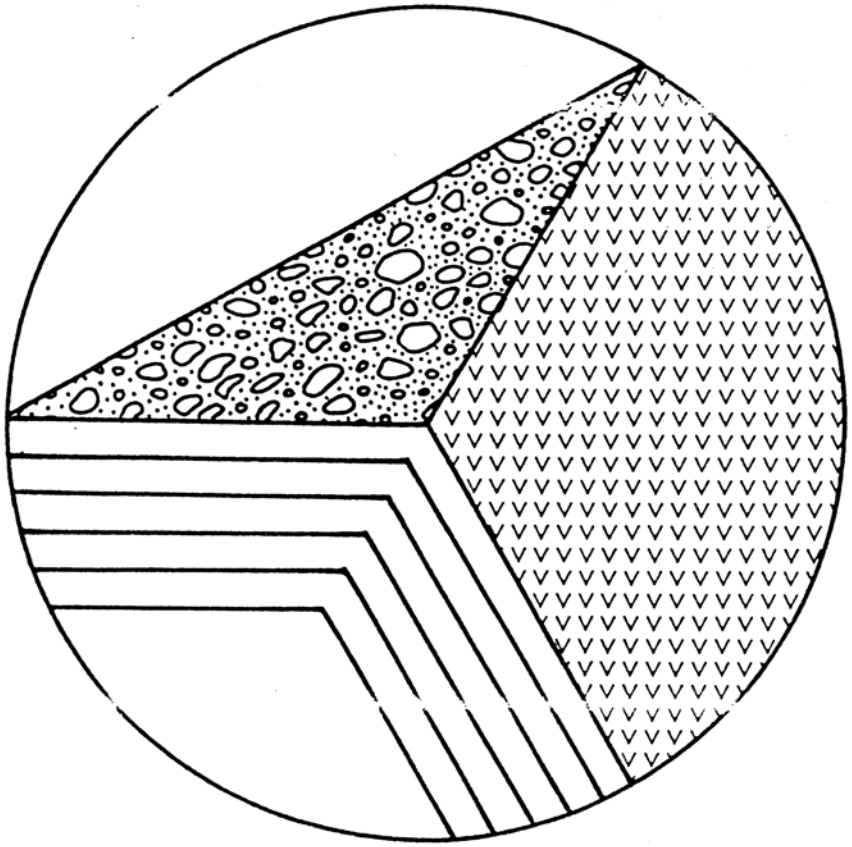
SEA LEVEL CHANGES AT ACTIVE PLATE MARGINS



TECHNICAL PROGRAMME

Poster presentations

CRETACEOUS UNCONFORMITIES, CHRONOSTRATIGRAPHY AND SEA-LEVEL CHANGES IN THE UNITED ARAB EMIRATES

A.S. Alsharhan
University of the United Arab Emirates, UAE

C.G.S. Kendall
University of South Carolina, USA

The Cretaceous of the United Arab Emirates is divided into three major units by regional unconformities: Lower Cretaceous Thamama Group (Berriasian-mid Aptian); mid-Cretaceous Wasia Group (Albian-Cenomanian, possibly early Turonian) and Upper Cretaceous Aruma Group (Coniacian-Maastrichtian).

The unconformity at the end of the Early Cretaceous appears to coincide with a pronounced eustatic lowering of sea-level during the middle Aptian. From the Valanginian through middle Aptian the stratigraphy of the UAE is a time of relative crustal stability, reflected by a steadily rising sea level with minor fluctuation. The sea-level curve indicates relative sea-level was higher during the mid-Cretaceous than during the Early Cretaceous. Tectonism plays an even greater role in controlling deposition during the Late Cretaceous and the unconformity at the end of the Late Cretaceous correlates well with a sea-level lowering.

This paper compares several existing eustatic sea-level curves for the Mesozoic with each other and with the Cretaceous stratigraphic sequence of the UAE and adjacent region. Bathymetric curves have been calculated for some wells, these display substantial variations in paleobathymetry which in part reflect eustatic changes of sea-level, but also reflect the effects of both epeirogenic and orogenic tectonism.

SEA-LEVEL CHANGES AS RECORDED AT THE PASSIVE MARGIN OF A FORELAND BASIN (GUADALQUIVIR DEPRESSION, SOUTHERN SPAIN)

José Borrego and J. Gabriel Pendon
University of Sevilla, Huelva, Spain

Guadalquivir Depression, located between the Iberian Meseta (cratonic area) to the north and the Betic [illegible] to the S-SE, is a typical example of foreland basin.

The sedimentary fill in the central-western sectors of this basin can be subdivided into several formations dated from Tortonian to Pleistocene.

Some sedimentary breaks in the stratigraphic series allow the distinction of sequences boundaries. These discontinuities are classified as follows: 1) erosional surfaces, 2) gentle angular unconformities, 3) lithologic breaks and 4) glauconitic levels.

These unconformities represent some of the ways by which relative sea-level changes can be recognized in the basin. They are the product of eustatic and/or tectonic events.

THE CORINTH CANAL, CENTRAL GREECE: COASTAL SUB-SEQUENCE GEOMETRIES CONTROLLED BY GLACIO-EUSTASY AND TECTONIC UPLIFT IN AN EXTENSIONAL BASIN

R.E.L. Collier
University of Leeds, Leeds, UK

The Corinth Basin is an asymmetric graben in central Greece, an area which has been extending north-south since the late Miocene. The Isthmus of Corinth, however, is undergoing tectonic uplift at [illegible] mm per ka. This poster presents a photomontage of a 1 km section along the Corinth Canal, which exposes Late Quaternary coastal deposits influenced by contemporaneous sea-level changes.

A series of beach-to-shoreface transgressive sub-sequences are seen. A proximal fining-up character within each sub-sequence is typical. More distal parts of each sub-sequence show a coarsening- then fining-up signature. A fining- and then coarsening-up trend is also seen. Each sub-sequence represents deposition on a NW or WNW-dipping coastal margin.

The sub-sequence geometries in the Corinth Canal section result from the interaction of three processes:

1) Glacio-eustasy - dated transgressive sub-sequences correspond with the c. 100 ka wavelength sea-level highs of the late Quaternary.
2) Tectonic uplift of the Corinth Isthmus.
3) Sediment supply rates fluctuating with late Quaternary climatic changes.

With relative falls in base-level the Isthmus has repeatedly undergone erosion (or calcretisation). During relative stillstand events wave-cut platforms have been eroded at new base-levels. These have then been buried as sediment has been supplied longshore during the continued, overall transgressive phase of each 100 ka glacio-eustatic cycle.

EOCENE DEPOSITIONAL SEQUENCES IN THE EASTERN PYRENEES

J.M. Costa[1], Ch. Betzler[2], E. Maestro[1]
[1] *Universitat Autònoma de Barcelona, Spain*
[2] *Institut u. Museum für Geologie u. Paläontologie, Tübingen, W Germany*

The Paleogene of the East Pyrenees reflects deposition in an active foreland basin. The effects of global changes in sea level are represented by major erosive unconformities delimiting the depositional sequences.

During lowstand conditions olistostromes, carbonate megaturbidites or siliclastic turbidites were deposited. Highstand conditions were characterized by carbonate platforms.

CARBONATE CLASTIC ALLUVIAL FAN AND FAN-DELTA SEDIMENTATION DURING COMPRESSIONAL TECTONICS

Hara Drinia, Eugenia Monogiou and George Postma
University of East Anglia, Norwich, UK

On the basis of structural and sedimentary evidence it is postulated that the tectonic regime in the Ierapetra Basin (Eastern Crete, Greece) switched from extensional to compressional in middle Miocene (Serravallian) times. The change in regional tectonics may be related to the activation of a subduction zone south of Crete (Hellenic Trench System).

1) During the N-S extensional phase, the Ierapetra and adjacent Basins were filled with mature, gravelly braided river (palaeocurrents to the west) and muddy floodplain facies (Males Formation).

2) The N-S compression phase is heralded by alluvial fans and shallow fan-delta systems (Prina complex) prograding southwards away from the thrust front. The sediments predominantly comprise immature carbonate clastics arranged in cyclothems of generally less than 15 m thickness.

3) During compression the average basin depth increased somewhat and fluctuated between a few

tens to a few hundred metres based on benthonic foraminifera (Fortuin, 1977) and ichno-facies. Deposition occurred probably in slope-type delta systems with turbidite-like sandstones and marls deposited in the prodelta area (Kalamavka Formation). This facies is arranged in sandstone lobes up to 10-15 m thick separated by marly sediments.

SEQUENCE STRATIGRAPHY IN THE PALEOGENE OF THE SOUTH PYRENEES: INTERACTION OF EUSTATISM AND REGIONAL TECTONIC PROCESSES

H. Eichenseer[1]
Ch. Betzler[1]
A. van den Hurk[1,2]
H.-P. Luterbacher[1]
[1]*Institut u. Museum für Geologie u. Paläontologie, Tübingen, W Germany*
[2]*Universitat Autònoma de Barcelona, Spain*

Detailed biostratigraphy confirms tht the important sequence boundaries of the Paleogene of the South Pyrenean Foreland Basin coincide with the third order sequence boundaries of the "Global Sea Level Chart" (Haq et al., 1987). These unconformities show varying degrees of tectonic overprint.

The distribution and geometry of the depositional systems is mainly controlled by local synsedimentary structural elements.

EUSTATIC, TECTONIC AND CLIMATIC CONTROLS ON DEPOSITIONAL CYCLES IN THE CARDIUM FORMATION, ALBERTA BASIN

Bruce S. Hart and A. Guy Plint
University of Western Ontario, London, Canada

At least three scales of cyclicity are recognized in the Turonian Cardium Formation. At least 150 km of shoreface progradation appears to coincide with a 3rd order global eustatic lowstand. Subordinate cycles (of about 150,000 years?) involving rapid shoreline movements of several 10s of kilometres, accompanied by unusually abundant conglomerate supply, are best explained in terms of periodic up-warping of the western margin of the basin. Subordinate packages within these tectonically-controlled cycles may reflect a ?Milankovitch-scale climatic control on sediment supply. Cardium deposition was strongly influenced by basement [illegible] progradation took place to the edge of a low-gradient 'platform', beyond which, slopes increased markedly. Relative sea level falls below this break in slope resulted in the formation of incised gravel-dominated shorefaces.

THE MESOZOIC SEDIMENTARY RECORD IN ISRAEL VERSUS GLOBAL EUSTATIC AND TECTONIC EFFECTS

F. Hirsch
Geological Survey of Israel, Jerusalem, Israel

Late Early Triassic werfenian facies (T1), Late Anisian (T2), Late Anisian-Early Carnian sepharadic and saharan facies (T3) and Late Carnian-Rhaetian alpinotype facies (T4) correspond well with Upper Absaroka cycles UAA1-3 (Haq et al, 1987).

Middle-Late Liassic (J1), Bajocian (J2) and Bathonian-Callovian (J3) Ethiopean facies and Oxfordian-Kimmeridgian (J4) Tethyan facies match Upper Absaroka UAA-4 and Lower Zuni LZA-4 cycles, whereas Early Bathonian and Late Callovian regressions differ from global cycles LZA1-3.

Tithonian-Aptian Gevar-Am (C1), Albian Lower Judea (C2), Cenomanian Middle Judea (C3), and Turonian-Coniacian (C4-C5) Upper Judea cycles correspond well with Lower-Upper Zuni LZB-2 - LZA-3 global eustatic events.

[illegible] Maastrichtian through Maastrichtian Mt. Scopus sedimentation was affected by alpidic folding of the Syrian Arc.

ASPECTS OF SEQUENCE STRATIGRAPHY IN THE EARLY AND MIDDLE EOCENE OF THE SOUTH-CENTRAL PYRENEES

E. Remacha and M. Zamorano
Universitat Autònoma de Barcelona, Spain

Eleven depositional sequences have been distinguished in the Ypresian and Lutetian sediments that fill the South Central Pyrenean foreland basin. Their correspondence with third order global cycles of coastal onlap (after Haq, Hardenbol & Vail, 1987) can be considered optimum. However there are differences in type of sequence (Type 1 or 2) due to definite thrust sheet tectonic control. We try to use new data to give relationships between tectonics, sedimentation and eustasy, in order to improve understanding of the Hecho Group turbidites.

RESPONSES OF DEPOSITIONAL SYSTEMS TO RELATIVE SEA-LEVEL CHANGES IN THE WELSH BASIN

R.D.A. Smith
University of Liverpool, Liverpool, UK

In late Llandovery (early Silurian) time a complex of axially-supplied sandstone-rich turbidite systems developed in the Welsh marginal basin during a well-documented period of transgression of the eastern basin margin (Midland Platform). However, the southern basin margin (source for the turbidite systems) contemporaneously experienced tectonic uplift resulting in relative sea-level fall and development of an angular unconformity.

According to Vail (1987): "Depositional sequences correlate throughout sedimentary basins and probably correlate globally". This is clearly not necessarily the case in active margin basins where adjacent basin margins may experience dramatically different subsidence/uplift histories.

SMALL-SCALE RELATIVE SEA LEVEL FLUCTUATIONS IN A PALEOGENE BIOCLASTIC WEDGE, EAST PISCO BASIN, PERU

Robyn Wright and Steve Taylor

Preliminary field work in East Pisco basin has revealed a Paleogene marine sequence that appears to hold a sensitive record of relative sea level change along the shallow forearc margin. The hierarchical arrangement of clinoform bedding units in well-exposed bioclastic bank deposits defines a repetitive complex sigmoid-oblique stratal pattern produced by alternating periods of aggradation (submergence) and lateral migration (sediment bypass). Maximum submergence of >15 m accompanied basement inundation, and progressively younger clinoforms prograded into decreasing accommodation space. Further study is attempting to constrain precise age control, submergence rates and tectonic-vs-eustatic driving mechanisms.