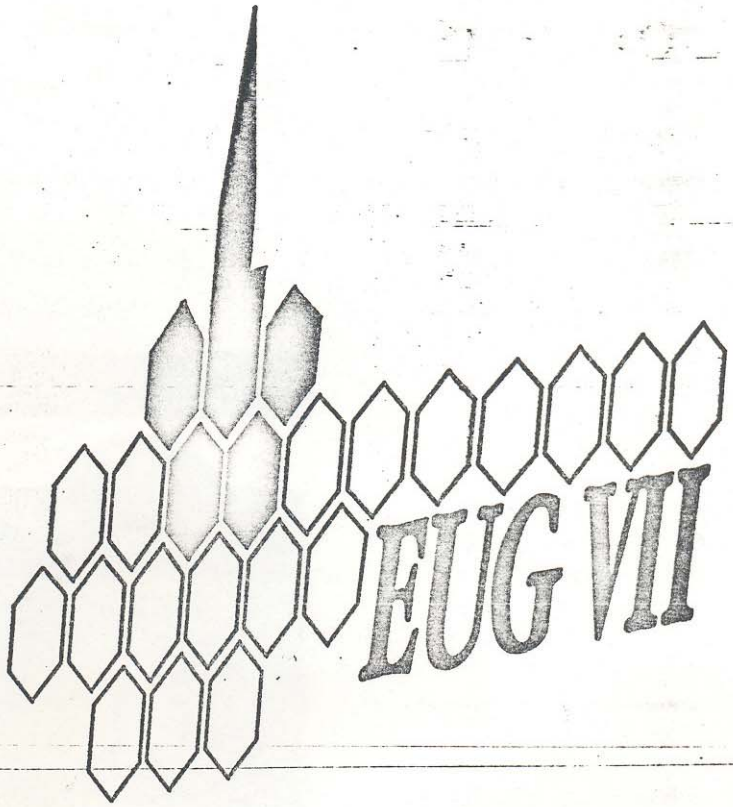

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1 Sedimentary facies of the Närkesberg formation, south-central Sweden

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An important part of the east-central Sweden is composed of an Early Proterozoic (ca 1950 Ma) volcano-sedimentary sequence intruded later by various generations of granitoids and basic rocks. The sedimentary components of the early volcano-sedimentary succession are dominated by meta-sandstones and minor marbles. Previously, a minor part of the sedimentary deposits have been the subject of sedimentary facies analysis; high grade of metamorphism in some areas may be one of the reasons to this.

New results from a sequence of meta-sandstones, Närkesberg formation, in south-central Sweden are reported here. The Närkesberg formation, intercalated by rhyolitic rocks, is composed of homogeneous, fine-grained meta-arkoses with a thickness of ca 5 km. The dominating sandy facies types are characterized by trough cross-bedding (St), tabular-tangential cross-bedding (Sp), horizontal lamination (Sl) and some minor ripple cross-bedding (Sr). Mudstones (Fl, Fm) appear as very thin intercalations between the sandy beds, but may range locally to a few metres. The basal beds (<100 m) on top of the rhyolite units are composed of matrix-supported breccias (Gms). Thin laminae of heavy minerals occur frequently in these sandstones. Wet-deformation structures, such as overturned cross-bedding, ball-and-pillow and minor slumps are also common.

Current direction analysis and the composition of the sandstones suggest the presence of a granitoid source in the northwest and transport to southeast. The succession is interpreted as deposited in a sand-dominated, braided, fluvial setting, where the sediment input was balanced by a regular subsidence of the basin, located probably close to a continental margin.

2 Middle Eocene slump sheets and paleoslope orientation in the Furlo area (central Appenines, Italy)

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A large 50 km^2 slump sheet associated with debris flow deposits was studied in the Furlo area (Umbro-Marchean Appenines). It lies within the marly limestones of the lower part of the Scaglia Variegata formation (Middle Eocene - Upper Eocene).

The lithologies constituting the slump sheet are mostly white and pink marly limestones of the Scaglia Variegata formation. Slightly deformed red cherty limestone blocks, up to 30 m long and 4 m thick, are also found. A typical characteristic is the presence of grey to pink cherty nodules (ranging from 10 to 100 cm in size) whose fluidal structure indicates soft-sediment deformation. The presence of limestone blocks and cherty nodules gives evidence that the upper part of the Scaglia Rossa formation was involved in the slumping.

A mean paleoslope dip direction of 85° (α_{95} =16°) was inferred from the slump orientations of the fold axes measured at 20 sites. Both the separation arc method (Hansen 1973) and the mean fold axis method (Jones 1940) have been considered. The separation arc method was preferred because of its capability to distinguish the usual along-slope (i.e. parallel to the strike of the slope) mean fold axis distribution from the down-slope mean fold axis distribution which also occurs in some sites. Also the axial plane orientation of the slump folds was used for the same purpose as suggested by Woodcock (1979) and similar results were obtained.

A depositional paleoslope dipping less than 3.7° was estimated on the basis of the clast size and the thickness of a debris flow deposit in the southern part of the studied area.

The thicknesses of the slump sheet and of the Scaglia Variegata formation were investigated at 13 sites with stratigraphic logs. The systematic decrease in thickness toward the West supports the hypothesis of a topographic high in the western area and confirms an E or ENE dipping, probably fault controlled, paleoslope.

3 Cave stratigraphy in Norway; the speleothem record.

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Deposits in karst caves comprise speleothems (stalagmites, stalactites), clastic sediments and fossils, from which paleoenvironmetal inferences can be made. The protected nature of karst caves imply that such data may be unique and fill in gaps in the records that are based on surface deposits. Cave data are also valuable terrestrial complements to the deep-sea record. The abundance of dateable material (i.e. speleothems) make cave sites attractive from a chronological point of view.

Speleothem deposition is discontinuous through time and is mainly controlled by climatic factors. The speleothem record of an area therefore provide a proxy measure of climatic changes during the timespan covered by available dating methods. The Norwegian karst represent an high-latitude extreme of the speleothem record in Europe. More than 150 samples have now been dated by U-series ($^{230}Th/^{234}U$) methods. Most samples are located around the Arctic Circle (65-68°N). The PDF curve of speleothem dates have been used to identify periods of enhanced calcite deposition and therefore "better" climatic condituons. Such curves have been constructed for North America and UK. The Norwegian PDF curve display fewer signals in the mid-Weichselian (i.e. Devensian) complex, with maxima at 30, 55 and 75 ka. The last Interstadial signal at 33 ka is represented by samples only a few kilometers from existing glaciers, and is also found in Spitsbergen caves (78°N). The "last interglacial" signal is sharper and narrower than the corresponding signal from N. England. This is in accord with a N-S directed paleoclimatic gradient.

Detailed dating on individual last interglacial speleothems reveal almost continuous speleothem growth from 150 ka to < 90 ka. Several samples from widely different areas display a marked hiatus at 130 ka, which may suggest a Younger Dryas type of oscillation at the end of the Saalian glaciation. $\delta^{18}O$ profiles of specimens that have grown in isotopic equilibrium suggest that warm, oceanic precipitation reached the caves shortly after 130 ka. This "Warm" signal lasted to about 115 ka, after which speleothem growth became much slower until <90ka. In high alpine environments speleothem deposition was halted at about 106 ka.

4 Clastic, flysch-type sequences in the Central Hellenides: an alpine orogenic model.

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During the Alpine orogenic cycle the Central Hellenides comprise three dinstict clastic, flyschotype series of Trias, Cretaceous and Tertiary, which correspond to different orogenic processes. The clastic series are seperated by sedimentary sequences (mainly calcareous and siliceous) which correspond to typical neritic and pelagic enviroments.

The lower clastic sequence comprises slates, calcshists, metapelites and metasandstones. Between these types there are thin intercalations or lenses of clastic limestones and cherts. The whole is strongly deformed and shows a very low degree of metamorphism.

The intermediate clastic sequence is presented more homogenous and shows typical characteristics of flysch.It comprises alternations of pelites and sandstones

and it is characterised by the presence of ophiolitic and calcareous clastic elements, as well as olistolites.

The Upper sequence starts with red pelites of Paleocene and is evoluated to a typical clastic sequence with alternations of sandstones, pelites and polymict coarser material. It is covered by clastic limestones with *Nummulites* and presents great thickness.

The deformation of the intermediate and upper clastic sequences is not very pronounced and they present discontinuous Alpine-type tectonic structures. The upper members of these sequences show typical slump structures (wildflysch).

The three clastic sequences correspond to geotectonic regions which were individualised during the Alpine cycle within an intesively evoluating enviroment. The stability of the characters of the clastic sequences contracts with the paleogeographic heterogeneity of the sedimentary sequences wich seperate them indicating intense orogenic differencetions in the formation of the Hellenides during the Alpine orogenic cycle.

6 Nannofossils distribution in the flysch rhythms.

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The nannofossils studies brought an important input for the flysch deposits stratigraphy. But in certain cases contradictory results appear. Tying to get an explanation for these results, we have sampled and analysed separately each part of the individual rhythms from different flysch types cropping out in the Romanian Carpathians.

In the lower members of turbidite beds,from the massive to upper parallel laminae layer (Ta to Td in Bouma's sequence),the nannofossils are of different ages,situation which shows very clear that they are redeposited.In this cases it is practically impossible to establish if the younger nannofossils from these layers are reworked from the underlying beds.

In the normal flysch sequences above the Td member follows a finer interval,corresponding to Bouma's Te, which usually can be devided into two different millimetric layers mainly distinguished by their colour.The lower layer seems to represent the normal pelagic sediment.It contains a nannoflora assemblage characteristic only for a certain age,fact which proves their "synchronism" with the deposition.The upper layer contains the same nannoflora assemblages as the previous layer but together with which again some older (reworked) tests are present.This situation can be explained only by a new terrigenous material influx, but comming from an other source zone than the turbidites.

In conclusion it has to be emphasized that the nannofossils diribution in the flysch sequences was rhythmically disturbed by the turbidite (as well as other types of flows) arrivels.For this reason the rhythms have to be precautionously sampled because only the nannoflora from pelagic sediments can be used for an accurate stratigraphy.

7 Criteria for recognition of multiple karst systems, tectonic versus sedimentary control, an example from the Triassic-Eocene carbonates, Buda Mts., Hungary

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The general pattern of hydrothermal caves in Triassic and Eocene carbonates of the Buda Mts. is basically controlled by multiphase tectonics. Late Eocene - Oligocene large-scale WSW-ENE strike-slip movements created the first generation of fault systems characterized by NW-SE, WSW-ENE and EEW-SSE directions.

As a result of the NW-SE axes extensional stress field NE-SW and WSW-ENE, NNE-SSW faults were developed. The post Miocene tectonic style is very similar to that of the Late Eocene - Oligocene and reactivated most of the former faults of that stage.

However there are cave geometries, which can not be explained merely by tectonics. Major cave passages follow the general SE dip of 30° of the Eocene strata. Possible pathways of ascending thermal and descending cold karst waters were determined by nearly vertical fissures of tectonic origin but horizontal water movement was mainly controlled by depositional facies pattern and lithology. Sea-level controlled isolated early karst horizons in the Upper Eocene limestones also created possible pathways for later water movements.

Thus on the basis of facial/sedimentary pattern and fault geometry it is possible to evaluate the role of tectonism versus depositional environment in the genesis of each cave.

8 GRAIN SIZE ANALYSIS METHOD FOR OLISTOSTROMES AND ITS APPLICATION

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In modern stratigraphic and sedimentological studies, there is an increasing frequency of recognition and description of olistostromes (debris flows, debrites), which are an important variety of the sedimentary column. The unusual involment of large size clasts, however, makes standard grain size analysis methods difficult to use in assessing various size distribution parameters. In this study, size sampling by photography and analysis by projection method was used to present one way of studying size distribution in this type of sediments. This method was applied to six olistostromes of late Jurassic (Oxfordian-Tithonian) and Late Cretaceous (Santonian-Early Maastrichtian) ages, occurring as block and lenses within an ophiolitic melange, situated between Alcı and Balkuyumcu villages, SW of Ankara, Turkey. Results of grain size analyses of these olistostromes (histograms, cumulative curves, some important size parameters) were compared with those of other clastic sedimentary deposits. In general, olistostromes appear to be very poorly sorted, positively or negatively skewed and platykurtic in which size distribution composed of semi-angular clasts. The scatter plots of the grain size distributions of the olistostromes tend to occur in areas distinctly different from those of other types of clastic sediments.