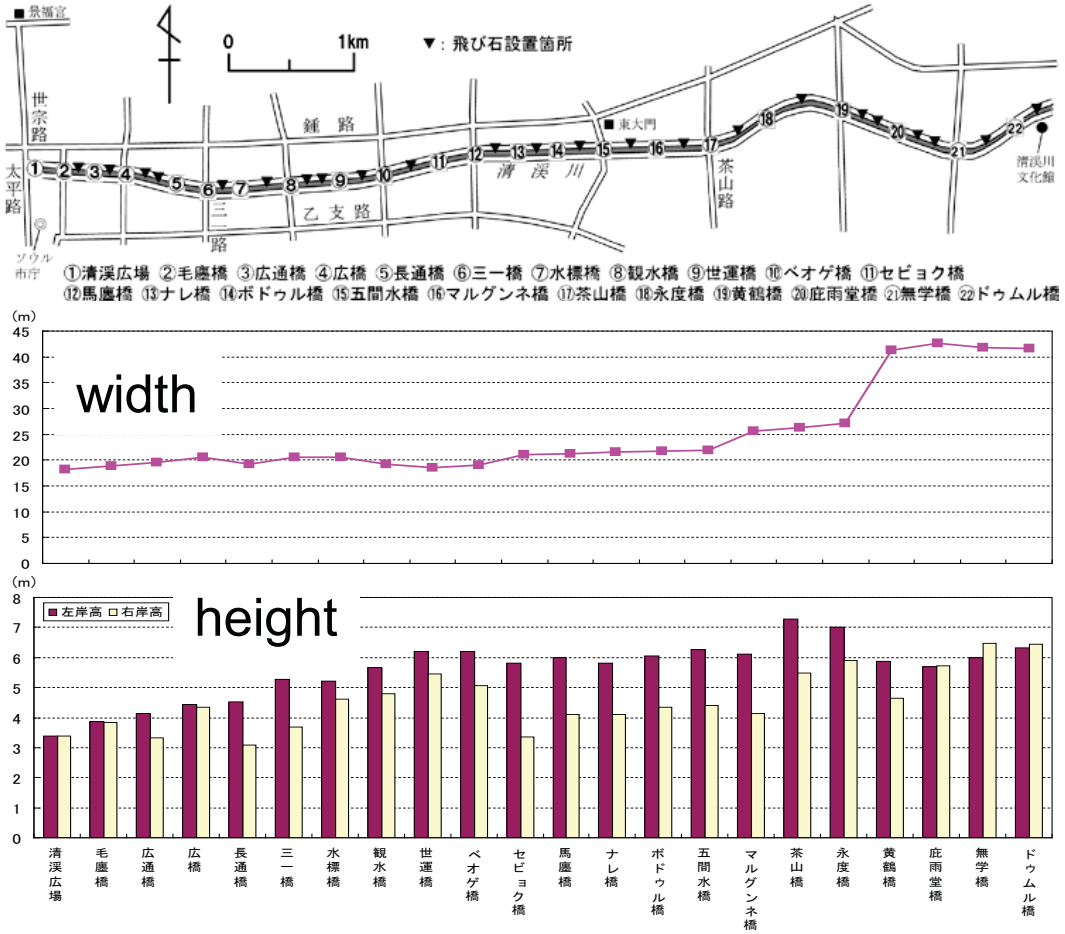
-SEOUL-

The City of Seoul

During the period from 1910 to 1945 when it was under Japanese administration, large-scale infrastructure development was carried out and urban development progressed. It sustained major damage in the Korean War starting from 1950 but due to its subsequent rapid economic growth a large number of workers came into the city, and urbanization and industrialization progressed rapidly. The population of Seoul City was 100,000 people in 1900 and had increased to 10,300,000 people by 2005. Currently almost half of the population and economy of the Republic of Korea is gathered in Seoul City and its surrounding areas, and it is drawing in industry as the Seoul Metropolis.

Characteristics of Cheonggyecheon River's Urban Waterscape: Sky-View Factor and Sky-Occupancy Factor

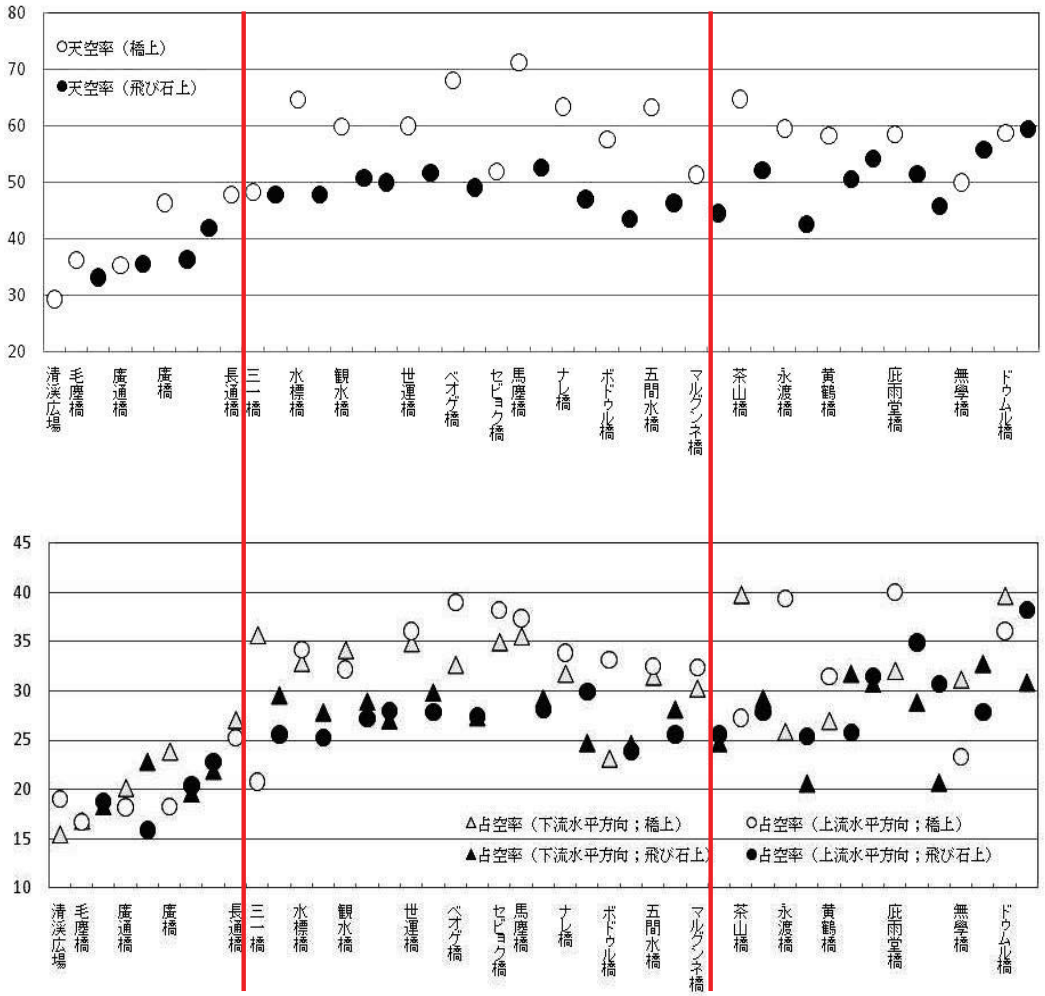
A. Yamashita (University of Tsukuba)・T. Taniguchi（Rissho University）



In this study, analyses were conducted on a 5.04 km section of the Cheonggyecheon River, from Cheong Gye Plaza to Dumuldari Bridge.

We measured the width between the revetments of both banks and the height of the revetments, by using a laser ranger. Next, we photographed a total of 45 areas using a fish-eye lens in the direction of the zenith and in the river's horizontal upstream–downstream directions.

sky view factor



sky occupancy factor

To determine its spatial characteristics, the waterside areas of the Cheonggyecheon River were divided into three sections, upstream, midstream, and downstream.

In the upstream section, both the sky-view and sky-occupancy factors were low because of the influence of the surrounding land use.

In the midstream section, the openness of waterside areas was lower, due to the high revetments.

In the downstream section, no clear tendency or characteristics were found.

・Yamashita, A. and Taniguchi, T. (2010) “Characteristics of Urban Waterscape of the Cheonggyecheon River in Seoul City in Terms of Sky View Factor and Sky Occupancy Factor”, *Proceedings of the Genaral Meeting of the Association of Japanese Geographers*, 77, 110. (in Japanese)

Groundwater in Seoul

Ninety percent of the tap water is supplied from the Han River, and the use of groundwater is relatively low. For this reason, economic development did not affect the groundwater pumping rate and the related groundwater disasters such as decrease of groundwater level and land subsidence have not occurred.

Human impact on groundwater flow and contamination using multiple isotopes

T. Hosono（Kumamoto University）・R. Ikawa（AIST）・J. Shimada（Kumamoto University）

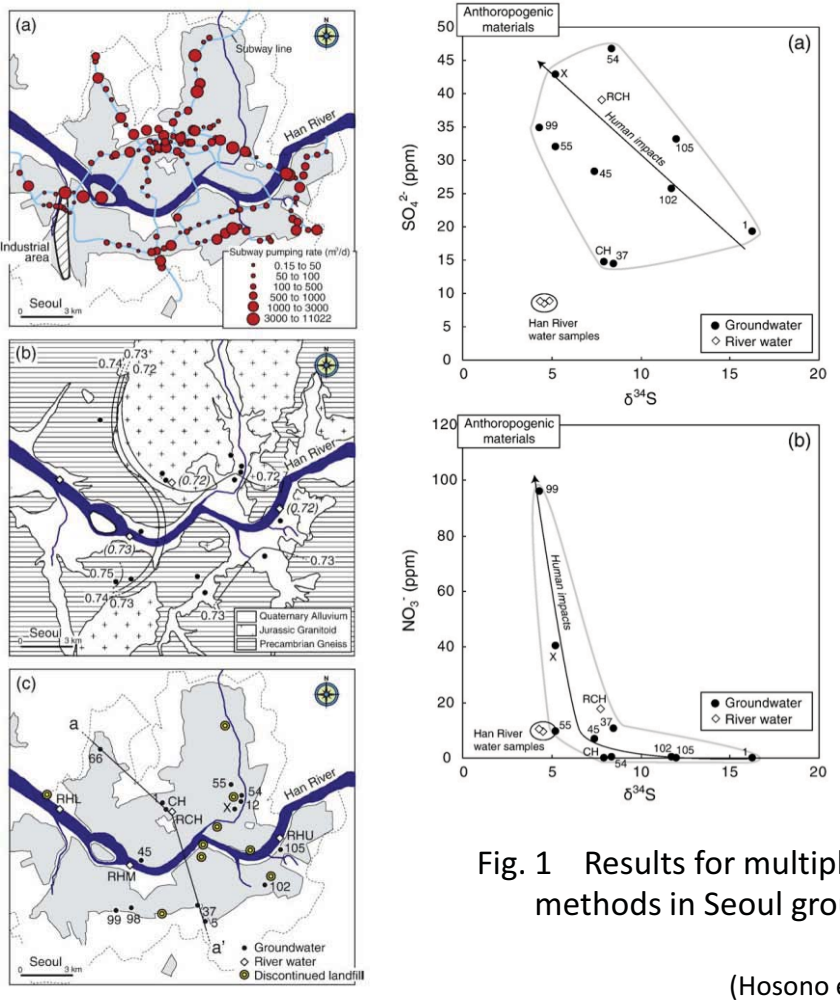


Fig. 1　Results for multiple isotope methods in Seoul groundwater basin
(Hosono et al., 2009)

The geology of the Seoul Basin is composed mainly of a basement of Precambrian gneisses, Jurassic granitoid intrusions, and a thin alluvium outer layer and soils of Quaternary age. Groundwater is situated within either shallow sedimentary deposits or fissure zones of crystalline metamorphic and plutonic rocks. This aquifer system is different from other Asian coastal megacities. The use of groundwater for drinking is continuously increasing, although approximately 90% of the municipal water supply is still dependent on Han River water.

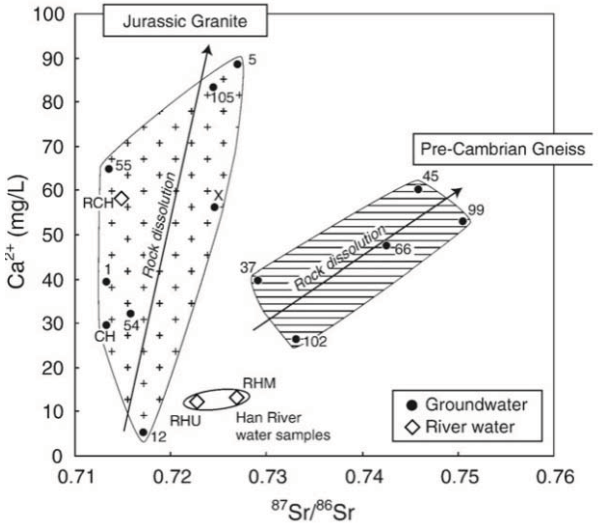


Fig. 2 Relationship between $^{87}Sr/^{86}Sr$ and Ca^{2+} to estimate groundwater flow
(Hosono et al. 2009)

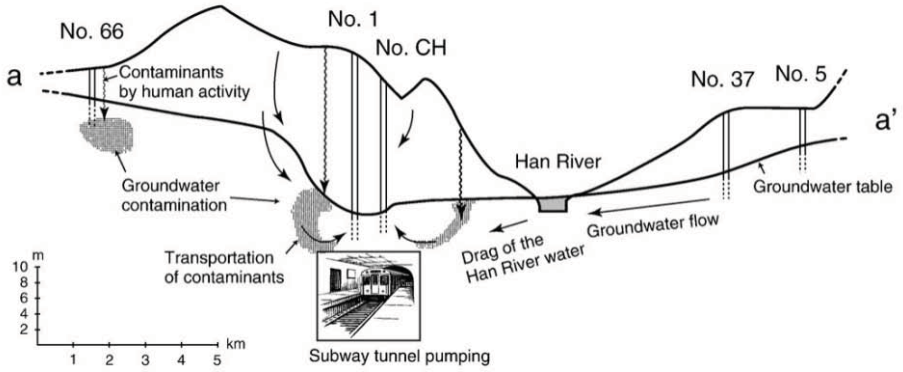


Fig. 3 Schematic model showing the transportation of contaminants under Seoul City
(Hosono et al. 2009)

The effects of human activities on Seoul's groundwater were evaluated using multiple isotopes (δD, T, $\delta^{15}N$, $\delta^{18}O$, $\delta^{34}S$, and $^{87}Sr/^{86}Sr$). Seoul's groundwater is discharged toward the northern-central part of the city because of the force of the subway tunnel pumping. Groundwater contamination, because of human activities, occur in the discharge area and in the high gradient area. Current groundwater flow suggests the transportation of contaminants toward the northern-central urbanized areas. This study has demonstrated that the use of multiple isotopes can help to investigate the mechanisms of the anthropogenic degradation of a megacity's groundwater quality.

T. Hosono, R. Ikawa, J. Shimada, T. Nakano, M. Saito, S. Onodera, K. Lee and M. Taniguchi (2009):
Human impacts on groundwater flow and contamination deduced by multiple isotopes in Seoul City, South Korea.
Science of the Total Environment, Volume 40. 3189-3197.

Subsurface Thermal Environment in Seoul

Subsurface temperature profile data collected by the Korea Institute of Geoscience & Mineral Resources shows that a rise in the underground temperature has occurred in the Seoul region as well. It is inferred that due to the impact of human activities, the ground surface temperature rapidly rose from the second half of the 20th century.

Reconstruction of ground surface temperature history

S. Goto (AIST)・H.C. Kim (KIGAM)・H. Uchida (AIST)・Y. Okubo (AIST)

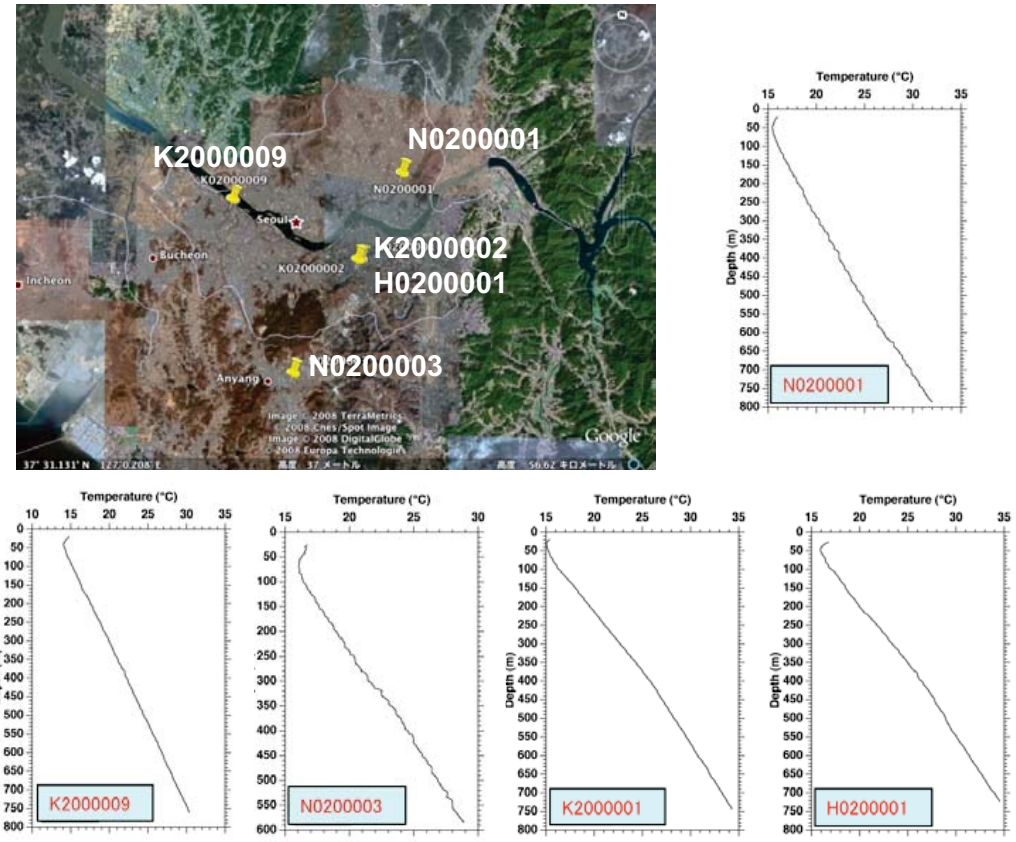


Figure 1. Borehole temperature profiles in Seoul

We reconstructed ground surface temperature (GST) history from borehole temperature profiles obtained in using the method developed by Goto and Yamano(2010). The results of this study suggest that GST has been influenced by human activities, such as land use change, since the mid-20th century.

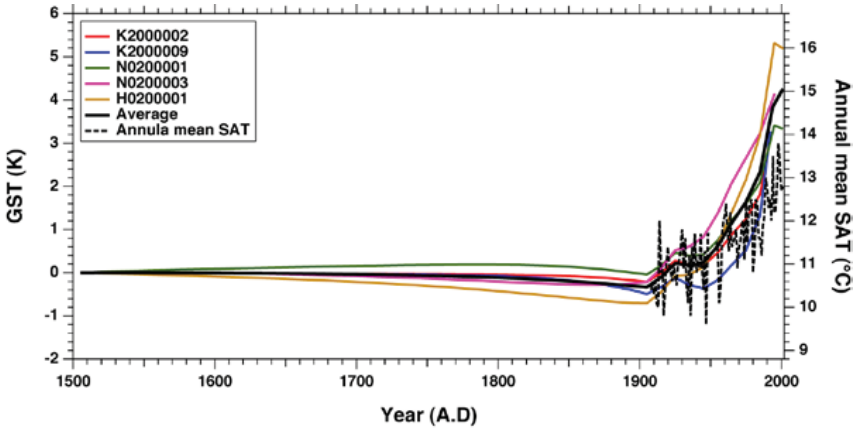


Figure 2. Results of GST history reconstruction from borehole temperature data. For comparison, annual mean surface air temperatures (SAT) are also plotted.

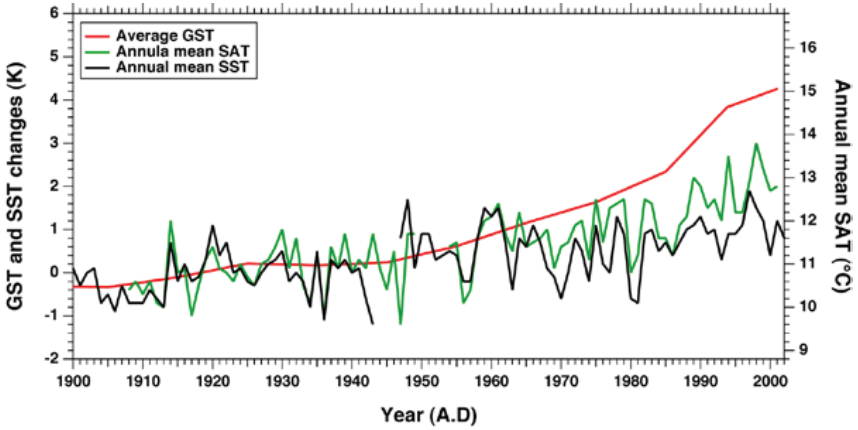


Figure 3. Comparison among reconstructed GST history, annual mean surface air temperature (SAT) change in Seoul and annual mean sea surface temperature (SST) change in the Yellow Sea.

The reconstructed GST histories in Seoul (Figure 2) indicate that GST began to increase in the early 20th century.

We assumed that changes in the annual mean sea surface temperature (SST) for the Yellow Sea (Takatsuki et al., 2007) were compatible with the background temperature change in the area around Seoul, and compared the reconstructed GST histories with the annual mean SST change (Figure 3). The increase in GST accelerated in the mid-20th century, suggesting that GST has been influenced by human activities, such as land use change, since that time.

Goto, S., and Yamano, M., Phys. Earth Planet. Int., 183, 435-446, 2010.

Groundwater Pollution in Seoul

Polluting substances leaking from landfill areas and sewage pipes are becoming more evident and also some groundwater has been confirmed to have nitrate-nitrogen levels above the reference value. It suggests that a crystalline basement rock creating an aerobic underground environment is one of the reasons for the nitrate pollution becoming more evident.