

# Paleomagnetism of the Scaglia Rossa Limestone in the Northern Apennines

by

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The *scaglia rossa* is a pink, pelagic limestone of mid-Cretaceous to Middle Eocene age in the Umbrian Apennines. As it is autochthonous or parautochthonous the formation offers an opportunity to evaluate paleomagnetically the rotational history of the Italian Peninsula. Over 400 samples from 43 sites in the unit were collected during four field seasons in 1973-1974.

The natural remanent magnetizations were weak ( $6 \times 10^{-6}$  to  $8 \times 10^{-8}$  Gauss) and had an initial soft component that could be easily removed, by thermal demagnetization to 250-350° C or by alternating field (AF) demagnetization in fields less than 100 oe. AF treatments in 100 oe. and 200 oe. were used for all samples.

The magnetic mineralogy is not simple. Magnetite was often accompanied by hematite. In samples where both were present thermal demagnetization showed that the hematite magnetization is in essentially the same direction as that of the magnetite, which suggests that the partial hematization may have occurred shortly after deposition. The results indicate that magnetization was probably acquired contemporaneously with deposition, making the *scaglia rossa* a good subject for paleotectonic and magnetic stratigraphy studies.

Samples distributed geographically over the *scaglia rossa* depositional basin did not eliminate the possibility of some oroclinal bending in the Northern Apennines, but the data clearly show the effect of a large scale rotation averaging 40-45° in a counterclockwise (CCW) sense.

Twenty three sites were sampled in the classic section at Gubbio where paleontologic ages are well established. The inclinations vary by only a few degrees, but are slightly low (35-40°) based on the present latitude of the sites. The declinations appear to show that the Italian Peninsula was rotating during part of the 50 m.y. represented by the formation. The most probable interpretation shows two distinct episodes of rotation : a 40° CCW rotation in the Campanian-Maestrichtian and a 30° CCW rotation after the Middle Eocene.

The magnetic reversal stratigraphy, as yet incompletely defined, shows very good agreement with the Cretaceous magnetic polarity time scale.

**M. Soffel :** Did you find some indications in your data for a movement of Italy towards the North since upper Cretaceous.

**M. Lowrie :** The data indicate a motion towards the North because the latitude of the pole position is slightly too low. After corrections have been made for the general movements of stable Europe since the time the difference is no more significant and a motion of Italy towards North becomes insignificant.

## Discussion

**M. Hsü :** Is there any rotation of *Scaglia rossa* block with respect to Africa as well as with respect to Europe since Upper Cretaceous.

**M. Lowrie :** The Upper Cretaceous and Lower Tertiary paleomagnetic poles derived from the *scaglia rossa* sites in the Bottaccione gorge near Gubbio do not agree with either the European or African VGP positions for the corresponding ages. On the basis of these data we infer that the *scaglia rossa* block has rotated with respect to both the African and the European plates since the Upper Cretaceous.

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*Rapp. Comm. int. Mer Médit.*, 23, 4a, p. 61 (1975).

