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The stages of mesoproterozoic and neoproterozoic rifting and evolvement of grabens in East European platform

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Long-term regional research and geological interpretation of seismic profiles allowed us to restore a more detailed history of evolvement and evolution of aulacogens of the East European platform. It was established that the formation of grabens and rifts is a relatively short descrete process acompanied by a general platform uplift and partial erosion of more ancient sediments. Periods of destruction and rifting changed into more calm periods of general subsidence and vice versa that resulted in formation of postgraben and postrift structures of syneclise type characterized by typical platform formations. Parts of these platform deposits were lately eroded and preserved only in the basis of more young aulacogens. Their early existence is reflected in the lithological composition of sediments. The fragments of EpiKarelian, EpiGrenville and EpiCadomian covers are especially well preserved.

The following sequence of mesoproterozoic and neoproterozoic rifting, sedimentation and structure formation:

About 1.8 – 1.7 billion years ago the continent of Proterozoic Baltica (East European craton) evolved. At the beginning of Mesoproterosoic, at its eastern edge the processes of rifting and destruction took place (burzyanskaya seies of the west slope of the Urals). At the continent itself, in its north-west part, some depressions, where from time to time terrigenous complexes of molassa type, comagmatic rapakivi granites. Among them volcanites of basalt rhyollite composition aged 1540-1600 million years which are associated with extension zones along the faults of north-west strike. The formation of depressions was closely connected with collision processes which took place at the time along the north-west edge of the continent. This is a sign of

tectonic activity of the north-west part of the East-European platform during the protoplatform stage of its evolution. At the same time, in more southern and central parts of the platform, typical platform-type associations of quartz sandstones were forming.

About 1400 – 1350 million years ago, after a great structural transformation, closely connected in terms of genesis, with the processes of formation of rift edge in the east one of the evidences being moshakskaya series in the Urals, within the scope of Baltica, intensive processes of extension took place that resulted in a system of listric faults that controlled sedimentation in evolving grabens and aulacogens. At the same time, in the southeast and east the processes of extension were more intensive, that is way the thickness of synchronous sediments was rising. At the end of the stage a transgression – regression cyclic development of sediments started to evolve that testifies to the connection of aulacogens with the back-arc basin of the Protouralic island arc. The formation of horst – graben structure of the eastern edge of Mesoproterozoic Baltica was not associated with active rifting, as it was believed before, but the impulses of extension in the agecent “pre-uralic” zone of the Pechora basin. Fragments of the paleooceanic parts of this edge have been reconstructed in the north of the Baltic shield, Timan, and the west slope of the Urals. The faults that restricted these north-west extension aulacogens (Mesen’, Kandalaksha – Dvina, and Pachelma can be characterised as consedimentary fenomena of listric type.

In neoproterozoic the general platform submersion, sea transgression and the formation of paleoplatform cover of Baltica which was part of epiGrenville Rodinia. As it tooks place, the most shallow- water red colour facies, as it was before, can be found in the western parts of the territory, while more deep – water dark colour limestones can be found in eastern and northeastern parts. We believe, this process was connected with the final stage of grenville (svekonorozh) collision in the west of the platform as well as with the spreading impulse and formation of oceanic crust in the back-arc basin of the Protouralic island arc in the east of Baltica.

At the beginning of Edicarian the convergence of Baltica with the ProtoUralian island arc and slow closure of the back-arc basin. The process resulted in the reviving of movements along the faults of south – west extension which segmentates aulacogens of Mezen. In some parts of them specific alkaline magmatism which is associated with local manifestation of tuffisits, kimberlites, etc.

Along the largest fault the extension zone of Srednerusskii aulacogene evolved.

The recieved data allow us to say that the modern structure of aulacogens of the East – European platform have been forming for a long time under the influence of multiple geodynamic factors. In the western part the structures of local extension prevailed of pull-apart type, while in the eastern part rift-type extension structures of northwest

strike which are connected, in terms of genesis, with the passive continental edge. At the end of Neoproterozoic rifting transversal structures of east – north – east strike (Srednerusskii aulacogen) which are connected, in terms of genesis, with the processes of Cadomian orogeny in the eastern part of the continent.