BRIEF RESULTS OF THE PALEOMAGNETIC STUDIES OF THE SIWALIK GROUP OF THE TRANS-INDUS SALT RANGE, PAKISTAN

Thirteen stratigraphic sections were measured and sampled, from the Siwalik Group rocks of the Trans-Indus Salt Range, for Paleomagnetic studies. After measuring Natural Remanent Magnetization (NRM) of all samples, a few were arbitrarily selected for progressive Alternating Field (AF) demagnetization and Partial Thermal Demagnetization (PTD). The results of these studies show that AF demagnetization is not sufficient for the successful removal of the secondary component of magnetization (Fig. 1), particularly in case of samples collected from reddish-brown siltstone/claystone units. However, PTD successfully enables to isolate the stable and primary component of magnetization (Fig. 2). Therefore, all samples were subjected to PTD at 500°C to 660°C, to obtain the stable component of remanent magnetization. These stable directions of remanent magnetization were used to establish a magnetic-polarity reversal sequence of each section, respectively. The details of magnetic-polarity stratigraphy for each section are given elsewhere (Khan, 1983), whereas brief results are described as follows.

The results of magnetic-polarity stratigraphy have, for the first time, enabled to establish chronostratigraphic correlation of the Siwalik Group of the Trans-Indus Salt Range. These studies are also of great significance for correlation of the Trans-Indus Siwalik Group to that of the Siwalik Group of the Potwar Plateau. Considering the fact that the Siwalik Group rocks of the Bhittani, Marwat, and Khasor areas, and upper part of the Siwalik Group of the Makarwal anticline have vertebrate fauna of Plio/Pleistocene age (Morris, 1938; West, 1979; Khan, 1983), the observed magnetic-polarity stratigraphic sequences are correlated to the standard Magnetic Polarity Time Scale of Mankinen and Dalrymple (1979). This correlation of magnetic-polarity stratigraphy clearly indicates that the Siwalik Group of the Makarwal anticline ranges in age from 11.8 m.y. (Chron 11) to 0.85 m.y. (Matuyama Chron), those of the Marwat anticline range in age from 3.3 m.y. (early Gauss Chron) to 0.5 m.y. (Brunhes Chron), those of the Khasor Range cover a time span of 3.2 m.y. (early Gauss Chron) to about 0.5 m.y. (Brunhes Chron), and those of the Bhittani anticline range in age from 3.85 m.y. (Cochiti Subchron) to 0.5 m.y. (upper part of the Brunhes Chron). These studies, therefore, indicate that the basal part of the Siwalik Group in the Trans-Indus Salt Range is younger than the basal part of the Siwalik Group in the Potwar Plateau, where the Siwalik Group sedimentation started prior to 15 m.y. (Johnson *et al.*, 1982). Therefore, the Siwalik Group of the Trans-Indus Salt Range, particularly those of the Makarwal anticline and the

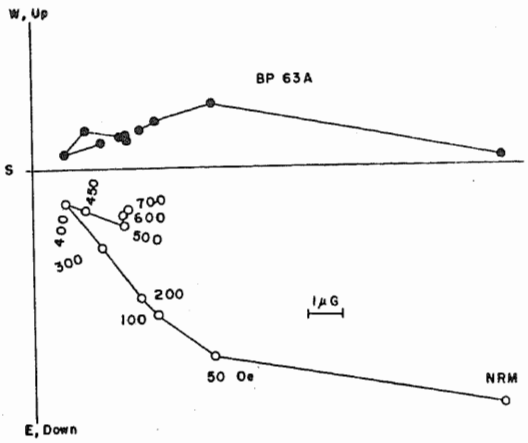

Fig. 1

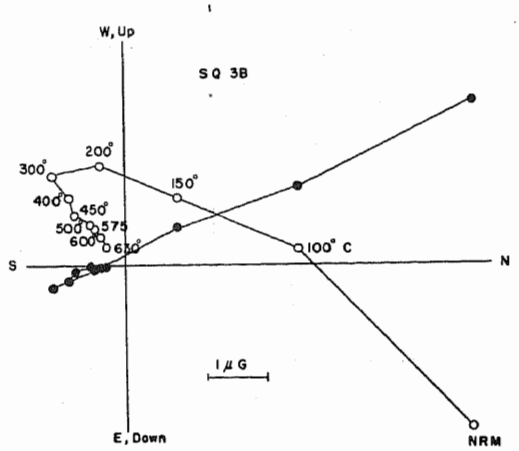

Fig. 2

Fig. 1. A typical result of progressive AF demagnetization. Orthogonal diagram is based on the successive end points of AF demagnetization vectors. Solid (open) circles are plotted on horizontal (vertical) plane. Short bar indicate sthe scale for remanent magnetization intensity. The plot is based on bedding corrected directions of magnetizations.

Fig. 2. A typical result of PTD. Plotting conventions are same as for Fig. 1.

Khasor Range, represent a molasse facies younging westward from the Potwar Plateau. However, onset of the Siwalik sedimentation in the Bhittani and Marwat anticlines could not be established with certainty due to lack of exposures of the basal part of the Siwalik Group in these areas.

This contrast in age between the Siwalik Group of the Trans-Indus area and that of the Potwar Plateau indicates that the Siwalik Group nomenclature, implying biostratigraphic zonation (Shah, 1977), cannot be used for the classification of the Siwalik Group of the Trans-Indus area (as suggested by Danilchik and Shah, 1976; Hemphil and Kidwai, 1975; Meissner *et al.*, 1974; Rehman *et al.*, 1983). This is also favoured by the fact that the lithologic units of the Siwalik Group cannot be physically traced from the Bhittani anticline to the Makarwal anticline and the Potwar Plateau.

The entire stratigraphic sequence of the Siwalik Group in the Trans-Indus Salt Range is conformable and suggests a lack of major tectonic activity in this area, except the subsidence of the basin, during the deposition of these sediments. However, deposition was brought to halt during the uplifting of the Himalayan mountain chain, at about 500,000 yrs. B.P. This young age of the tectonic activity is also suggested by the presence of uplifted Recent alluvial terraces.

Sediment accumulation rates have been calculated using the results of magnetic-polarity stratigraphy. It is observed that the sediment accumulation rates of the Siwalik Group of the Trans-Indus area are generally higher than those calculated for the Siwalik Group of the Potwar Plateau (Opdyke *et al.*, 1979; Johnson *et al.*, 1982). This suggests that the area now occupied by the Trans-Indus Salt Range was rapidly subsiding during the time of deposition of the Siwalik Group sediments. Lack of hiatus in the entire stratigraphic sequence of the Trans-Indus Siwalik Group suggests rapid erosion of the source area which kept pace with the rapidly subsiding basin and consistently provided detrital material.

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