(apholate treated)—Distal end of the ovariole showing follicular epthelium of two sides coming closer because of reduced size of oocyte. Note the presence of vacuoles and cellular degeneration in follicular tissue and thick tunica propria, 10 × 40. Fig. 4. 72 hr (apholate treated) follicles have become continuous due to degeneration of interfollicular tissue, 10 × 40. Fig. 5. 216 hr. (apholate treated)—showing distal end of ovariole with three clumped oocytes two of them placed side by side. Note the aggregation of nuclei in the centre. The proximal end of ovariole shows dark stained granules of large size, 10 × 10. Fig. 6. 216 hr (apholate treated)— proximal end of the ovariole showing fibrous degeneration. Note that the granules have been discharged leaving empty speces, 10 × 40. Fig. 7. 24 hr. (metepa treated)—The cytoplasm of the oocyte showing three different zones. Also note the vacuoles in cytoplasm. 10 × 10. Fig. 8. 48 hr (metepa treated)—Oocyte showing the bursting of the germinal visicle. Note the granulation of the material of germinal vesicle, 10 × 40. Fig. 9. 72 hr (metepa treated)—Mature oocyte showing increased thickness of the follicular epithelium and large vacuoles. Note also the granulation of cytoplasm, 10 × 40. Fig. 10. 96 hr (metepa treated)—Note the enlarged follicular tissue and only remnants of cytoplasm and granules, 10 × 40. Fig. 11. 24 hr (thiotepa treated)—Oocyte cytoplasm showing three distinct zones. The follicular epithelium has thickened, 10 × 40. Fig. 12. (Thiotepa treated) —showing continuation of the follicles. Note clumping of the chromatin, 10 × 10.

cc—Clumped chromatin; *cv*—Cytoplasm; *f*—Fibres; *fe*—Follicular epithelium; *g*—Granules; *gv*—Germinal vesicle; *if*—Interfollicular tissue; *io*—Immature oocyte; *n*—Nuclei; *o*—Ovariole; *oo*—Oocyte; *s*—Space; *tp*—Tunica propria; *v*—Vacuoles; *z-1* to *z-3*—Zones of damaged oocyte.

72 hr. The size of the ovariole remains uneffected. Prolonged treatment produces fibrous degeneration.

Morgan[2] expressed his doubt that the affected cells may be able to overcome the effect of chemosterilants. The formation of fibrous tissue after the treatment with apholate, metepa and thiotepa clearly indicates that the damage is a permanent one. Though the nature of the damage in the ovarioles caused by all the three chemicals is more or less same, it is interesting to note that apholate affects the length and width both (as was also reported by Burden and Smittle[3]) metepa only the width while thiotepa does not affect the size of the ovariole at all.

La Brecque and Smith[4] raised a question whether chemosterilants affect fecundity and oviposition through inhibition of neuroendocrine system in insects. Bhargava and Tandon[1] report that apholate causes atrophy in corpora allata and thus inhibits hormone release in *P. americana*. Apholate has been known to affect fecundity and oviposition in many insects[5-7]. The present investigation clearly shows that oocytes are damaged beyond repair after treatment with apholate, metepa and thiotepa. As the control of oocyte maturation by corpora allata is well known[8], it is reasonable to assume that apholate damages the oocytes *via* corpora allata in *P. americana*. As the two other alkylating agents are showing almost similar effects on the oocytes, the mode of action of all the three compounds might be the same.

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DARSHAK SEA MOUNT IN THE NORTH-EASTERN ARABIAN SEA

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Abstract

The Darshak Sea Mount is situated just south of the Indus Canyon. It rises upwards from a depth of about 1,500 m to approximately 450 m towards the surface. Similar submarine hills and sea mounts are seen in the profiles and physiographic maps of that region. These sea mounts and submarine hills possibly mark the site of earlier volcanic activity probably related to Deccan Traps.

THE topography of the sea floor to a large extent reflects its geology and structure. Geomorphological maps based on the analyses of echograms thus provide useful basic information on the geology and structure of the sea bed. As a part of the Institute's project on regional geology of the

Western Continental Margin of India, a geomorphological map of this region is being compiled. This is based on the analyses of echograms of this area collected by the various ships in recent years including some of the survey vessels.

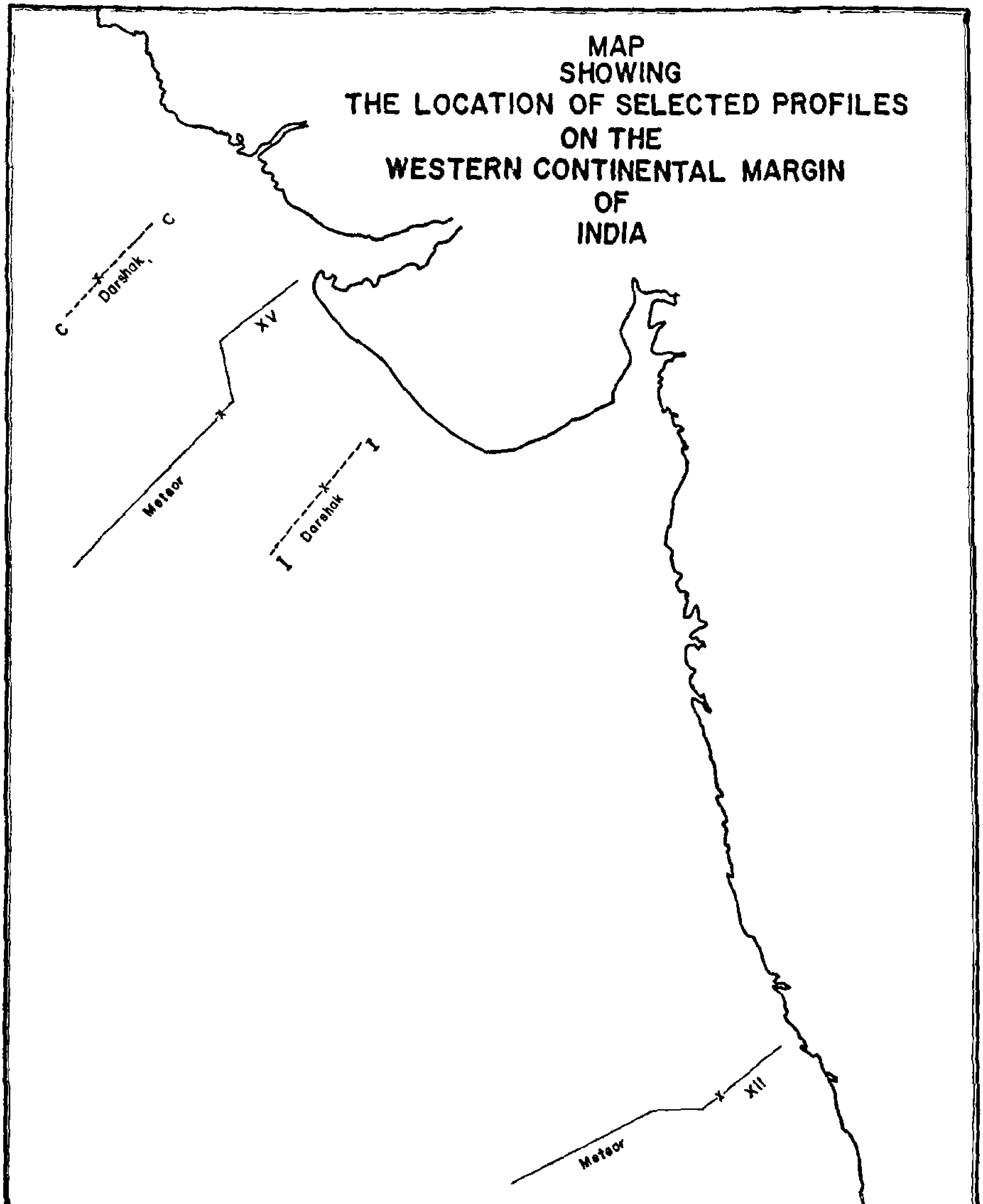

FIG. 3

The echograms are first used to prepare profiles showing the submarine topography. These are prepared on a horizontal scale of 1 cm to 2 nautical miles and vertical scale of 1 cm = 100 m which gives a vertical exaggeration of 1 : 37. The profiles thus prepared are used for compiling geomorphological maps. An interesting feature of some of the profiles recently prepared is the occurrence of well-defined submarine hills on the continental slope and continental rise (Fig. 1). The northernmost of these submarine hills is situated (22° 28' : 66° 42') just south of the Indus Canyon on the continental rise. In Track C a submarine hill rises upwards from a depth of about 1,500 metres to 450 metres towards the surface (Fig. 2). The a slope of about 14° and the seaward side about 20°. Though the area has not been surveyed in detail in the recent cruise but a comparison of the existing profile with the soundings made by earlier ships indicates that the topographic high is an isolated feature within the Indus Cone sediments.

The tracks both on the north and south indicate (GEBCO Chart C 132) that the feature does not have a wide extent either towards or along the shelf. The slopes are more or less similar to those recorded on some of the Pacific sea mounts (Emery, Tracey and Ladd[2] quoted in Fairbridge, 1966). The submarine hill has a sharp peak and the topography on the top is very much rugged. These features agree well with the definition of the sea mount

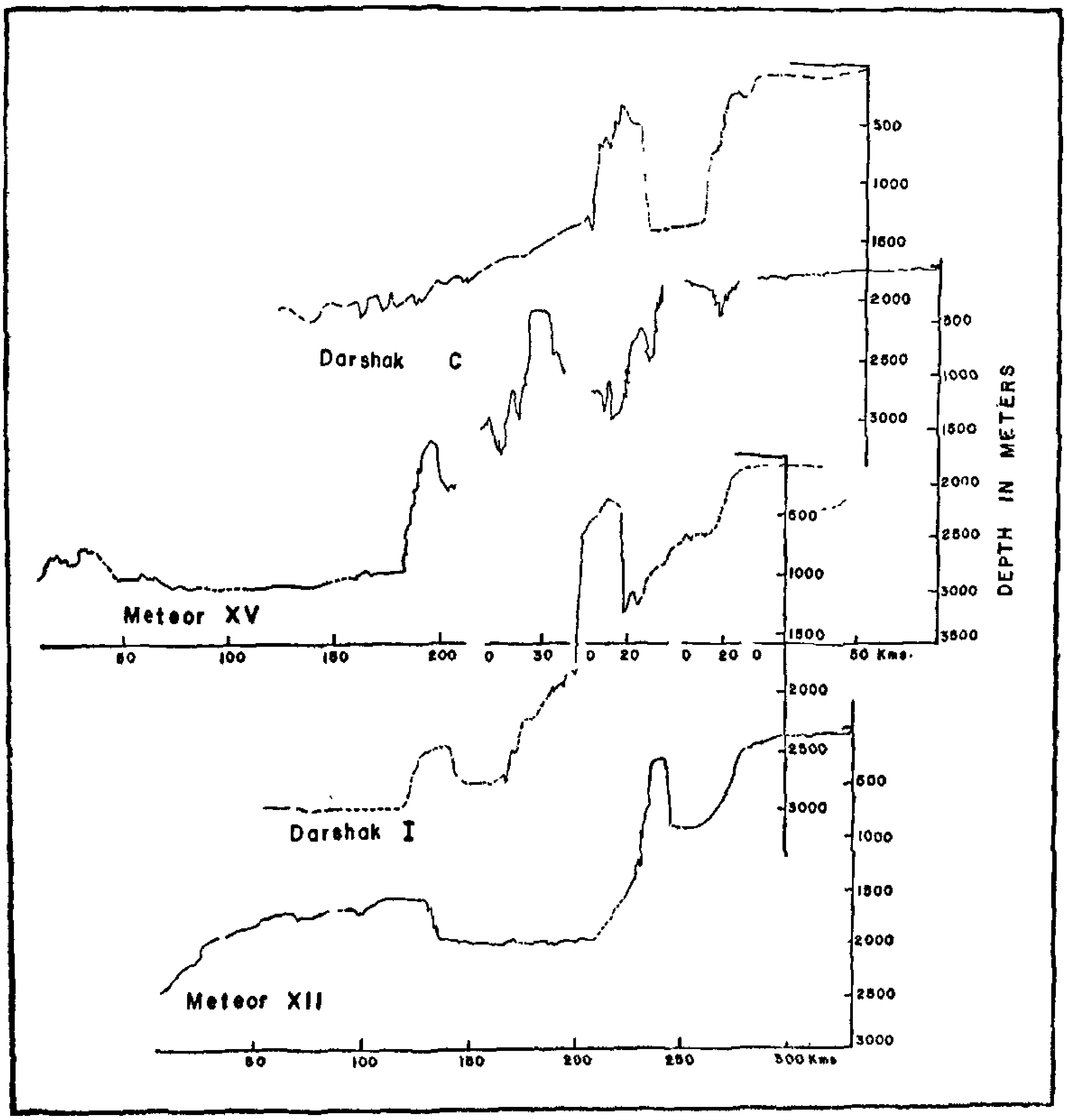

Fig. 2

hill has a base of about 18·5 km which is roughly reduced to 8 km at the top. The landward side has given by the International Committee on Ocean Bottom Features (1952), which identifies the sea mount as an isolated or comparatively isolated elevation of the deep sea floor from approximately 1,000 metres or more.

The present topographic feature is named as "DARSHAK SEA MOUNT" after the Indian Naval Ship "DARSHAK" from whose echograms it was confirmed. The seaward side of the Profile across this hill shows a characteristic depression which may be similar to the peripheral depression recorded on some of the sea mounts in the Pacific (Fairbridge, 1966)[3]. In this area the depression may also be due to its little accumulation of sediments from the Indus on the seaward side. However, more detailed studies of the sea mount are needed as the origin of this depression may be far much more complex than that of a simple model of upstream deposition (Roberts, Hogg, Bishop and Flewellen, 1974)[7]. Though the present height of the submarine hill above the sea floor is about 1,000 meters, there can be little doubt that the original relief must have been much greater as the surrounding area has been filled subsequently by the Indus sediments whose thickness in the area exceeds 2·5 km (Neprochnov, 1961)[6]. Over 2,000 sea mounts have been discovered in all major ocean basins and the recent expeditions in the Indian ocean have also reported many. The physiographic diagram published by Heezen and Tharp (1964)[4] shows a number of sea mounts in the Indian Ocean. In the north-eastern Arabian Sea, submarine hills are shown on the extension of the Laccadive Ridge and along the edge of the western continental slope of India. The other submarine hill represented in the profile (I in Fig. 2) including the present sea mount appear to be the northernmost extension of these submarine hills and may possibly represent an extension of the Laccadive trend along the western continental slope of India.

Similar submarine hills are also seen in the profiles based on the echograms (XV and XII in Figs. 1 and 2) of *RV Meteor* as far south as 24° and 14° latitude. These submarine hills and their extensions which may include the Darshak Sea Mount possibly represent a widespread occurrence of similar topography along the continental margin. Their occurrence along the western margin is of significance as it is well known that most of the submarine hills and sea mounts are submarine volcanoes (Menard, 1964[5]; Uchupi, Phillips and Prada, 1970[9]) and they are also related to fracture zones. Thus the submarine hills of the continental slope and rise may possibly represent a period of extensive volcanism. Evidently these sea mounts and submarine hills along the Western continental margin possibly mark the sites of earlier volcanic activity. The most extensive volcanic activity on the adjacent peninsular India is found in the Deccan Trap period. Agarwal (1975)[1] has given the time span of the Deccan Trap activity from early Paleocene to beyond Eocene (65–34 m.y). Recent studies (Siddiquie and Sukheswala[8], 1976) indicate that the paleocene acid igneous activity on the Laccadive ridge is a westwrad extension of the Deccan Traps. These submarine hills could possibly represent submarine volcanoes along the Western continental slope of the country. At present these observations about volcanism are largely speculative, and therefore, a detailed study involving sampling from these submarine hills would provide an important clue to the Geology and history of the Western margin.

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