Morphotectonic analysis along the northern margin of Samos Island, related to the seismic activity of October 2020, Aegean Sea, Greece

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On October 30th 2020 a strong earthquake of magnitude 7.0 occurred north of Samos Island at the Eastern Aegean Sea. This seismic event was another destructive active deformation in the long seismic history of Samos since the ancient times. Preliminary reports focused the seismic epicenter at about 10 km north of Karlovassi, situated at the western part of the Samos E-W trending coastline. The earthquake mechanism corresponds to an E-W normal fault dipping to the north. The activated fault was assumed to be running along the northern margin of Samos Island, which bounds from the south the Samos basin.

Immediately after the seismic activity and during the aftershock period in December 2020 an hydrographic survey off the northern coastal margin of Samos Island was conducted with R/V NAUTILOS of the Hellenic Navy Hydrographic Service, using the multibeam SeaBat 7160 RESON. The result of the hydrographic survey was a detailed bathymetric map with 15m grid interval and 50m isobaths. The main morphological aspects of Samos Basin are a 14 km long, 6 km wide and 690 m deep elongated E-W basin developed north of Samos Island.

The southern margin of the basin is abrupt with morphological slopes of more than 10º, following the major E-W normal fault surface, running along the coastal zone, with an overall throw of more than 500m. In contrast, the northern margin of the basin shows a gradual slope increase towards the south from 1º to 5º. Numerous small canyons trending N-S transversal to the main direction of the Samos coastline are observed along the southern margin, between 600 and 100 m water depth. These canyons have a length around 2,7 km and width between 100-300 m. Two large submarine landslides with a canyon width of 1,3 km and 0,8 Km, are located north of Karlovasi. The creation of the canyons is probably due to the uplift of Northern Samos Island and their 500 m vertical height difference corresponds to the average fault throw that has controlled the steep slopes of the margin. The orientation of the fault scarp changes at the western Samos coastline from E-W to ENE-WSW facing the neighboring Ikaria Basin, which is developed to the west of Samos Basin. The division line between the Ikaria and Samos basins runs N-S from the northern slopes and coast of the Kerketeas mountain (1443m). The aftershocks of the 30th October main
shock are limited east of the N-S division line with only a minor activity 15 km to the west within the eastern margin of the Ikaria Basin.