EFFECTS OF CAPILLARY SUCTION PRESSURE ON PINDOS AND IONIOS FLYSCH PELITIC ROCK MASS SOUNDNESS BY EXCAVATIONS

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The two processes «slaking» and «swelling» are made responsible for rock breekdown and floor heave, respectively, during excavations of the Power and Tailrace Tunnels in the Pigai Aoos Hydroelectric Project. The tunnels were built through the pelitic rocks of the Pindos and Ionios Flysch. The intepretation of the test results of the investigated samples led to limitation of the conditions under which these processes occur. Slaking takes place under varying high humidity conditions due to capillary suction pressures, whereas swelling occurs after strong dehydration of the rock mass and the expandable clay minerals (corrensite).

GEOTECHNICAL PROBLEMS OF THE UNTERGROUND STRUCTURES AND DAM FOUNDATIONS IN THE HYDROELECTRIC PROJECT PIGES AOOS

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The hydroelectric project «Piges Aoos», as a construction, is a large scale technical project and is constructed in an area with complicated and unfavourable geological conditions. During the execution of the work various and serious geotachnical problems were deat, with in the dam foundation (one main dam and six lateral ones) and the excavations of the underground structures.

The main dam has been founded on strongly tectonized and serpentinized peridotites. The problems that heve been encountered during the foundation were the difficulty of preparing an acceptable foundation plain and the weak but outspread confined aquifers.

The divertion tunnel was also constructed in peridotite which in the first part was strongly tectonized and serpentinized. During the opening of the tunnel many stability problems were encountered.

In the foundation of the lateral dams (in the Pindos Flysch) the problems were the difficulty to form the foundation plain because of the strong tectonism of the rocks and the differential errosion.

The power tunnel was constructed in the Pindos Flysch. Stability problems were met only in the red pelites of the Pindos Flysch. The underground water, the drainage of the tunnel, the great grout absorbtions in the injections were the major problems in the thick-bedded sandstones.

The escape tunnel at a length of 2 Km has been constructed in the Ionian Flysch, inside which silt-stones dominate. In a big part of the tunnel the rock was strongly tectonized due to the Pindos thrusting. The excavation of the tunnel faced serious stability problems. The problems kept on even after the installation of protection measures whereas additional protection measures often had to be taken several days or even months following the excavation.

ENVIRONMENTAL ISOTOPE STUDIES ON KARST GROUNDWATER IN THE HELICON MOUNTAINS (BEOTIA/GREECE)

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The Helicon Mountains in Beotia, stratigraphically and structurally rather well understood, are taken as a perfect example of a Mediterrenean karstic massif. A large number of springs, connected with either shallow or deep karst pathways, drain the range. Considerable amounts of groundwater are directly discharged into the Bay of Domvrena. In connection with recent hydrogeologic investigations a geothermic zone has been detected and structurally located the southeast of Levadia.

Stable oxygen isotope compositions of the water as well as carbon isotope compositions of dissolved inorganic carbon (DIC) have been investigated from water samples of springs, wells and open drainage channels from both the mountains and the plains. Main drainage directions of shallow and deep karstic systems could be delineated by ^{18}O distributions in the groundwaters. This result is based on the altitude effect of isotopic differentiation. $\delta\ ^{13}C_{DIC}$ ratios refer to a variety of carbon sources, such as atmosphere, soil-biology or weathering.

Characteristic δ value ranges for different waters cen be shown by comparison of $\delta\ ^{13}C_{DIC}$ and $\delta\ ^{18}O$ ratios. Little variation of isotope ratios of deep karstic waters depend on sizes of recharge areas and reservoirs. High isotopic $\delta\ ^{13}C_{DIC}$ values are relevent to carbon exchanges with atmospheric CO_2. This is particularly the case in mountainous regions, where only thin soil covers exist end precipitation rapidly supplies the phreatic zone. The restricted sizes and the variations in altitude of the recharge areas of shallow karstic waterbodies are reflected in varying δ values of DIC and ^{18}O.

Recharge areas of the geothermic waters are similar to those of deep karstic waterbodies. Nevertheless they are to be distinguisthed by isotopical heavy DIC, because endogenic carbon is conveyed from below.

The varying δ values of waters from open systems are caused by equilibration with atmospheric carbon and ^{18}O enrichment due to evaporation.