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Relationship between Structural Deformation and Sediment Dispersal in the Western Niger Delta

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The interaction between structural deformation and sediment dispersal is a major geological process that determines the filling of the sedimentary basins. Many recent studies show that deep-water sedimentary processes can be affected by former and current tectonic trends. These deposits interest much the oil and gas industry by their capability of being interesting reservoirs. This is why it is necessary to predict sedimentary patterns and their response to tectonic deformation at a variety of spatial scales and over the life span of a sediment routing system in deep-water settings.

This study focuses upon the northwest Niger Delta, which is comprised of a slope extensional, translational and compression structural settings. In the deepwater region, the overpressured upper unit of the Akata formation hosts a regional-scale detachment, above which a fold and thrust belt has developed within the overlaying Agbada formation. This formation contains a succession of mass-transport deposits, turbidites and channel-levee deposits.

Using 2D and 3D seismic data in this area, prior work has established the relationship between structures and channels developments. Previous studies describe examples of the uplift of the fold-and-thrust belt being responsible for channels cutting through the relief, and large channel systems localized above active transfer faults for long periods of time. However no systematic study of the change in channel location and pattern during fault growth has yet been made in older strata and in closer areas from the shelf.

In this project the growth of individual fault arrays is being related to spatial patterns of erosion and sedimentation and channel development. We concentrate on the temporal persistence of sediment pathways across the delta, and on identifying long-term changes in channel geometry and process that may be driven by the time-varying distribution of surface deformation. We expect to identify the main areas of local sediment source and deposit, and to produce map with these results.

Ongoing work focuses on understanding the Miocene deposits through different tectonic trends in the same area. We can see that a strike-slip fault zone separates a compression-dominated area comprising folds and reverse faults, and an area of normal faults in which the structures are all related to an extensional regime. Using seismic extraction techniques including amplitude and coherency maps we are analysing how sediments distribution is affected throughout this structurally complex zone.