

GEOLOGIC COLUMN AND UNIT DESCRIPTIONS

AGE	ROCK UNIT	LITHOLOGY; THICKNESS WHERE KNOWN	UNIT DESCRIPTION	REFERENCES																																								
QUATERNARY	Alluvium	<i>Sand, silt, clay, and gravel; thickness less than 20 m.</i>	Alluvium includes the younger fluvial deposits distributed along rivers, along with wind-drifted sands and "playa" deposits; consists mainly of sand, silt and clay, with gravel and detritus on the hill slopes. Thickness is generally less than 10 meters, but in the broad plains along the Hsin-kai Ho [新開河] and Liao Ho [遼河] it may exceed 20 m.	<p>Geol. Inst. S. Manchuria Ry. Co., 1937, Geologic map of Manchuria: scale 1:1,000,000.</p> <p>HARAGUCHI, Kuman, 1939, (a) Report on geology of the first projected reservoir dam site of the Liao Ho, (b) Report on geology of the second projected reservoir dam site of the Liao Ho: Bull. Geol. Inst. Manchoukuo, no. 96.</p> <p>HATA, Jūkichi, 1931, Explanatory text to the geologic map Fen-tien, scale 1:400,000: Geol. Inst. S. Manchuria Ry. Co.</p> <p>KOBAYASHI, Teichi, 1942, Stratigraphic relation among the Mesozoic fossil-beds in the Korea-Manchurian land: Proc. Imp. Acad. Tokyo, v. 16.</p> <p>SAITŌ, Rinji, 1940, Geologic map of Manchuria and adjacent areas, scale 1:3,000,000: Geol. Survey Manchoukuo.</p> <p>_____, 1943, Precambrian stratigraphy of South Manchuria and North China: Mem. Geol. Survey Manchoukuo (formerly Mem. Geol. Inst. Manchoukuo).</p> <p>Author unknown, 1945, Geologic sheet "T'ieh-ling", scale 1:150,000: Geol. Survey Manchoukuo (unpublished due to end of World War II).</p>																																								
	Diluvium	<i>Qds, aeolian sand and silt; thickness about 20 m</i>	Diluvium comprises the following three units: Qds consists of aeolian sands and silt which were probably deposited within the fluvio-lacustrine basins of Uppermost Pleistocene age and may have been upheaved and wind-eroded to result in the desert.																																									
		<i>Qdl, loess, sandy loess, and aeolian sand; thickness more than 30 m</i>	Qdl consists of loess, sandy loess, and aeolian sands, and predominantly occurs west of the Liao Ho. It is probably Upper Pleistocene. Locally it is underlain by the red clay, presumably Uppermost Neogene in age.																																									
		<i>Qdg, sand, gravel, and sandy loess; thickness about 20 m</i>	Qdg, consisting chiefly of sand and gravel, is locally accompanied by sandy loess. False bedding is usually marked. It forms the southern margin of the old fluvial deposits which are predominant in the vast central Manchurian plain.																																									
TERTIARY	~~~~~Unconformity~~~~~																																											
	Neogene basalt	<i>Olivine basalt and tuff; thickness variable</i>	Neogene basalt consists of flows and sheets of olivine basalt and associated tuff. The thickness in the south-eastern part of the map area was estimated as 120 m; it is not known in the central area.																																									
MESOZOIC	~~~~~Unconformity~~~~~																																											
	Chuantou formation	<i>Conglomerate, tuffaceous shale, sandstone, and shale; thickness 1,000 to 1,500 m</i>	The Chuantou formation (泉頭群), or "red formation", consists, in descending order, of conglomerate, alternating sandstone and shale, pebbly sandstone, tuffaceous sandstone, tuff, shale, and basal conglomerate. The total thickness was estimated as 1,000 to 1,500 m.																																									
	Rhyolite	<i>Rhyolite flows</i>	Rhyolite is exposed as a number of isolated hills northeast of Shih-chia-kang-tzu [石家崗子]. The rock may be volcanic flows erupted in an early stage of the Chuantou formation.																																									
	~~~~~Effusive contact~~~~~																																											
	Undifferentiated Mesozoic rocks	<i>Conglomerate, sandstone, and shale; thickness unknown</i>	Undifferentiated Mesozoic rocks are chiefly conglomerate and sandstone, with some shale beds, and may be an extension of the so-called "Fouhsin conglomerate" which covers the Jurassic coal-bearing formation (Mju) with a disconformity. In the area of the Fou-hsin sheet (NK 51-4) adjacent on the west, the Fouhsin conglomerate is assigned to Lower Cretaceous, but in this map area no data to help age determination are available.																																									
	Jurassic volcanic formation	<i>Andesite and porphyrite, with sandstone, shale, conglomerate, and coal; total thickness 500-650 m</i>	The Jurassic volcanic formation (Mjv) near the district of I-lu [伊路] consists, in descending order, of porphyrite flows, coal-bearing beds (Mj) including tuff and andesite flows, and a thick succession of porphyrite flows and sheets. The coal-bearing beds comprise a thickness of 200 m. The total thickness of the formation was estimated as 500 to 650 m.																																									
Porphyrite	<i>Propylitic andesite, and diabase porphyrite</i>	Porphyrite is mainly propylitic andesite and diabase porphyrite, and may be contemporaneous with the Jurassic volcanic formation (Mjv).																																										
~~~~~Intrusive and effusive contact~~~~~																																												
Pre-Jurassic granite and quartz porphyry	<i>Granite, felsite, and quartz porphyry</i>	Granite (g ₂) is mainly biotite granite which may be older in age than the Jurassic volcanic formation (Mjv). Quartz porphyry (qp) is found as small exposures and may be a marginal facies of the granite (g ₂).																																										
PALEOZOIC	~~~~~Intrusive contact~~~~~																																											
	Pachiatzu series	<i>Slate, limestone, sandstone, and conglomerate; thickness 400 m</i>	The Pachiatzu series (八家子群) consists, in descending order, of greenish shale containing limestone lenses (250 m thick), reddish sandstone (150 to 200 m), and basal conglomerate (50 m); no fossils have been found. The name was given to a presumably Cambrian formation in the Ta-fan Ho [大汎河] basin by some Japanese geologists of the Manchoukuo Geological Survey, just before the end of World War II (1945).																																									
PRECAMBRIAN	~~~~~Unconformity~~~~~																																											
	Sinian (Fanho) system	<i>Quartzite, slate, limestone, and dolomite; probable thickness more than 5,000 m in the east, 1,000-2,000 m in the west</i>	<p>The Sinian system in the area southeast of T'ieh-ling [鐵嶺], studied by the Geological Survey of Manchoukuo (1944-1945), was named the Fanho system (風河系) where the sequence in descending order is as follows:</p> <table style="margin-left: 20px;"> <tr> <td rowspan="2" style="vertical-align: middle;">Upper, or Huishihtun series [舒士頓系 (pCuU)]</td> <td>Quartzite and slate in alternation; thickness 500 to 800 m</td> </tr> <tr> <td>Limestone; 250 to 300 m</td> </tr> <tr> <td colspan="2" style="text-align: center;">..... 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This complex resembles the so-called Taishan complex of North China.</td> </tr> </table>	Upper, or Huishihtun series [舒士頓系 (pCuU)]	Quartzite and slate in alternation; thickness 500 to 800 m	Limestone; 250 to 300 m Unconformity		T'iehling series [鐵嶺系]	Dolomite; 450 m or more	Slate and quartzite; 450 to 500 m	Quartzite and slate; 450 to 500 m	Lower series (pCuL)	Slate; 250 to 300 m	Quartzite and dolomite in alternation; 500 m or more	Chaiho series [柴河系]	Dolomite with a cryptozoon bed; 1,200 m	Quartzite; 90 to 320 m	Sanchiatzu series [三岔子系]	Quartzite and dolomite in alternation; 500 m or more	Dolomite with a cryptozoon bed; 1,000 to 1,200 m	~~~~~Unconformity~~~~~		Granite gneiss	<i>Biotite granite gneiss</i>	In the western part of the map area the Sinian system consists, in descending order, of siliceous limestone, slate, phyllite with thin beds of limestone, and quartzite; thickness is estimated as 1,000 to 2,000 m.	~~~~~Intrusive contact~~~~~			Middle Precambrian system	<i>Crystalline dolomite, quartzite, slate, chlorite-mica schist, crystalline limestone; thickness unknown</i>	Granite gneiss is mainly biotite-granite gneiss with schistosity parallel to the rocks of the Middle Precambrian system. 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