GEOLOGICAL MAP OF IRAN
1:100.000 SERIES
SHEET 7150-RAFSANJAN 1

The sheet area is to the w and SW of Rafsanjan, covering part of the town itself. Between the Rafsanjan plain in the NE, and the shahr-e-Babak- Sirjan plain in the SW, the main mountain trunk rises to altitudes between 2000 and 2570 m. the most important communication is the firs-class road Kerman-Yazd in the northern part. The third-class road from Rafsanjan to Sar Cheshmeh and several motorable tracks transect the central trunk, connecting Rafsanjan with shahr-e-Babak and Pariz . Large areas are not accessible by vehicles.

REVIEW OF FORMATIONS

UPPER CRETACEOUS MARLS were found in a very small area only, tectonically enclosed in Eocene flysch. This is a lithologically homogeneous series of light-coloured marls or marly siltstones, containing sporadically a rich pelagic microfauna (globotruncana ex gr. Tricarinata, Heterohelicida, and others).

EOCENE FLYSCH. Lower horizons of this series are not known. In the outcropping part., which is many hundred meters thick, three horizons may be disitinguished. The lowermost horizon exposed consists mainly of sequences with intervals of current lamination (fine-grained calcarenites or silty micrites with characteristic convoluted lamination) and upper horizontal lamination, grading into plitic intervals. Sedimentary structures are rare and are represented only by brush, prod, and scarce drag marks. Bioglyghs are prominent, in such simple forms as paleo-chorda and pallaeobullia. In the fine-grained calcarenites numerus microforms have been found; the upper Cretaceous forms (globotruncana div.sp.) are considered to have been redeposited form older deposits, and the Lower Eocene is represented by globoigerina sp., Globorotalia cf. aragonensis, Heterohelix sp., and others. The middle horizon is sedimentologically more heterogeneous. Sequences have all intervals developed, the lower ones being thicker. The arenites consist of greywackes and feldspathic greywackes (always calcareous) as well as calcarenites and biocalcarenites of the biosparite group. Fluxoturbidites are also present, consisting mainly of feldspathic greywackes. An abundant fauna was fond, mainly of Maestrichtian age (Lepidorbites socialis, siderolites calcitrapoides, Numophalocia cretacea, omphallocyclus sp.), with Eocene forms also (Spiroclypeus sp., Asterodiscus sp., Calcarina sp., Nummulites sp., Gypsina sp.).
The upper horizon is marked by thick fluxoturbites alternating with sequences consisting of biocalcarenites with an abundant Eocene (mostly nummulitic) fauna. Glomalveolina cf. subtilis, Nummulites var. sp., Assilina sp., Cuvierina vallensis, and others were determined. In the upper part of the horizon, the fluxoturbidites are conglomeratic.

CONGLOMERATIC LIMESTONES AND RUDITES. The flysch passes upwark into a lithologically variegated horizon, several decameters thick, consisting of conglomeratic limestones, rudites, and thick-bedded arenites, changing laterally. Limestones form thick beds with abundant fauna, interbedded with fine-grained calcarenites or sandy marls. They correspond to biostromal lag deposits, and contain fragments of pelecypods and gastropods. as well as operculina sp., assilina sp., amphistegina sp., spiroclypeus sp., and numerous nummulites. Sandstones show coorse cross-bedding and pebble clouds, characteristic of a shallow-water environment. Rudites were found in the eastern part of the area; they area pink in colour, and consist mainly of angular fragments of cretaceous flysch rocks.

CONGLOMERATS develop gradually from the limestones mentioned. Their lower-middle Eocene age is proved at the bases by large foraminifera (Alveolina div. sp., A.cf.. oblonga). They have a rather chaotic granulometry and very poor sorting. Pebbles and blocks consist of calcarenites, sparites, micrites, and (in some horizons only) of nummulites and alveolina limestones. Normal contacts of conglomerates can be rarely seen because of ubiquitous tectonization; the lower one is well exposed W of shir Abad.

RED SANSTONES grade from the conglomerates. They comprise calcareous and feldspathic subgreywackes and fine-grained calcarenites, and frequently show horizontal and in places cross laminbation of a shallow-water type. The thickness of sandstones is several hundred meters.

MARLS AND LIMESTONES outcrop near the western margin of the sheet, and have mostly tectonic contacts with other strata. They represent a rhythmic alternation of limestones, micrites (marly and sandy), and marls, without coarse detritus of signs of shallow-water deposition. These rocks are not fossiliferous.

EOCENE VOLCANOGENIC COMPLEX unconformably overlies the Eocene sedimentary strata. Five distinct horizons have been distinguished.

The lowermost horizon begins with basal arenites, about 7 m thick, overlain by an alternation of agglomerates, tuffs, and lava flows. In the lower part of this horizon, volcanoenic rocks are andesite-basalts with monoclinic pyroxene and rare olivine (weiselbergites and navites). Lava flows contain in places amygdales and have a slaggy structure. they pass upwards into rocks of albite-trachytic composition, with a subaerial ignimbritic flow, a few meters in thickness. Over this flow, conglomerates occur, followed by rocks with andesite-basaltic composition. This horizon is about 120 m thick.

The second horizon is composed of calcareous and some carbonate-sandy rocks, with Middle-Upper Eocene fauna of nummulites, pellecypods, gastropods, and echinoids, where conoclypeus conoides and schiraster delbosi have been determined. This horizon is about 30 m thick.

The third horizon is built up of rocks which have andesite-basaltic, albite-trachytic, and trachy-andesitic composition in the lower parts. And andesite-basaltic in the upper part. Pyroclastics are dominant, with scarce lava flows. Toward the top of this horizon, the quantities of olivine and monoclinic pyroxene decrease. The thickness is over 500 m.

The foutth horizon is possibly unconformable over the third one. It consists of pinkish arkoses, and andesite dacitic tuffs, tuffo-sandstones and tuffo-conglomerates, with scarce lava flows. Volcanics from this horizon contain, beside monoclinic pyroxene, also hornblende, some biotite, and abundant volcanic glass in the groundmass. Rittmann's explosive index is over 90% the thickness amounts to 350 m.

The uppermost, fifth horizon, is the thickest one. It begins with pyroxene trachyandesitic lava flows, agglomerates and tuffs, alternating upwards with pyroxene trachybasalts, pyroxene-olivine trachybasalts and their pyroclastics pyroxene-olivine dolerites, and scarce sedimentary beds. Volcanics from this horizon have more alkali-feldspar and olivine than in the lower horizons. They are more potassic whilst volcanics of lower horizons have mainly a calcalkali and sodic character. Dykes, genetically belonging to this horizon, are abundant.

PLUTONIC ROCKS are present only as a small boss in the SE corner of the sheet area. These rocks have generally a monzonitic composition, with some trasitions toward granosyenites and syenites. They consist of andesine, perthitized K-feldspar (orthoclase or onrthoclase), myrmekite, biotite, and some augite and quartz Dykes of pertaining rocks are very numerous; they have a diorite-porphyritic and quartz-diorite-porphyritic composition, consisting of labradorite, augite, quartz, and rare biotite. All these magmatites intrude Eocene rocks Around the monzonitic body, sometimes along dykes as well, the surrounding rocks are altered (hornfels of amphibolite and albite-epidote facies, with some epidotization and chloritization and strong carbonitization). The monzonite contains tourmaline greisen.

NEOGENE VOLCANICS are represented by the rest of the small Bad Bakht Kug central volcano which is composed of hydrochemically consolidated pyroclastics and subvolcanic veins of dacitoid composition. These rocks correspond to the volcanics of the Sar Cheshmeh area.

NEOGENE sedimentary strata form two series. The older outcrops at Marakash Kuh. It consists of sandstones and microconglomerates, with a conspicuous horizon of vitroclastic dacitic tuffs. These sediments are tilted and (near Uraf) folded. The younger Neogene sediments consist of sandstones, frequently with pebbles of volcanic rocks. They are almost horizontal.

QUATERNARY. Old (Pliocene-pleistocene?) terraces are well developed in the S part of the sheet area, as well as remnants of older gravel fans. Younger dasht covers mountain slopes toward the plains; in the northern part of the sheet area, the plain is covered with sand, having well developed depositional forms of longitudinal and barchan type.

STRUCTURAL FEATURES

There different styles of deformation characterize (I) the lower, sedimentary part of the Eocene, (II) the Eocene volcanogenic complex, and (III) the Neogene beds.

The tectonics of the Eocene sedimentary strata are of alpine type and highly complicated. Sedimentation was uninterrupted up to the end of sedimentation of post-flysch marls and limestones, ending in the Middle Eocene when a major phase of folding took place. The rocks are folded into tight forms, with a high index and a general SE overturn. The most conspicuous is the large recumbent shir Abad anticline, with an amplitude of several kilo-meters (cross section A-B). This type folding accounts for the invergeces of m-Dm folds are seemingly towards the NE; the folds have in fact a SW-overturn, with a degree of overgnces of about 160º in the lower, inverse limb of the anticline. The

differences in ductility between conglomerates and other rocks caused in many places a tectonization of contacts, very conspicuous W of Cheshmeh Khezr.
The Eocene volcanogenic complex, which unconformably overlies Eocene sedimentary strata, is folded into large open folds with undulating axes. The most outstanding is the Rud-e-Moghuiyeh anticline. South-west of this, a gentle syncline is situated, having its possible continuation towards the SE in the Nazar Abad syncline. Faults form three main systems: those of regional importance are NW-SE; others have only local significance cutting the structures obliquely. The Tell-e-Fattah black represents a halfgraben, with a tectonic SW boundary where rather large and complicated movements took place, even with transposition of s-surfaces in the flysch.
Towards the NE, the central block is limited by a regional longitudinal fault, rejuvenated even in the Quaternary. North-east of this fault the Neogene of Marakash Kuh occurs, with dips up to 35º. The younger Neogene beds are horizontal.

MINERAL OCCURRENCES

In the area there are hydrothermal copper occurrences, located in the Eocene volcanogenic complex and associated most probably with diorite intrusives and dykes. The palangi, deposit, situated in the Tall-e-Fattah block, comprises three mineralized zone (Cheshmeh Kher, palangi, and taleh Dozdeh) representing. A low degree of hydrothermal activity accompanied by carbonitization and some sericitization and argilization. The silicified and mineralized Deh siahan fault zone (E of Sardi village) carries veinlets and dense impregnations with Cu-minerals Impregnation type, with Cu-carbonates, chalcopyrite and pyrite, were found SE of Zandeyeh and W of Shah A bad. Metasomatic types occur in the left tributary of Rud-e-Moghuiyeh, replacing carbonate rocks. Weak impregnations of galena with malachite coatings have been found E of sardi village.