Palynology Across a Sequence Boundary, Wilcox Group, Bastrop, Texas*

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Abstract

Palynological sampling within shoaling-upward regressive deposits in the upper Calvert Bluff Fm and overlying transgressive deposits of the Carrizo Fm, exposed beside the Colorado River near Bastrop, Texas, reveals a rich assemblage of well-preserved palynomorphs. This section contains an unconformity equivalent to the sequence boundary between the Lower-Middle Wilcox and Upper Wilcox of the subsurface, probably corresponding to the Paleocene Eocene Thermal Maximum. Regressive deposits are shallow marine and shorezone in origin, later eroded and channeled during lowstand exposure, covered with fluvial channel fill deposits and capped with shallow marine shorezone sheet sands of the Carrizo Fm. Sedimentation rates were high and large amounts of plant material were deposited, resulting in the destruction of calcareous fossils due to production of acids from decaying plant material. Thus, palynology remains the key to understanding these deposits. Palynological processing included HCL, HF, acetolysis and heavy density separation. Kerogen slides were produced prior to acetolysis.

The diversity of palynomorphs is highest in sediments deposited in deeper and quieter waters, lower in the section. The Calvert Bluff section is entirely late Paleocene in age. The late Paleocene - late Eocene zonal indicator Thompsonipollis magnificus is present throughout the section and Paleocene palynomorphs Triporopollenites arboratus, Nyssapollenites (?), Maceopolipollenites, Momipites, Caryapollenites, pre-Symplocoipollenites (?), Cricatricosisporites, Tetracolporopollenites and fungal spores Brachisporisporites and Diporisporites (D. hamenii) are present. Pollen in fluvial channel deposits is mostly reworked and poorly preserved, although plant tissue and trichomes are plentiful and well preserved. Plant spores, fugal spores and freshwater algae occur throughout the channel fill.
No dinoflagellate cysts have been identified in this sample set, but previous sampling in the section obtained sparse dinoflagellates and foram chamber linings. The plethora of pollen and spores and scarcity of dinoflagellates can be attributed to the large amounts of sediment and plant detritus flushed into this area.

References


Palynology across a sequence boundary, Wilcox Group, Bastrop, Texas

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Study area - Northwestern GOM
Study area
Study area

Pine Forest Golf Course and Red Bluff on Colorado River
Wilcox depositional systems
Red Bluff (Riverbank) section

Carrizo Fm above; Calvert Bluff Fm below
Continuous deposition – mud to sand

Shoaling-upwards deposition; increasing energy levels

Coarsening-upwards set of deposits; mudstones grade upward to sandstones above

Great lateral continuity of thin and thick sediment layers

Lenses of storm sand
Evidence of marine deposition

- Bioturbation fabric
- Ophiomorpha burrow
- Presence of typical marine traces
- Presence of marine microtaxa (foram test linings; dinoflagellates)
Study area

Pine Forest Golf Course and Red Bluff on Colorado River
Stratigraphy

Formation boundaries and sequence boundary in section
Paleosol on sequence boundary

Rooting traces visible in lower part of paleosol interval
Channel margin

Erosional margin of channel, cut into basal Carrizo sandstone
Pinching out of channel sands
Channel complex - lower fill

Pulses of deposition in channel fill; sands with mudstone caps; common water escape structures

Sampling a zone of muddy sediment
Deposit of granular wood particles mixed with quartz sand
Marine flooding horizon
Red Bluff (Riverbank) section

Carrizo Fm above; Calvert Bluff Fm below
**Lower Paleogene pollen zonation**

For northern Gulf of Mexico

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Palynostratigraphy of the Wilcox Group.

Elsik and Crabaugh (2001)
Sample diversity - palynomorphs

Calvert Bluff Fm. paly diversity: 67 forms
Eocene pollen

Platycaryapollenites

Spineapollis spinosus

Spineapollis spinosus
Eocene pollen

Bagelopollis verrucatus

Sonneratiaceae

Symplocoipollenites
Spores

- Lycopodium
- Sphagnum
- Cicatricosisporites
- Deltoidospora
Gymnosperms

Piceaepollenites

Abies or Pinus

Ephedra voluta

20 μm
Additional taxa

Pistillipollenites mcgregorii

Momipites

Favitricolporites
Freshwater channel assemblage

- Schizosporis
- Foveolate algal cyst
- Botryococcus
- Tetraporina
- Cymatiosphaera?
- TCT
- Plant cuticle
P/E zonation

- Elsik zonation based primarily upon last occurrences of taxa (or first downhole occurrence)
- Is a general zonation for northern Gulf - not specific to northwest sector
- Concern that ages of taxa end ranges may vary along east-west climate gradient
Conclusions

- Calvert Bluff and Carrizo Fm. are marine influenced
- Calvert Bluff is at least partly basal Eocene in age
Acknowledgements

- Devon Energy
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