Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

AGE003-P05 会場:コンベンションホール 時間:5 月 27 日 10:30-13:00

中国東北部ソンナン平原の地下水位変動機構
Causes of shallow ground water fluctuation at Songnen plain Northeast China

西村 拓 [1*], 溝口 勝 [1], 井本博美 [1], 石濱 嘉夫 [1], 宮崎 毅 [1]
Taku Nishimura[1*], Masaru Mizoguchi[1], Hiromi Imoto[1], Ishihama, Yoshio[1], Tsuyoshi Miyazaki[1]

[1] 東京大学大学院農学生命科学研究科
[1]The University of Tokyo

Songnen Plain is located northeastern China, and covers around $17.0*10^6$ ha. Soil alkalization in the Songnen plain has been a serious problem for the last two decades in the areas overlain shallow ground water. Ground water level in the plain has seasonal changes and affects water circulation and thus extent of soil alkalization. In this study, soil temperature, moisture, ground water level as well as climatic data of salt accumulated and vegetated fields were monitored for one year. The processes causing the fluctuation of shallow ground water are discussed. It is worth noting the low temperature and less precipitation of this region. During winter, air temperature drops to be lower than -20?C and seasonal soil freezing occurs around 1m in depth. Rainstorm happens mostly from May until September, and annual precipitation in 2005-2006 was 336 mm. Ground water level started to decrease in November and showed the lowest level of -3 m below the ground surface at early April. Then, it showed slight increase until early June. Ground water level showed two distinct rises during the summer of 2006, mid-June and late-July. During the mid-June, the rise in temperature enhanced evapo-transpiration and thus decreased the soil moisture at shallow depth. During rainfall event of this period, most of rainwater was captured by the dry shallow soil layer and could not affect ground water level. This interpretation is supported by the fact that during early July when the region had several rainfall events falling on a dry surface soil, ground water level decreased though there were large rain storms. Soil temperature profile suggests seasonal frozen soil had melted early June. It is expected liquid water accumulated low permeable frozen soil then flowed into aquifer and caused a rise in ground water level after the melt of frozen subsoil. Latter half of July, surface soil moisture was always almost saturated and rainfall in this period caused large rise in ground water level. The rise was more than 10 times greater than rainfall depth. The mid-June rise in ground water level was also more than 10 times greater than the rainfall depth of the same period. However, the process of the rise in ground water level was different to that of the July rise. Large rise of shallow ground water level in response to rainfall event has been reported by several researchers. Small input of water into nearly saturated soil is a key mechanism of the phenomenon. In Songnen plain very interesting rise of shallow ground water level was observed. In early summer, when surface soil is significantly dry due to evapotranspiration and frozen and low permeable subsurface soil has just melted, accumulated water on frozen subsoil may be a key addition of water to rise shallow ground water. while in mid-summer, i.e. late July, when frequent precipitation is observed, rainfall event onto nearly saturated surface soil stimulates rise in shallow ground water level. Both processes could rise shallow ground water level around 1.0 m and as a result, totally, 2.5m of ground water level rise had happened under 336mm precipitation during the summer of 2006.

キーワード: 塩分集積, , 季節凍土, 土壌水分, 降雨, 浅層地下水
Keywords: Salt accumulation, seasonally frozen soil, shallow ground water, rainfall, soil moisture