Amsterdam '14

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Kerpini Fault Controlled Sedimentation in Kerpini Fault Block, Greece

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SUMMARY

Sedimentary rocks in Kerpini Fault Block can be distinguished into three main groups, from the oldest to youngest as the following: 1) Fluvial Sandstone-Conglomerate, 2) Alluvial Fan Conglomerate, and 3) Late Fluvial Sandstone-Conglomerate.

The first and second groups were deposited in the early syn-sedimentary phase while the third group in the late syn-sedimentary phase.

The general dip directions of the syn-fault deposits (southeast) is slightly oriented towards the maximum throw of the fault. The constant dip for these sediments can be explained by the location of reverse drag of the fault that far north away from the Kerpini fault.

Introduction

The Corinth Rift, located in the Gulf of Corinth, Greece, represents a Miocene to Recent extensional rift system which structures are exposed in the southwestern part of the Gulf, in what is known as the Kalavrita region (study area, Fig. 1). It consists of a series of rotated fault blocks dipping north forming half graben structures and filled by the Pliocene-Quaternary deposits above the basement (Moretti et al., 2003).

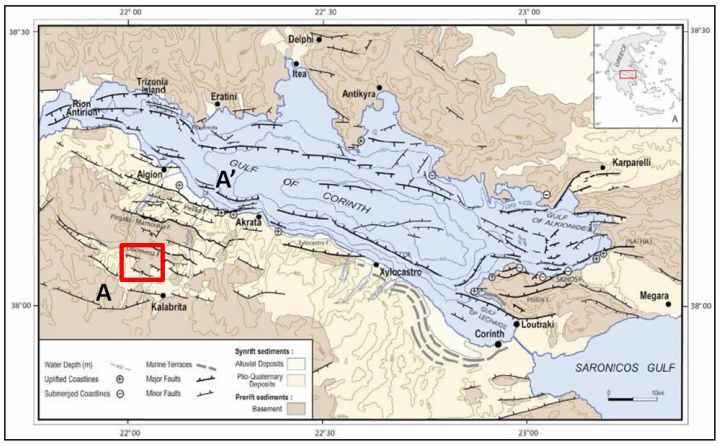

Figure 1. *Map showing the geological frame work of the Corinth Rift, series of E-W normal faults are the main structure in this area, with highlighted of study area (Modified from: Moretti et al., 2003).*

It has been previously proposed, based on field observations that sedimentation occurred during faulting and that the main direction of deposition is perpendicular to the fault strike (Ford et al., 2013). However, dip of the sedimentary rocks seem to have constant values within the half grabens which is in contrast with classical syn-sedimentary models where dips of younger rocks are lower than the older rocks as the fault increases displacement (Fig. 2).

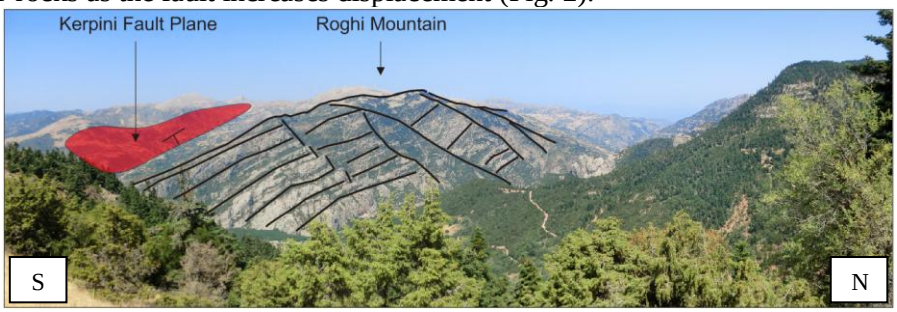

Figure 2. *Photograph looking west of the Kerpini fault block, where the Roghi Mountain and interpreted Kerpini Fault Plane. In the Roghi Mountain, the sediment is dominated by Alluvial Fan Conglomerate facies. These rocks have constant dips of 20°-30° against the Kerpini fault.*

The main objective of this study is to reveal the fault influence into the sedimentation in a real field example and model it into a 3D geological reservoir model that can be used as a template for better understanding half graben systems and their infill in the subsurface such as the North Sea basin.

Methodology

Field work data is the main dataset for this study. Based on field work data, several analyses were conducted. Structural and facies mapping of the Kerpini fault block half graben structure was performed. The structural analysis included strike and dip measurements of the fault plane and sedimentary layers. Sedimentary facies included detailed mapping of the facies within the block and a 3D reservoir model is constructed in order to reveal the relationship between sedimentation and fault movements using the displacements and reverse drag (zero displacement point) location as variables.

Preliminary Observations

According to field work observations, the sedimentary rocks infilling the Kerpini fault block can be distinguished into three main groups (Fig. 3), from oldest to youngest as the following:

1) Fluvial Sandstone-Conglomerate with channelized shape sandstones and conglomerates as a background, most of the sandstones are located in the centre of the fault block

2) Alluvial Fan Conglomerate, supported by the poor sorting deposits with graded bedding sediment structure in some outcrops and smaller grain size to the north, this facies was deposited while the new NE-SW fault starts to move and increase the slope gradient
3) Late Fluvial Sandstone-Conglomerate, this facies has been interpreted as the youngest sediment with low dips angle which coming from E-W river direction

Dips of the first and second groups of sedimentary rocks are almost constant with an average of 20°-25°. The general dip directions (southeast) appear to be not directly perpendicular to the fault plane (N75°E), but slightly oriented towards the maximum throw of the fault. The third group have different bedding orientation (dipping north) and dips of the sedimentary rocks seem to have a gentler angle (some of them are almost horizontal) suggesting less influence of the fault movement.

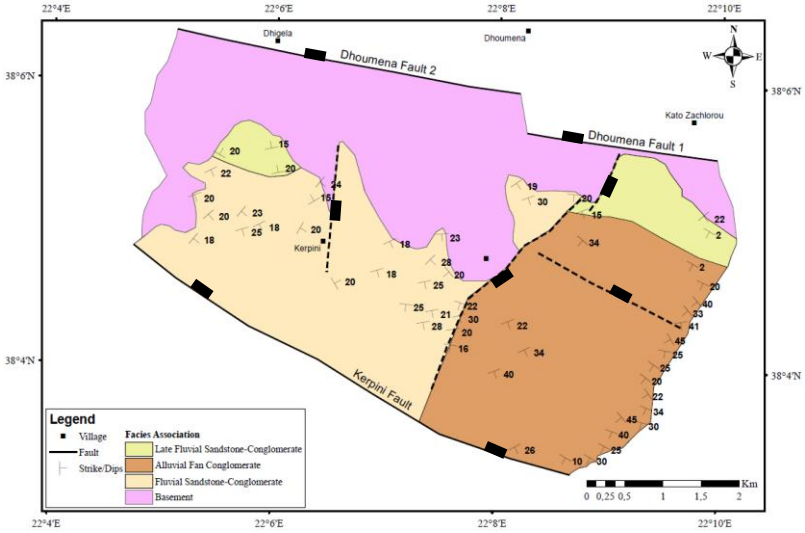

***Figure 3**. Map showing the distribution of sediment facies in Kerpini Fault Block.*

Discussions and Conclusions

Based on the observations, we interpreted that the maximum throw of Kerpini fault is towards the eastern part of the fault and propagate gradually to the west (Fig. 3). The constant dips of the rocks located in here suggest that the distance of reverse drag of the fault is far north, away from the fault plane so that the dip of the fault is slightly constant.

The sedimentation direction for the first and second groups has been interpreted to have been sourced diagonal from both tips of the fault in the SW and SE as smaller grain sizes in the centre of the fault block are mapped, and coarser gradually to the east and west. These groups were deposited in the early syn-sedimentary phase. For the youngest sedimentary rocks (third group), the source has been interpreted coming from the east in the late syn-sedimentary phase.

Acknowledgements

University of Stavanger is acknowledged for the financial support for this study. Institute of Geology and Mineral Exploration (IGME) Greece is also thanked for the permission to run the field work.

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