The 75km Kirkkavak fault propagation fold which led to megaslumping in the Miocene Kőprűçay basin

Peter McPhee[1] Douwe van Hinsbergen[1] Nuretdin Kaymakci[2]

[1]Universiteit Utrecht, Netherlands p.j.mcphee@uu.nl [2]Middle East Technical University, Ankara, Turkey

Universiteit Utrecht

NWO Netherlands Organisation for Scientific Research

1. Introduction

We document a major fault propagation fold in the Tauride basement of the Miocene Kőprűçay Basin (Antalya, Turkey). This structure runs along the eastern side of the Kőprűçay valley and has uplifted the Triassic to Cretaceous basement and Miocene outliers relative to the Miocene basin. Previously, this vertical offset was attributed to strike-slip displacement, or reverse displacement on the Kirkkavak fault: we argue that this fault does not exist as a significant structure.

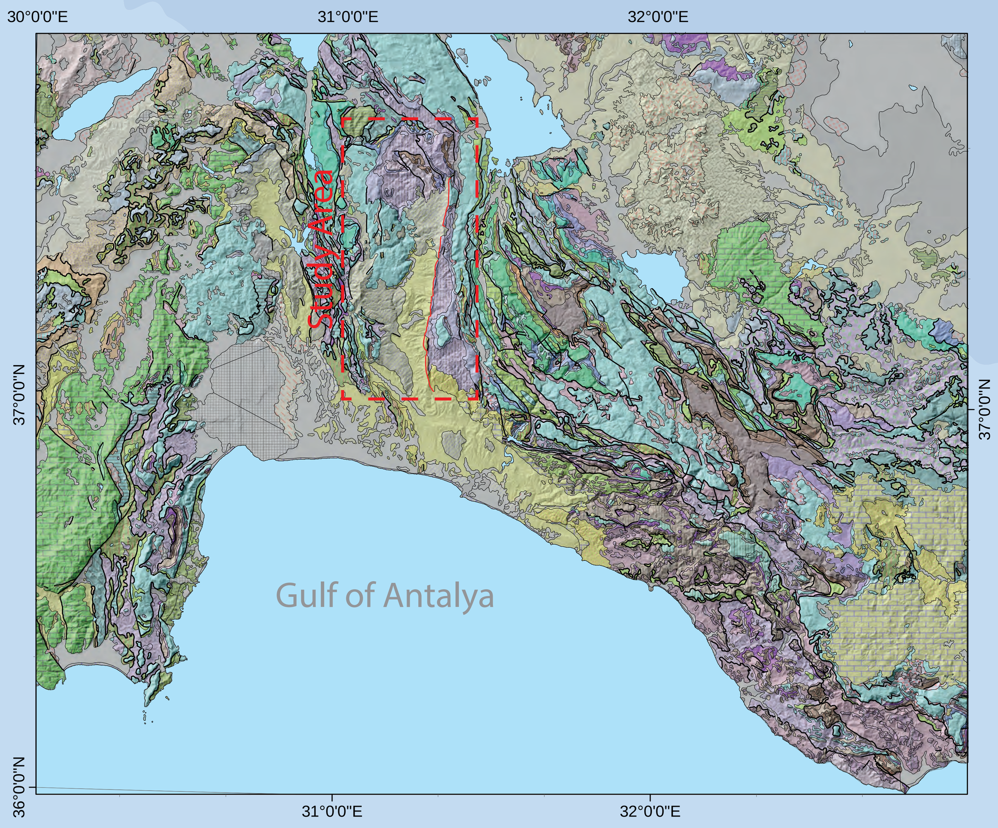


Figure 1: Regional geological map of the western Taurus Mts. (adapted from MTA 1:500,000 Konya sheet).

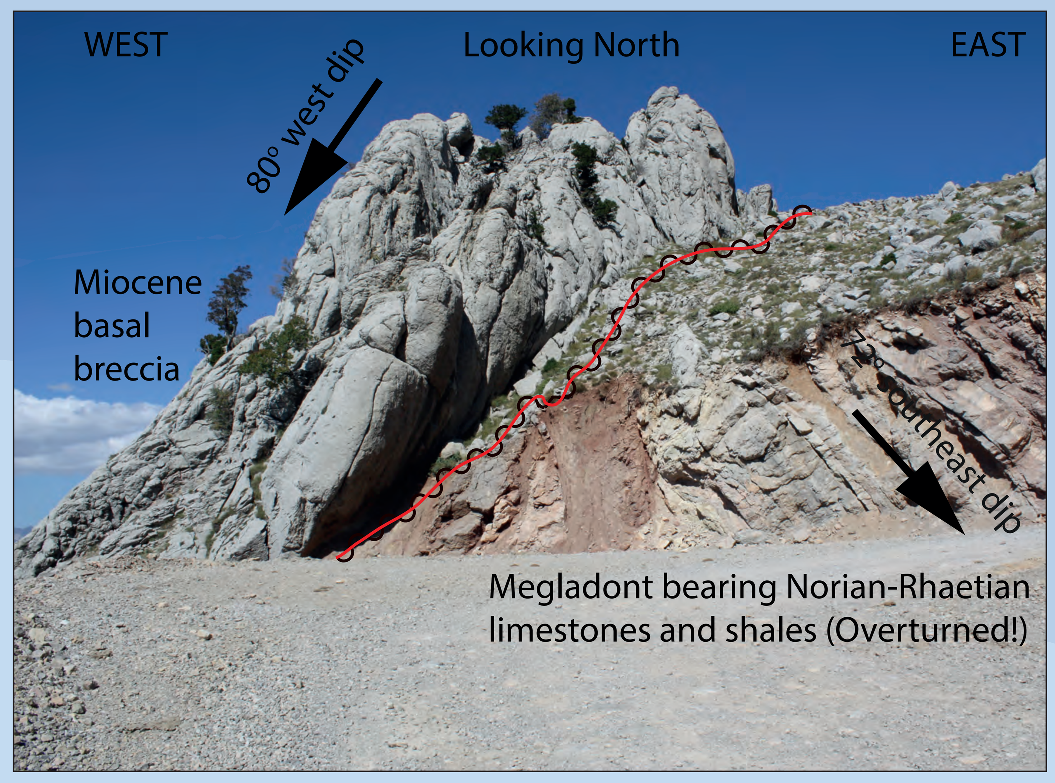


Figure 2: The angular unconformity between the Miocene basal conglomerate and overturned Upper Triassic (Norian-Rhaetian) limestone. Kesme – Dumanlı mountain pass, Northern Koprűlű valley.

2. Basement Thrusting

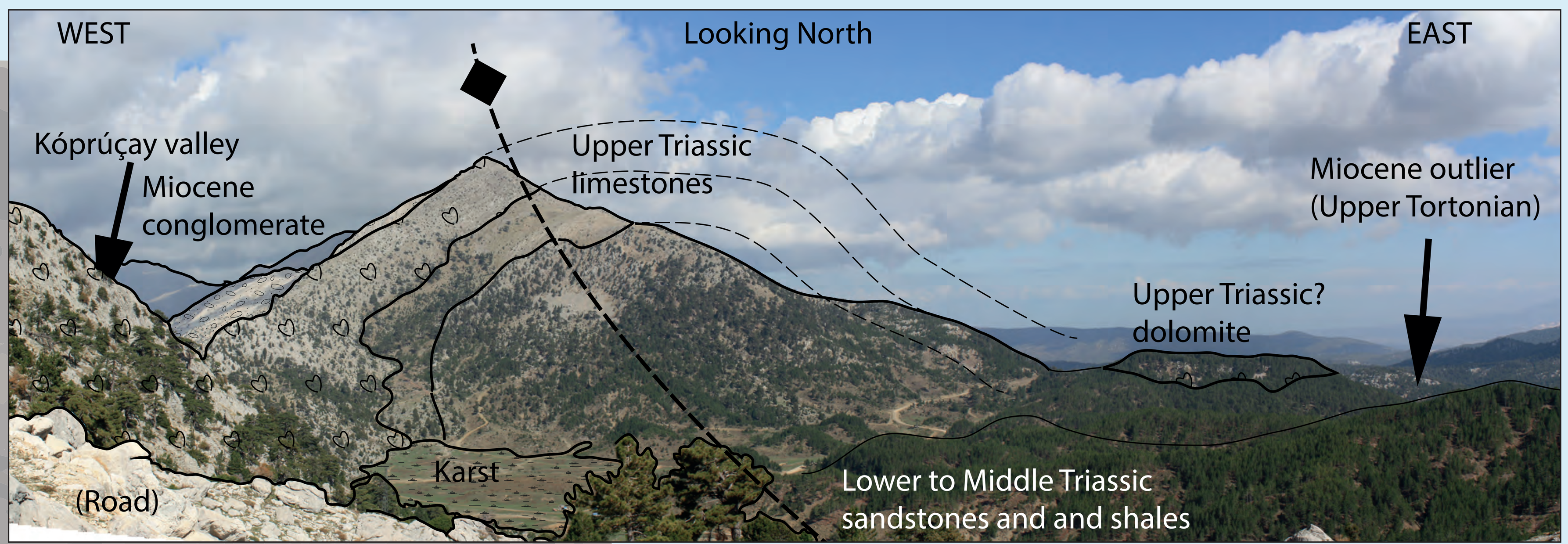
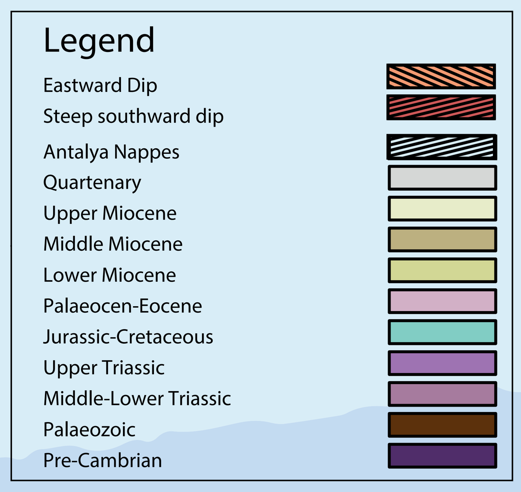
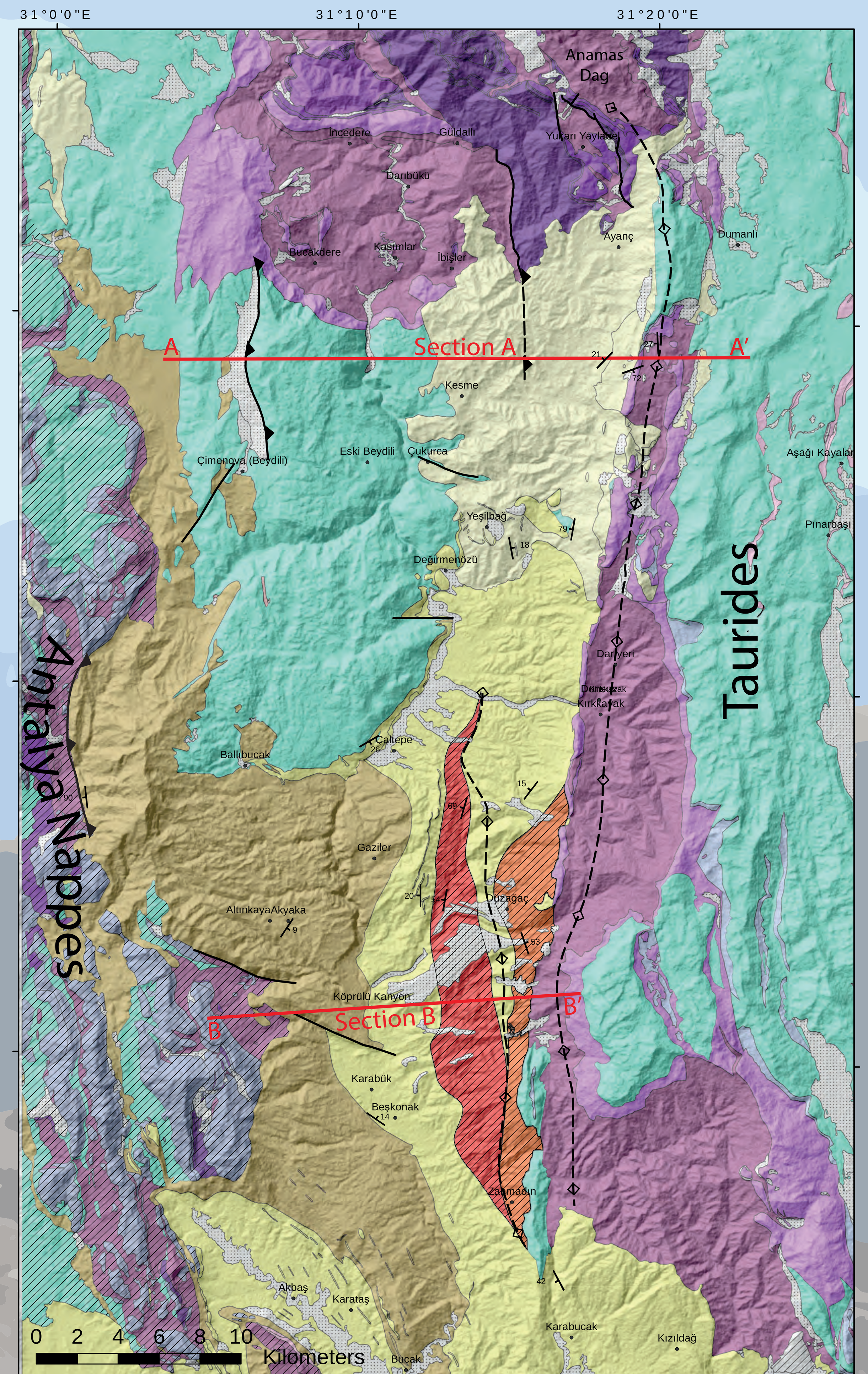
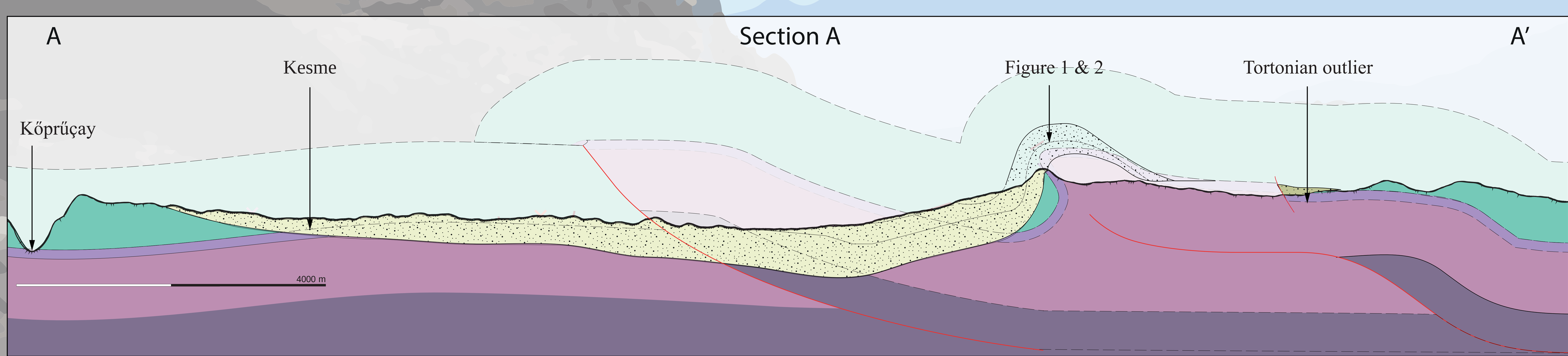


Figure 4: Core of the basement anticline on the Kesme – Dumanlı mountain pass. Middle to Lower Triassic sandstones and shals are exposed in the core of the anticline. On the eastern limb, the Triassic limestone is pervasively dolomitised. An Upper Miocene (Tortonian) outlier is preserved on the eastern side of the fold. The Tortonian sediments onlap onto the Triassic basement with a dip of around 20 degrees: tilting as a result of late reactivation of the blind fault.

Figure 3: A basic geological map of the Kőprűçay basin showing key structures. The slump has been shaded to indicate steeply dipping, folded sediments (red), and east-dipping bedding (orange).

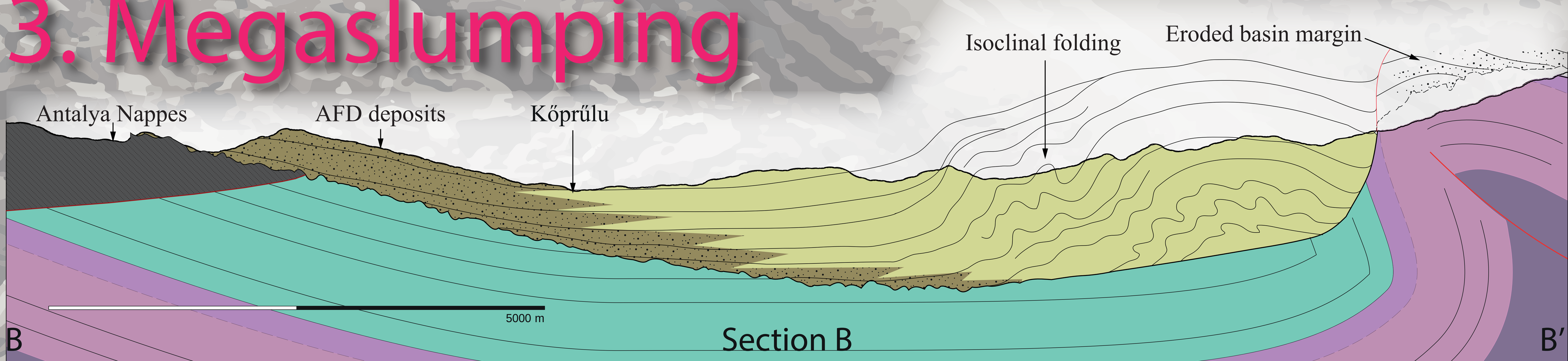






Section A: A measured cross section across the Kőprűçay Basin at Kesme. The eastern basin margin has been uplifted and folded during late reactivation of a blind thrust.In the Anamas Dağ, pre-Cambrian basement is thrust over Middle to Late Triassic strata, with a preserved hanging wall anticline. To the south this becomes a blind thrust which underlies the Kirkkavak ridge. A second basement involved thrust runs along the centre of the Kőprűçay valley near Kesme. This thrust also emplaces pre-Cambrian basement onto Triassic rocks. The fault is covered by undeformed Miocene conglomerates indicating that the fault is at least older than the middle Miocene.

3. Megaslumping



Section B: During uplift, the unlithified sand and mud sequence slid incrementally along the basement-sediment interface. This displacement was accommodated by ductile folding and faulting along the basin axis.

Figure 5: Syn-sedimentary and post depositional soft sediment deformation in inter-bedded sandstones and shale in the basin centre.

Figure 6: Eastern edge of the basin. In the southern half of the valley, a thick succession of conglomerates preserved on the western edge of the basin form a basin margin sequence. A significant margin sequence is not observed along the eastern side of the basin. Minor conglomerates are present, but these are not indicative of a fault scarp of a major fault with more than a kilometre of throw.
In any case, we should expect course clastic sediments to be delivered from the Taurus fold-thrust belt. The lack of marginal facies in the east is either a result of erosional truncation of an uplifted basin flank or a subdued topography in the Taurus.

4. Conclusion

- Shortening in the Taurides fold-thrust belt continued (or restarted) in the Miocene, and did not end in the Eocene.
- There is no significant evidence of strike-slip deformation along the Kirkkavak ridge. Oblique convergence must be accommodated on other structures.
- Uplift along the Kirkkavak fold has truncated the basin margin sequence, and caused a major slump to develop in the basin axis.
- Localised variation in the uplift of Miocene sediments is structurally controlled by basement deformation. In the Taurides, this should be considered when reconstructing the uplift of the Anatolian Plateau using the sedimentary record.