4-7. - GEODYNAMICS AND PALAEOMAGNETICS IN THE MEDITERRANEAN

by D.H. TARLING (Newcastle - G.B.)

The rotations of the Iberian peninsula, Sardinia, Corsica, the Southern Alps, Turkey and the Lebenon have now been suggested relative to either Europe or Africa, away from the Alpine zone, using palaeomagnetic methods. In most cases, these rotations are consistent with geological reconstructions, although the timing of the actual rotations are mostly poorly defined at the moment. It is therefore important to establish the precision with which such rotations can be detected and dated by palaeomagnetic methods as well as to consider the types of motion which are, in practice, not determinable by such techniques.

The process by which igneous rocks acquire and loose a remanent magnetisation are reasonably well established, but are much less well understood for sediments which may easily carry a magnetisation acquired long after their original deposition. Detailed physical and geological tests are required to establish that the measured remanent magnetisation was acquired at a known time and the direction of remanence must be corrected for any subsequent tectonic movements, such a tilting, which have affected the area. Under such circumstances, the direction of the Earth's magnetic field can be determined precisely (within $\pm 1°$, but more usually within ± 2 - $3°$). As the direction of the geomagnetic field varies with a periodicity of several hundred years, sufficient observations must be made to obtain an average direction of the palaeo-geomagnetic field which can then be compared with observations of similar age from another area of the world. Such an averaging process requires some 100 + separate samples, or preferably sites, if the average field is to be defined within some $5°$ in any one area. The comparison ot two areas of the same age can be done directly if the areas were close together when they acquired their remanence, but the spatial variation of the average geomagnetic field means that direct comparisons are difficult over greater distances and comparison is usually made assuming that the average geomagnetic field corrsponds to that of an axial geocentric dipole. This assumption is difficult to test, but appears to be reasonably valid ($\pm 5°$) except during more recent times when the field is changing polarity.

In general, therefore, rotations of more than 5-$10°$ can be detected using detailed surveys in two areas in whitch the geological history is reasonably well known and where stable remanent magnetisation can be determined of the same age. In the Mediterranean region, it is difficult to fulfil these requirements, mainly because rocks with the ability to retain their original remanence are are and the geology is complex. Ophiolites, for example, are usually considerably weathered or altered and have undergone complex tectonic movements since their original emplacement. A further complication is that few reliable palaeomagnetic results are available for extra-Alpine Europe during the Cretaceous and Jurassic. Nonetheless, palaeomagnetic studies, based on local geological mapping, affords an extremely useful tool to determine the past relationships of blocks within the Mediterranean. However, these techniques yield information only on rotations or, to a lesser extent, palaeolatitudinal motions, unless a wide range of geological time is covered in both regions; the Iberian peninsula, for example, has had a net rotational movement relative to France, but the actual movement almost certainly comprises rotational and transcurrent motions as the geology of the Pyrenees is not consistent with a simple rotational closure.

Remarques à la suite de l'exposé 4-7. - par D.H. TARLING

Dr. CLOSS - We have to thank you for this excellent review of paleomagnetism and of Mediterranean problems. We suggest that people interested in these methods would have an informal meeting, possibly to-night, as Pr. TARLING intends to leave monday.

BOBIER - Il existe au sein de la Sous-Commission du Néogène Méditerranéen de la Commission Internationale de Stratigraphie un comité de datation qui a décidé de travailler en coopération avec les paléomagnéticiens. Un effort spécial est fait dans le domaine méditerranéen et le Dr. MANZONI de Bologne se propose pour centraliser les données et les projets ; il n'est pas nécessaire de doubler cette organisation.

J'ai fait des mesures le long du Nord de l'Algérie entre les frontières marocaine et tunisienne. Au Cénozoïque, les andésites du Miocène moyen, près de Cavallo, donnent de bons résultats. Les intrusions du Nord-algérien ont des caractères voisins mais des directions divergentes sont trouvées, dues au mode de mise en place.