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B. E. Prather and C. Pirmez, Shell International E&P Inc, Houston, TX

Evolution of a Shallow Ponded Basin, Niger Delta Slope

Detailed mapping of a shallow, well-imaged intra-slope basin fill sequence near the seafloor shows that slope gradient, entry points and accommodation control patterns of deposition within healing-phase deposits of a shallow ponded basin. Deposition begins following subsidence of the intraslope basin and creation of ponded accommodation. Introduction of submarine gravity flows into the basin occurs through leveed slope gullies that incise underlying slope muds (?) at the proximal end of the basin and become depositional once entering ponded accommodation. Linear incisions at the distal end of the basin suggest gravity flows down-cut the basin sill as they by-pass the basin. Erosional by-pass of the sill occurs once the basin is filled to spill or just before. A channelized fan apron down-laps onto the ponded deposits, healing the topographic profile. Lateral deposition away from the channels at the head of the fan apron is partly responsible for the overall up-dip shift in depocenter during this healing phase. As healing progresses, by-passing gravity flows accelerate over the steep lee face of the basin sill and develop deeper incisional channels. Erosion of the sill progresses by headward migrating knickpoints that truncate ponded and fan apron deposits. Where these knickpoints migrate across the entire basin the feeder channels connect directly to the basin spill-point. Connection of these features promotes coarse-grained sediment bypass and accumulation of overbank deposits in upper parts of the slope wedge as flows are directed to the next outboard basin.