RADIAL GROUNDWATER FLOW TOWARD A SPRING

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Maillet's single term and Schoeller's multiterm karstic spring discharge models have long been in use in hydrology and hydrogeology. The former is a physically based model. However, the single linear reservoir assumption of the total flow domain is inadequate to describe the kastric spring discharge process. The empirical approach of the latter model gives rise to some physical difficulties in the interpretation of model parameters.

Birsoy showed that the empirical equation of Schoeller can be derived physically by using the partial differential equation of unidirectional groundwater flow. The major drawback in this physically based approach is this assumption of unidirectional flow. It is clear that this assumption may well describe the groundwater flow toward a ditch or a river, but how well it works for flow toward a spring is doubtful.

Radial flow may be more representative of flow toward a spring than the unidirectional flow. Therefore, in the presented study, the partial differential equation of radial groundwater flow is solved by transforming the partial differential equation into n ordinary differential equations with n unknows. The resulting equation is similar to the emprically proposed equation by Scholler and theoretically derived equation for unidirectional flow by Birsoy. Physical interpretation of modal parameters will naturally be different.

INVERSELY PILED METAMORPHIC SUCCESSIONS OF THE PHYLLITE QUARZITE SERIES OF THE SOUTHERN PELOPONNESUS. - STRUCTURAL AND GEODYNAMIC IMPLICATIONS.

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The Phyllite-Quartzite Series (PQS), widely distributed in SE-Lakonia, is formed by several successions different in lithology, petrography, metamorphism and deformation. The spatial relationships between thesa successions give information about the structure of the PQS and the geodynamic evolution of the external Hellenides.

Three characteristic successions make up the PQS in SE Laconia: Succession 1 is a monotonous alternation of metaquartzites and phyllites of low grade Barrowian metamorphism with the characteristic prograde mineral paragenesis.

quartz + sericite + albite + chlorite ± paragonite ± biotite

Indications of high pressure are lacking within this sequence.

Succession 2 contains metaquartzites, micaschists and metavolcanics with the characteristic prograde mineral paragenesis quartz + muscovite/phengite + glaucophane + chloritoid (metaclastics) and epidote + albite + glaucophane/crossite ± chlorite ± calcite (metavolcanics).

Succession 3 consists of garnetiferous micashists and metaquartzites with the characteristic prograde mineral paragenesis quartz + muscovite/phengite + garnet + glaucophane ± chloritoid.

These different mineral paregeneses can be found in almost all sections of the respective successions.

Normally the contact between the different successions of the PQS are steeply dipping fault zones. They continue upward into the Tripolitza Series resp. The Tyros Beds, which have been thrusted over the PQS. The throw within the Tripolitza Series is smaller than within the PQS, however.

In some sections it can be demonstrated, that parts of the hp/lt-metamorphic successions 2 and 3 rest on succession 1, which has suffered lower metamorphic conditions, with a subhorizontal tectonic contact.

This inverse piling of metamorphic rocks is coused by the uplift of the hp/lt-metamorphics from deeper crustal levels and consequent thrusting upon parts of the PQS, which show no parageneses typical of hp-metamorphism. Processes responsible for this uplift should be localized at the base of the overriding crustal sleb.

According to geophysical results and the plate tectonic situation the external Hellenides are underthrusted by a subducting crustal slab in the aree of the Peloponnesus. Extension and simultaneous uplift and exhumation of lower crust may be due to a growing wedge at the base of the upper plate. Uplift is controlled by underplating connected with mechanisms which can be described in analogy to the conception presented by PLATT (1986).

NEW DATA ON THE HELLENIC TROUGH STRUCTURE

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The analysis of geological-geophysical results obtained during the 10th leg of R/V "Antares" within the Hellenic Through south of the Kithira Island, Greece, together with previous data allows us to draw the following conclusions: