

Anomalous kinematic types of the earthquakes at Mid Atlantic Ridge and their geodynamic interpretation

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Along Mid Atlantic Ridge (MAR) strong seismic events having typical for ridge axis focal mechanisms (normal fault and strike slip for offset zones) comprised 90% of query. The rest 10% contains events with mechanisms showing the presence of tension and pressure along the direction, not perpendicular to the MAR. Figure 1.1 shows the distribution of these mechanisms along MAR axis respect to latitude (mechanisms are shown in projection on horizontal plane) after (Harvard CMT catalog). Figure 1.2 shows the location of the projection of stress and strain activation zones (SSAZ) on to MAR axis after (Sokolov et al., 2008; clusters 3 and 14), computed by cluster analysis of geophysical properties of lithosphere. Figure 1.3 shows the location of transform fault intersections with MAR axis after (Sokolov N.S., 2007).

Comparison of listed parameters shows following features. Anomalous mechanisms at epicenters are distributed along axis space not randomly. Their concentration (Fig.1.1) is attracted to the zones (Fig.1.2), which are detected in Atlantic Ocean lithosphere from contrast combination of Bouguer anomaly maximums and isostatic anomalies minimums (cluster 3), which usually could be observed at forearc regions, and also from increased values of P-wave tomography (cluster 14), which shows the increased stress sensibility of the geological media. These zones after (Sokolov N.S., 2007) are conjugated with the presence of thrust structures, detected by seismic prospecting, and after (Mazarovich, Sokolov, 2004) are conjugated with modern deformations of sedimentary cover, having anisotropy of structural orientation. These facts substantially allows to make the definition of them as stress and strain activation zones (SSAZ) on the territory including MAR, abyssal plains and slopes. Correlation of SSAZ with the geometry of transform faults (Fig.1.3) shows the synchronization with the increase of transform faults total length.

Observed comparison allows to conclude, that the neotectonic features of Atlantic lithosphere, including MAR, is being activated along sublateral zones with movement vector having mainly north-south direction, which leads to the formation of pressure and tension zones with corresponding orientation of stress axis and focal mechanisms.

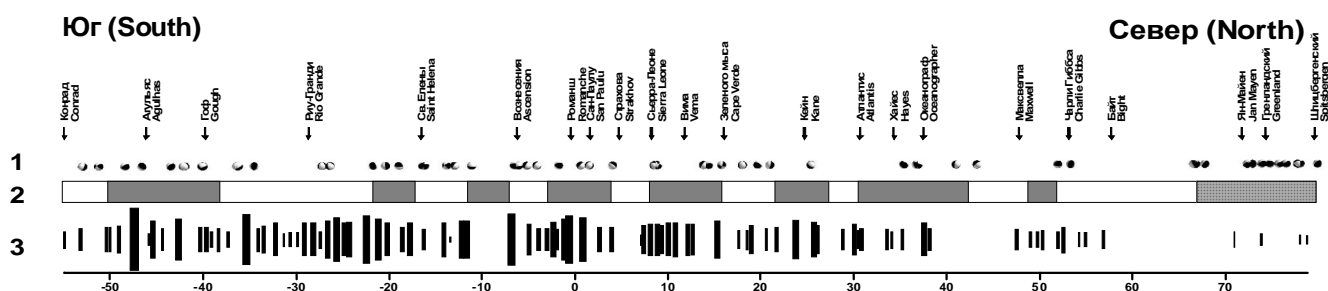


Fig. 1. Location of some geological and geophysical parameters along MAR (X axis - latitude):

- 1 – anomalous for ridge axis earthquake focal mechanisms,
- 2 – location of stress and strain activation zones,
- 3 – location of MAR and major transform fault intersections (the mark is scaled by fault length including passive parts; maximum – 6620 km)