

Study on the shape of seawater / freshwater interface and groundwater flow system

Atsunao Marui[1]

[1] GSJ, AIST

<http://www.groundwater.jp/>

The research about the total groundwater flow system and upward flow elements around the coastal area are very important for better understanding about the environment of deep zone. The groundwater flow system started from the mountain area runs down to the ocean. At the end of the flow system, fresh groundwater faced to the salt water and formed a seawater / freshwater interface. The interface is squeezed to the offshore because of the pressure of groundwater flow, usually. So the fresh groundwater discharged to the marine bottom. And also the deep groundwater flows upward along the interface and discharge to the marine. We can get important information about deep zone of the groundwater flow system from the submarine groundwater discharge. The latest research found many submarine groundwater discharge all over the world. There are a lot of fresh water discharge to the ocean is reported even in 3,000m depth marine floor and beach line. The huge volume of groundwater that effect to marine water quality is thought to be drained to the ocean, in some research work. The half of the river discharge water is supplied by groundwater flow system, normally.

The shape of the seawater / freshwater interface is important to make clear the rate of groundwater flow because the distribution of the water pressure in an aquifer is decided by the interface shape. And the point of the fresh water discharge in submarine is also important to get the information of the deep fresh groundwater. The study purpose is to make clear the shape of seawater / freshwater interface for that reasons.

There are two test fields in the Japanese Islands, one is located in the northern part of the Kujyukuri long beach near by Narita New Tokyo Air Port, and another one is located in the east beach of the Rishiri Island in Hokkaido. The Rishiri Island is a volcanic island and the geology of the test area is composed by lava flow, pyroclastic flow and its secondary deposits. Submarine groundwater discharge is observed about 200m offshore in 10 to 30m depth, and it makes a big ripple on the marine surface in a fine and gentle day. Fisherman knows the point of the groundwater discharge, and it is a good point of fishing from old days. One another point, it is called Hasunuma Beach Park, is a typical sedimentary area, which is composed by silt, clay and sand. A clear submarine groundwater discharge is not found in the diving (human eyes), however, the observation of electric conductivities and water temperature show the evidence of the fresh water discharge. Drilling research on the land is done to confirmation of the depth of the interface, in both field. After the sounding and some electric tests, the holes were used for the sounding job between holes or between hole and ground surface. The shape of the interface is made clear in these research field by the physical land research (incl. drilling) and diving research in the marine side. The shape of the interface, especially in the angle of the interface, is corresponded to the geology, because the fresh water flow rate is thought to be decided by the geology and rainfall rate. On the other hand, the Tr concentration of the submarine groundwater discharge is quite higher than that of the groundwater and precipitation around the area. It is one evidence of the deep groundwater discharge at the point (deep groundwater runs up along the interface).