

**PS Stratigraphic and Sedimentary Processes Simulation to Explore the
Silurian and Devonian Sequence in the Madre de Dios Basin***

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Abstract

Petroleum exploration of frontier areas, such as the Madre de Dios basin, requires an innovative model-based approach in order to lower the exploration risks. For this purpose, the DionisosFlow™ software has been used to explore the Silurian and Devonian stratigraphic sequence at regional scale and to determine if reservoirs observed at the well's location were likely to extend to the South where no well has been drilled. The simulation of stratigraphic and sedimentary processes allowed to create a 3D geogrid predicting the internal stratigraphic architecture of the Silurian and Devonian series, consistent with well data, seismic and regional geological information. The geogrid includes reservoir distribution, sealing capacity and deposit environments. Particularly, the resulting model has highlighted the presence of a large clinoform sequence during the middle Devonian period revealing a reservoir unit made of coastal to deltaic front sands extending toward the South of the basin. Such prograding sequence results from an uplift of about 200m where erosion and remobilization of sediment provided a large quantity of silico-clastic deposits to the south in deeper bathymetric area. 3D simulations of stratigraphic and sedimentary processes provided maps of net sand thickness and seal distribution all over the basin. A subtle tectonic event was identified defining a new potential play in the Madre de Dios basin originating from a mild regional structuration inducing structural traps. Additionally, the model provided a consistent stratigraphic chart for Silurian and Devonian period.

Stratigraphic and Sedimentary Processes Simulation to explore the Silurian and Devonian Sequences in the Madre de Dios Basin



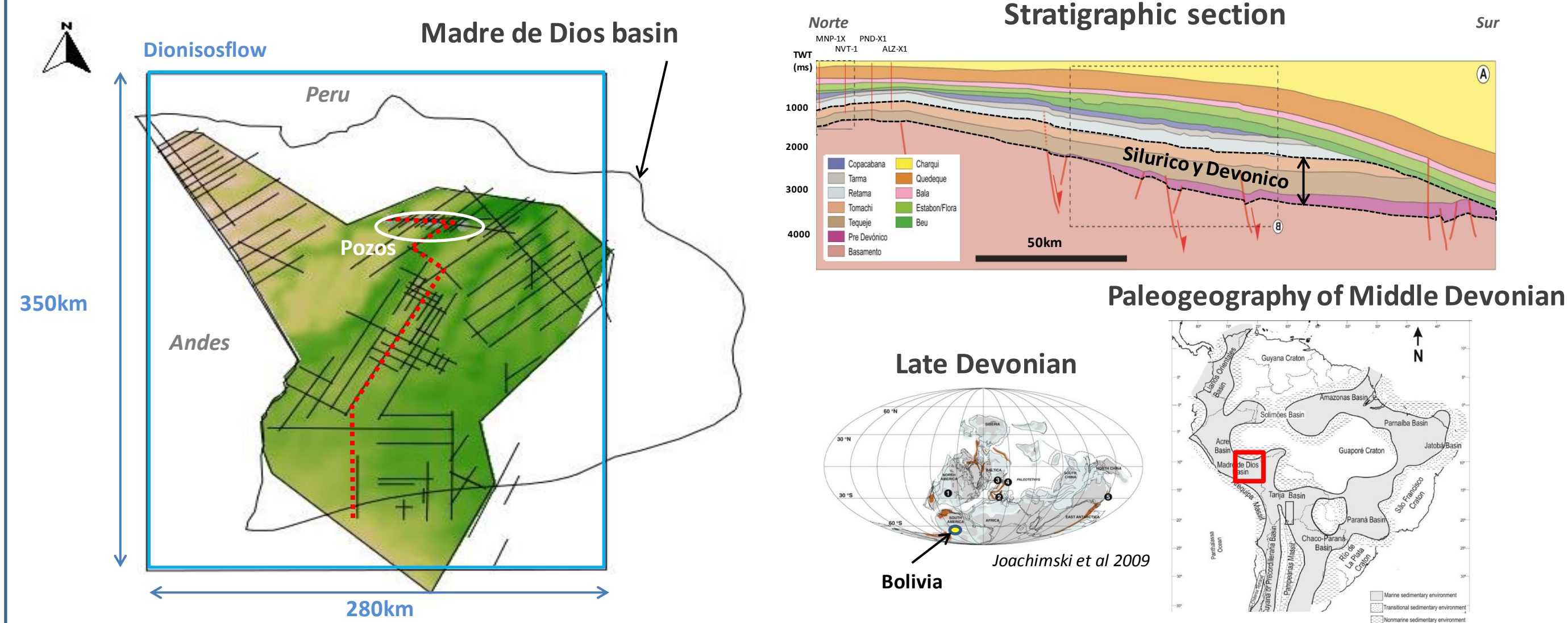
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INTRODUCTION

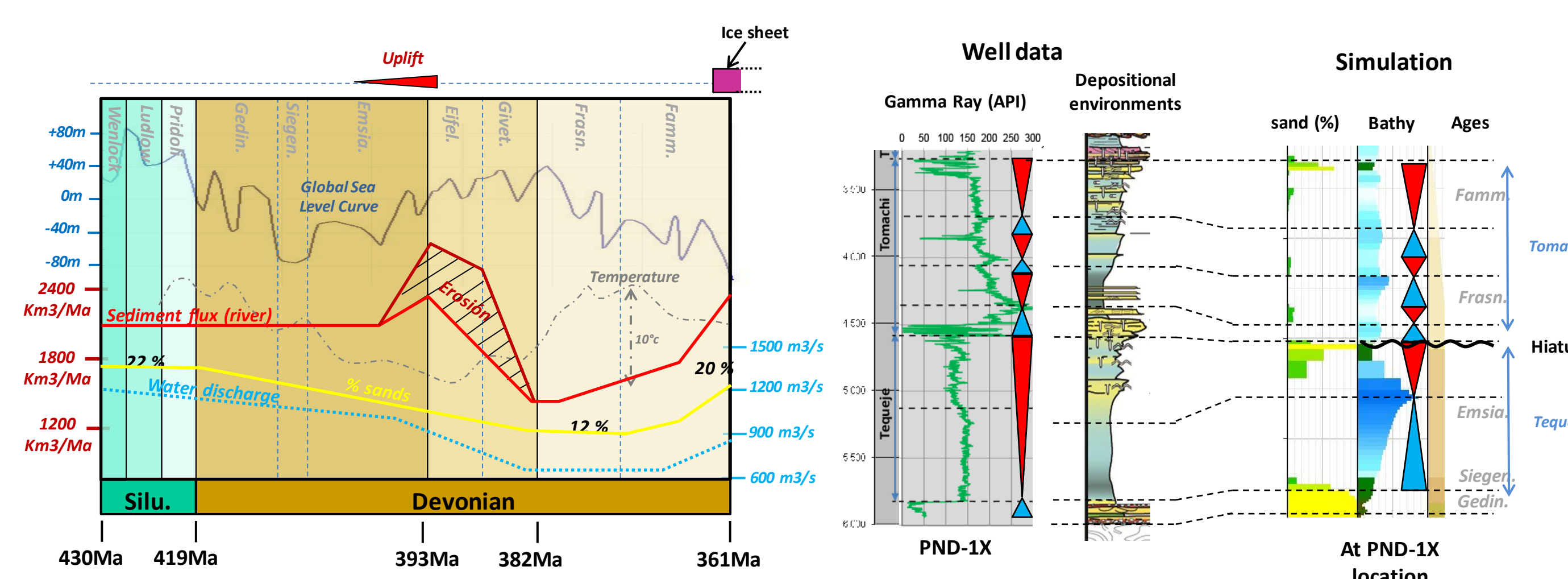
Petroleum exploration of frontier areas, such as the Madre de Dios basin, requires an innovative model based approach in order to lower the exploration risks. For this purpose, the DionisosFlow™ software has been used to explore the Silurian and Devonian stratigraphic sequence at regional scale and determine if reservoirs observed at the wells location were likely to extend to the South where no well has been drilled.

GEOLOGICAL FRAMEWORK



Madre de Dios is an under-explored basin in the northern part of Bolivia. Silurian and Devonian series are thick intervals in the region with rich TOC content levels. Series are buried below the Andean foreland. During Silurian and Devonian, a large granitic province exists below very low latitude and a glacial period occurred during Silurian and Carboniferous periods.

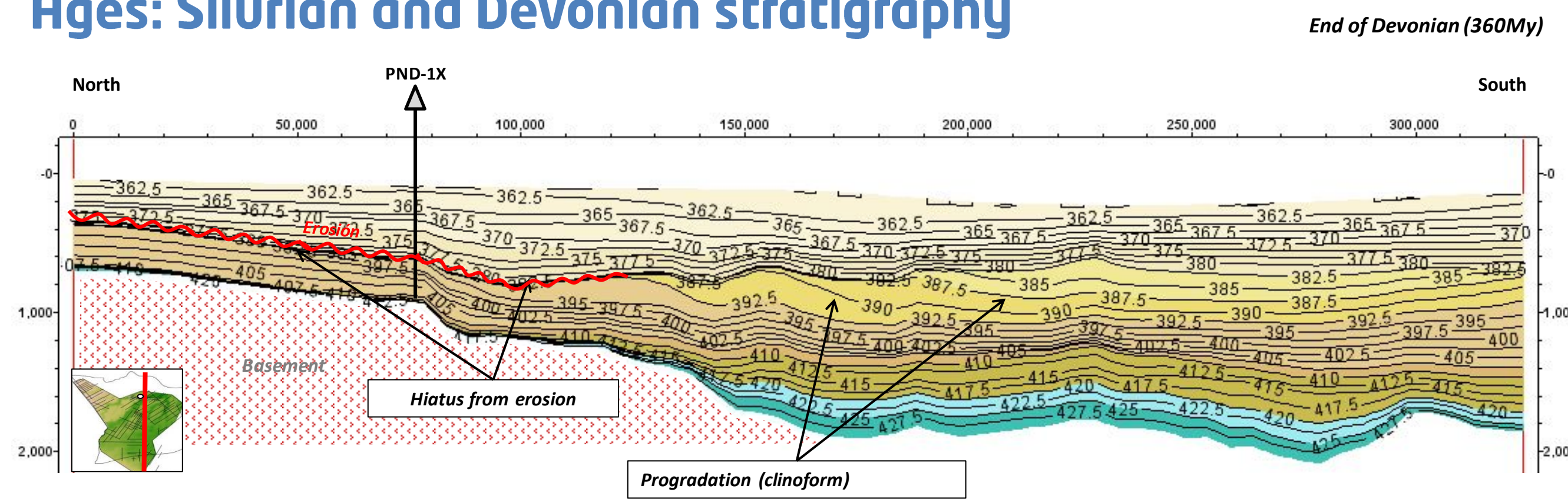
INPUT PARAMETERS AND CALIBRATION



The simulation of stratigraphic and sedimentary processes allowed to create a 3D geogrid predicting the internal stratigraphic architecture of the Silurian and Devonian series, consistent with well data, seismic and regional geological information. The geogrid includes reservoir distribution, sealing capacity and deposit environments.

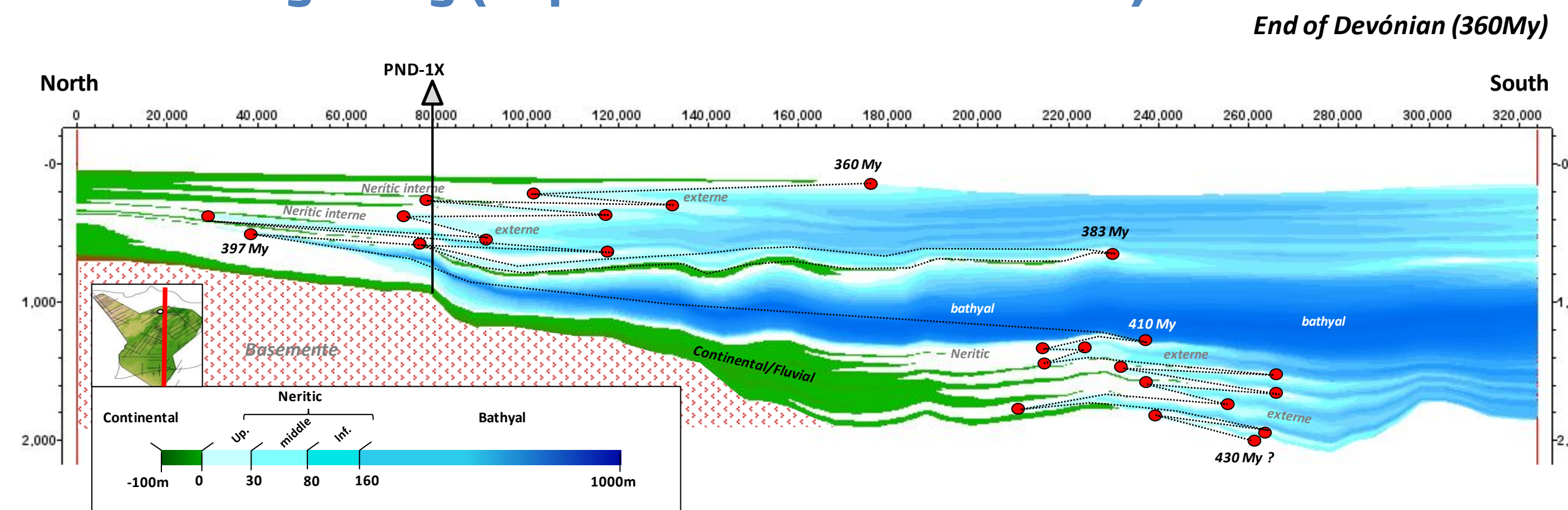
RESULTS

Ages: Silurian and Devonian stratigraphy



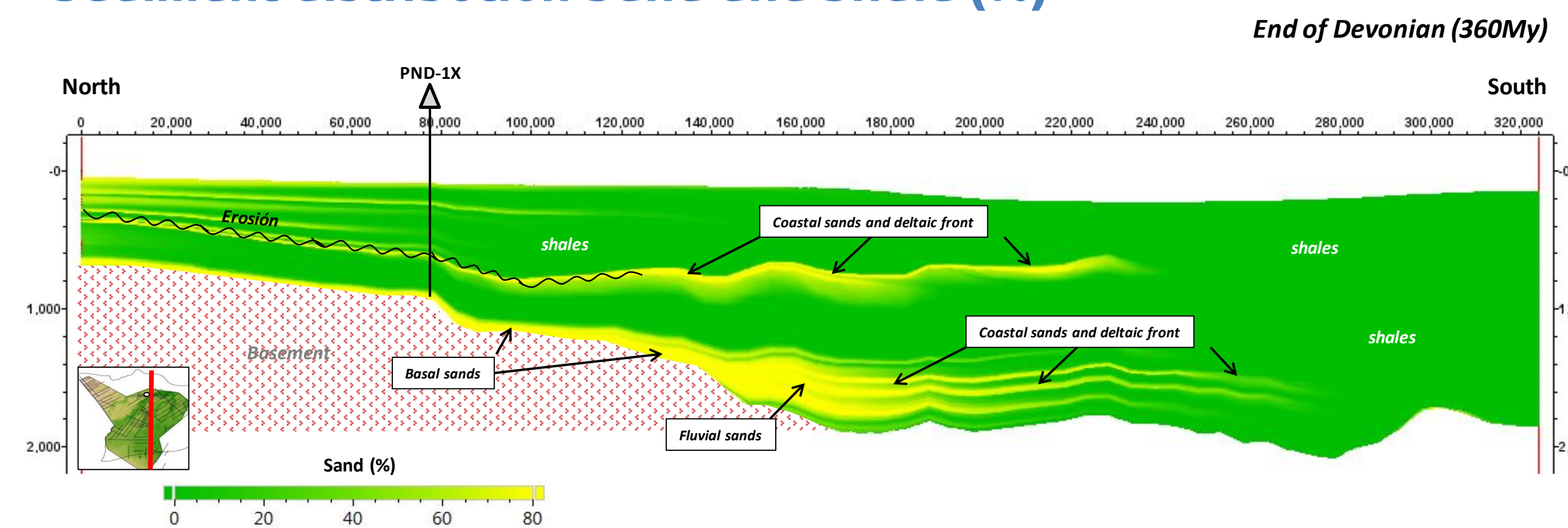
The model highlights the presence of a large clinoform sequence during the middle Devonian period. Such prograding sequence results from an uplift of about 200m where erosion and remobilization of sediments provided a large quantity of silico-clastic deposits to the South in deeper bathymetric area.

Paleobathymetry (depositional environments)



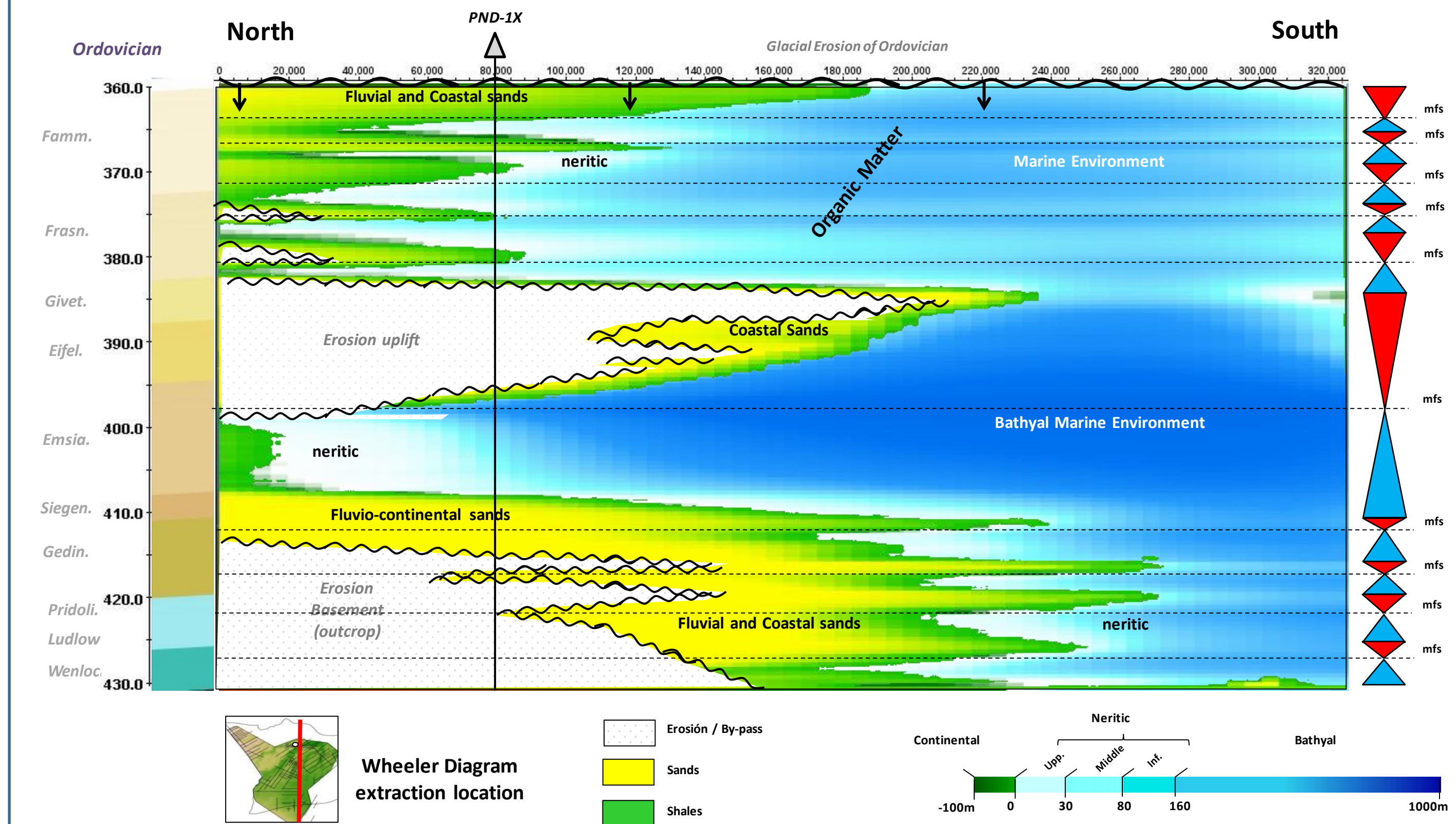
Simulated bathymetry helps to identify the stratigraphic sequences in the basin and main depositional environments such as continental, fluvial, fluvio-deltaic, coastal, neritic to bathyal.

Sediment distribution Sand and Shale (%)



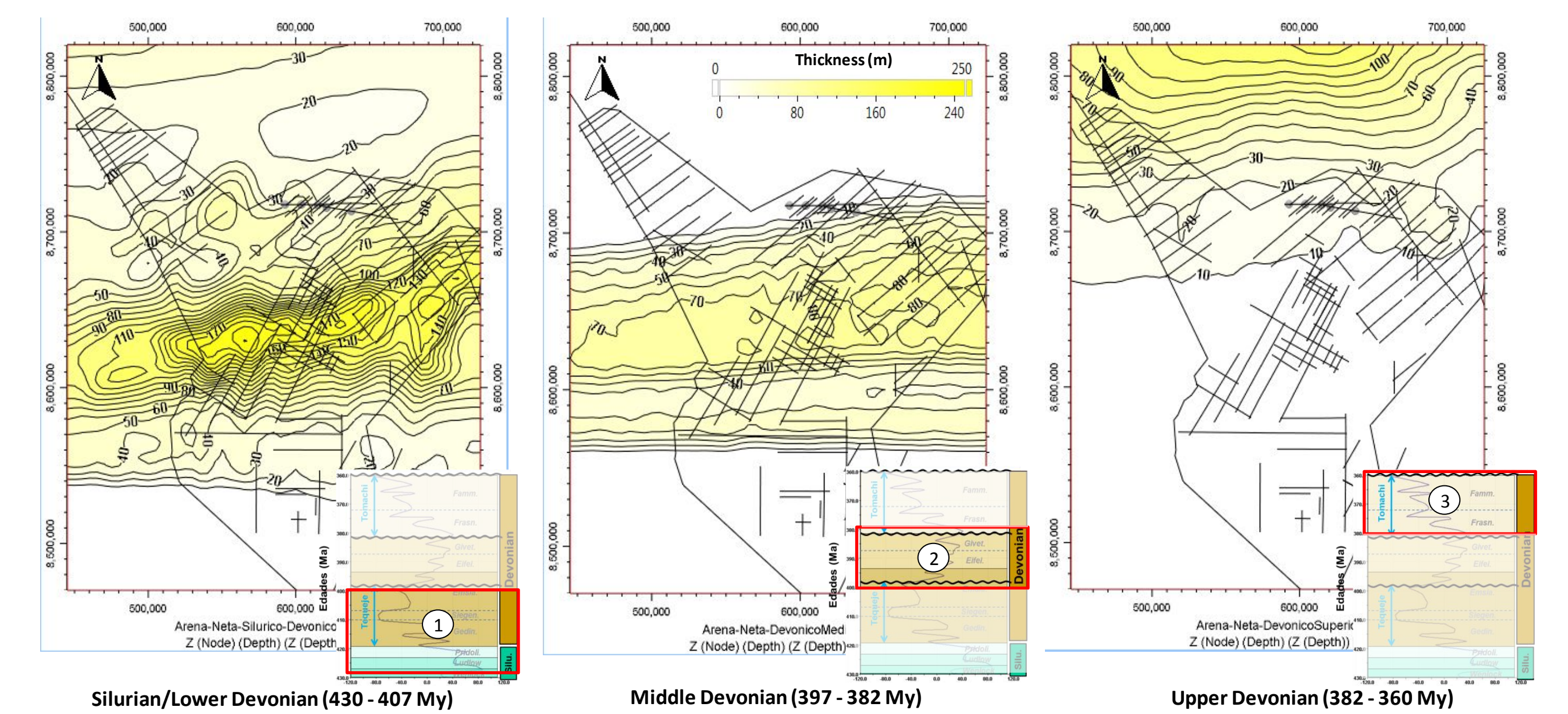
Reservoir potential exists in the basin from Silurian to Early Devonian, mainly constituted by coastal sands, and in Middle Devonian, made of fluvio-deltaic systems and coastal sands.

Wheeler Diagram



A Wheeler Diagram has been elaborated from simulation giving a consistent stratigraphic chart for Silurian and Devonian periods. Rich organic matter is deposited after the tectonic event of middle Devonian probably in relation with the new paleo-geographic conditions.

Net Sand Thickness maps



Mapping of net sand thicknesses gives the most probable areas to reach good reservoirs in the basin.

CONCLUSION

The 3D simulation of stratigraphic and sedimentary processes provided maps of net sand thickness and seal distribution all over the basin. A subtle tectonic event was identified defining a new potential play in the Madre de Dios basin originating from a regional structuration, inducing probable structural traps.