

# Geo-pollution Science, Medical Geology and Urban Geology

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## **A post audit of numerical modeling of VOC contamination sites**

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### **Abstract**

In 1991, a transport simulation using the MOC model was executed to predict the movement of PCE plume near Shizuoka Station. According to the prediction, the PCE plume had moved to the downstream, and disappeared about 20 years later. Based on the results of observation, the PCE plume have not moved, however, vanished about 10 years after. The disagreement between calculated and observed results was considered to be caused by neglecting groundwater recharge and pumpage. In the modeling process, groundwater recharge and pumpage were assumed to compensate each other. With groundwater recharge and pumpage, a transport simulation using MODFLOW and MT3D was executed and it was able to show the disappearance process of the plume.

At a TCE contamination site in Mobara City, a simulation of remediation process with pumping wells was executed. The prediction without inputting contamination source caused rapid reduction of TCE concentration comparing observed results. If development process of a plume is unknown and distribution of a plume as of finding is only known, an inaccurate model could simulate the contaminant plume. Then, predictions by means of this model may include large errors. It is shown that an inadequate model with short calibration period may produce large errors in prediction.

**Keyword** : MOC, PCE, Post audit, Prediction, TCE, Transport simulation

## **Records of fossil fuel combustion during the last 150 years using Spheroidal Carbonaceous Particles (SCPs) and Inorganic Ash Spheres (IASs) in the sediment of Osaka Bay, Japan**

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### **Abstract**

Spheroidal carbonaceous particles (SCPs) and inorganic ash spheres (IASs) produced from the high temperature combustion of fossil fuels are found in high concentrations in the upper levels of sediment core taken from Osaka Bay. The temporal distributions of SCPs and IASs show that the similar patterns start in c.1930 and become maximum in late 1950s - 1960s. These results show good coincidence with SCPs trend recorded at moat and pond sediments in Osaka City. It is considered that these temporal patterns correspond to the industrial activity (fuel consumption) in the Osaka Bay area, and environment pollution controlled the measures. SCPs and IASs are effective as air pollution tracers, and can follow changes of the fossil fuel combustion after the Industrial Revolution.

**Keyword** : Spheroidal carbonaceous particles, Inorganic ash spheres, Fossil fuel combustion, Osaka Bay

## **Heavy metals in fine fractions (<32 $\mu$ m) of urban park soils in Nagoya City, central Japan**

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### **Abstract**

Chemical compositions of fine-fractions (<32 $\mu$ m) of urban park soils in Nagoya City, Central Japan are studied, in order to obtain information about heavy metal pollution in the urban area. Concentrations of Si, Ti, Al, Fe, Mn, K, Ca, P, Cr, Co, Ni, Cu, Zn, Pb, N, C, H and S were measured on topsoil samples collected from 150 parks. The results show that fine fractions of park soils are enriched in heavy metals such as Cr, Ni, Cu, Zn and Pb compared with hypothetical background levels. Additionally, it is suggested that Fe and Mn were derived significantly from anthropogenic sources. Among these “enriched elements”, Zn is likely derived from tire and/or asphalt dust, whereas Fe and Mn and possibly Cr and Ni appear to be loaded to park soils as iron alloy particles. These metallic iron particles may have been partially derived from parts of vehicles such as their bodies and brake disks.

**Keyword** : Heavy metals, Urban park soils, Nagoya, Vehicles, Fine fractions

## **Damage caused by the 2004 Mid Niigata Prefecture Earthquake in southern Niigata Plain, Niigata Prefecture, northeast Japan -Preliminary report on liquefaction of ground-**

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### **Abstract**

The 2004 Mid Niigata Prefecture Earthquake ( $M = 6.8$ ) rocked the central part of Niigata Prefecture on October 23, 2004 and caused considerable damage such as liquefaction of ground, destruction of numerous wooden houses and collapse of many slopes. In southern Niigata Plain, distribution and land condition of the liquefied area were investigated. The liquefaction mainly occurred in the former river course and former riverside land of the Shinano River, and was found within the range of about 30 km from the epicenter. On embankments of the river, sand boiling was observed, and also collapse of roads and uplift of manholes were recognized where sewerage had been constructed. These facts indicate that man-made strata such as fillings and refilling earth were liquefied, and the liquefaction presumably resulted from small aquifer which existed in the man-made strata. Some countermeasure or other is indispensable for liquefaction of the man-made strata.

**Keyword** : 2004 Mid Niigata Prefecture Earthquake, Damage, Liquefaction, Land condition, Man-made strata, Niigata Plain