Geophysical Research Abstracts
Vol. 18, EGU2016-17042-1, 2016
EGU General Assembly 2016


# Length variation of Gravity-Driven systems in the Amazon River Mouth Basin: a history of carbonate-siliciclastic sedimentation and post-rift subsidence

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This study address the post-rift sedimentary record of the Amazon River Mouth Basin with a focus on gravity tectonics. We investigate shale detachment layers and the timing of different gravity deformation phases. Our study was based on more than 20,000 km of 2D multi-channel seismic data, 4,453 km2 of 3D multi-channel seismic data and 40 exploratory well data. A reliable age model was constructed based on biostratigraphic data. Five industry wells on the shelf/upper slope region and seven scientific wells drilled by DSDP and ODP in the distal Ceará Rise region were used for platform and deep environments correlations. This allowed us to calibrate the seismic lines and compare the sedimentation rates in different domains of the basin (e.g. shelf, slope, deep basin). In the Basin's shelf a widespread carbonate sequence dated as Late Paleocene grew up over a Latest Albian to Early Paleocene prograding clastic sequence. From the Eocene to the Late Miocene a mixed siliciclastic-carbonate aggrading megasequence developed. The first gravitational deformation event took place during the Eocene. The proximal limit (normal faults) of this this gravity-deformation system occurs along the hinge line. The major and deeper detachment layer was identified within the previously deposed Late Cretaceous-Early Paleocene stratigraphic sequence (Cenomanian-Turonian deep shale source rock?). Further downslope, during the same period a stack of thrust sheets was created. In the central part of the Basin, a second gravitational deformation phase took place from Late Oligocene to early Late Miocene. During this period the basal detachment layer (Late Cretaceous?) was reactivated and the frontal thrust sheet created ridges and piggy-back basins. From the Late Miocene to present time, a major increase in the siliciclastic sedimentation rates was evidenced in the axis of the modern Amazon Delta. A huge aggrading-prograding mega-sequence forced the expansion of a third gravitational system and the reactivation of the deep detachment layer. The older trust faults systems and ridges were also reactivated. Bellow the ridges pull-down effects suggest high pressure, confirmed by the presence of mud volcanoes. The length of the modern gravity system is much larger than the previous ones and the antiformal stack propagated further than previous compressive front. This enlargement of the gravity system is clearly generated by the modification of the slope equilibrium profile and the differential topography between the platform and the deep basin. A complementary geophysical study is ongoing. Detailed seismic facies analyses are conducted by linking seismic attributes to specific geology-related facies (e.g. channelized zone, hemipelagic sediments, carbonate, etc.). Tests on linear classifiers (e.g. k-means clustering) and non-linear analyses (e.g. image processing, neural networks) are carried on at basin scale.