

GEOLOGIC COLUMN AND UNIT DESCRIPTIONS: MANCHURIAN SEQUENCE ONLY

AGE	ROCK UNIT	LITHOLOGY; THICKNESS WHERE KNOWN	REMARKS
QUATERNARY	Alluvium	Younger fluvial deposits composed of mud, sand, and gravel; 50m thick	Yields placer gold
	Unconformity		
	Quaternary basalt	Olivine basalt flow; 10 to 30m thick	
	Diluvium	Older fluvial deposits composed of sand and gravel; 20 to 50m thick	
TERTIARY	Unconformity		
	Tertiary basalt	Olivine basalt flow; 150m	
	Quartz porphyry	Probably massive	Acidic volcanic rock overlain by Tertiary basalt flow.
	INTRUSIVE CONTACT		
	Paleogene formation	Coal, shale, sandstone, and conglomerate; about 220m thick	Terrestrial deposits intercalated with thin coal seams. The upper shaly part yields fossil plants <i>Sequoia</i> , <i>Pinus</i> , etc.
	Unconformity		
MESOZOIC	Andesite	Hornblende-biotite andesite, and pyroxene andesite	Occurs as dikes.
	Cretaceous granite	Pink, medium- to coarse-grained granite	Locally grades into granite porphyry.
	INTRUSIVE CONTACT		
	Talatzu series	Coarse, yellowish brown sandstone, black shale with nodules, conglomeratic sandstone, and conglomerate; with low-grade oil shale in the middle part; approximate total thickness 1,000m	Upper part: Massive, coarse-grained yellowish brown sandstone, intercalated with gray sandy shale; 300 m ± thick. Middle part: Gray shale intercalated with medium-grained sandstone; yields fossils such as <i>Sphaerium chinensis</i> Suzuki, <i>Vitiformes (Tulokoides) talatzensis</i> Suzuki, <i>Balticus</i> cf. <i>chionoides</i> (Schlosser), <i>Trigonoides kodaira</i> Kobayashi et Suzuki, <i>Phya nishidai</i> Suzuki, <i>Cyrena</i> sp., <i>Estheria</i> sp., <i>Manchurichthys uwatoki</i> Saito; 500 m ± thick. Lower part: Conglomerate with arkose matrix; 250 m ± thick.
	Unconformity		
	Lungching series	Reddish brown, sandy shale, tuffaceous sandstone, bouldery conglomerate, conglomeratic sandstone, andesite, tuff, and breccia	Upper part: Alternation of reddish brown or bluish green sandy shale and arkose sandstone; intercalated with tuffaceous rocks; 650 m ± thick. Middle part (Upper pyroclastic formation): Variegated tuffaceous agglomerate and andesite flows; 150 m thick. The Lungching series is composed of undifferentiated Mesozoic rocks and its age is referred to the Jurassic. Although provisionally assigned to the middle part in this map area, the stratigraphic position of the pyroclastic rocks within the Lungching series is not definitely known. Lower part: Bouldery conglomerate with arkose matrix; interfingers with conglomeratic sandstone or coarse-grained sandstone; 350 m thick.
	Rhyolite	Aphanitic rhyolite	Light-gray, aphanitic rhyolite occurring as small dikes.
	Houng coal-bearing formation	Coal, shale, sandstone, conglomeratic sandstone; 100 to 250m thick	The Middle Jurassic coal-bearing formation; conformably overlies the Lower pyroclastic formation; contains the following fossil plants: <i>Gladophloeis lobifolia</i> (Phillips), <i>G. denticulata</i> (Brong.), <i>C. browniana</i> (Dr.), <i>Araucalites rotokoenis</i> (Kawasaki), <i>Cephalotaxus</i> cf. <i>ramosa</i> (Fontaine), <i>Ginkgoites</i> cf. <i>sibirica</i> (Heer), <i>Bisiera</i> cf. <i>asadai</i> Yabe et Oishi, <i>Equisetites</i> sp., <i>Czekanowskia murrayana</i> (L. et R.), <i>Phaenocopsis</i> sp., <i>Ph. speciosa</i> Heer, <i>Pteridopteris</i> ? sp., <i>Pterocladus manchuricus</i> (Tokoyama), <i>Pityophyllum sarsenoki</i> (Heer), <i>P. lindstromi</i> Nashorst, <i>Podocarpites lanceolatus</i> (L. et H.).
	Lower pyroclastic	Trachyandesite and aphanitic andesite; thickness 300m or more	
	Mesozoic(?) formation	Shale, sandstone, conglomerate, and volcanic ejecta	Mesozoic(?) formation composed of shale, sandstone, conglomerate, and volcanic ejecta; thickness not known.
UPPER PALEOZOIC	Granite	Biotite granite and hornblende-biotite granite	
	Gabbro	Hornblende gabbro	
	Diorite	Biotite-hornblende-quartz diorite	Probably a marginal facies of granite.
	Gneiss	Hornblende gneiss, augen gneiss, orthogneiss and metagneiss	A larger part is composed of orthogneiss, in association with metagneiss which was formed by intrusion of the orthogneiss into the Upper Paleozoic Touman formation. It is possible that the unit includes Precambrian gneiss within the map area.
	INTRUSIVE CONTACT		
PRECAMBRIAN	Touman formation	Crystalline limestone, calcareous slate, clay slate, hornfels, calcareous sandstone, conglomerate, chlorite schist; thickness more than 500m	The upper part is composed of crystalline limestone in lenses, 10 to 50 m thick. The middle part, which comprises most of the Touman formation, consists chiefly of black clay slate. Calcareous slate, hornfels, calcareous sandstone and conglomerate also occur. The lower part is composed of conglomerate and coarse-grained sandstone and is exposed along the banks of the Tou-man Chiang [图 2 页]. Occurrence of chlorite schist is not rare.
	Unconformity		
	Sinian formation	Slate, quartzite, conglomerate; thickness not known	
Unconformity			
Liaoho system?	Crystalline schist; thickness not known	Probably correlated to the Liaoho system.	
(Column not drawn to scale)			

REFERENCES

- Geological Institute, South Manchuria Railway Company, 1938, Geological Map of Manchuria, scale 1:1,000,000.
 NISIDA, Shōtō, 1940, Geological Map of Manchoukuo, scale 1:150,000.
 USHIMARU, Shōtarō and IMAI, Sumi, 1932, Geological Map of Manchuria, Tou-man-chiang [图 2 页] sheet, scale 1:100,000.
 UENO, Tōsio and ASANO, Gorō, 1939, Geology along the road from Hing-yueh-kou [图 2 页] to An-tu [图 2 页]; Bull. Geol. Inst. Manchoukuo, no. 97.