Local Survey in Bangkok

Photo 1

<Extraction of Seabed Sediment and Surface Layer Soil>
Photo 1 shows our survey to sample seabed sediment cores along the bank of the Chao Phraya River in Bangkok, Thailand. The reason that the color of the Chao Phraya River and the sea near the mouth of the river is brown is that clay made up of extremely fine particles, known as Bangkok clay, is floating in the water. The objective of this survey was to investigate the accumulation of polluting substances via river and waste water, etc. in seabed sediment. The process used was simple: dive into the sea, insert an acrylic tube into the seabed, and extract sediment cores. However, it is quite difficult to implement because when you dive into the sea visibility is zero due to the floating clay from the Chao Phraya River so the researchers could not see what they were doing.

Photo2

In this survey, we detected the amount of polluting substances accumulated in the sedimentary soil on the seabed at the mouth of the river, a place where polluting substances are thought to accumulate underground. Then we were also able to estimate the accumulation time and the accumulation speed, giving us the advantage of estimating pollution environment in the past. We carried out the same kind of survey in other cities such as Jakarta, Manila, etc. in addition to Bangkok, and studied the relationships between human activities such as industrial activity, etc. in each city and the pollution history of the coastal ocean environments. Furthermore, Photo 2 shows a soil extraction auger being used to extract the surface layer soil of Bangkok. Just as in the case of seabed sediment, the objective here is to investigate the accumulation of polluting substances in the soil.

Photo 3

<Setting up of Submarine Spring Water Monitoring Devices>

Photo 3 shows the long-term monitoring system being set up the mouth of the Chao Phraya River in Bangkok, Thailand to observe the submarine groundwater discharge. Submarine groundwater discharge (SGD) refers to the groundwater that is discharged from the seabed and it has been gaining attention in recent years as a new route travelled by polluting substances from land to the ocean. In Photo 3 a seepage meter (the yellow object in the photo) is being installed on the seabed with the cooperation of a local diver, in order to measure the SGD. The measurement is made by using a heat sensor to detect the flow velocity of the extremely tiny amount of groundwater from the seabed. Because this method involves long-term tying it is necessary to secure a power source. With the cooperation of a professor at a local university (Chulalongkorn University), our counterpart, we were able to install the monitoring system inside a public facility. Through this survey, we studied the change over time in the load of substances travelling from the land via groundwater.

Photo 4（left）

Photo 5（right）

<Deep Layer Groundwater Extraction>

We sampled deep groundwater in the suburbs surrounding Bangkok, Thailand, in order to measure the age of the groundwater (Photos 4 and 5). A carbon isotope (carbon 14) and a hydrogen isotope (tritium) are often used to measure the age of groundwater, but in this survey we attempted to measure the age of the groundwater by measuring the concentration of substances called CFCs in the groundwater. These CFCs have been attracting attention in recent years as tracers that can estimate the age of young groundwater (stored from ten years to about fifty years). CFCs are organic compounds artificially made for industrial applications, and three types can be used as age estimate tracers: CFC-11 (CFCl3), CFC-12 (CF2Cl2), and CFC-113 (C2F3Cl3). The concentration of CFCs in the air increased monotonically until the 1990s along with the increase in industrial production. Their major distinctive feature is that they possess a concentration peak in a more recent years than tritium in precipitation. When sampling groundwater to use in the CFCs analysis it is necessary to take into consideration 1) a water-sampling procedure that prevents air contamination, and 2) selection of materials for the equipment so that it will not be a source of CFC pollution. Therefore, specialized water-sampling technologies are necessary. The water-sampling container used in this survey was a stainless steel container with an aluminum coating on the inside. We passed a nylon tube through the container, poured the groundwater into a glass bottle and sealed the container with an airtight stopper until the container is full.