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Lineament structure analysis of the Karelsky coast (White Sea) for the understanding of the neotectonic processes

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The White Sea region has undergone significant rebuilding during the Neotectonic period. Its tectonic structure and development is determined by four main factors.
First of all, the modern White Sea structure inherits a palaeo-rift which appeared during the Middle-Late Riphean – the Kandalaksha-Dvina rift (Baluev, Przhiyaglovsky, Terekhov, 2009). Secondly, this rift with its unhomogenous crust conditions has been reactivated which caused differentiated vertical movements: subsidence of the axial part and uplift on the flanks, accompanied by modern earthquakes (Vinogradov, 2006). Thirdly, the Baltic crystalline shield is a steadily raising area for millions of years. Finally, the glacioisostatic and hydroisostatic processes due to the pressure of a 2-km thick glacier and the consequent filling of the White sea basin with marine water (Svendsen et al., 2004) have also greatly influenced the modern structure of the territory.
One of the methods to determine the particularities of the neotectonic development is the analysis of lineaments. A lineament is a fault, fracture, weak zone or crack expressed in the modern topography by different kinds of linear forms: ledges and scarps, straightened river valleys, linear chains of lakes, ravines, etc. Lineaments can be selected in field or with the use of satellite imagery and remote sensing data and proved by the results of geological surveys (state geological maps). Geomorphologic studies of the territory help to separate tectonic linear landforms from exogenous ones.
We have performed the analysis of the lineament structure for a key area of the Karelsky coast of the White Sea from island Veliky in the north to Sonostrov island in the south.
The main feature of the region is the presence of a big drop fault which stretches in the north-north-westerly direction along the coast. It represents the outmost borders of the Kandlaksha-Dvina graben. The direction of the cutting faults is different and depends on the location of separate blocks.
The biggest difference is observed between the southernmost Sonostrov block and the rest. The lineaments which cross the main drop fault have a north-east – south-westerly direction.
Moving to the north, the direction of those lineaments changes first to sublateral and then to the west-north-west – east-south –easterly. Therefore the faults and weak zones turn if we move closer to the north-western angle of the Kandalaksha-Dvina rift.
It also has to be noticed that for most of the blocks the directions of rock jointing can coincide with the main disjunctive dislocations directions, however, never coincides with the smaller orthogonal fractures and lineaments. By comparing the modern lineament net with the rose-diagrams for palaeosoic dykes which were trapped by the then existing faults and cracks we can tell that their directions don't coincide either.
All those differences mean that the neotectonic structure is inherited from the old one of the Riphean rift structure and its palaeosoic development, but doesn't fully repeat it. The latest activization and glacio-and hydroisostatic processes were probably the driving factors of the area's recent tectonic development.
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