GEOLOGIC COLUMN AND UNIT DESCRIPTION

AGE	ROCK UNIT	LITHOLOGY: THICKNESS WHERE KNOWN	REMARKS	ECONOMIC VALUE
QUATERNARY	Recent alluvium (Qal)	*Sand, gravel, clay; thickness less than 10m*	Qal: Covers low terrace remnants and flood plains.	Placer gold was worked in the basin of Hun-chun Ho.
	Diluvium (Qdg)	*Sand, gravel, clay; thickness 20m or less*	Qdg: Covers higher terrace remnants which fringe the flood plain of Hun-chun Ho (琿春河), Manchuria; consists mainly of coarse sand and gravel beds.	The gravel beds are commonly auriferous, and have been prosperously worked by Chinese and Japanese placer-gold miners.
	~~Unconformity~~~			
	Neogene basalt (b2)	*Olivine basalt as flows and sheet*	b_2: Mainly olivine basalt as flows and sheets of varied thickness; generally occurs in association with the Upper coal-bearing formation of Tertiary. The basalt may have been erupted and overflowed, presumably during the Miocene, on a peneplain considered to have been formed after minor disturbance in the Upper coal-bearing formation. Uplift and erosion followed and the basalt has been exposed as the cap of hills.	No recognizable mineral value.
	~~Effusive Contact~~~			
TERTIARY	Hunchun formation (Manchuria) / Kainei series (Korea) / Posyet series (USSR) (Tl)	*Sandstone, shale, clay, conglomerate, and coal; approximate thickness 5000m*	Tl: Generally consists of soft conglomerate, sandstone, and shale, with intercalation of coal seams of variable thickness. In the coal field of Hun-chun (琿春), Manchuria, the total thickness of the formation is approximately 500 m. In Korea it is considered to be an extension of the "Kainei series" (or "Hoeryong series" in Korean language) named by Takeshi ICHIMURA, while the Manchurian sequence was termed the "Hunchun group" by Rikizō IMAIZUMI, and in the Ussuri region, USSR, it has called the "Posyet series" by Soviet geologists. The strata can be divided into the Upper and Lower coal-bearing formations with the following sequence in descending order.	Placer-gold miners. No recognizable mineral value.
	~~Probable Unconformity~~~			
	Andesite (a)	*Augite andesite of pre-Oligocene eruption, with flow-structure; thickness about 150m near Pan-hsi-kou*	a: This andesite is the "augite andesite" reported by Takao SAKAMOTO from the vicinity of Hu-lu-pieh (葫芦别) in the Hun-chun Ho basin. According to Rikizō IMAIZUMI, the andesite is dark green, compact, and is characterized by platy joints; the rock contains a few sparse and small phenocrysts of plagioclase and augite; the fine-textured groundmass is mostly composed of an aggregation of plagioclase with flecks of augite crystals; flow-structure occasionally can be seen. The relation between the andesite and the Paleogene formation is not known in the district of Hu-lu-pieh, but near Pan-hsi-kou (板西沟), south of Hun-chun, the andesite, cropping out with a thickness of about 150 m, is unconformably overlain by the Paleogene formation.	No recognizable mineral value.
	~~Effusive Contact~~~			
MESOZOIC	Granite (g2)	*Biotite granite, hornblende-biotite granite*	g_2: Mainly biotite granite and hornblende-biotite granite. Presumably intruded during the Triassic as the Upper Paleozoic formation reveals various effects of contact metamorphism by the intrusion of the granite. Marginal facies of granite commonly grades into quartz diorite and diorite.	Some gold-ore deposits of small value occur in Korea.
	Diorite (d)	*Augite diorite*	d: Marginal facies of the granite; only a few diorite masses have been located in the Hun-chun Ho basin, Manchuria. The rock is generally dark-green, medium-graind, and consists of plagioclase, augite, hornblende and some biotite.	No recognizable mineral value.
	~~Intrusive Contact~~~			
PALEOZOIC	Upper Paleozoic formation (Pu)	*Shale, sandstone, graywacke, hornfels, slate, phyllite, conglomerate, limestone, schist, amphibolite, gneiss; thickness more than 1,000m*	Pu: The Upper Paleozoic formation of the map area, although not studied in detail, is a marine formation contact-metamorphosed in various degrees by granite intrusion. The formation mainly consists of various kinds of hornfels-like rocks modified from shale, tuff, sandstone and conglomerate, and commonly intercalated with crystalline limestone. In some localities the formation becomes injection gneiss. The formation as a whole closely resembles the so-called "Touman formation" of the adjacent "Yen-chi" map area which is generally considered as the Permo-Carboniferous. At Kogomwon in Korea, Ryoichi KODAIRA collected fossils including Schwagerina, Fusulina cayeuxi, Productus, Spirifer, and crinoids from the rock of the Upper Paleozoic formation. Later Ryuzō TORIYAMA found Pseudodoliolina sp. and Parafusulina sp. from the same locality and assigned the rock to the Middle-Upper Permian. This formation extends eastward into the Ussuri region of USSR, where it is believed to consist of the Permian and the Triassic formations by the Russian geologists including W. A. OBRUTSCHEW.	No recognizable mineral value.
AGE UNKNOWN	Granite gneiss (ggn)	*Gneissose granite, paragneiss, schist*	ggn: Granite gneiss of unknown age is distributed in the districts of Najin (羅津) and Unggi (雄基) in Korea. It consists mainly of gneissose granite, with local occurrence of various paragneisses and schists.	No recognizable mineral value.
	Crystalline schist (Sch)	*Mica schist, chlorite schist, biotite schist, biotite gneiss, quartzite, hornfels, slate, phyllite, crystalline limestone*	sch: Crystalline schist of unknown age is distributed in the southwestern corner of the map area. It consists of mica schist, chlorite schist, biotite schist, biotite gneiss, quartzite, hornfels, slate, phyllite, and crystalline limestone; thickness is not known.	No recognizable mineral value.

(Column not drawn to scale)

According to a study by Riuji ENDO on the coal-bearing formation in the Aoji-dong and Kogŏnwŏn areas, the Lower coal-bearing formation yields 12 species of plant fossils, including Fagus antipofi HEER; the Upper coal-bearing formation, numerous plant fossils including Engelhardtia cfr. brongniarti SAPORTA. ENDO therefore regards the principal, or Lower coal-bearing formation as Oligocene, and the Upper coal-bearing formation as Miocene. In the Hun-chun coal field, Manchuria, more than 9 species of plant fossils, including Fagus antipofi HEER, were also collected, so ENDO believed that the strata should contain Paleogene coal-bearing formation. From the Posyet coal field, about 16 species of plant fossils, including Fagus antipofi HEER, were identified by Russian geologists, and W. A. OBRUTSCHEW regarded the age of the coal-bearing formation as Paleogene. Coal from the Paleogene formation is brown coal or lignits.

	Area including Aoji-dong (阿吉地洞) and Kogŏnwon (古乾原), Korea (By R. ENDO)	Coal field of Hun-chun, Manchuria (By R. IMAIZUMI)
Upper coal-bearing formation	Conglomerate, with occasional sandstone beds Tuffaceous shale and coal seams (Engelhardtia-beds) Alternation of sandstone and shale; sandstone occasionally shows cross-bedding. ~~~~~Unconformity~~~~~	Sandstone and shale beds, 300 m ± thick; consists of pale-green shale and fine-grained sandstone intercalated with medium-grained sandstone and clay; about 20 seams of coal of variable thickness were found by test-boring carried out by the Hunchun Coal Mines Co. ——No recognizable unconformity——
Lower coal-bearing formation	Coal-bearing formation; consists of sandstone, shale, and coal, with many plant fossils. Basal conglomerate beds.	Conglomerate and sandstone beds, 200 m ± thick. The top is generally sandy, and grades into the Upper coal-bearing formation. The bottom is locally composed of boulder conglomerate. Thin seams of coal commonly occur in the conglomerate beds.

Coal Mine	Heating Value (Calories per kilogram)	Estimated Reserves (Unit 1,000 tons)	(Tonnage)(Year)
1 Agochi (阿吉地)	4,400	110,000	368,000 (1937) 328,300 (1938)
2 Shōryō (冰良)	5,200		10,800 (1938)
3 Kunji (訓戒)	4,000	70,000	68,100 (1938)
4 Kokangen (古乾原)	5,200		101,000 (1938)
5 Hun-chun (琿春)	5,200	95,850	34,140 (1940) 100,000 (1944)

Note: For 1-5, see the mine sites on the map. No data for the Pos'yet coal field, USSR. Coal is brown coal or lignite. At Agochi coal mine the coal was consumed by a low-temperature distillation plant at the mine site.

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