## Landslide situation and Geological characteristics around the Gebasawa River in Nagano Prefecture due to heavy rain in September 2021

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On September 5, 2021, the sediment disaster occurred in the Gebasawa River, Chino City, Nagano Prefecture, due to local heavy rain. The Gebasawa River is a tributary of the Miyagawa River in the Tenryu River system, located in the northeastern slope of Tsuetsuki Pass at the northern end of the Akaishi Mountains, at the northwestern end of Chino City, Nagano Prefecture. The Gebasawa River has an area of about 2.04 km<sup>2</sup>, a channel length of about 3.0 km, and a relative height of about 480 m (elevation 760-1,240 m). The cumulative rainfall from 15:00 to 24:00 on September 5, 2021 was 159 mm (Tsuetsuki Pass rainfall observation station). As a result of the Radar-AMeDAS rainfall, the range of local heavy rain was limited to about 7 km east-west and about 3 km north-south around the Gebasawa River. This disaster caused damage to the houses and traffic disruptions on prefectural road. We report the results confirmed by field surveys and airborne LiDAR data on the situation of landslides occurrence and geological characteristics in the range of local heavy rain.

The Gebasawa river has main river and the left tributary, and traces of landslide and a slightly weak lineament structure are shown around this basin by the topographical interpretation. The Saino River basin, which locates in the south of the Gebasawa river, and Sawa Rivers basin, which locates in the west of Saino River, had rainfall as much as amount of the upper Gebasawa River. For the geology, ltoigawa-Shizuoka Tectonic Line, which runs from northwest to southeast, and the Median Tectonic Line, which runs from southwest to northeast are intersected around the Gebasawa River. The Moriya Formation and Enrei Volcanic Rocks (En) on the western edge of Fossa Magna are distributed. The Gebasawa River is mainly distributed with the Takabe Conglomerate Member of Moriya Formation (Mc). Enrei Volcanic Rocks are distributed in a part of the Gebasawa main river and the Saino River. In Sawa River, the Karasawagawa Acidic Volcanic Rocks Member of Moriya Formation (Md) and the Kumakubo Andesite Member of Moriya Formation (Mk) are distributed.

In the Gebasawa River, many shallow landslides and river bank collapses have occurred. But in the surrounding Saino River basin and Sawa River basin, we did not find landslides by this survey. Also, the Gebasawa River basin had a higher relative elevation and steeper slope than the Saino River basin and the Sawa River basin.

Shallow landslide that we confirmed in this survey has 10 m width, 80 m length, and 1.6 m depth. This landslide occurred at a talus deposit containing rock fragments of Enrei Volcanic Rocks and Takabe Conglomerate Member. Maximum gravel diameter of the landslide deposit is 25 cm.

On the other hand, landslide that we confirmed in this survey has 16 m width, 60 m length, and 3.0 m depth. The landslide occurred at the position where the fault fracture zone of the Takabe Conglomerate Member was continuous. Maximum gravel diameter of the landslide deposit is 80 cm. In addition, river bed erosion with a depth of 1 m or more was observed in almost the Gebasawa left tributary.

In other words, the Takabe Conglomerate Member of Gebasawa left tributary may be relatively susceptible to weathering and erosion. It may have affected the formation of steeper terrain than that of

the other basins. Therefore, the left tributary of the Gebasawa River had more sediment runoff than the main river did because of landslides in the fault fracture zone and erosion of the valley floor.

Keywords: Geological characteristics, Rainfall-induced landslide, Sediment disaster, Fault fracture zone, Fossa magna