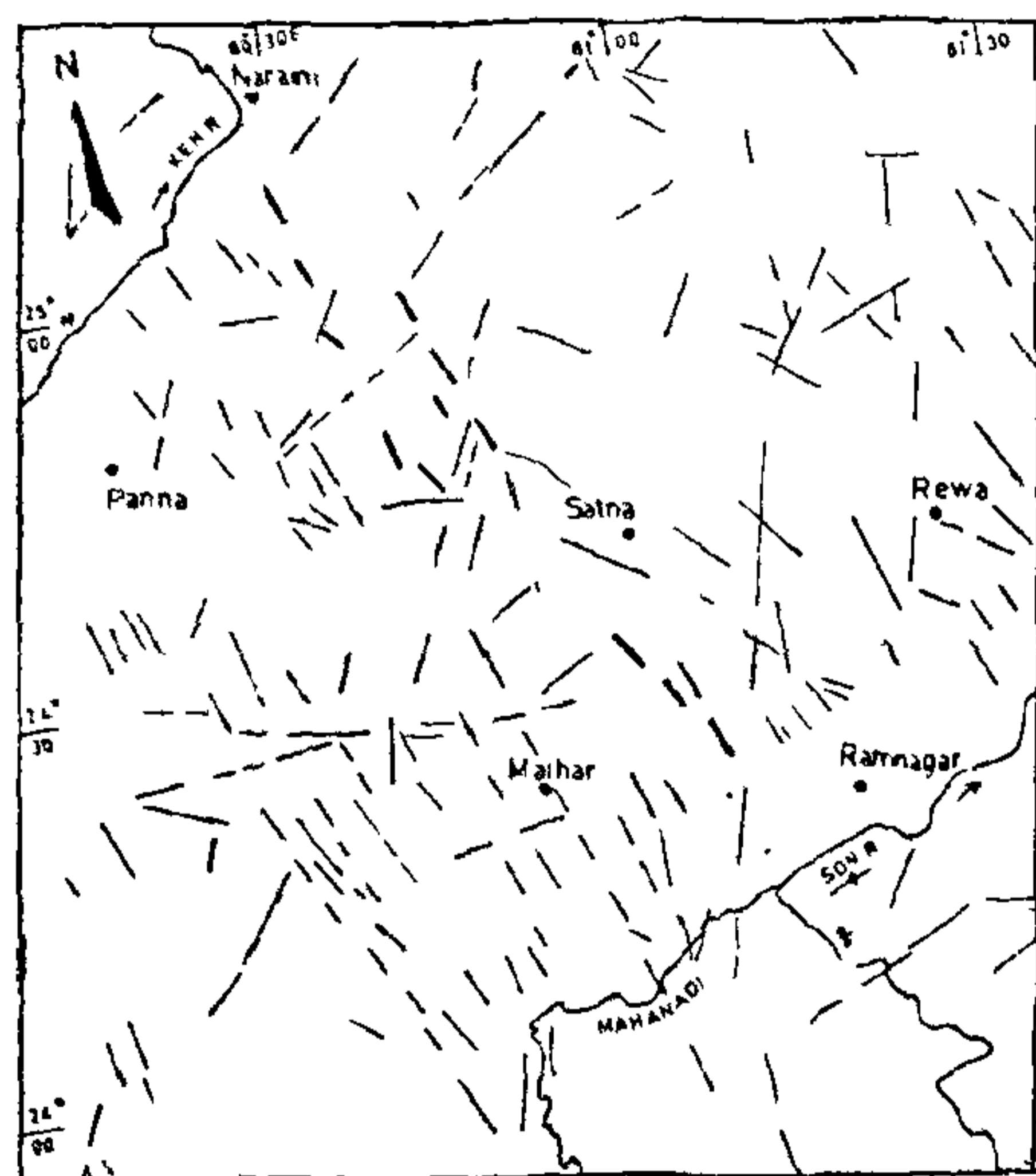


the presence of a number of individual linears which form a part of the lineament.

On studying the exposures in the river Son south of Markandeya, it was discovered that the shales and siltstones belonging to the Semris, are traversed by a number of master joints which run for nearly 200 to 300 metres along the azimuth of the lineament. Their presence indicates that the lineament is a fracture zone which trends NNW-SSE.

Study of the area carried out with the help of the satellite imageries, the aerial photographs on 1:60000 scale and the field work revealed the existence of FNE-W^{SW} trending canoe folds, some of which run for nearly 30-50 km along their axes and have been shown in Fig. 1.



LANDSAT-1, ID 1057-04350, Band 5 6-7. Scale: 1:1000,000.

FIG. 1

The folds are believed to have formed at the outcome of SSE-NNW regional stress field. Paucity of such folds in the sediments, younger than the Semris indicate that the stresses became weaker after the deposition of the Semris. The 'Ken-Son lineament' described here represents the extension fracture system resulting from such a stress field.

The presence of this lineament with a number of small linears along its azimuth is discernible on the multiband satellite pictures much better than the aerial photographs. In the case of the band No. 7 of the satellite, the lineament looks dark, due to the moisture accumulation. The moisture absorbs the near infrared energy imparting a dark tone to the linea-

ment. In band No. 5 of the imagery the vegetated areas along the fracture zone developed especially along the sandstones, look dark due to the absorption of the energy in that band by the chlorophyll in the vegetation.

Due to the vast areal coverage of the satellite picture, it was possible to detect a regional linear feature like the Ken-Son lineament which would otherwise have been missed on an aerial photograph which covers a limited area.

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CHRYBOTILE ASBESTOS OCCURRENCES IN THE ULTRAMAFIC ROCKS FROM SANGUEM DISTRICT, GOA, INDIA

THE note reports the occurrence of chrysotile asbestos in the ultramafic rocks from Sanguem (15° 00' 00" and 15° 20' 16" and 74° 04' 00" and 74° 15' 00") district of Goa. The mode of occurrence, the controls of localisation and the properties of the mineral are described in the following paragraphs.

The ultramafic rocks, which correspond to the metabasics of Pascoe³, form the lowermost assemblage of the Dharwar granite-greenstone belt in this part of Indian Peninsula. They are found to occur about 2 km to SSE of Netravli village which is about 11 km to the SE of Sanvorde town in the Sanguem district of Goa.

The ultramafics show varying degrees of serpentinisation. The study of thin sections reveals that the serpentinised dunites at the base are the host rocks to the chrysotile asbestos mineralisation. From the field observations, it is seen that a strong mineralisation control is evident in the dunites affected by folding and shear deformation. Asbestos is found to occur as veins along the limbs of the minor folds. The hinge portions of such folds are not available for observations as they are more lateritised than the limbs. The asbestos fibres are found to have developed at right angles to the walls of the fractures. The width of veins varies from half centimeter to more than four centimeters. In other cases, asbestos fibres are found to have developed along strike slip faults, the length of fibres being parallel to the strike of the faults. In such cases, the fibres are of considerable length although they are found as a thin coating along the wall of the fracture.

The fibres are soft, whitish in colour and have a silky lustre. The specific gravity is 2.56. The proper-

ties of the asbestos correspond to those of chrysotile. When heated, the fibres suffered a loss in weight of 1, 10 and 13% at 500°, 700° and 850° C respectively. The mineral lost its lustre completely at 850° and became dull grey in colour. The fibres became brittle and could be easily crushed to powder with a slight pressure. From 850° C onwards upto 1100° C the weight remained constant. This indicates at 850° C the crystal structure of the mineral breaks down. The mineral has been found to be resistant to acid and alkali.

The examination of thin sections of serpentinites reveals that the asbestos is formed by the action of hydrothermal solutions on olivine present in the rock. According to Nagy and Faust², fibres appear to be best developed in serpentinites deficient in Fe and Al. The mineral veins may be considered to be formed by filling fractures through the agency of hydrothermal solutions aided by requisite structural deformation, as chrysotile asbestos is a stress-controlled mineral. Anhaeusser¹ is of the opinion that folding is the dominant regional controlling factor for asbestos development whereas faulting and fracturing provide the more localised control governing fibre growth and fibre density.

Finally, it is suggested that the present variety of asbestos is of long fibre type, which is easily separable. It can be used for the manufacture of yarn, asbestos cement, etc.

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A PRELIMINARY REPORT ON THE FAUNA IN RADIOLARITES OF OPHIOLITE-MELANGE ZONE AROUND MULBEKH, LADAKH

THE note gives a first report of the planktonic foraminiferal and radiolarian assemblage from cherts and jasperites associated with the ophiolite-melange suite from Mulbekh (34° 07' 30" N.; 76° 22' 30" E.) in Ladakh district of Kashmir. The ophiolite-melange belongs to the Indus ophiolite belt sandwiched bet-

ween the Kashmir-Rupshu basin to the south and Ladakh granitic mass with its sedimentary cover to the north. The geology of the area is discussed by Shah *et al.*¹.

The ophiolite-melange consists of tectonically emplaced serpentinite bodies and associated sedimentary material. The latter consists of chert, cherty shale, jasperite and occasional limestone. The fauna was recovered from a number of beds of chert and jasperite around Mulbekh and north of Shergol (34° 24' 00" N.; 76° 19' 20" E.). It could be studied only in thin sections since the rock did not respond to maceration. As such the specific identification of foraminifers could not be made and the generic identification of radiolarians is doubtful. The foraminifers identified include *Globotruncana* sp., *Heterohelix* sp. and *Rugoglobigerina* sp. while the radiolarians include *Liosphaera* sp., *Rhodosphaera* sp., *Cenosphaera* sp., *Dictyomitra* sp., *Sethocyrtis* sp. and *Flustrella* (*Flustrella*) sp. Tewari *et al.*² have reported *Globotruncana fornicata* and other planktonic and benthonic foraminifera from Gya in Ladakh from the rocks of the 'Indus Flysch'; the present report, however, is the first one from the 'melange' zone. *Globotruncana* and *Heterohelix* indicate a Middle to Upper Cretaceous age. These genera are also known from Sangcha Malla Formation³ of Kumaun where their specific determination has been made.

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