Present extent of research

My PhD project involves the study of two adjacent, tectonically generated sedimentary basins in central eastern Turkey. The basins formed on the northern margin of the Tauride microcontinent during collision and suturing of the Mesozoic Tethys Ocean. The basins provide an excellent opportunity to study processes involved in orogenic assembly as the basins are well exposed and relatively undeformed.

The Darende Basin (the first of the two basins being studied) has a Jurassic-Upper Cretaceous carbonate platform basement, overlain by southward-obducted ophiolites. Sedimentation on the emplaced ophiolites began in the Maastrichtian following a basin-wide transgression. Ophiolite-derived clastics accumulated in basin depocentres, followed by Maastrichtian-aged, rudist-rich patch reefs and microbial carbonates at the basin margins and on palaeotopographic highs. Inferred Early Paleogene extension initiated localised basalt-andesite volcanism. During the Early Eocene, inferred flexural subsidence created accommodation space, which filled with a variety of facies including sandstones, limestones, marls, calcarenites, conglomerates and evaporites, successively recording deepening, shallowing and ultimately emergence.

The Hekimhan Basin (the second of the two basins) is situated ~75km north east of the Darende Basin. The Hekimhan Basin is geographically larger, covering roughly twice the area of the Darende Basin and is topographically more rugged and inaccessible. The basin contains similar facies and ages to those of the Darende Basin with a few key differences. The basin is underlain by Jurassic-Cretaceous crystalline carbonate platform basement, although this is only exposed in localised areas. In contrast to the Darende Basin, ophiolite melange and other ophiolite sequences are well exposed and relatively common in the outcrop. Sedimentation in the basin began in the Late Cretaceous with similar facies to the Darende Basin: thick, red, ophiolite-derived clastics overlain by spectacular rudist patch reefs and shallow-marine limestones. These facies, in contrast to the Darende Basin, are overlain by almost 1000 metres of subaqueous basaltic to trachytic lavas and associated volcaniclastic material. Numerous intrusions cut these lavas including basaltic to gabbroic dyke swarms, plagiogranite bodies and ~3km by 4km syenite body displaying extraordinary orbicular structures, contact metamorphism, hydrothermal alteration and mineralisation. The volcanic facies are overlain by Late Cretaceous shallow marine limestones and dolomites. A fundamental difference between the Darende Basin and the Hekimhan Basin is that sedimentation is continuous from the Late Cretaceous into the Paleocene and subsequently continued until the Middle Miocene when the basin became emergent. These facies are comprised of interbedded sandstones, siltstones, marls and limestones.

Both basins are very well preserved and are generally only affected by post Mid-Eocene suture tightening and Neotectonic deformation, predominantly sinistral strike-slip faulting, especially affecting the Hekimhan Basin. The preservation of the basins is attributed to the existence of a strain free “shadow” zone to the east of a large microcontinent, the Nidğe-Kırşehir Massif; a ridged indenter between Eurasia to the north and the Taurides to the south (see figure 1 below).

The following tectonically controlled stages are inferred: 1) Late Cretaceous extension possibly relating to northward subduction of remaining Tethyan oceanic

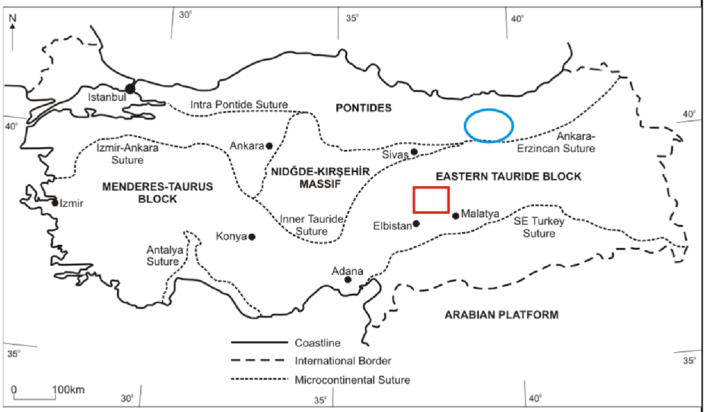

Figure 1 - Outline map of Turkey showing suture zones and the main tectonic blocks. Present study area highlighted by red box, proposed study area highlighted by blue circle.

crust, resulting in transgression and sedimentary deposition in the Darende and Hekimhan Basins. On-going crustal extension in the Hekimhan Basin promoted the emplacement of lavas and intrusive magma bodies; 2) Localised latest Cretaceous emergence in the Darende Basin, possibly controlled by flexural uplift or sea-level change, with continued sedimentation in the Hekimhan Basin; 3) Early Eocene flexural subsidence, likely caused by initial collision of the Tauride microcontinent with Eurasia, “forcing” the Darende Basin to subside and sedimentation to resume; 4) Late Eocene “hard collision” possibly resulting in rift-shoulder-uplift and restriction of the Darende Basin, culminating in subaerial exposure. No further marine sedimentation occurred in the basin after the Late Eocene. In contrast, the Hekimhan Basin continued to deposit sediments until it became emergent in the Middle Miocene.

Project proposal

The basins studied here are part of a continent-wide system of basins involved in the closure of a large ocean (the Tethys Ocean) and later continental collision. There is a large mountain range, the Pontides, ~350km to the north east of these basins composed of a suite of volcanic rocks. These volcanic rocks are traditionally interpreted as part of a continental margin-type magmatic arc related to northward subduction of the Northern Neotethys. These basins formed on the southern margin of the Northern Neotethys oceanic plate which subducted northwards beneath Eurasia. The resulting magmatic arc would have been very similar to the Andes volcanic arc (South America) in both topographic height and volcanic activity. Today the volcanic arc forms part of the Eastern Pontides mountain chain in the north east of Turkey.

At present my fieldwork will be carried out entirely within the Darende and Hekimhan Basins. However, I have a strong interest in arc related processes including sedimentation and volcanism. Taking advantage of my PhD fieldwork in Turkey, I would like, after this work, to visit the classic Upper Cretaceous Pontide magmatic arc several hundred kms to the north east of my study area as this will give me a broader perspective on Tethyan geology, outwith my specific thesis objectives. I feel I have a good volcanogenic and volcanisclastic background having visited and studied Tenerife as an undergraduate and have the necessary skills to derive benefit from this study. Although not part of my PhD, it will build on my PhD training and this is a subject area that I would like to consider going into in the future.

Budget

In order for me to visit the Pontide Magmatic arc to the north east of my field area I would like to request £500 from the Steve Farrell Memorial Fund for 10 days of fieldwork.

I would like to reiterate that this would be entirely separate from my current PhD fieldwork. My budget is already stretched to maximum and I simply could not visit the Pontide Magmatic arc without this additional funding.

Breakdown of costs

Car hire for 10 days - £220
Accommodation for 10 days for one Turkish field assistant and myself– £100
Fuel - £100
Food for 10 days for one Turkish field assistant and myself - £80

*These prices are based on previous fieldwork experience but may vary depending on accommodation quality etc.