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North Gondwanan mid-Palaeozoic bioevent/biogeography patterns in relation to crustal dynamics

ABSTRACT BOOK
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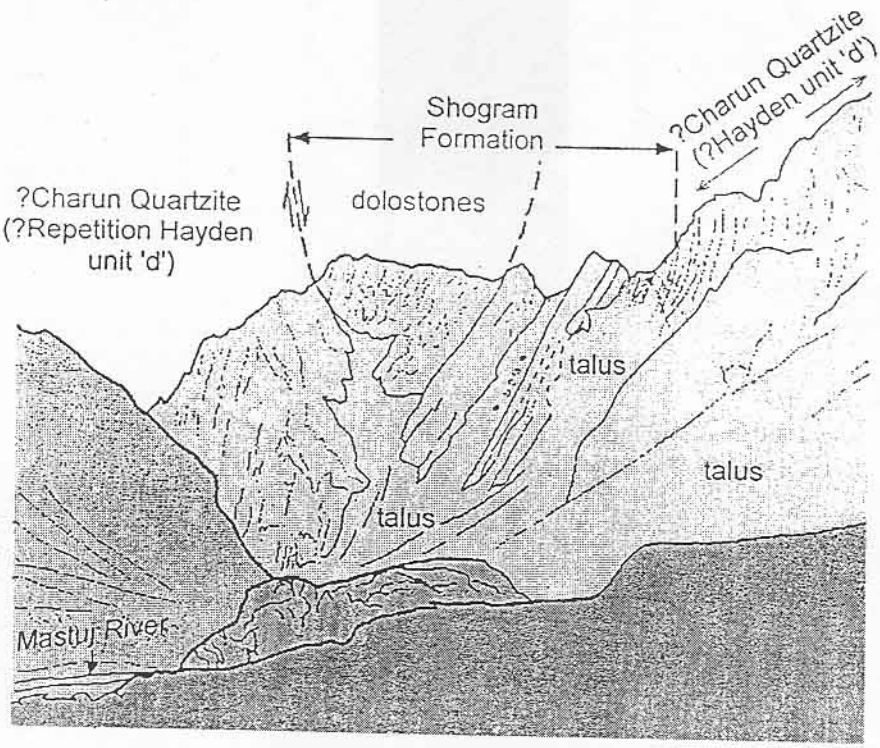

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DIFFERENCES IN THE GEOLOGICAL EVOLUTION OF THE ISTANBUL AND ZONGULDAK TERRANES, NORTHERN TURKEY

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The "Palaeozoic of Istanbul" was always regarded as one terrane belonging to the Variscan Belt (for summarising this view see Görür et al., 1997). Göncüoğlu & Kozur (1998a,b) and Kozur (1998a,b) recognised that the "Palaeozoic of Istanbul" belongs to two different terranes, the Istanbul Terrane (Palaeozoic-Mesozoic sequence around Istanbul-Gebze) and the Zonguldak Terrane (Çamdag, Zonguldak, Amasra and Safranbolu regions). These terranes have a very different Palaeozoic-Mesozoic history, but both were north of Perigondwana since the Early Palaeozoic. In the Zonguldak Zone of the Zonguldak Terrane, the basement consists of Precambrian gneisses of unknown age and mainly of a well dated Cadomian basement. It comprises both an oceanic sequence consisting of ultramafics, gabbros, basalts, tuffs and an island arc sequence (granites, felsic volcanics and pyroclastics), which is dated with 550 my. The Ordovician begins unconformably above the Cadomian basement with Tremadoc dark greenish-grey siltstones and dark-red sandstones. Locally, an undated arkosic sandstone is present below dated Tremadoc rocks. Dark-grey Arenig-lower Llanvirn mudstones and siltstones with graptolites and trilobites of Welsh-European affinities indicate a rapid deepening of the basin. Overlying limestones and mudstones yielded Caradoc and Caradoc-Ashgill conodonts (CAI = 5-6) with the warm-water *Amorphognathus tvaerensis* Bergström. The Silurian consists mainly of black and grey graptolitic shales and mudstones with subordinate pelagic limestone intercalations (partly dolomitized). Different levels (Wenlock to Přidoli) are unconformably overlain by Lower Devonian sandstones and quartzites. All Silurian conodonts are distinctly thermally altered CAI=5).

The transgressive Lower Devonian siliciclastics are conformably overlain by shallow-water dolomites and limestones with shallow-water conodonts (CAI=2-2.5) of Emsian to Late Devonian age. Therefore, the Caledonian discordance of the Zonguldak Zone is post-Silurian/pre-Emsian.

Shallow-water, partly dolomitic limestones continued in the Lower Carboniferous. The youngest marine Palaeozoic beds are lower Namurian conodont-bearing limestones (CAI=1). Upper Carboniferous, uppermost Permian, and Triassic are represented by continental beds, in the Carboniferous with the same plant associations as in the Donetz Basin, Middle and Western Europe.

The following conclusions can be drawn from this geological evolution: (1) In Cadomian time, the Zonguldak Terrane was situated at the margin of Gondwana. (2) Continuous Middle Ordovician to uppermost Silurian (or lowermost Devonian) pelagic beds were deposited. They were partly eroded down to the Wenlock in pre-Emsian time (Caledonian discordance). (3) There were distinct post-Přidoli/pre-Emsian Caledonian movements and thermal alteration. (4) In Caledonian time, the Zonguldak Terrane was part of the Baltic warm-water province (5) The Zonguldak Terrane does not belong to the Variscan chain, but was in Variscan time a stable shallow-water shelf attached to the southern margin of Eurasia. (6) The Zonguldak Terrane may be part of a non-oceanic Tornquist Sea or a marginal part of an oceanic Tornquist Sea. Its Palaeozoic development is very similar to that of the Moesian Platform. The entirely continental Triassic of the Zonguldak Terrane indicates a slightly more northern position of the Zonguldak Terrane compared with the Moesian Platform.

The Çamdag Zone of the Zonguldak Terrane has since the Devonian the typical development of the Zonguldak Terrane. In Caledonian time, however, it was an elevated zone. Most of the Ordovician and the entire Silurian are missing. The terrigenous sedimentary input from the north in the late Ordovician and Silurian of the Istanbul Terrane probably originated from the Çamdag Zone.

The oldest rocks in the Istanbul Zone s.s. (Haas, 1968, Kaya, 1973) are Ordovician siliciclastic deposits. Upper Caradoc-Ashgill ostracodes (Sayar & Schallreuter, 1989) belong to the Baltic province with only a few forms that occur both in Baltica and in Perigondwana. There are also faunistic connections to Siberia and North America. The brachiopods show connections to Baltica, Bohemia and the Appalachians (Sayar & Schallreuter, 1989). Thus, the Ordovician had apparently a warm-temperate fauna with close connections to North Europe and Siberia/North America (warm-water), but also with few connections to Perigondwana (cold-water). Shallow-water deposits continued up to the lower Emsian (siliciclastic rocks continued up to the top of the Llandovery, whereas from Wenlock to Pridoli limestones, in the Lower Devonian partly also clastics were deposited).

Pelagic basinal deposits began in the upper Emsian and continued up to the Tournaisian (with black radiolarites), whereas in the Viséan deep-water Culm flysch was deposited. The youngest marine Palaeozoic deposits yielded lower Bashkirian fossils. The Lower Triassic rests unconformably on Bashkirian or older beds. Middle Triassic condensed deep-water deposits and Upper Triassic flyschoid siliciclastic turbidites and olistostromes are very similar to the adjacent northern part of the Karakaya Ocean, but also to the northern Dobrudzha, which has a distinctly different Palaeozoic development.

Lower Carboniferous flysch and Variscan thermal alteration of the conodonts (Devonian CAI = 4, Gedik, 1988) indicate that the Istanbul Zone s.s. belongs to the Variscan Belt. Caledonian movements and thermal alterations are unknown. The original position of the Istanbul Terrane was south of that of the Zonguldak Terrane and its western continuation in the Moesian Zone.

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