

matters arising

Interarc spreading in the Carpathian area

BOCCALETTI and GUAZZONE (ref. 1) have invoked the interarc spreading hypothesis to explain the genesis of the present structure of the Mediterranean area. We consider it necessary to clear up some fundamental points regarding one of the sectors they discussed.

The area inside the Carpathian Bend (including the Transylvania Basin in Rumania) was presented by Boccaletti and Guazzone as an interarc basin, the front and back inarc parts of which would be the Neogene volcanic zones in the East Carpathians and Apuseni Mountains. Because such a hypothesis has so far not been examined and argued but only stated²⁻⁴ we point out here the main geological facts which must be considered.

First, the basement of the Transylvanian Basin comprises both metamorphic and igneous (pre-Cenomanian) rocks, similar to those in the Carpathians⁵. Second, the sedimentary undeformed cover includes Palaeogene and early Miocene deposits continuous over large areas⁶. Third, there have so far been no observations indicating anomalous heat flow in this area.

The first point precludes any interpretation of the Transylvanian area as an interarc basin. If, however, this evidence were not considered, the second point would preclude a late Miocene age for the spreading process. Nevertheless, if the spreading were of that age, the Transylvanian Basin, being younger than the Pannonian Basin, should have a higher or comparable heat flow to that of the latter.

Finally, we emphasise that Karig⁷ developed the idea of interarc spreading for volcanic island arcs; his hypothesis cannot, however, be extended indiscriminately to apply to continental areas such as that inside the Carpathian Bend.

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DRS BOCCALETTI AND GUAZZONE REPLY

—The structural model comprising a consuming (or contracting) zone, a folded arc, a magmatic arc, and spreading (or distended) zones, after Karig's formulation¹ and after additional ideas by Dickinson² and Dewey *et al.*^{3,4} must be considered the best model to date for investigating fossil continental margins, both in wide, contracting palaeo-oceans and in small, contracting palaeomarginal basins. Differences between oceanic and continental arcs are probably only a matter of differences in the ages of the contracting processes and differences in the dimensions of contracting areas. Consequently, different stages of maturity probably also occur in areas beyond the arcs.

In that sense all Mediterranean basins, both present and fossils, are very different from those of the western Pacific. Even the Tyrrhenian Basin, which is generally accepted as a typical marginal basin in the Mediterranean area (with active subduction, typical polarity and migration, and typical folded and magmatic arcs) also shows a crustal substratum that is strongly thinned and very hot. It seems to be complicated, however, by many sialic microfragments and sialic seamounts. These sialic 'lenses' are probably actual examples of a segmentation stage in the pre-Tyrrhenian crust. The original floor of the Tyrrhenian Sea, as well as the substrata of the other Mediterranean basins, was never entirely substituted by typical oceanic crust.

The points raised by Radulescu and Sandulescu⁵ can be explained as effects of a low level of maturity of evolution in the Carpathian arc-trench system, where the back-arc crust has been distended, thinned and in places fragmented to a certain degree. In fact, Tortonian sediments directly overlie the basement in many places of the Transylvanian Basin⁶. Some spreading may occur under cover, caused by discontinuous subduction; perhaps that can be

correlated with rotated arc migration. Incidentally, the age of the oldest deposits contemporaneous with the spreading in the basin must be related to later surface volcanism.

Stegena⁷⁻⁸ suggest that the inter-Carpathian area should be considered to be "warm". Comparisons between the Pannonian and Transylvanian basins could not give the same result if the directions of the investigation profiles are changed. In fact, it has been clearly demonstrated that the northern Carpathians are inactive whereas the south-eastern Carpathian Arc is still active⁹. Geothermic correlations between different basins should take into account the different thicknesses of their covers. The only conjecture that we can advance about the comparison between the Pannonian and Transylvanian basins is that the second is probably less 'mature' than the first.

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LSD and dopamine receptors

PIERI *et al.*¹ reported a circling behaviour response to LSD in rats with unilateral chemical lesions of the ascending medial forebrain bundle. They used two rotational models; one was produced by 6-hydroxydopamine injection and the other by 5,6-dihydroxytryptamine injection. The factor common to both models was a deficit of dopamine in the ipsilateral forebrain. The authors demonstrated strong maximal contralateral turning responses to LSD given in a dose range of 0.1-1.5 mg kg⁻¹. Only the time course of turning seemed to be dose dependent.

We have repeated these experiments in similar animal models and have found the effects less convincing. Indeed, LSD

¹ Boccaletti, M., Guazzone, G., *Nature*, **252**, 18 (1974).