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Integrated Geophysical-Geological Analysis Unmasked a Buried Regional Structure in the Eurasian-African Region

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The studied region (coordinates: $0^o - 55^o$ North, and $22^o - 62^o$ East) occupies a huge region of about 24 million km^2. Among the essential geological and geophysical features of the region we can select several key phenomena which are briefly described below:
(1) Triple junction of the rift branches of the Red Sea, the Gulf of Aden and the East African zone with the Afar triangle,
(2) Caucasian-Arabian syntaxis – a collisional structure narrowing the Alpine-Himalayan belt in the intermediate zone between the Eastern and Western Caucasus,
(3) Presence of the Cyprus gravity anomaly – one of the largest gravity anomalies in the world – in the center of the Easternmost Mediterranean (Gass and Masson-Smith, 1963; Eppelbaum and Katz, 2012a),
(4) Presence in the Easternmost Mediterranean (south of Cyprus) the most ancient known block of oceanic earth crust (Early Permian ?) classified as a Kiama paleomagnetic hyperzone of inverse polarity (Eppelbaum et al., 2014),
(5) Giant counterclockwise GPS vector rotation in the Eastern Mediterranean – Northern Africa (e.g., Reilinger et al., 2006) (in the center of this rotation occur the Cyprus Is. and the block of oceanic crust of the Kiama paleomagnetic hyperzone),
(6) Development of a chain-wise sequence of the pull-apart basin zones along the Dead Sea Transform formed in the lowest modern topography values in the world exceeding –420 m (e.g., Ben-Avraham et al., 2006),
(7) Development of the Cretaceous basite belt with kimberlite-alkaline (mantle xenoliths) inclusions (Eppelbaum and Katz, 2012b; Sharkov et al., 2017) which discordantly cuts both the Mesozoic terrane belt and the Neoproterozoic belt of the Nubian and Sinai plates (Eppelbaum et al., 2018).
(8) Phenomenon of the Messinian crisis (about 5.5 million years ago) caused the lowest hypsometric values (<-2000 m) in the history of the Earth during which the Mediterranean Sea dried out.
(9) Extreme landscape-geomorphological changings (triggered by tectonic evolution) in the region during recent geological time (2 million years ago) which led to emergence evolution of hominids and their migration along the narrow Eastern Mediterranean land bridge at the time of the Gelasian-Akchagylian eustatic transgression into the Eurasia and Northern Africa.

The combination of these unique geological and geophysical phenomena at a relatively short distance each from other requires development of a new physical-geological model of global geodynamics in this region. Such a model may be constructed only with application of comprehensive integrated geological-geophysical investigation by the use of modern technological and numerical methods.

Therefore, the performed research has included a variety of methods: gravity data processing (mainly satellite gravity data retracked to the earth's surface), paleomagnetic data analysis and GPS vectors inspection with attraction of seismic, seismological and magnetic data examination and total interrelation with numerous tectono-structural reconstructions. Based on this combined analysis, a buried deep regional structure (uplift) in the Eurasian-African region has been identified. Over the deep structure center a Heletz swell is located.