РЕЦЕНЗИЯ НА СТАТЬЮ

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Название статьи On the subduction of the Apulian lithospheric microplate under the Euro-Asian one and the mantle wedge thermal convection as a possible mechanism of hydrocarbons upward transport in the Pannonia and the Vardar basins.

1. Актуальность темы

According to [3], the subduction of the Apulian lithospheric microplate under the Dinarides, Pannonia basin and Vardar zone is sufficiently flat and during the last ~ 45 Ma occurred at the angle of ~ 25°, which remained unchanged during this time interval. The genesis of the Dinarides mountain belt (with the transversal horizontal extent of ~ 300 km) apparently is of the thrust and fold nature, associated with the former collision and subduction of the oceanic branches of the Neo-Tethis and Alpine-Tethis as the result of thrusting of the African plate under the Eastern and Western Europe during the last 55 – 35 Ma [3]. In [1] numerous papers are referred, containing contradictory estimates of the relative motions of the Apulian lithospheric microplate and Euro-Asian plates, made on the basis of seismic, geophysical and geodetic data. In fig. 3 in [Op. cit.] the velocity of subduction of the Apulian lithospheric microplate under the Euro-Asian one is seen to amount to ~5 – 8 mm×a^{-1} according to referred works, while in [1] this velocity is estimated to be of the order of ~5 mm×a^{-1} according to calculations based on geodetic observations. In [12] the Pannonia basin and Vardar zone are noted to be the zones of the Middle Miocene extension occurred ~14 – 11.6 Ma ago, which led to the lithosphere thinning, these zones being the back-arc basin characterized by the back-arc spreading. At that time the single mountain belt parallel to Apulian shore was split into Carpathians and Dinarides and the shallow Pannonian sea was formed, which existed approximately to 600 thousand years ago. Presently the Pannonian oil- and gas-bearing basin is situated in this region. Here the conditions are clarified under which the centre of the back-arc spreading initiates as the result of convective instability, driven by the dissipative heat release in the mantle wedge above the subducting Apulian lithospheric microplate.

2. Научная новизна, значимость работы

According to [4, 8, 9] two types of dissipation-driven small-scale thermal convection in the mantle wedge are possible, viz. the 3D finger-like convective jets, raising to volcanic chain, and 2D transversal Karig vortices, aligned perpendicularly to subduction. These two types of convection are shown to be spatially separated due to the pressure and temperature dependence of mantle effective viscosity, the Karig vortices, if any of them formed, being located behind the volcanic arc [4]. There are contradictory judgments on the velocity of subduction of the Apulian lithospheric microplate under the Euro-Asian one, although the order of magnitude of the present-day subduction velocity (~ 10 mm×a^{-1}) can apparently be regarded as established sufficiently reliably. The mountainous massif Dinarides locates parallel to the north-eastern shore of the Adriatic sea, and probably is of the thrust-and-fold nature. The 2D maximum of the heat flux anomaly of ~100 mW×m^{-2} observed in the rear of the Dinarides massif in the Pannonia basin and the Vardar zone [10] can be assumed to owe its origin to the convective heat supply from the mantle wedge. Numerical modeling of the 2D convection, occurring in the mantle wedge in the form of the Karig vortices and presumably transporting heat upwards, allows to judge about the mean water content in the mantle wedge and to assume the mantle hydrocarbons to be transported to the Earth's surface by the upwelling convective flows. Numerical convection models accounting for the

pressure-, temperature- and stress-dependence of viscosity fit best to observational data in the case of non-Newtonian rheology at the mantle water content of ~ (0.3 – 3)´10^{-1} weight % for the velocity of subduction of ~ 10 mm×a^{-1} during the Middle Miocene. In [15] such rather a high water content (and even greater one, up to 3 weight %) can be observed in the mantle wedge in the mantle transition zone. The Middle Miocene subduction velocity of ~10 mm×a^{-1} during the formation of the Pannonia basin is of the order of the observed presently, or, can somewhat exceed it because of the gradual diminution of the velocity of convergence of African and Euro-Asian plates.

3. Логичность и последовательность изложения материала

Присутствует

4. Проведение анализа по заявленной проблематике

Приведен полный анализ

5. Статистическая обработка материалов (эксперимент)

Присутствует

6. Исполнение методов научного познания

Да

7. Цитируемость научных источников

Да

8. Научный стиль изложения, терминология

Присутствует

9. Соответствие правилам оформления

Да

10. Замечания рецензента (если есть)

Нет

Рекомендации к опубликованию (подчеркнуть)		
Публиковать безусловно	Публиковать после доработки/устранения замечаний	Отклонить (обосновать)

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