Schweiz. Vereinigung von Petroleum-Geologen und –Ingenieuren

Association Suisse des Géologues et Ingénieurs du Pétrole

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Swiss Association of Petroleum Geologists and Engineers

The Swiss Association of Petroleum Geologists and Engineers (VSP/ASP)
– as part of its 2009–2010 Lecture Programme and in cooperation with AAPG –
presents a talk by

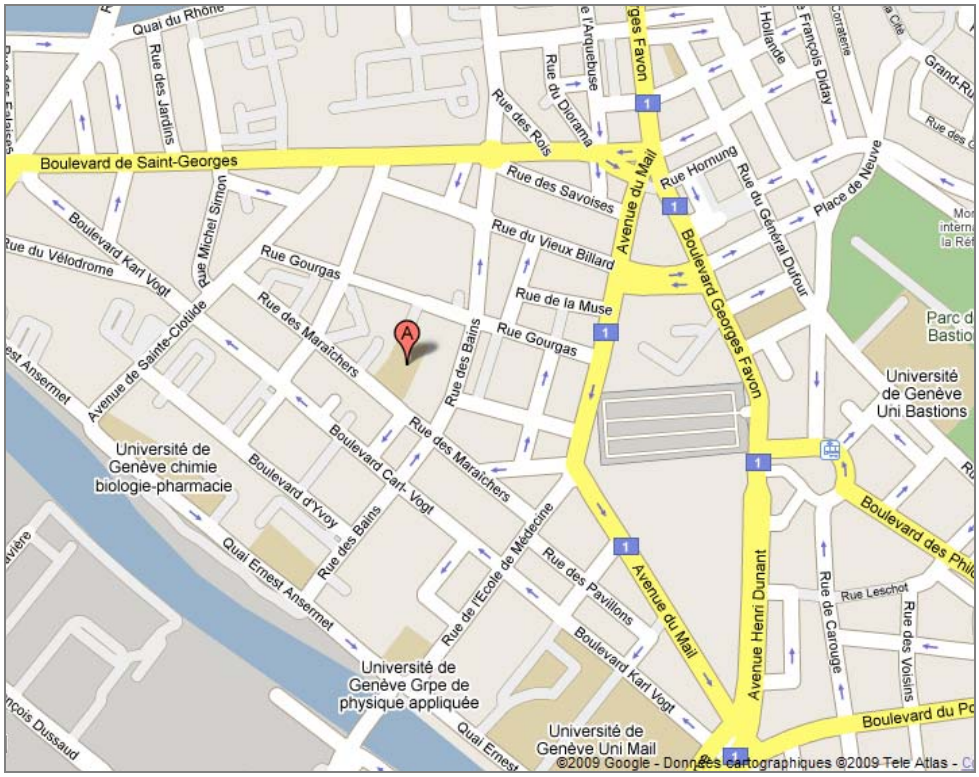
Prof. Guy Plint
AAPG Distinguished Lecturer
University of Western Ontario Canada

The Evolution of a Cenomanian Delta Complex in the Western Canada Foreland Basin: Paleogeographic and Stratigraphic Responses to Tectonic and Eustatic Forcing

Thursday, 10 June 2010, 18h00
University of Geneva, Department des Sciences de la Terre, Auditorium 1
13, Rue des Maraichers
1205 Genève

You are cordially invited to attend (non VSP/ASP guests welcome)

Peter Burri, President VSP/ASP



2009-10 AAPG Distinguished Lecture

Abstract

GUY PLINT

University of Western Ontario, London, Ontario, Canada

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The Evolution of a Cenomanian Delta Complex in the Western Canada Foreland Basin: Paleogeographic and Stratigraphic Responses to Tectonic and Eustatic Forcing

The Dunvegan Formation is of deltaic origin and records > 400 km of SE-directed deltaic progradation along the axis of the foredeep. Successive delta complexes are separated by regional transgressive mudstones that provide a means of dividing the succession, which is up to ~250 m thick, into genetic allomembers, bounded by transgressive surfaces. Allomembers can also be interpreted as depositional sequences, within which prodelta, delta front, and coastal plain environments can be recognized.

The delta plain was traversed by extensive paleovalleys that have been mapped using 4800 well logs. Paleovalley patterns change from rectilinear to dendritic over time. This change may be attributable to variable syn-depositional activity on faults extending up from Paleozoic strata. Paleovalleys are separated by extensive interfluve paleosols (subaerial unconformities) that are recognizable on the basis of distinctive pedogenic textures that probably represent tens of k.y. of non-deposition. Depositional sequences are interpreted to be the result of eustatic changes on the order to 10-20 m on time-scales of < 200 k.y. Geometric considerations suggest that depositional sequences cannot be attributed to changes in pattern or rate of tectonic subsidence.

Isopach maps show that, in the NW, Dunvegan deltas were initially deposited in an area of rapid subsidence, in water perhaps as much as 100 m deep in which tall muddy clinoforms were deposited. Clinoforms lap out ~80 km from the delta front, suggesting that offshore dispersal of mud was relatively inefficient. The deltas gradually prograded onto an area experiencing a lower subsidence rate where stratal surfaces are effectively parallel over > 400 km. A low subsidence rate allowed the sea floor to aggrade to < ~40 m depth, above which storm-driven wave re-suspension resulted in efficient off- and along-shore dispersal of mud.

The lateral change from steep, tall clinoforms, through less steep, less tall clinoforms, to no clinoforms over a 950 km dip transect suggests that offshore mud dispersal was strongly controlled by effective wave base, which appears to have lain at about 40 m. Clinoforms, which are rare in the Canadian portion of the basin, seem to form only when accommodation > supply, resulting in relatively deep water and consequent inefficient mud dispersal. The scarcity of clinoforms in >shelf= mudstone units implies that for most of the time, supply > accommodation, wave-driven dispersal was efficient, and water depth rarely exceeded ~40 m, even at distances of >300 km offshore.

Guy Plint received his B.Sc. in Geology from the University of Reading in 1977. A Shell International Petroleum Company Studentship enabled him to design and fund his own doctoral study (1977-81) at the University of Oxford where he investigated the Eocene strata of the Hampshire Basin. A post-doctoral fellowship in New Brunswick (1981-84) introduced him to Pennsylvanian alluvial sediments deposited in a very tectonically-active, strike-slip setting around the Bay of Fundy. He took a second post-doctoral fellowship with Roger Walker at McMaster University (1984-86), which initiated his lasting fascination with Cretaceous rocks of the Western Canada foreland basin. He joined the faculty of the University of Western Ontario in 1986.

He has completed 25 consecutive summer field seasons in the Rocky Mountain Foothills, where he has been accompanied by successive generations of graduate students and post-docs. Integration of detailed facies studies in outcrop with the geometric framework afforded by an extensive subsurface well-log database has formed the basis for many projects that have established the regional, 3-D stratigraphy of middle-Cretaceous strata.

On the basis of this stratigraphic framework it is now possible to build detailed paleogeographic maps, and to visualize the interacting effects of tectonism, eustasy, and varying sediment supply over an area of some 250,000 km^2. Continuing studies with collaborating scientists are integrating biostratigraphy, isotope stratigraphy and high-precision geochronology with the established sequence stratigraphic framework in an effort to establish regional to inter-continental correlations, and, hence, better understand mechanisms that controlled depositional cyclicity.

American Association of Petroleum Geologists
An International Geological Organization
P.O. Box 979 • Tulsa, Oklahoma 74101-0979 USA
(918) 560-2621 • Fax; (918) 560-2678 • email: kdotts@aapg.org