since 150 Ma, from south to north. It is related to the breakup of the Supercontinent Pangea. Its opening mechanism has been much discussed. The two main models are a) a chain of deep-mantle plumes along which the mid-Atlantic ridge formed, and b) “back-arc” extension behind the Alpine subduction zones.

It is unlikely that Pangea was a young supercontinent that emerged from an earlier Proto-Pangea (Sanzhong Li et al., 2018). Instead, it is likely an intermediate stage of the long process of supercontinent evolution from Proto-Pangea to a future Amersia.