Geometric trends for floodplain lakes in high accommodation floodplains

Grijalva and Usumacinta Rivers, Mexico

Characteristics - An extensional basin has formed in this area due to the Yucatan moving in the southwest direction in sympathy with the right-lateral displacement along the Orizaba fault zone (Barkdoll and Scearce, 1990). The floodplains are mature and many of the lakes have filled. In the tropical setting vegetation has played a key role in filling the lakes. Dissection by channels is very common and stabilization by vegetation appears to be a factor.

Methods

Hypothesis on formation of dissecting splay channels

Poliol observation of satellite photos it appears that the floodplain lake dissecting channels are formed by a combination of hyporheal flow, seasonal changes in water level and vegetation. Very similar channels form in the meandering accommodation control by drainage rivers to form water reservoirs where the river enters the lake. These examples are from lakes in North Texas, USA.

Attribute Comparison

General Observations

- Maximum lake size is constrained by the distance between major channel levees or major channel levees and valley wall.
- Maximum lake size is rarely obtained because of filling by splay and dissection of larger lakes by channels into smaller lakes. These minor channel are probably built up by splay deposition as described by Hill et al., 2001 and are known to evolve to infill channel avulsions (Smith et al., 1999, Smith and Pienkos, 1999).
- Lakes may fill with peat in areas distal to sediment influx, this occurs more rapidly in warmer climates.
- Dissection nature of such channels is probably related to support by vegetation and is much more common in tropical and temperate climates.
- Lakes shrink and swell seasonally causing a complex interrelationship between lake and emergent floodplain environments.

- Splay is standing water from elongate channels rather than splay delta most of the time.

Conclusions

Interfluvies are in high accommodation settings are a complex mosaic of lakes, splay delta, dissecting channels, swamps and emergent floodplain over evolving and shifting at high frequency dependent on fluctuations in climate, sediment supply and aggradation rates. Rather than constraining dimension of temporal lakes to constrain dimension of lake—derived facies it is probably better to consider a lake complex comprising the interfluvies area with a facies assemblage reflective of the mosaic of environments.

Implications for Petroleum

Dissecting channels may form good conduits between reservoir channel belts for petroleum through floodplain lake complexes and may play an important role in the reservoir is self sourced. Interfluvie lake areas may not thus model well as continuous seals.

Ideas for future research

- Obtain time lapse high resolution satellite photos and geophotos from both rainy and dry seasons to refine the study.
- Look for possible missed relationships between floodplain lakes and their related fluvial system.
- Do a ground study of one of the floodplain lake areas to obtain bathymetry data from lakes/channels and take core samples from filled lakes and channels to map and describe the sediments left behind.