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Geology of a part of the Kohistan terrane between Gilgit and Chilas, northern areas, Pakistan

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ABSTRACT: *More than 4000 Km² area of the Kohistan terrane, exposed between Gilgit and Chilas, is mapped and described in this paper. A variety of plutonic and metamorphosed volcanic and sedimentary rocks are encountered in the mapped area, which have been classified into Kamila amphibolite, Chilas complex, Kohistan batholith and Jaglot Group. The Jaglot Group, comprising a succession of mesediments and metavolcanics, is divided into three stratigraphic units, which, from base to top, include Gilgit Formation [~1km thick succession of schists, paragneisses, calc-silicates and amphibolites (some derived from the pillowed basalts)], Gashu-Confluence Volcanics (>0.5km thick volcaniclastics and massive to pillowed basalts) and Thelichi Formation (comprising a volcanic basal part, overlain by >1km thick turbidites with a thick marble unit in the middle). The rocks of the Jaglot Group are regionally metamorphosed in amphibolite- and greenschist facies; the highest grade is depicted by the occurrence of silliminite in the pargneisses of the Gilgit Formation. A pair of crustal-scale anticline (the Gilgit anticline) and syncline (Jaglot syncline) control the structure of the area. These, together with their parasitic folds, repeat the stratigraphy of the area several times. The Jaglot Group is regionally correlated with the succession of metasediments and metavolcanics exposed along the Northern Suture (i. e., Yasin Group Sediments and Chalt Volcanics) and is considered to have been deposited in an oceanic basin (probably of a back-arc affinity) on the basis of the predominance of turbidites in the metasediments and pillowed basalts in the volcanics.*

INTRODUCTION

The Kohistan terrane in northern Pakistan is identified as crust of a Cretaceous island arc, tectonically squeezed between the collided Indian and Karakoram-Asian plates (Fig. 1) during Late Cretaceous and Late Palaeocene-Early Eocene (Tahirkheli et al., 1979; Coward et al., 1986). Despite its petrological significance, for being one of the rare occurrences of a continuous exposure of more or less a complete arc crust, hitherto only a few detailed studies have been conducted. The major contributions regarding the geology of the Kohistan terrane include Ivanac et al. (1956), Desio (1974, 1979), Tahirkheli et al., (1979), Jan and Howie (1981), Jan and Windley (1990), Bard et al. (1980), Coward et al. (1986, 1987), Petterson and Windley (1985, 1991), Pudsey et al. (1985), Khan M. A. et al. (1989, 1993), Treloar et al. (1989), Ghazanfar et al. (1991), Miller et al. (1991) and Sullivan et al. (1993) and. Much of the existing knowledge about Kohistan comes from studies conducted along relatively easily accessible valleys like Indus, Hunza, Swat and Dir. An extensive terrane comprising high-relief mountains, between these valleys, remains to be mapped.

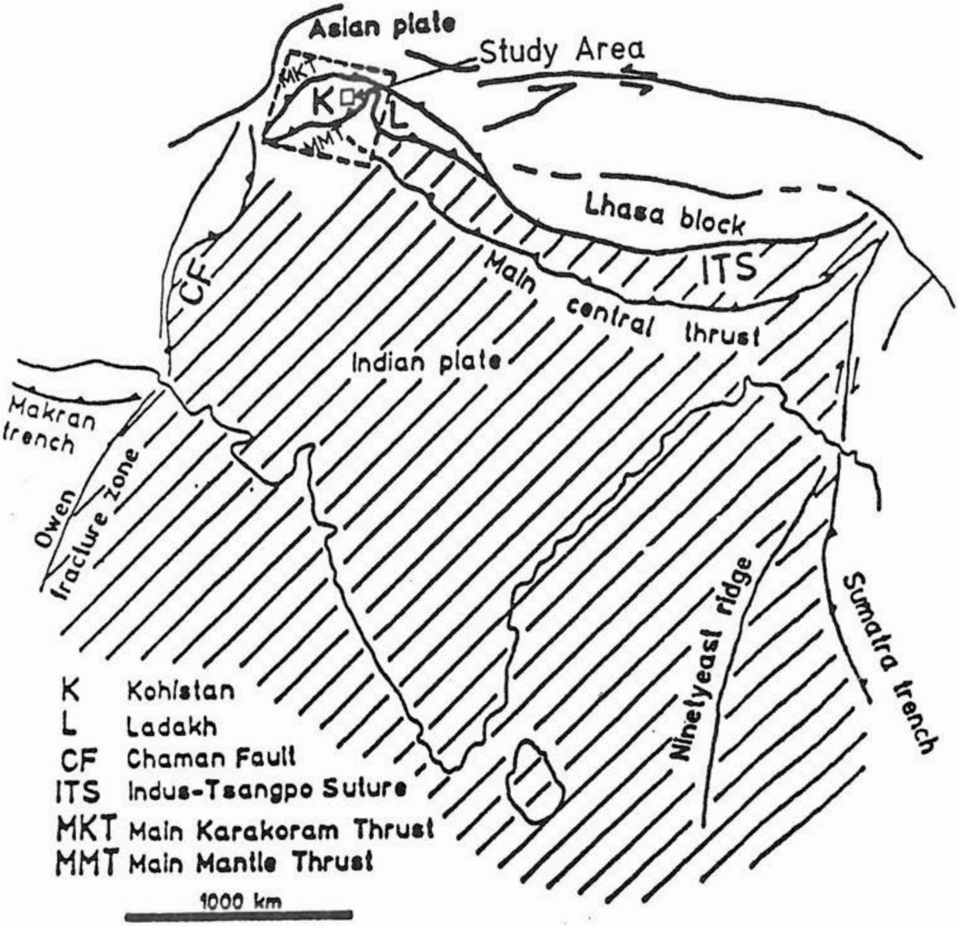

Fig. 1. Sketch map showing the Himalayan collision zone involving a collage of Asian plates and the Indian plate (shaded). The tectonic position of the Kohistan and Ladakh terranes is shown, together with the location of the presently studied area.

This study was initiated as a Geological Survey of Pakistan routine mapping program. Later it was incorporated into an ongoing program of mapping and research in Kohistan, being conducted by the NCE Geology, University of Peshawar. This paper describes the geology of the drainage divide between Gilgit and Indus rivers (latitudes 35° 26' to 36°N and longitudes 74° to 74° 38'E), in the area west of Jaglot (Fig. 2). The prepheral parts of the mapped area are accessible by the Karakoram Highway (KKH), along the Indus and Gilgit rivers. The interior was accessed by trekking across ~ 4000 metres high passes connecting northern tributaries of Indus (Kiner Gah, Ame Ges Gah, Goharabad and Sai Nala) with those to the south of the Gilgit river (e.g., Kar Gah, Shinghai Gah and Chileli Gah).

The previous studies, in the mapped area, remained restricted to reconnaissance along KKH (e. g., Tahirkheli, 1982). The only map, with any details, was produced by Ahmed et al. (1977) for the road-side area between Jaglot and Thelichi. Petterson (1984) mapped the area adjacent to

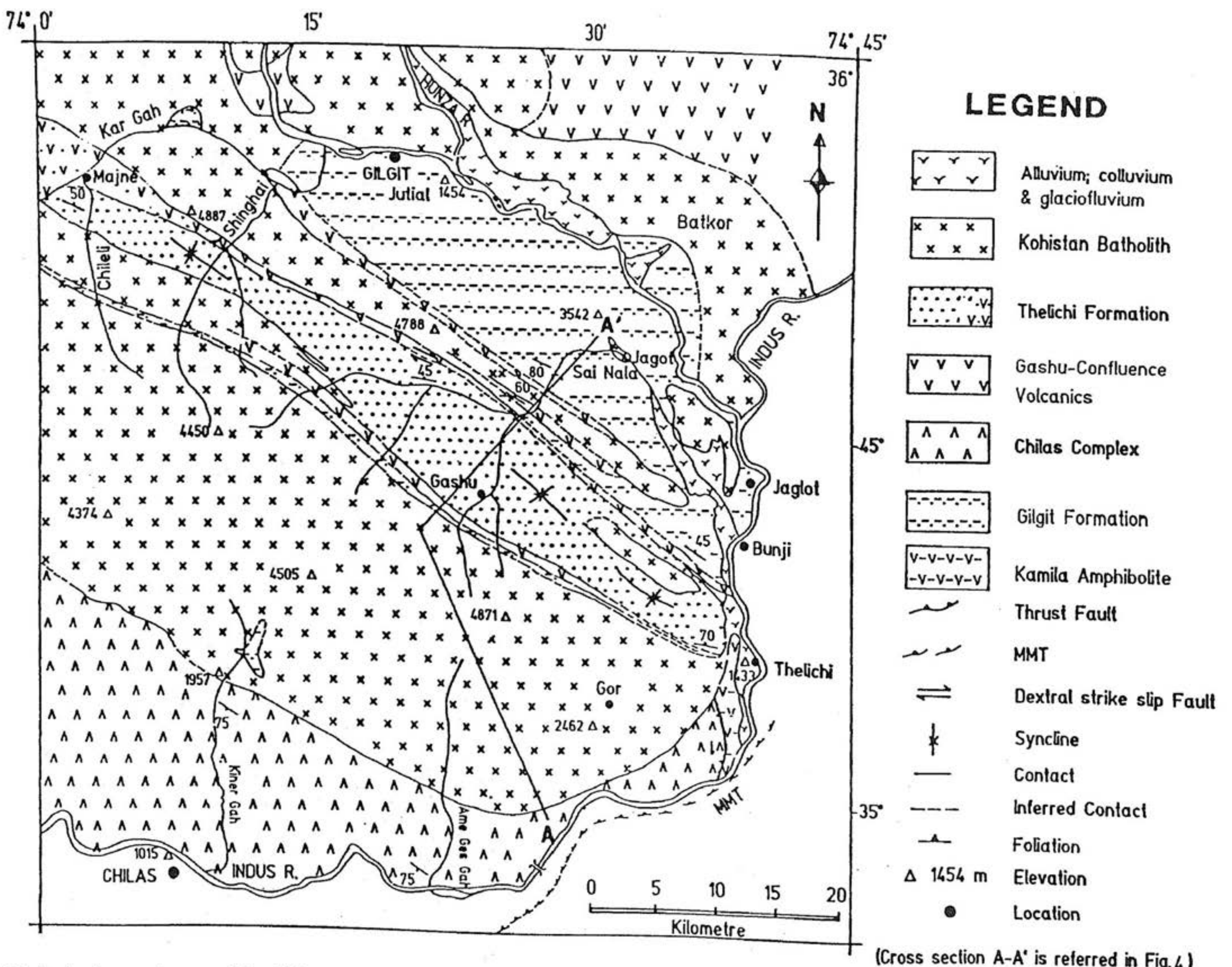

Fig. 2. Geological map of a part of the Kohistan terrane exposed between Chilas and Gilgit, northern Pakistan.

the Gilgit river, between the Indus confluence in the SE to the west of Gilgit, outlining the granitic plutons belonging to the Kohistan batholith. Coward et al. (1986, 1987), based on their studies along KKH in the Thelichi area, pointed out the existence of a major fold structure which they termed the "Jaglot syncline".

Through this paper, we present a detailed map of this difficult and previously unmapped terrain. Not only that the contacts of the plutonic rocks of the Kohistan batholith (Petterson and Windley, 1985) and Chilas complex (Jan et al., 1984; Khan M. A. et al., 1989) are delineated, the country rocks have been classified in terms of their stratigraphic relations. Finally, in the light of these observations, we draw some conclusions regarding the tectonomagmatic evolution of the Kohistan terrain.

GENERAL GEOLOGY

The mapped area consists of a variety of plutonic and metamorphosed volcanic and sedimentary rocks. Broadly, these are divisible into three groups; Chilas complex, Kohistan batholith and country rocks comprising stratified metasedimentary and metavolcanic successions.

The Chilas complex

Much of the southern part of the mapped area comprises the Chilas complex. It consists, predominantly, of pyroxene diorites and gabbronorites. However, all the major rock types, reported elsewhere from the complex (Jan et al., 1984; Khan M. A. et al., 1985, 1989, 1993), are present in subordinate proportions. These include gabbros, anorthosites, troctolites, peridotites, dunites and mafic dykes. Locally the pyroxene diorites and gabbronorites are sheared yielding amphibolites. In the eastern part of the mapped area, the Chilas complex has a direct northern contact with the granitic rocks of the Kohistan batholith. The contact is typically intrusive, as shown by the dykes and apophyses originating from the granitic body and cutting into the Chilas complex. This feature is particularly well exposed near the village of Drang (southwest of Gor). Despite an intrusive nature, however, the contact is remarkably linear either due to post-intrusion flattening or more likely, due to the linear nature of the magmatic axis for the Kohistan batholith. In the western part of the mapped area, there are screens and xenoliths of amphibolites, paragneisses and biotite schists contained in the pyroxene diorites of the Chilas complex. This feature is particularly well displayed in Kiner Gah (Khan, 1988). The paragneisses and schists contain quartz, plagioclase, biotite, garnet, kyanite and graphite. In the northern parts of Kiner Gah and Hudar Gah, the Chilas complex intrudes the amphibolites. The contact is sharp and shows chilling effects. Amphibolite xenoliths are found within the complex near the contact. We use these observations to conclude that i) the Chilas complex was intruded into a sequence of country rocks comprising pelitic schists and paragneisses, which are commonly intercalated with amphibolites and ii) the Chilas complex was itself intruded by the Kohistan batholith.

The Chilas complex has a tectonic contact with the Kamila amphibolite in southern Kohistan (Khan & Coward, 1990). Only a small part of the Kamila amphibolite occurs in the mapped area, to the eastern side of the Thelichi-Raikot sector of the KKH. Again the contact between the Kamila amphibolite and the Chilas complex is sheard. The two have a tectonic contact with, and at a right angle to the trend of, the metasedimentary succession of the Thelichi area.

Kohistan batholith

Tahirkheli and Jan (1979) and Jan et al. (1981) identified the presence of a major belt of granitic rocks in the northern parts of the Kohistan terrane, which was later termed as the Kohistan batholith by Petterson and Windley (1985) and Coward et al. (1986). As far as the presently mapped area is concerned, it is commonly shown to be occupied entirely by the Kohistan batholith (e.g., Tahirkheli and Jan, 1979; Coward et al., 1986). Despite a greater variety of rocks recognised during this study (Fig. 2), the granitic rocks of the Kohistan batholith are still in preponderance. The batholith, in the studied area, comprises three mutually parallel plutonic belts. These include, from SW to NE, Gor, Shinghai and Batkor. Several smaller plutons, either intrusive into the older plutons or the other lithologies, are mapped separately (Fig. 2).

Gor plutonic belt: This is the principal occurrence of the Kohistan batholith in the studied area. It occurs along the drainage divide between the Indus and Gilgit rivers. It is about 25-30 km wide and, in the mapped area alone, stretches for 60-70 km in a WNW-ESE trend. The Gor pluton is a coherent body of mainly quartz diorite composition. Some 15% of the Gor pluton consists of intrusions of other phases including granodiorite, granite and adamellite. There are abundant aplites but pegmatites are sparse. The main pluton contains abundant xenoliths and autoliths of basic composition. The latter are probably derived from some unexposed earlier phases of the batholith. Both the northern and the southern contacts of the pluton are intrusive. In the south, the Gor pluton is intrusive into the Chilas complex, while in the north, it is intruded into the folded sedimentary succession of the Jaglot Group. The map pattern of the Jaglot syncline and the Gor pluton (Fig. 2) do not depict cross-cutting relationship between the two. However, there is no field evidence suggesting involvement of the Gor pluton in the folding. We consider that the intrusion of the Gor pluton postdated the folding.

Shinghai plutonic belt: A large plutonic body of the Kohistan batholith occurs to the west of Gilgit in the Kar Gah area. An extension of this body stretches towards SE, across the Shinghai Gah and Sai Nala, but terminates before reaching KKH. Altogether, the pluton is about 2 km wide and about 25 km long. This pluton is predominantly basic to intermediate in composition, comprising gabbros and diorites. At places, serpentinites and pyroxene-rich ultramafic rocks occur as xenoliths (Khan T. et al., 1989). The pluton is commonly sheared and amphibolitised.

Batkor plutonic belt: This plutonic body occurs just NW of Jaglot, passes through the Indus confluence, and stretches along the Gilgit river on its northeastern side. It was studied in details by Petterson (1984). He noticed the presence of three phases at the Indus confluence and at the ridge just to the north of Gilgit. These included tonalite gneisses (stage 1), diorites (stage 2) and leucogranitic aplites/pegmatites (stage 3). The latter are extremely abundant near the Indus confluence, where up to 50% of the batholith comprises of them. They become progressively subordinate towards NE, away from Nanga Parbat. The present study confirms observations of Petterson (1984). The ridge, across the river from Gilgit, comprises tonalite/trondhjemite, whereas the rest of the Batkor belt comprises, mainly, of diorites and granodiorites.

Several discrete plutons were mapped and studied during the course of this work. These include Jut granodiorite, Chileli granite, Dusi granite and Kar Gah leucogranites. Further details of the Kohistan batholith and its component plutons will be presented separately (Khan et al., in prep.).

Jaglot Group of metasediments and metavolcanics

The Thelichi-Gilgit sector of the KKH passes through a succession of metasediments and metavolcanics, defined as the Jaglot Group during this study. Wadia (1933) was first to note their occurrence. On the basis of abundance of pelites and local presence of graphite, he correlated them with the Precambrian Salkhala Formation from the Indian plate. Tahirkheli (1979, 1982), after recognising affinity of these metasediments with the Kohistan terrane, assigned them a Jurassic-Cretaceous age and suggested a correlation with those at Kalam. Coward et al. (1987) noted that these metasediments are stratigraphically lowest in the Kohistan sequence and occupy the core of a large antiformal fold.

The Jaglot Group was mapped in detail during the course of this study. The group is exposed in two NW-SE trending belts between the Gilgit river and the Gor drainage divide, separated by the Shinghai plutonic belt of the Kohistan batholith. The SE extension of the group is truncated against faults associated with the Raikot fault/Main Mantle Thrust along the Indus river, while the NW extension is oblitrated by the intrusions of the Kohistan batholith. Detailed distribution, lithological description and mutual relations are treated in the following section.

LOCAL STRATIGRAPHY

The Jaglot Group of metasedimentary and volcanic rocks, in the studied area, is divisible into three units. These include, in a stratigraphic order, the Gilgit Formation, the Gashu-Confluence Volcanics and the Thelichi Formation.

Gilgit Formation

Lithological description: The Gilgit Formation comprises mainly of paragneisses and schists of metasedimentary origin. They include both metapellites as well as metpsammites, commonly interstratified at regular intervals. At several places, it appears that the two have gradational relationship with each other. Other lithologies in the formation include amphibolites and calc-silicates. The amphibolites are frequent and form laterally continuous horizons. Although some of the amphibolites may be transposed dykes and sills, others are definitely derived from basic tuffs and volcanic flows. One such horizon in the Sai Nala, midway between Jaglot and Gashu confluence, comprises about 4 metres thick sequence of stretched pillows. The calc-silicate horizons are common in the upper part of the formation, above the pillowed-amphibolite horizon.

The rocks of the Gilgit Formation show evidence of regional metamorphism up to sillimanite grade. The metamorphic index minerals in the paragneisses and schists include biotite, garnet, kyanite and sillimanite. The top-most unit in the Gilgit paragneisses is biotite schist grading downward into garnetiferous schist, and kyanite and sillimanite gneisses. In the deeper levels the paragneisses have undergone anatexis, resulting in the development of pigmatites.

Distribution: The distribution of the Gilgit Formation is controlled by structure. Three NW-SE trending belts are mapped. The principal belt (15 x 40 km) is located between Jaglot in the SE and Gilgit in the NW, in the core of a large antiform (Coward et al., 1987). The other two belts are relatively much narrower (< 500 metres each) and occupy the two limbs of the Jaglot syncline, enclosing the younger strata of Gashu-Confluence Volcanics and the Thelichi Formation.

Stratigraphic relations: The lower contact of the Gilgit Formation is not exposed. However there are indications that the Gilgit Formation is underplated by the Chilas complex. For instance, just to the south of the Sai Nala-Indus confluence near Jaglot, the paragneisses enclose a block of layered basic rocks which resemble closely with those of the Chilas complex. Screens and xenoliths of biotite schists and paragneisses of the Gilgit Formation are abundantly enclosed in the Chilas complex in the Kiner Gah area.

The Gilgit Formation has a stratigraphic upper contact with the Gashu-Confluence Volcanics. Observations in the Sai Nala, between Jalgot and Gashu confluence, suggest a transitional contact between the two, marked by a zone of intercalated biotite schists and metabasalts.

Thickness: The enormous width of the exposures in the Sai Nala section is clearly due to intense and common parasitic folding. The thickness in the limbs of the Jaglot syncline, on the other hand, is probably attenuated due to ductile stretching. The thickness of the Gilgit Formation (Fig. 3), therefore, remains highly speculative.

Gashu-Confluence Volcanics

The presence of amphibolites, on the roadside between Thelichi and Jaglot, is previously noted by Ahmed et al. (1977), Tahirkheli and Jan (1979) and Bard et al. (1980). We have mapped the extension of these metavolcanic amphibolites towards NW, across the Sai Nala, Shinghai Gah and Kar Gah, and have named them after their occurrence at the Gashu confluence, in the upper reaches of the Sai Nala. However, it may be stated that their exposure at the KKH between Thelichi and Jaglot is equally comprehensive both in terms of complete lithologies and intact stratigraphic position, which may be referred to as the type section.

Lithological description: The Gashu-Confluence Volcanics comprise tuffs, volcaniclastic sediments and flows. An ~500 metre thick section along the KKH, south of Jaglot, comprises pillowed basalts alternating with massive basalts and volcaniclastic sediments. The volcanics and associated rocks are metamorphosed to lower amphibolite facies of regional metamorphism.

Stratigraphic relations: The Gashu-Confluence Volcanics are about 500 metres in thickness (Fig. 3) and have a transitional contact with the underlying schists and paragneisses of the Gilgit Formation. The upper contact with the Thelichi Formation is sheared. However, persistence of the two formations along the contact suggests that originally the contact was stratigraphic. We further consider about the possibility of an unconformity at this contact. This speculation is based on a break in the grade of regional metamorphism between the Gasu-confluence volcanics and the Thelichi Formation; the former is lower amphibolite/upper greenschist and the latter hardly approaches lower greenschist facies.

Thelichi formation

The Thelichi Formation was previously described as Salkhala series (Wadia, 1932) and Thalichi beds (Tahirkheli, 1982). Detailed mapping, during the course of this study, shows that the Thelichi Formation occurs in the core of the Jaglot syncline, and is therefore younger than the Gashu-Confluence Volcanics and the Gilgit Formation.

Lithological description: The Thelichi Formation comprises a sequence of slates, marbles and metavolcanics. The basal unit, which is localized only in the upper reaches of Kar Gah, comprises volcanics, which in this study, are termed Majne volcanics. These are fine grained and schistose to massive, presumably comprising volcaniclastic sediments and flows. Elsewhere in the studied area, the Majne volcanics either do not continue laterally, or are difficult to be distinguished from the underlying Gashu-Confluence Volcanics. The rest of the formation comprises predominantly of interbedded slates and sandstones, probably derived from an assemblage of interbedded sand-, silt- and mudstone of turbidite origin. A thick unit comprising thick-bedded marbles occur in the middle part of the formation. The unit is laterally persistent and serves as a useful marker horizon. The succession of slates above and below the marble unit are grossly identical.

As mentioned above, the lower contact of the Thelichi Formation with Gashu-Confluence Volcanics is sheared.

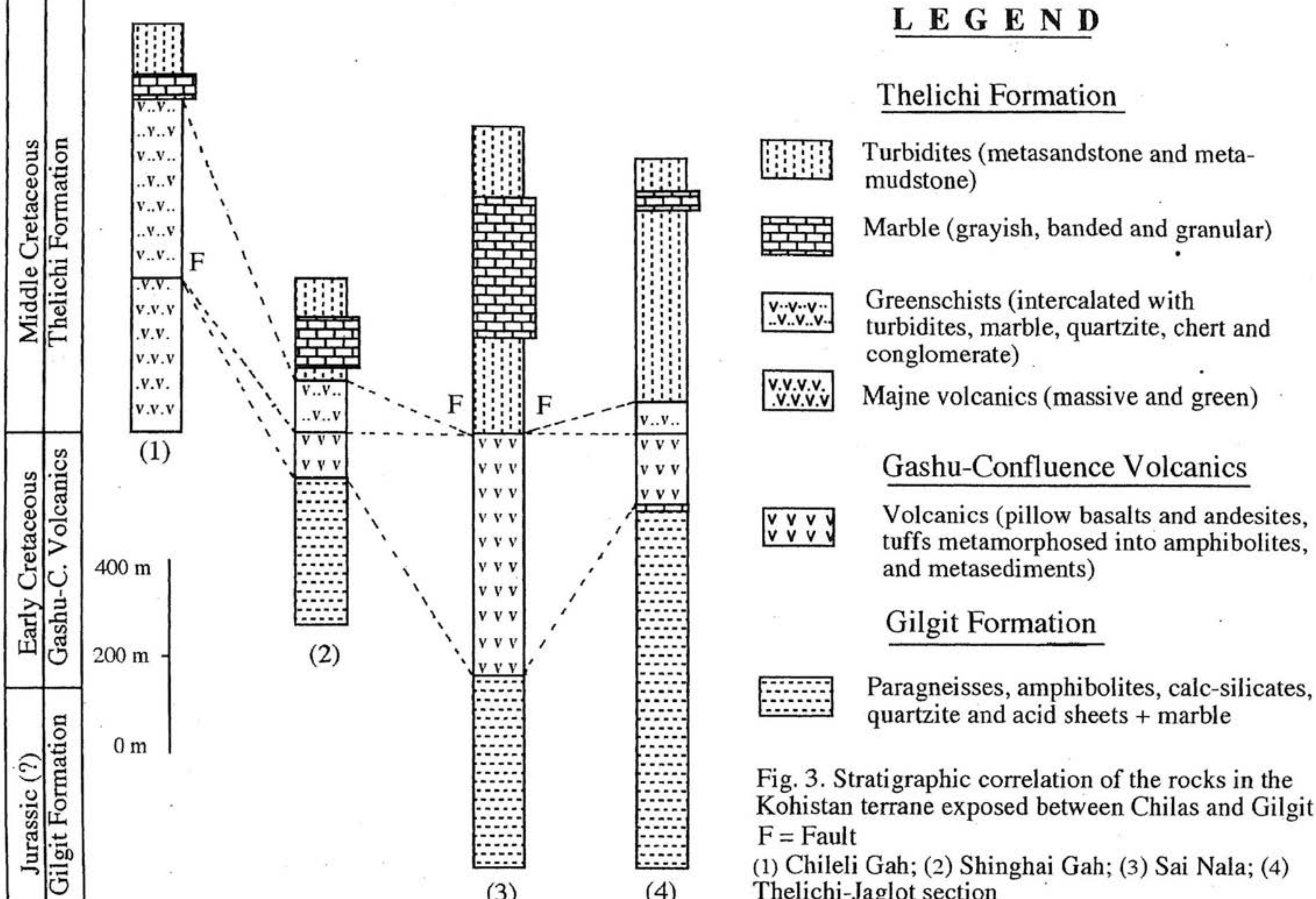

Fig. 3. Stratigraphic correlation of the rocks in the Kohistan terrane exposed between Chilas and Gilgit
F = Fault
(1) Chileli Gah; (2) Shinghai Gah; (3) Sai Nala; (4) Thelichi-Jaglot section

Fig. 3. Stratigraphic correlation of the rocks in the Kohistan terrane exposed between Gilgit and Chilas.
1. Chelili Gah, 2. Shinghai Gah, 3. Sai Nala, 4. Thelichi-Jaglot section; F = Fault.

STRUCTURE

The structure of the mapped area is principally governed by a pair of anticline and syncline, respectively termed the Gilgit anticline and Jaglot syncline (Coward et al., 1986, 1987). The folds are of a crustal scale and involve the entire middle to upper arc crust of the Kohistan terrane (Fig. 4). The Gilgit anticline has a half wavelength of approximately 15 km. The Gilgit Formation occupies the core of the anticline. The SW limb of the Gilgit anticline dips towards south in Jaglot and lower reaches of the Sai Nala. A major parasitic fold occurs in the upper reaches of the Sai Nala, just to the north of Gashu confluence. This not only repeats the Gilgit Formation and Gashu-Confluence Volcanics twice but also changes the vergence towards SW.

The Jaglot syncline is best exposed in the Thelichi section and has been traced towards northwest in the mapped area. It is a plunging fold with vergence towards SW. The fold axis trends N50°W and plunges 30° towards SE. Extensive intrusions of plutons belonging to the Kohistan batholith obliterate the structures south of Majne in Chileli Gah. In the NW limb at the Gashu confluence, the Gashu-Confluence Volcanics are underlain by the metasediments of the Thelichi Formation in an overturned sequence. The core of the syncline is characterized by a tight closure, occupied by the Thelichi Formation. A broad shear zone is present in the Gashu valley, in the core of the Jaglot syncline, which is marked by abundance of isoclinal folds and reverse faults. These small-scale folds disturb the regular foliation directions in the parent rocks. The Gashu-Confluence Volcanics and ultimately the paragneisses/schists of the Gilgit Formation reappear SW of the Gashu village at the SW limb of the Jaglot syncline. Further south

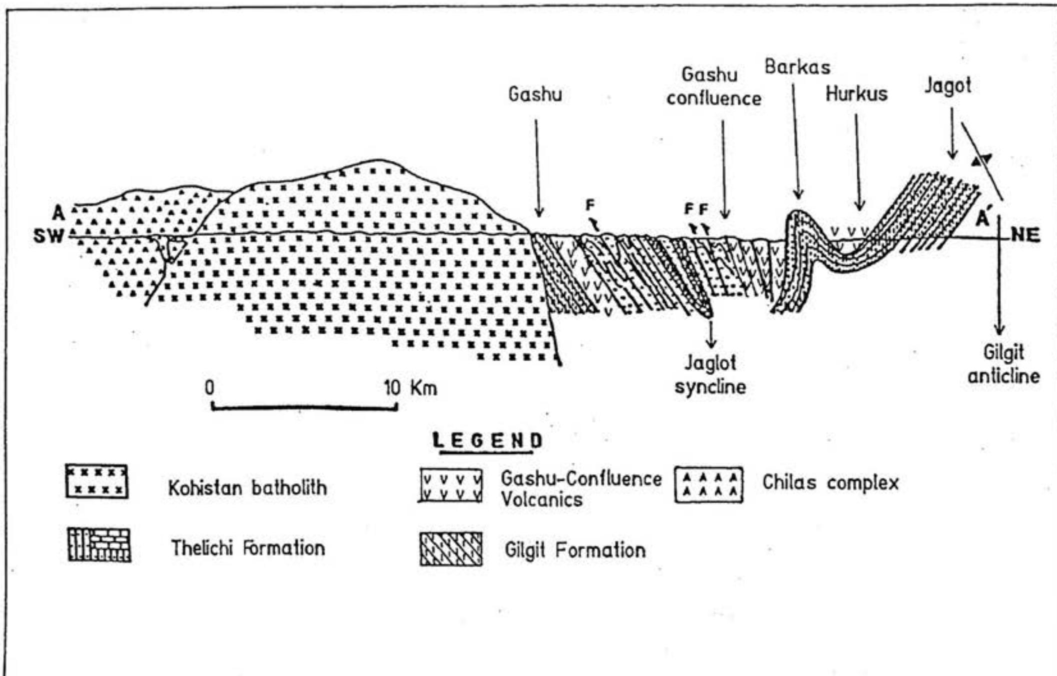

Fig. 4. Generalized cross-section showing structural repetiotion of the Jaglot Group. The section line follows Sai Nala and Gashu Gah. Vertical scale exaggerated.

the structure is clearly cut by the main Kohistan batholith, obliterating any relationship between the Jaglot syncline and the structures in the Chilas complex.

In the Chilas complex many NW trending ductile shear zones have been recognised. For instance, in Kiner Gah at Thak, a 2 km wide zone is occupied by a sheared tonalite (amphibolite). Here, the tonalite strikes N30°W and dips 40°N, but further south in the shear zone, it strikes N55°W and dips 85°S. Shear folds are commonly found in the tonalite, and pigmatites are developed along the intense shears. A second major shear zone has been recognised in the northernmost part of the Kiner Gah and Hudar Gah. Some amphibolites overlying the Chilas complex show shear structures. The tonalites found at these localities are intensely sheared, making them difficult to distinguish from the metasedimentary biotite-quartz gneiss. The sheared tonalite shows two trends of foliations i.e. N35°W/ 50°SE and N60°W/50°NE, making an asymmetric anticline.

There is no direct control available for the determination of the age of deformation in the studied area. The involvement of the Thelichi Formation [which is considered to be Albian/ Aptian (Middle Cretaceous) in age on the basis of its correlation with the Yasin Group] marks the upper age limit of deformation to be ~ 100 Ma. The Gor pluton, which cuts the Jaglot syncline at its SW limb, is correlatable with the stage II plutons of Petterson and Windley (1985) and thus may be 60-80 Ma. Old. Therefore the Gilgit/ Jaglot fold structures and associated deformation may be roughly correlated with the closure of the northern suture (Coward et al. 1986, 1987).

REGIONAL CORRELATION

Although it is for the first time that the high-grade schists and paragneisses of the Gilgit Formation are mapped in detail and assigned the status of a stratigraphic entity, the rocks of similar compositional characters are recognised sporadically from various parts of the Kohistan terrane. The closest vicinity from where such rocks are reported is the Kiner Gah, north of Chilas. Khan (1988) and Khan and Jan (1992) recognised a suite of xenoliths comprising biotite schists and paragneisses included in the gabbronorites/ pyroxene diorites of the Chilas complex. These were interpretted to be part of the country rocks at the roof of the magma chamber. To the north of the presently studied area, Tahirkheli (1982) reported Garnet-staurolite schists and paragneisses from south of Jaffarabad, Hunza valley. The stratigraphic position of these rocks i.e., below the Chalt volcanics, is very similar to that of the Gilgit Formation below the Gasu-confluence Volcanics. We use this correlation, together with the arguments based on structural analyses, to suggest that the volcanics and turbidite sediments overlying the Gilgit Formation, in the presently studied area (i.e., Gashu-Confluence Volcanics and the Thelichi Formation), are equivalents of the Chalt Volcanics and the Yasin Group Sediments.

On more regional levels, the Gilgit Formation appears to have sound resemblance in lithologies and stratigraphic position with the Katazarh Formation (Hanson, 1989) in part of the Kohistan terrane extending into the Baltistan region. This formation comprises metasediments that are regionally metamorphosed to garnet and silliminite grades. The Katazarh Formation is overlain by volcaniclastic metasediments and metavolcanics equivalent to the Gashu-Confluence Volcanics.

Other regional equivalents of the Jaglot Group are reported from Swat-Dir Kohistan. A succession of schists (termed Karandukai schists by Tahirkheli, 1982 and Peshmal Schists by Sullivan et al., 1993) overlain by amphibolites (termed Mankial volcanics; Sullivan et al., 1993) constitute the Kalam Group in the upper Swat. These rocks resemble closely with the lower part of the Jaglot Group in terms of composition and stratigraphic order. The equivalents of the Thelichi Formation are, however, missing from Dir-Swat Kohistan area.

Lithologies similar to those of the Thelichi Formation have been recognised at several places in different sectors of the Kohistan terrane, e. g., the Yasin Group in Yasin and Hunza area (Ivanac et al., 1956; Pudsey, 1986; Tahirkheli, 1982); Purit and Gawuch formations from Drosh sector, Shamran sediments from Yasin-Rakaposhi sector (Pudsey et al., 1985) and Burjila Formation from Burjila-Skardu and Khapalu-Hushe sector (Desio, 1979; Tahirkheli, 1982). These units, likewise the Thelichi Formation, contain turbidite sediments including sand-, silt- and mudstones and limestones. It may be noted that although the Thelichi Formation did not yield any fossils, the equivalent Yasin Group of sediments contain Albian-Aptian fauna (Hayden, 1916; Ivanac et al., 1956; Pudsey et al., 1986).

CONCLUSIONS

Several aspects of the geology of the Kohistan terrane have been addressed in this study.

1. The presence of a succession of metasediments and metavolcanics in the central parts of the Kohistan terrane, i.e., south of Gilgit near Jaglot, is never explained satisfactorily prior to this work. The present study has revealed that this succession, termed 'Jaglot Group', comprises an intact stratigraphy which, from base to top, consists of Gilgit Formation, Gashu-Confluence Volcanics and Thelichi Formation. Structurally, the Gilgit Formation occupies the core, and the overlying succession, the southern limb of the Gilgit anticline. We suggest that the Gashu-Confluence Volcanics and the overlying Thelichi Formation are the equivalents of the succession exposed at the northern limb of the Gilgit anticline i.e., Chalt volcanics and Yasin sediments.
2. The nature of the northern contact of the Chilas complex has been studied carefully for the first time. Our studies in the upper reaches of the northern tributaries of the Indus river (Raikot-Chilas sector) suggest that the Chilas complex was intruded into a sequence of intercalated high-grade metasediments and amphibolites, which equate with the Gilgit Formation in the basal parts of the Jaglot Group. Nowhere, in the mapped area, the Chilas complex is noticed intruding the rest of the stratigraphic units in the Jaglot Group. We do not conceive the idea that these units were deposited later than the intrusion of the Chilas complex. More likely the Chilas complex intruded but did not cross cut the Jaglot Group, rather underplated it.
3. The Chilas complex is in direct contact with the Kohistan batholith in the eastern parts of the studied area. The Gor plutonic belt of the Kohistan batholith intrudes the Chilas complex at its southern side along a linear intrusive contact.
4. Two of the three principal plutonic belts, belonging to the Kohistan batholith, i.e., Gor and Batkor, are not involved in the Jaglot folding event, rather they intrude the folded Jaglot Group. We are, however, uncertain about the Shinghai plutonic belt, which shows abundance of ductile shear zones and might have preceded the Jaglot folding event.

The implications for the broad tectonic evolution of the Kohistan terrane, in the light of the present study, are outlined in Khan T. et al. (1993). In this paper, we restrict ourselves to the Jaglot Group and its significance in the regional tectonics of Kohistan. Features like intercalation between the metapelites and metapsamites, preservation of graded relationship between the two lithologies, and geochemistry pointing to provenance from passive-continental margin setting (Khan T. et al., 1994) suggest that the Gilgit Formation had a turbidite precursor prior to metamorphism. Likewise, the sediments of the Thalichi Formation are characterized by interbedded sand-, silt- and mudstones successions (Bouma sequence), predominance of mudstone, common internal lamination, graded bedding and sole structures, which point to their turbidite nature. Thus the pillowed basalts of the Gashu-Confluence Volcanics (=Chalt Volcanics) are sandwiched in a turbidite succession suggesting that the entire Jaglot Group was deposited in an oceanic basin. It is quite possible that the pelagic sediments of the Gilgit Formation represent remnants of the Neotethy's oceanic crust, which served as a basement for the products (i.e., the Gashu-Confluence Volcanics and the Thelichi Formation) of a new oceanic basin. The occurrence of the Jaglot Group at or in the vicinity of the Northern Suture (Pudsey, 1986) and to the north of the principal occurrence of island-arc assemblage in the Kohistan terrane, points to a back-arc origin for this oceanic basin. The possibility of the Chilas complex for having been generated and emplaced in a back-arc setting was previously suggested by us Khan M. A. et al. (1989, 1993). We believe that a large part of the Kohistan terrane, in its northern parts, comprises back-arc assemblage rather than an island arc.

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