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The Cadomian zircon province - A major crustal unit at the northern Tethyan margin - Constraints from LA-ICP-MS U-Pb and Lu-Hf analysis of detrital and magmatic zircon (Saxo-Thuringian Zone, Bohemian Massif)

Ulf Linnemann (1) and Axel Gerdes (2)

(1) Senckenberg Naturforschende Gesellschaft, Senckenberg Dresden, Dresden, Germany (ulf.linnemann@senckenberg.de), (2) Institut für Geowissenschaften, Mineralogie, Johann Wolfgang Goethe-Universität Frankfurt/M., Senckenberganlage 28, D-60054 Frankfurt/M., Germany

The Cadomian zircon province is composed of a mixture of zircons from Cadomian arc sediments and of zircons of the West African hinterland. It forms an important block at the northern margin of the Tethys and supported basins by masses of sand. It can be identified easily by the U-Pb ages and the Lu-Hf isotope composition of zircon populations and is a powerful tool for palaeogeographic reconstructions. Sediment provenances and magmatic events of Late Neoproterozoic (Ediacaran) and Cambro-Ordovician rock complexes from the Saxo-Thuringian zone are constrained by new LA-ICP-MS U-Pb dating of detrital and magmatic zircons and their Lu-Hf isotope composition. These results in combination with the analysis of the plate-tectonic setting constrained from field observations, sedimentological and geochemical data, and trends of the basin development are used to reconstruct Cadomian orogenic processes during the Late Neoproterozoic and the earliest Cambrian. A continuum between Cadomian orogenesis and the opening of the Rheic Ocean in the Cambro-Ordovician is supported by the data set. In our model the early stage of the Cadomian evolution is characterized by a Cordilleran-type continental magmatic arc, which was established at the periphery of the West African craton between ∼650 and 600 Ma. Subsequently, at ∼590 to 560 Ma, a back-arc basin was formed behind the Cadomian magmatic arc. The back-arc basin was closed between ∼545 and 540 Ma, leading to the development of a short-lived Cadomian retroarc basin. Subsequently, a mid-oceanic ridge was subducted underneath the Cadomian orogen. Slab break-off of the subducted oceanic plate resulted in increased heat flow leading to voluminous magmatic and anatectic events that culminated at ∼540 Ma. Oblique incision of the oceanic ridge into the continent caused the formation of rift basins during the Lower to Middle Cambrian. This process continued from the Middle to Upper Cambrian, finally caused the opening of the Rheic Ocean in the Lower Ordovician.