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GEOLOGICAL ASPECTS OF THE KINNAUR EARTHQUAKE HIMACHAL PRADESH

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Introduction: The border districts of Spiti and Kinnaur in the Himachal Pradesh were rocked by a severe earthquake of intensity 7.00 on Richter Scale and VIII to IX on the Modified Mercalli Intensity Scale (Singh *et al*, 1975) at 1.31 p.m. on 19th Jan., 1975. Resulting ground motion caused heavy damage to property and loss of several lives. The epicentre of this earthquake has been located 450 km north of Delhi at Long. 78°E Lat. 32°N (Chaudhri and Srivastava, 1975) in the vicinity of the Samsag ridge near Sumdoh. The earthquake was felt all over the Himachal Pradesh, J. & K., Punjab, Haryana, Chandigarh, hill districts of U.P. and as far south as Delhi, though no damage to property and loss of life was reported except in Spiti and Kinnaur Districts of Himachal Pradesh. Maximum damage due to this earthquake has taken place along the Spiti river in the lower Spiti valley and the areas around the confluence of the Spiti river with the Sutlej. The worst affected villages include Chango, Shalkar, Leo, Sumra, Hango, Nako, Malling, Pooh, Namgia, Kaurik, Tashigong, Sumdoh, Dhankar, Giu, Thabo, Po, Lari, Kaza, Hurling, Larling, Damul and Kay.

The present communication describes the geological setting of the area around the epicentre and discusses possible causes of the earthquake.

Geological setting: The area which suffered the maximum effects of the earthquake lies around the border village of Sumdoh. Bracketed portion on Fig. 1 shows the area affected by the earthquake whereas Fig. 2 gives the geological set up of this region. A careful glance at the geological map (Fig. 2) reveals that the area is traversed by a series of major faults. The most prominent of these faults is the Shalkhar fault which trends nearly N-S. This fault extends for a length of about 30 km along which Carboniferous sediments (limestone, shale and phyllite) abut against Cambrian (phyllite, slates and quartzite) (Hayden, 1904; Gupta and Kumar, 1975). These two groups of rocks are underlain by the Precambrian crystallines. The area falls on the margin of the boundary between the so-called Tethyan region and the Central Himalaya. A marked change in the lithology, grade of metamorphism and structure is observed in a traverse from south to north. Area south of Kalpa

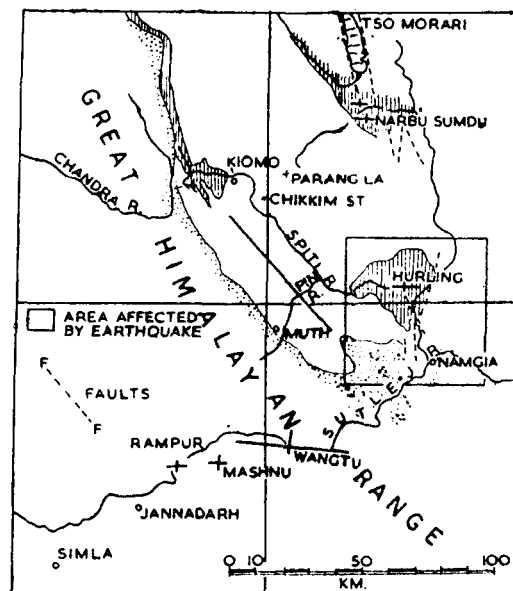


Figure 1. An outline map of a part of the Himalaya showing the location of the area affected by the earthquake (after Berthelsen, 1951).

and Pooh comprising the crystallines of the Jutogh-Salkhala type exhibit a polyphased tectono-metamorphic history and show southeasterly verging major folds. These rocks constitute the root zone of the crystalline nappes of the Lesser Himalaya. The sediments belonging to Cambrian and Carboniferous show simple, upright, Jura type folds.

Discussion: The quake-hit area referred to above lies on the boundary between the Tethyan and central crystalline region and is traversed by numerous faults. The present earthquake seems to have resulted due to disturbance along the N-S to NNW-SSE trending Shalkhar fault. This is further confirmed by a series of N-S, NNE-SSW, NNW-SSE traversing ground fissures in the Spiti and Parachu valleys. Reactivation of the Shalkhar and possibly other fault planes in the area might have taken place due to the isostatic readjustments in this part of the Himalaya, thus resulting in the earthquake. That this region has not yet stabilized is evident from hundreds of after shocks already reported and still being recorded.

One of the major effects of the Kinnaur earthquake has been the disturbance of the hill slopes around the villages of Malling, Dogri, Shalkhar and Kaurik. As a result of this number of landslides have occurred bringing down huge quantities of

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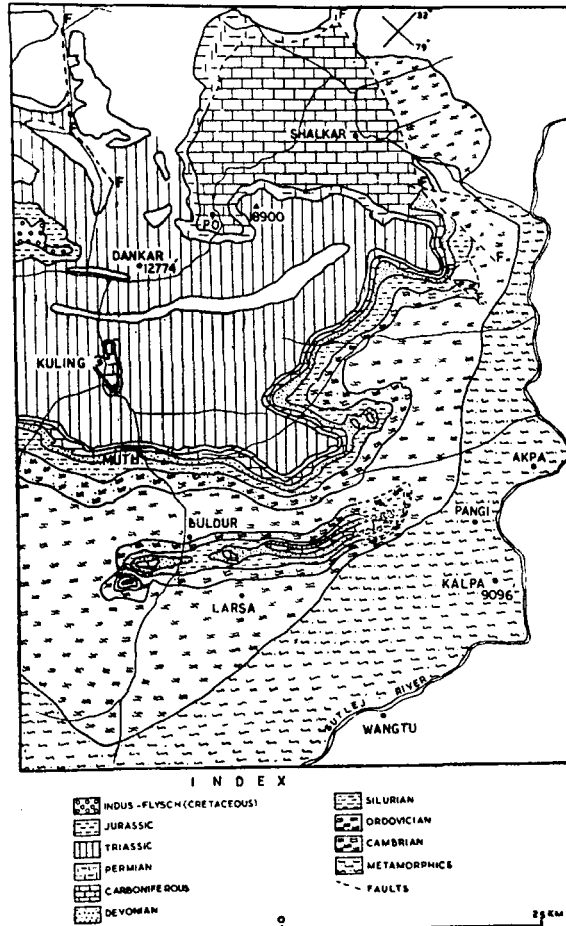


Figure 2. Geological map of the areas affected by the earthquake (modified after Hayden, 1904).

debris which blocked the roads and river courses. The damming of the Parachu river between Sumdoh and Kaurik was also due to one such major landslide. The region being devoid of vegetation, the hill slopes are covered with glacial debris, which give way due to slight disturbance in the slopes.

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