P16-2 PALEOSEISMIC DISLOCATIONS IN BULGARIA- NATURE HAZARD, RELIEF AND PHENOMENA

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The problem of studying the paleoseismic dislocations and the relief disturbance in particular, caused by the strong earthquakes during the historic and the contemporary stage (before 8000 years B.P.) is a new and extremely interesting one. The aim of their investigations is to determine the trends for potential seismic hazards, to delineate the zones and single sections of paleofaults, which are generating seismic energy, to distinguish the stages and intervals of display of contemporary hazardous effects around them, to solve geoecological and social aspects of the problem, etc.

The problems connected with the discovery, mapping and investigating of the paleoseismic relief effects in Bulgaria is still at an initial stage. During the recent years the author has managed to localise about 13 local paleostructures in the country, caused by strong impulse tectonic movements. Some of the have been studied and mapped and the investigation of the others is impending in the near future. Archaeoearthquakes or contemporary earthquakes have been recorded in their vicinity.

The “Srebarna” paleoseismic dislocation was discovered accidentally in 1991 when the reserve was facing an ecological crisis and a broken off gravitation block emerged the subsided water. It had been the result of a single impulse tectonic event with a magnitude of 8-9 degree and presumable epicentre depth of 30-60 km. This event took place at the boundary between the Holocene and the Pleistocene (10500 ± 250 years B.P.). The paleoseismic fault is situated in a tectonic node, its established length being 2750 m, the width of the affected zone - from 750 to 1000 m, and the amplitude of vertical movement - 20 m. As a result, a geomorphological anomaly occurred - the Kulnezhka and Srebarnenska river mouths vanished, a swamp was formed in front of the broken off block and an accumulation pocket - behind it. There was a disturbance in the hydrological and hydrogeological conditions - the direction of the surface run-off of the rivers was changed and their water was bifurcated to the basis of the block and lost in the karst substrate underneath. The region was reactivated in 1864, 1892 and 1893.

The “Madara” paleoseismic dislocation was established during the work of the author on a project for the assessment of the dynamic and static stability of the “Madara Horseman” rock massif in 1990-1991. During the Middle Pleistocene the region around the historic monument and the regions situated to the north and to the north-east of it, were subjected to bilateral impulse movements. The dislocations “Madara” (1.5-2.0 km long, N-S direction) and “Kyulevcha” (1.0-1.5 km long, NW-SE direction) were formed. Both are of the seismogravitational type. Open fissures were formed in the basic massif and the movements of the two paleoseismic faults were in the range of 0.5 to 0.8 m. The width of the external open fissure reaches up to 0.8 m in the upper part of the gravitation block and more than 1.5 m in the lower part, where the Malka cave is found (inhabited by primitive men). Its width increases under the influence of gravitation. According to the classification of Solonenko (1975) this phenomenon could be created for similar characteristics of the rock complexes and relief deformation in the case of a 10-11 degree earthquake with a magnitude of 8-9 and a depth of the epicentre within the range of 2-10 km. Contemporary seismic dislocations with destructive effects were recorded in the region - the collapse under the “Nimfite” cave in 1928, and the widening of the cracks of the bas-relief and the rockfall near the Kyulevcha village, caused by the Vrancea earthquake in 1977. Besides the possession of its own seismic energy, the region is influenced by other earthquakes and has an induced seismic hazard related with the antropogenic activities on the salt body in the Provadia district. Paleoseismic relief and geological deformations of older age were also established by the author during a revision on the Provadia plateau in 1997.

The global rearrangements of the Fore-Carpathian, Black Sea and Mediterranean basins and the initial pre-Quaternary tectonic impulse and the following destruction, the rearrangement of the river basins, the formation of the structural-denudation and structural-accumulation lowering, the shaping of the plateau structural edges, the rising of the mountain structures, the formation of the continental neighbourhood, are connected according to the opinion of the author with the origin of the paleoseismic dislocations: “Bregare”, “Trunchovitsa”, “Popovo”, “Momina Skala” in the Shoumen district and “Lovnishka”, “Chuipetlyovo”, “Pernik”, “Kroupnik”, “Melnik”, “Petrich” and the paleoseismic phenomenon to the north of the Varna city.

During the Middle Pleistocene the “Bregare”, “Trunchovitsa”, “Popovo”, “Pernik” and other dislocations were reactivated. New paleofaults generating seismic energy were created.

The Holocene-Pleistocene boundary is very active and with well preserved relief seismic deformations. Many of the older paleoseismic dislocations are reactivated. The deformations are with impressive size and morphology at the foot of the mountains (Vitosha, Rila, Pirin and the Rhodopes), the North-Bulgarian plateaux (“Pamukchii”, “Trapishte”, “Mortagonovo”, “Preslav”, “St. Mihailovski”) and the subaquatic and aquatic part of the Black Sea continental neighbourhood.

The recording, mapping and studying of the nature of these phenomena, the assessment of the macroseismic effect in the relief, the time of display and reactivating, and their wholesome assessment would result in the solution of a number of practical problems during the evaluation of the seismic hazard. Many failures in engineering activities could be avoided, the cultural (historic and contemporary) monuments could be better preserved and a considerable social effect could be achieved.