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Development of the model of El Hierro island (Canary Islands) on a basis of complementary interpretation the results of low-frequency microseismic sounding and gravimetric survey

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The experimental study of deep (up to depth of 50 km) subsurface structure of the Earth's crust under the El Hierro volcanic island has been carried out by means of the two different geophysical methods: the precise gravimetric survey and the original method of sounding with low-frequency microseisms based on advanced possibility to determine the interior structure and geological medium heterogeneities by comparison the spectral intensity at various frequencies in a background low-frequency microseismic noise field registered at the spatially distributed data acquisition points. The Earth's crust structure study results were compared with known geological data. Thus, it provided a basis to develop the tectonic model of the volcanic island. Two vertical intrusive bodies were revealed under the volcanic island. Complementary analysis of gravimetric and microseismic results has shown that one of intrusions near the center of the island (the "eastern" intrusion) is featuring the solidified tap in its upper part which extends to depth of 10 km from the surface and one may observe a transition to partial melted rocks at more depths. There is also a good coincidence with geological dating on the surface corresponding to age of about 1.2my. Another intrusion in the western part of the island is composed from relatively light magmatic associations; it does not have any solidified parts and seems to be closely associated with recent volcanic activity on the surface. Results are well harmonized with geological data on

various mechanisms of eruptive activity. In case of volcanic activity related to the first intrusion one may expect the explosive scenario. The second intrusion governs effusive volcanic activity. It is believed that simultaneous development of both scenarios sounds reliable due to extended time of magma cooling and fractioning in the isolated volume of “western” intrusion. This magmatic body has stopped its upward progress due to sudden pressure decrease related to explosive eruption from “eastern” intrusion while both magmatic bodies seem to have the deep magmatic source in common.