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## The origin of the rock of stonewalls in the Hitsujisaru and Tatsumi tower remains of the Yamagata Castle

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Yamagata Castle was constructed in the 14<sup>th</sup> century and is located on the end of the alluvial fan of the Mamigasakigawa River (Fig. 1), near Yamagata city in northeast Japan. It was enlarged in the late 16<sup>th</sup> and early 17<sup>th</sup> centuries, and part of the area has now become Kajyo Park (Fig. 2A).

Several towers were built on the stone wall and embankment for the defence of the castle. The Hitsujisaru and Tatsumi towers (Fig. 2B & 2C) were built on the embankment before the construction of large-scale stonewalls (e.g., at the Higashiote gate).

The kind of rock used for the stone walls of these towers is different from that of the large-scale stonewalls of later times. We identified the geological origin of the stonewall rocks.

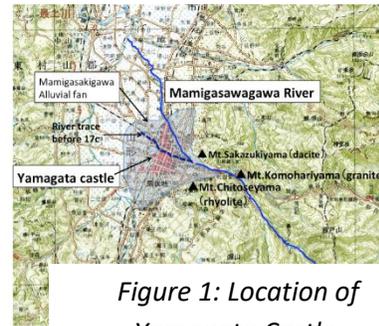


Figure 1: Location of Yamagata Castle.

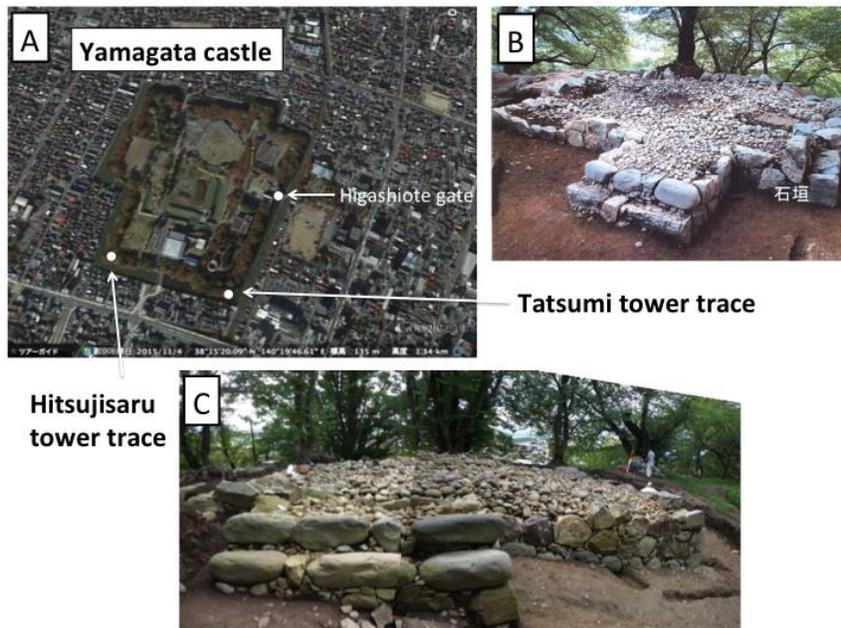


Figure 2: A: Location of Tatsumi and Hitsujisaru tower remains within the Yamagata castle. B: Remains of Tatsumi tower. C: Remains of Hitsujisaru tower.

The rock used on the stone walls of the towers is comprised of fine- to medium-grained granite, dacite with banded structure, and silicified rhyolite. On the other hand, the rocks of the Higashiote Gate consist mainly of andesite [1] [2]. It has been recognized that

andesite gravels of the alluvial fan were used for the construction of the large-scale stone wall of later times. Judging from the geology and lithology of the rock, it is thought that rocks used for the building of the towers were carried from the mountains located between 3 and 7 km away from the castle.

*References:*

- [1] Ohtomo Y. and Okuyama H. (2012) Abstracts, Annual Meeting, Geol. Soc. of Japan, 119:231 (in Japanese)
- [2] Ohtomo Y. et al. (2014) Abstracts, Annual Meeting, Geol. Soc. of Japan, 121:191 (in Japanese)

