

A note on the tectonic framework and geologic set-up of the Pangong-Chushul sector, Ladakh Himalaya

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Abstract

The Pangong Tso-Spanggur Tso and the Shyok-Chushul-Dungti are the two tectonic zones in the area north of the Ladakh Range. The former zone has an association of metapelites, metacarbonates and metavolcanics in a graben type basin bounded by granitoids. The latter zone comprises *Orbitolita* limestone, argillite, lava flows and grey-purple conglomerates in another graben type basin bounded on the NE by Pangong Granitoid and on the SW by the Ladakh Granitoid belts. These, along with the Indus Tectonic zone represent NW-SE trending parallel tectonic zones in the Trans-Himalayan Zone. The Pangong Tso-Spanggur Tso appear to be part of the larger Permian basin of Tibet. The *Orbitolita* limestone-volcanics-conglomerates of the Shyok-Chushul Tectonic Zone are comparable with the Sangeluma belt of the Indus Tectonic Zone. These are independent zones but contemporaneous in development.

Introduction

The present note records the geological observations made by the authors in the Pangong Tso-Chushul sector of the Ladakh Himalaya during a traverse in the autumn of 1980. The area lies within the Trans-Himalayan zone. Considerable geological information is available on the area NW of this sector (Stoliczka, 1874; Norin, 1946; Bhandari *et al.*, 1978; Gupta and Sharma, 1978; Thakur *et al.*, 1981). This area represents the SE extension of the Shyok-Nubra Tectonic Zone.

Tectonic Framework

Two parallel tectonic zones are recognised in the sector north of the Ladakh Range. These are designated as:

- i. the Pangong Tso-Spanggur Tso Tectonic Zone to the north
- ii. Shyok-Chushul-Dungti Tectonic Zone to the south.

These two tectonic zones are separated from each other by the Pangong Granitoid belt. South of the Shyok-Chushul-Dungti Tectonic Zone lies the Ladakh Granitoid belt. These tectonic zones having NW-SE trend represent graben type basins with distinct volcano-sedimentary association (Figs. 1 and 2).

Geological Set-up

Pangong Tso-Spanggur Tso Tectonic Zone: In this sector the study is limited to the southern bank of the Pangong Tso (Lake) and distant observations of litho-tectonic units along the northern bank. The high mountain ranges NE of the Pangong Tso appear to be made of granitoid complex, followed towards south by metamorphosed greenstones with intercalated metapelites and metacarbonates. South of the Pangong Tso there is a zone of quartz-graphite-sericite schist with marble intercalations. Metasediments are followed towards south by gneisses and migmatites with considerable paleosome. Migmatites contain pegmatoids which are both concordant and discordant to the NW-SE regional foliation. The Pangong and Spanggur lakes are located within this zone and they appear to be structurally controlled. South of Pangong Tso-Spanggur Tso, along the Pangong Mountains, there is a 12-14 km broad zone of gneissic granitoids. Augen gneisses predominate

GEOLOGICAL SKETCH OF THE PANGONG TSO-INDUS SECTOR,
LADAKH HIMALAYA.

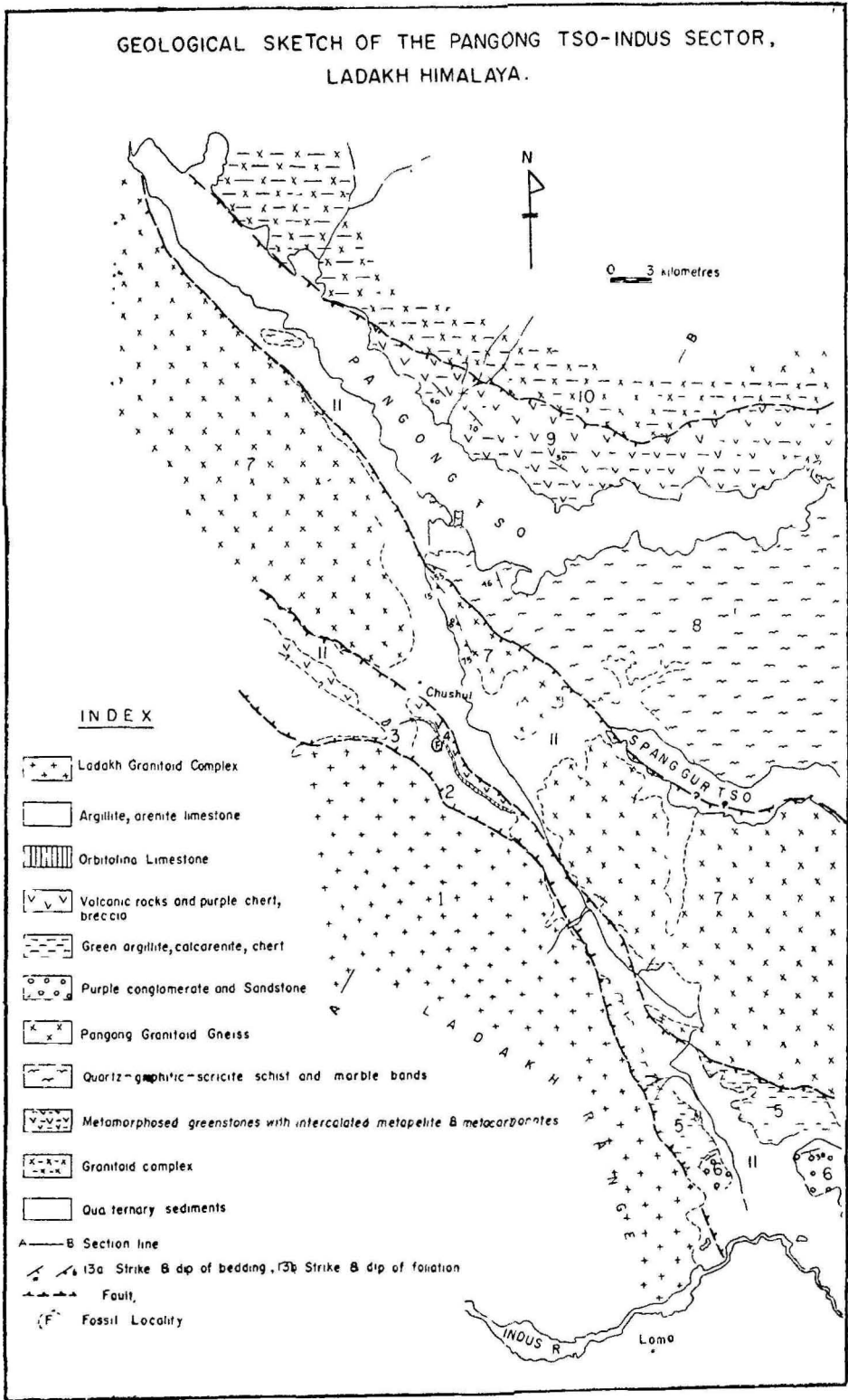


Figure 1.

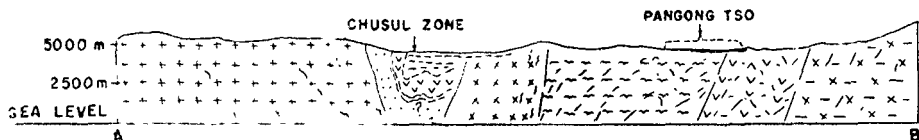


Figure 2. Geological cross section from A to B.

followed by biotite granite. SE of the Pangong mountains, along the NE flank, bordering Spanggur Tso there are dioritic rocks.

Shyok-Chushul Tectonic Zone: Chushul-Dungti segment: This comprises a NW-SE trending tectonic zone and lies in the SE extension of the main Shyok Tectonic Zone. It is apparently a fault-bound graben type basin in which a complex association of Cretaceous-Tertiary sediments and volcanics are seen.

The Chushul-Dungti segment is bounded on the NE by the Pangong Granitoid belt and on the SE by the Ladakh Granitoid belt. Along the NE flank of the Ladakh Granitoid belt of the Ladakh Range, there is a zone of SW dipping sediments and volcanics (which appear to be an overturned sequence). From the Ladakh Granitoid contact, the succession commences with shales and interbeds of limestone, followed by arenite, lenticular *Orbitolina* limestone, purple breccia, volcanic sequence with pillow-lava, chert, calcarenite and green argillite.

Close to the Indus bend, further SE of the area cited above, there are two distinct units of sediments. The lower unit comprises shale, dark coloured siltstone with green chert and limestone interbeds containing phragmacone of belemnites and *Orbitolina*. A gabbro-diorite body is also seen enveloped by sediments.

The upper unit of sediments comprise grey and purple conglomerate. The purple conglomerate contains clasts of jasper, volcanic rocks and quartzite and also *Nummulitic* limestone. The conglomerates form a broad outcrop north of Dungti along the Indus left bank flank of the mountains.

Discussion

Our present knowledge about the Pangong Tso-Spanggur Tso Tectonic Zone is pitifully little. The tectonic nature of the zone is undoubted, but the lithological content in the zone is altogether different from those of the Shyok-Chushul and the Indus Tectonic Zones. The metapelites and metacarbonates may belong to Permian sequence of the Karakorum basin where similar occurrences are reported (Desio, 1979). This zone towards SE broadens out considerably and in Tibet, Permian sediments are known to occur.

The Shyok-Chushul Tectonic Zone has received considerable attention in recent years. The significance of the Chushul-Dungti segment of this zone lies in the fact of the occurrence of *Orbitolina* bearing limestone. This assigns a Lower-Middle Cretaceous age to the sediments. The *Orbitolina* bearing limestone and shale are comparable with the Khalsi Formation of the Sangeluma Group in the Indus Tectonic Zone (Srikantia and Razdan, 1980). As the volcanics succeed the sediments, they possibly belong to Upper Cretaceous-Paleocene and are comparable with the Dras Volcanics of the Sangeluma belt in age. The conglomerates with clasts of *Nummulitic* limestone bear a close resemblance with the Shergol Formation of the Sangeluma Group in the Indus Tectonic Zone (Srikantia and Razdan, 1980). However, for a

more purposeful correlation, detailed data on a regional scale are necessary. Nevertheless, the contemporaneity of the Shyok-Chushul and the Indus Tectonic Zones seems plausible.

Ophiolitic rocks are rather scarce in the Shyok-Chushul zone. Excepting for a small outcrop of serpentinitised harzburgite west of Tiggur in the Lower Nubra valley there are not many ophiolite bodies in this tectonic zone (Personal observation, Srikantia). Gansser (1977, 1980) has shown a broad ophiolite unit in the Shyok-Chushul Zone and has opined that it is the branching of the Indus Tectonic zone due to a transverse fault across the Ladakh range. However, this seems to be in conflict with the information available on the Geological Map of China (1976), where these two tectonic zones are separately and independently indicated. According to our studies the ophiolite belt of the Sangeluma Group of the Indus Tectonic Zone continues towards Hanle within Indian territory and it appears to continue into Tibet. In the Ladakh Himalaya the Shyok and the Indus Tectonic Zones are independent of each other though contemporaneous in development.

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