

U/1. Uil, H., 1983. (ed.) Technical report on groundwater resources in Domail plain, Bannu and Karak Districts, North West Frontier Province. Report IV-I, 51p. Pakistan-Dutch program, GWI, North West Frontier Province, Water and Power Development Authority, Hydrogeology Directorate, Peshawar and TNO Groundwater Survey, The Netherlands.

Key words: Groundwater, Domail plain, Bannu, Karak, NWFP.

U/2. Ukai, Y. & Kimura, Y., 1965. On the chemical composition of the granitic rocks collected from the Karakoram and Hindu Kush ranges. In: Matsushita, S & Huzita, K. (Eds), Geology of the Karakoram and Hindukush. Results of the Kyoto University Scientific Expedition to the Karakoram and Hindukush, 1955, Vol. VII, 121-130. Nippon Printing & Publishing Co., Ltd., Japan.

This is a preliminary, major element, geochemistry of seven granitic rocks from diverse bodies of granitoids. One sample each was collected near Kalam, Diwangar in upper Ushu valley of Swat, Shunji Gol in Ghizar, Urdukas in Baltoro, and upper Hispar, and two between the Indus-Gilgit confluence and Pari. Chemical analyses are accompanied by CIPW norms, Niggli values and cation numbers. Analyses are plotted on Harker diagram and An-Ab-Or triangle. It is "considered that most of these rocks were produced through the granitization of sedimentary rocks".

Key words: Granites, geochemistry, granites, Hindu Kush, Karakoram.

U/3. Ullah, A., 1998. Petrotectonics, petrology and genesis of uranium mineralization of the Siwalik Group of Thatti Nasrati and Shavah Shanwah Area. Ph.D. Thesis, Punjab University, Lahore.

Key words: Petrotectonics, petrology, mineralization, radioactive minerals, Siwaliks, Karak.

U/4. Ullah, H., 1983-85. Geotechnical studies of landslide along Murree-Kohala and Murree-Bhurban Road, District Rawalpindi. M.Sc. Thesis, Punjab University, Lahore, 108p.

The Murree Kohala road one of the most important road of the country which provides facilities of communication between Pakistan and Azad Kashmir, crossing over the Jhelum river at Kohala. This road is also important for defence point of view. The slopes along the Murree Kohala road are very unstable, especially kassari to Phagwalai village. The condition of the Murree-Kohala road is satisfactory where a good driver can drive every type of vehicle at the speed of 40-50 km/hour, except for the landslide areas. At Murree Kohala road three major slides were selected for study namely Kasseni (K0, K1' K2' K3), Norgali (N1' N2) and Eliot (A1, A2). These are between lower topas to Eliot which are also marked on the map. The second road which join Kohala is starting from Jhikkagali via Burban which meet the Murree Kohala road near phagwani Village. There is also a slide near Kashmiri Bazar which is shown on the map. The project area is lying in the Murree Formation which is mainly composed of Shale, mudstone and sandstone. The detailed geological mapping of the active landslides area were carried out on, the map, sandstone, mudstone and shale with specific symbol on the map.

Key words: Geotechnical, landslides, Rawalpindi.

U/5. Ullah, Z., 1981-83. Geology and petrology of Darel valley (District Diamer) with special emphasis on the petrology of diorites and amphibolites of the area. M.Sc. Thesis, Punjab University, Lahore, 63p.

This thesis presents a geological map of the 30 sq .miles of project area (DAREL) on scale 1" = 1 mile. The project area (Darel) lies in Gilgit Agency, district Diamer. The area is located in the centre of Kohistan. Area is disturbed tectonically, being involved in Himalayan orogeny. The area is composed of igneous and metamorphic rocks. The main rock units in the area are Norite, Diorite, Amphibolites and Granodiorites. Mineralogical description and

petrographic analysis of these rock units are reported in detail. An attempt is made to interpret the petrogenesis of rock types. The Thesis presents a detailed geological and petrological investigation of the project area. Norite and amphibolites represent oceanic crust while Diorite and Granodiorite etc. represent plutonic equivalents of arc. To achieve this goal a period of 45 days was spent at the site during July, August 1984.

Key words: Petrology, diorites, amphibolites, Darel, Diamir, Kohistan.

U/6. Untersteiner, N., 1957a. Glazial-meteorologische untersuchungen im Karakorum. I: Strahlung. Archiv fur Meteorologie, Geophysik und Bioklimatologie, Series B(8), 1-30.

Records of radiation in the ablation area of Chogo Lungma Glacier (Karakorum) show that, in comparison with corresponding conditions in the European Alps, the radiation climate in the Karakorums during summer is characterized by high daily totals of global radiation. This is less due to stronger solar radiation but to a slower decrease of global radiation with increasing cloudiness ($\alpha=0.5$). A relation between the daily sums of global, solar, and sky radiation with cloud amount is given. The short wave radiation balance of firn and bare ice is evaluated from numerous measurements of the albedo. Long wave radiation from the atmosphere is computed from an assumed distribution of temperature and moisture in the free atmosphere by means of Elsasser's diagram, as well as from observed surface values with Ångström's formula, what leads to a good agreement. The outgoing radiation from the glacier's surface is computed according to its temperature. From these data the total radiation balance during the period of observations is derived. By far the greatest, and for its mass balance important, variations of the radiative energy exchange of the glacier is caused by variations of the reflectivity of its surface. Finally, the results of several radiation measurements at higher altitude are given. An estimate of the radiation balance at an altitude of 6.000 to 7.000 m shows that assuming an albedo of 0.75, melting of the snow in this climatic regime (no summer monsoon) seems only possible under rare conditions.

Key words: Glaciers, meteorology, radiation, Karakoram.

U/7. Untersteiner, N., 1957b. Glazial-meteorologische untersuchungen im Karakorum. II: Warmehaushalt. Archiv fur Meteorologie, Geophysik und Bioklimatologie, Series B(8), 137-171.

The present paper deals with further glacial-meteorological observations on Chogo Lungma Glacier carried out during the "Frankfurter Himalaya-Expedition 1955". These observations comprise: ablation, wind velocity at 20, 100, and 300 cm height, temperature and humidity at 20 and 100 cm height, surface temperature, temperature gradient between 20 and 100 cm, precipitation, evaporation, as well as the short and long wave radiative heat exchange at the surface as published in a previous paper. The first series of measurements (Station I, altitude about 4000 m) covers the melting of the remains of winter firn (51 cm) in the course of 6 days. The second series (Station II, altitude about 4300 m) covers the ablation of 120 cm of bare ice with an average albedo of 0,30. Both stations were situated below the firn line on the flat glacier tongue. The daily variation of ablation closely resembles that found in the Alps and indicates a very high percentage of radiative ablation. The glacier wind on Chogo Lungma is exceptionally weak which is probably due to its morphological features (Mustagh-Type). An explanation of the daily course of glacier wind is given by considering the temperature difference between air and ice.

The mean vertical distributions of wind velocity, temperature and humidity may well be represented by logarithmic laws. The vertical flux of perceptible and latent heat are calculated by means of the adiabatic "Austausch" coefficient. To account for stability according to Lettau's formula would necessitate the application of non-logarithmic laws for the temperature and humidity distribution in order to give a constant heat flux. However, the deviations in the lowermost decimetres are small. The mean daily heat economy at Stations I and II is given in Table 6. The correspondence between observed and computed ablation is satisfactory and justifies the methods applied. Radiation balance (long and short wave) contributes 88% over firn and 95% over bare ice to the total ablation. As is to be expected, convective heat supply is of the same order of magnitude as on other temperate glaciers. Ablation by evaporation is negligible. The part of evaporation in the glacial heat economy is discussed in connection with the problems of "nieve de los penitentes". It is shown that, under certain conditions, evaporation may achieve some importance in the *thermal* budget but that its importance in the *mass* budget (ablation by evaporation) in the ablation area of temperate glaciers will always be negligible compared to the ablation by melting, due to the great amount of heat required for evaporation. Based upon the small local differences of the heat budget of "sun-cupped" firn an explanation is given of the formation of nieve de los penitentes. The possibilities of simplified measurements of heat

economy, especially on expeditions, are discussed. Finally, the glacial heat budget in high, middle, and lower latitudes is compared, and the predominant importance for glacier shrinkage and advance of summer weather (changes of albedo by temporary snow covers, duration of sunshine) is stressed.

Key words: Glaciers, meteorology, Karakoram.

U/8. Uppal, I.H., 1972. Preliminary account of the Harichand ultramafic complex, Malakand Agency, NWFP, Pakistan. Geological Bulletin, University of Punjab 9, 55-63.

The Harichand ultramafic complex, in the Malakand Agency, covering about 45 square miles, has been mapped for the first time on a scale of 6 inches to 1 mile and is presented here on a reduced scale of 1 inch to 1 mile. The complex constituents large bodies of harzburgite with small conformable outcrops of dunite rock. The harzburgite-dunite bodies are partially surrounded by peridotite rock, which is serpentinized along its contact with the country rocks, consisting of low-grade schists. Two small bodies of metagabbroic rock are present in the metamorphic formation falling within the mapped area. Chromitite at places is associated with dunite, while orthopyroxenite dykes sporadically traverse the area. Preliminary account based on field observations and petrographic studies is given, while the results of details petrological and chemical work will be presented in a later communication.

Key words: Ultramafics, petrography, Harichand, Malakand.

U/9. Uppal, I.H., 1980. Origin of chromite deposits and associate dunite of the Harichand ultramafic complex, Malakand Agency. Contributions to the Geology of Pakistan 1, 113-120.

The Harichand ultramafic complex, also called the Dargai complex, is a large body of ultramafic rocks, peridotites and dunite. There are sizable bodies of chromite pods, lenses and layers. Those associated with the dunite are described in this paper.

The podiform deposits of chromite associated with the dunite bodies ominously exposed in the Hari Chand Complex have been subjected to investigation. Field observations, petrographic and chemical studies of selective specimens show that the chromite & dunite were formed prior to the crystallization of the host rocks in deep magma chamber to make basement layer of the crystal mush. These were later on mobilized and transported upward into the upper part of magma chamber when the main mass of the ultramafic complex solidified.

Key words: Ultramafics, dunite, chromite, petrology, Harichand, Malakand.

U/10. Usman, K. & Ali, L., 1998. Structure and stratigraphy of a part of Kohat-Karak districts south of Lachi, N.W.F.P., Pakistan. M.Sc. Thesis, University of Peshawar, 70p.

Key words: Structure, stratigraphy, Kohat, Karak.