AAPG International Conference
Barcelona, Spain
September 21-24, 2003

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The Role of Deformation Processes on the Geometry of Mud-Dominated Deep-Sea Fans: Oligocene and Lower-Middle Miocene Turbiditic Systems of the Lower Congo Basin

The parameters controlling the morphology of two major turbiditic systems of the Lower Congo basin are investigated over a large area (5000 km^2) and for a large period of time (Oligocene to Middle Miocene, about 10 My). (1) The Chattian system is almost exclusively composed of turbiditic deposits (stacked channel-levee complexes). The geometry of the channel-levee complexes is mainly constructive and their spatial distribution is controlled, at the scale of the study area, by sedimentary processes (compensation phenomenon). (2) As a difference, the Burdigalian-Langhian system is made up of erosive channel complexes (E/C ratio over 1) and lobes isolated within a hemipelagic background. The geometry of turbiditic deposits is partly controlled, at the scale of the study area, by seafloor deformation related to growth structures (major and secondary faults, turtle back anticline) rather than sedimentary topography. They are separated by hemipelagic deposits of Aquitanian age (Lower Miocene), related to high eustatic sea level, whereas turbiditic systems are related to eustatic sea level lows. However, even though they are both associated with eustatic sea level lows, similar climatic contexts, and similar distances from source, Chattian and Burdigalian-Langhian systems exhibit different morphology. We relate this difference to regional and local deformation. The Miocene West African margin uplift, explains the more erosive character of the Burdigalian-Langhian system. We propose a model based on the ratio of sedimentation rate versus local deformation (S/D ratio) to explain the origin of the topography that controls the morphology of the systems.