THE LITTLE HUNGARIAN PLAIN/VIENNA BASIN, AND THE NORTH BANDA SEA AS A SOUTHEAST ASIAN ANALOGUE

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INTRODUCTION

At their eastern end, the Alps split into two distinct mountain chains. To the southeast the Dinarides extend along the eastern shore of the Adriatic and eventually link with the Hellenides in Greece. To the east the great loop of the Carpathians encloses the Pannonian and Transylvaniain basins. However, and in contrast to the situation in the Dinarides, there is no strong and direct mountain link between the Alps and Carpathians. Instead the two are separated by the wide flatlands of the Little Hungarian Plain and the Vienna Basin (Figure 1). The existence of the Little Carpathian range, which partly bridges the gap and separates the plain from the basin, testifies to an essential Alpine-Carpathian continuity but renders the hiatus even less explicable.

THE BANDA ARC

Comparisons have recently been drawn between the Carpathian and Banda Arcs, despite the intra-continental setting of the one and the quasi-oceanic setting of the other (Milsom 2000a). In the same way that the Carpathian arc encloses a complex of young extensional basins and is characterized by Neogene volcanism that has migrated eastwards with time, the Banda Arc (Figure 2) encloses the North and South Banda basins. . In the Banda Arc also, volcanism has migrated eastwards, and the islands in the eastern part of the arc are still active..In contrast to Pannonia, however, extension has proceeded to the point at which oceanic crust has been generated

There are a multitude of hypotheses concerning the evolution of the Banda Sea, including some that consider the oceanic crust under the two deep basins to be trapped sea floor of Mesozoic or Paleogene, rather than Neogene, age. However, the most recent work in the area (see Hinschberger et al. 2001 and references therein) has provided a steadily increasing body of support for a young origin. Evidence has also accumulated that the islands of the non-volcanic Outer Banda Arc were originally located at the Triassic northwest margin of Australia (e.g. Milsom 2000b), and that this origin is shared both by high-standing ridges in the central Banda Sea (Villeneuve et al. 1994) and by the basement rocks of eastern Sulawesi (Surono & Bachri 2002).

The wide dispersal of Australian fragments around the fold and thrust belt of the Outer Banda Arc resembles the dispersal of Alpine elements in the Carpathians. Both regions have experienced large-scale and rapid extension within what is, overall, a compressive environment created by the convergence of major continental blocks. The difference is that the processes in the Banda region should be more accessible to direct examination, both because the extension is more recent and because of the absence of thick sediment cover concealing basement structures. To some extent these advantages outweigh the disadvantages presented by poor access and a relatively sparse database. Comparative studies should be viewed as aids to understanding of both areas.

NORTH BANDA BASIN

The North Banda Basin (Figure 1) is the smaller of the two oceanic basins in the Banda Sea. It separates the islands of Buru and Seram in the Outer Banda Arc from Southeast Sulawesi and its southern extension in the islands of Buton, Muna and Kabaena. However, despite the presence of the basin, considered by Réhault et al. (1994) to be of Late Miocene age, the Mesozoic stratigraphies exposed on Buton, Buru and Seram are virtually identical. There are, in fact, greater differences between the Mesozoic in the north and south of Buton than between either of these and the Mesozoic of Buru.

There is an emerging consensus that both East Sulawesi and Buton arrived at the margin of SE Asia in the mid-Tertiary (Polvé et al. 1997, Smith & Silver 1991). The geological similarities between East Sulawesi, Buton, Buru and Seram and the interpreted young age of the North Banda Basin suggest that all these blocks formed part of a single terrane that first collided with the Asian continental margin in the Oligocene or Early Miocene and then broke apart. An explanation for this sequence of events can be found in the now commonplace observation that collision orogeny is frequently followed by collapse and extension, probably as a consequence of the excess gravitational potential energy contained within the orogen. In the Banda Sea, the post-orogenic rifting evidently continued beyond the point at which it could be accommodated by mere continental extension, and new oceanic crust was formed within the loop of the developing fold and thrust belt. Continuing extension in the South Banda Basin led inevitably to stretching of this belt and it eventually fractured, opening up the North Banda Basin along the fracture.

IMPLICATIONS FOR THE VIENNA BASIN/LITTLE HUNGARIAN PLAIN

The geographical similarities between the North Banda Basin and the Vienna Basin/Little Hungarian Plain are striking. Both depressions occupy discontinuities in mountain belts that are geologically homogeneous. Both are associated with much larger depressions that have formed recently and rapidly behind arcuate fold and thrust belts. It is difficult to believe that these similarities are not expressions of common processes, even though extension in the Carpathian region was probably nowhere sufficient to cause new oceanic crust to be generated. Even this difference does not necessarily indicate a difference in extensional beta-factor. It is at least feasible that the crust that suffered extension was originally considerably thicker in Carpathia than in the Banda Arc. Further comparative studies of the two areas are likely to lead to advances in understanding of both, and also of fundamental geological processes which, the common existence of arcuate fold and thrust belts suggests, have operated very widely throughout geological time.

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Fig. 1. The Carpathians, showing the location of the Vienna Basin and the Little Hungarian Plain.

Fig. 2. The Banda Arc, eastern Indonesia. Bathymetric contours at 1 km intervals.

Fig. 1.

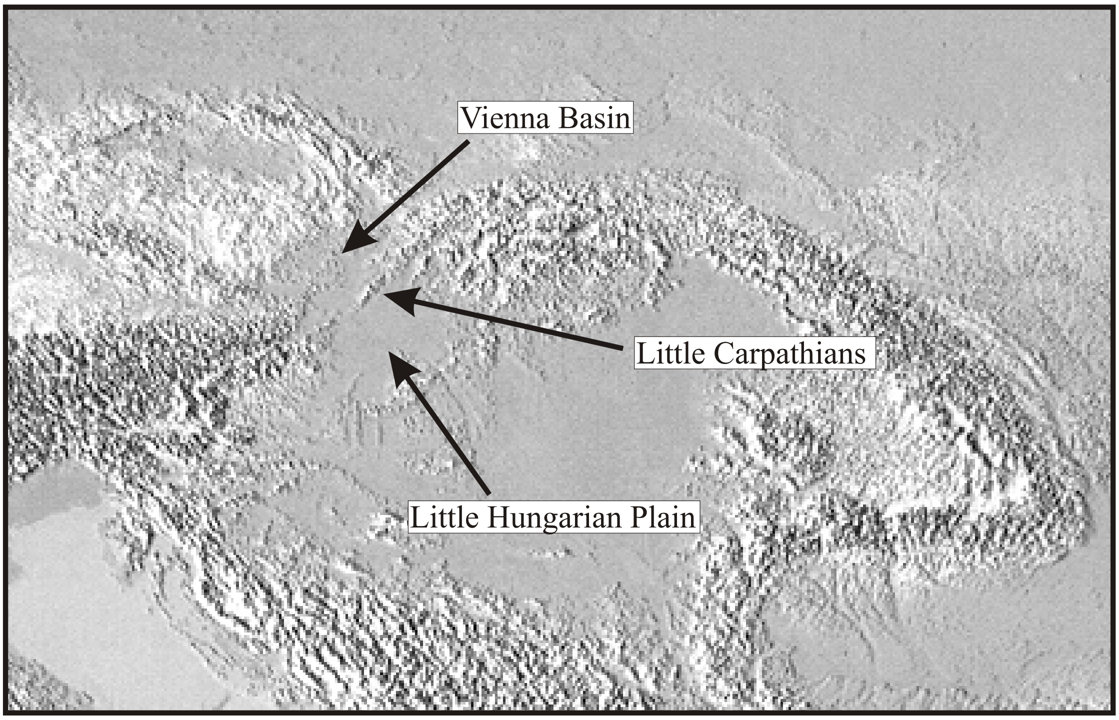
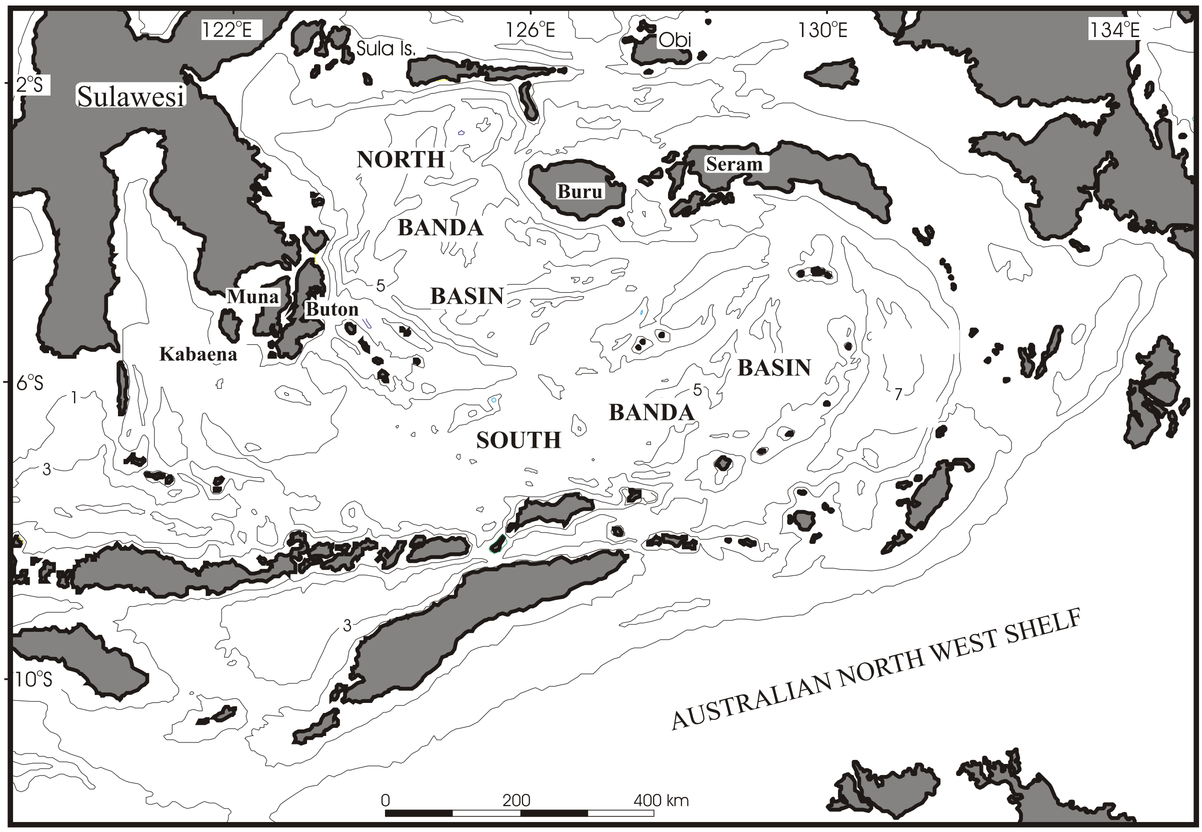


Fig. 2.



Milsom: Vienna Basin/Little Hungarian Plain - North Banda Sea