Modeling of the role of groundwater level on building anaerobic condition in the soil

Kenichi Tsuchiya[1]; Takeo Onishi[2]; Muneoki Yoh[3]

[1] Dept of Agric, TUAT; [2] RIHN; [3] Tokyo Univ. Agri. Tech.

Anaerobic area is performing a very important role in the global material circulating as the field of reduction reaction like dinitrification. Anaerobic area in the soil may occur in the condition like wetland which soil is saturated with water. If the soil is over lapped by water, the border line dividing aerobic-anaerobic area exists about 1mm-5mm depth from the soil surface. But under the condition, which water level is under the soil surface, the line is considered to exist at variable depth with ground water level.

To estimate the relationship between aerobic-anaerobic border line and ground water level, the model of $O\{2\}$ concentration profile in the soil was made by theoretical calculation with a factor that gas diffusion coefficient and gas flux. Gas flux data was obtained by soil incubation experiment. Many equations which contain air filled porosity and total porosity in the soil are proposed to estimate gas diffusion coefficient. These porosities are related to soil water tension, and this relation is described as water retention curve. When the effect of rain fall can be ignored, this soil water tension is determined by ground water level. So if the physical information of the soil is prepared, gas diffusion coefficient can estimate by the gas flux and ground water level.

The model of $O{2}$ concentration corresponds with measured $O{2}$ profile.