Digitalization of flood depth data of the July 1974 Flood (Tanabata flood) and differences in natural conditions and flood depths between the September 2022 Flood and the July 1974 Flood at Shizuoka City

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The Tomoe River, which flows through the Shimizu lowlands of Shizuoka Prefecture, frequently causes flood damage. The July 1974 Tanabata torrential rainfall (total rainfall 508 mm) caused 26,156 houses to be inundated above and below floor level and 2,584 ha in flooded area. After this damage, Shizuoka Prefecture and Shizuoka City promoted flood control projects along the Tomoe River, and the Ohya River drainage channel was completed and put into service in 1998. However, in September 2022, heavy rainfall (410 mm total rainfall) caused by Typhoon No. 15 overflowed the Tomoe River and some of its tributaries, resulting in flooding above and below floor level.

This study shows the difference in natural conditions - ground deformation and tidal range - between the July 1974 flood and the September 2022 flood as a basis for future flood damage mitigation in the Tomoe River.

The land at the mouth of the Tomoe River sank about 37 cm during the 50-year period between the July 1974 flood and the September 2022 flood, due to the overlap between subsidence caused by the subduction of the Philippine Sea Plate and sea-level rise caused by global warming. In addition, a slight decrease in topographic gradient (5 cm at 12.5 km) occurred upstream (Shizuoka) and downstream (Shimizu) of the Tomoe River. Since these phenomena will continue in the future, the frequency of floods in the Tomoe River basin will increase.

In the case of the July 1974 flood, the rainfall was coincident with the ebb tide, whereas in the September 2022 flood, the rainfall coincided with the high tide. Thus, with respect to the timing of tides relative to rainfall, the July 1974 flood acted to reduce damage, while the September 2022 flood acted to increase damage.

Field observation shows that inundation depths are higher in the July 1974 flood than in the September 2022 flood, 64-82 cm higher in many areas, but in some areas the difference is only 7-20 cm. Therefore, the Tomoe River requires continued flood control projects by Shizuoka City.

Keywords: July 1974 Flood (Tanabata flood), September 2022 Flood, inundation depths, relative sea-level changes