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In recent years, the chemical approach to groundwater has become a major interest of study from the viewpoint of groundwater purification in a paddy field or a marsh. Reduced water, due to the low solubility oxygen from atmosphere to water and the metabolisms of heterotrophic microorganisms in a paddy field and marsh, infiltrates into subsurface. The sequences of reduction reactions (O2 reduction, denitrification, Mn(IV)- reduction, and Fe(III)- reduction) occur at reducing condition, in a ponded land like paddy field. Dissolved Mn2+ and Fe2+ are caused by redox reactions to give cation exchange reactions. After an oxidation condition in subsurface has been changed, Mn2+ and Fe2+ are reprecipitated as Mn- Fe- oxyhydroxides, respectively. In this study, a simulation model with chemical reactions for multicomponent mass transport was developed and applied for column experiments. This experiment has reproduced the redox condition by using of plow soil and artificial materials (quartz sand, glass beads). Reactions in the model must be taken into account in redox conditions which are both biochemical reaction and cation exchange reaction. Especially, the model considered the effects of O2 gas diffusion and the dissolution-precipitation reactions of iron in oxidized layer. The results of the numerical simulation are summarized as follows. 1) The simulated values of O2, Mn2+ and Fe2+ agree with the experimental results, the reliability of the developed biochemical model was ascertained. 2) In quartz sand layer, O2 in gas phase is depleted by dissolution into liquid phase because of small gas volume, while in glass beads layer O2 in gas phase showed constant because of large gas volume. 3) The simulated amount of Fe precipitation in oxidized layer agree with experimental results, and the depth of accumulated Fe precipitation can be reproduced by the developed model.

H52B-06 1520h

Effect of Pore Structure on Eedistribution of Subsurface Water in Sarobetsu Mire, Northern Japan

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We measured the diurnal change in groundwater level (GWL) and other hydrological factors in sphagnum peat in Sarobetsu Mire, Hokkaido, Japan. Field measurements confirmed that at nighttime, the GWL lowered just after a rainfall event and its decrease rate slowed with time, until finally the GWL rose@later in the night. At the study site, however, the groundwater inflow hardly occurs. The field experiment reproduced this tendency under the condition that the groundwater flow was completely interrupted. A new model was proposed to explain the GWL change during the night without groundwater flow, considering the peat-soil structure. Sphagnum peat has various scales of pores, including those found on the inside of plant cell walls. These pores were classified into two types based on their water infiltration capacity. One is the large pore that can easily be filled with water and also can be easily drained. The GWL is formed in these large pores. The other type is the small pore that cannot be filled with water or drained of water so easily. Just after a rainfall event, the water potential in the large pores is larger than that in the small pores, and accordingly the discharge from the large pores to the small pores occurs. Since the GWL is formed in the large pores, the GWL decreases during the night. The lowering GWL rate slows as the difference in the two pore potentials grows smaller. Further, when the water potential in the large pores becomes lower than that in the small pores by intensive evapotranspiration, the water starts to move from the small pores to the large pores, and consequently the GWL increases later in the@night.@@The diurnal change in the water loss from the large pores was compared with that caused by evapotranspiration. The comparison showed that all of the water loss from the large pores during daytime was evapotranspiration, whereas the water loss from the large pores during nighttime was mostly in the form of the storage change in the small pores. The storage change in the small pores in a day ranged from -1.9 to 2.1 mm/day, and these values were a large proportion of the day?s total evapotranspiration. The characteristics of the subsurface water movement in sphagnum peat indicate that the sphagnum peat acts as a buffer zone to prevent drastic changes in the GWL.

URL: http://wwwgeo.ees.hokudai.ac.jp/memberhome/~hana/index.htm

H52C NYC: 401 Friday 1535h

Hydroclimatic Variations and Trends

(joint with A)

Presiding: **J Yoshitani,** Public Works Research Institute; **H Lins,** U.S. Geological Survey

H52C-01 1535h

Influence of the Recent Decadal Weakening of the East Asian Winter Monsoon on the Hydrological Cycle over the North Pacific

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The wintertime atmospheric circulation over the Far East and Northwestern (NW) Pacific is characterized by persistent southward transport of cold, dry air associated with a northwesterly monsoonal flow between the Siberian High and Aleutian Low. Strong meridional temperature gradients the monsoonal flow sustains and an abundant heat supply from the warm ocean surface both maintain the high baroclinicity over this region that feeds baroclinic eddies to form a well-defined stormtrack downstream, marked as a zonally-oriented belt of local precipitation maxima in midlatitude. We found that the weakening of the winter monsoon, which occurred in the late 1980s, did substantially influence the hydrological cycle over the entire North Pacific through the associated changes not only in the surface wind field but also in the stormtrack activity. The most profound signature of the latter was the disappearance of the well-known midwinter suppression in the seasonal march of the stormtrack activity over the NW Pacific, owing to the marked stormtrack activation in midwinter since the late 1980s. As captured in satellite measurements, this activation also increased precipitation in a midlatitude belt around southern Japan, while the local moisture supply from the ocean was reduced significantly in the presence of the weakened monsoon. Over the Northeastern (NE) Pacific, the enhanced diffluence of the stormtrack gave rise to more frequent penetration of storms into the subtropics than before, causing an increase in convective rainfall in the presence of enhanced evaporation from the nearby ocean. The enhanced stormtrack diffluence also caused less frequent passage of storms in the midlatitude NE Pacific and the associated reduction in precipitation. At the same time, the surface evaporation was enhanced over that region, as the advection of warm, moist air from the south weakened in association of the weakened Aleutian Low. The anomalous surplus and deficit in the net local moisture supply thus generated over the NE and NW Pacific, respectively, were balanced by anomalous westward transport of moisture in the midlatitude troposphere, as diagnosed in the NCEP/NCAR reanalyses.

H52C-02 1550h

Cross-Correlation Between Southern Oscillation Index and Precipitation in Fukuoka, Japan

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Southern Oscillation is a phenomenon which affects large-scale atmospheric and oceanographic features of the tropical Pacific Ocean. The oscillation can be characterized by indices based on variations in either sea surface temperatures or differences in barometric pressures. Its best-known extremes are the El Nino and La Nina events. The impacts of Southern Oscillation on climate are widespread and extend far beyond the tropical Pacific. However, the concrete influence is not so clear, especially in middle to high latitudes like Japan. A general tendency of cool summer and warm winter during El Nino events is seen in Japan, but no significant correlation is presented so far between El Nino or La Nina events and precipitation in Japan.

In this study, cross-correlation between Southern Oscillation Index (SOI) and precipitation in Fukuoka , Japan, is investigated in detail. The data used in this study comprise 109 years of monthly precipitation in Fukuoka, Japan, and SOI from January 1890 to December 1998 (1308 months).

The result shows no significant correlation between SOI and precipitation in Fukuoka for the whole data, which was also been found for other precipitation data in Japan. In the next step, the SOI data are categorized into 5 groups according to their magnitudes: A) strong El Nino, B) weak El Nino, C) normal condition, D) weak La Nina, E) strong La Nina. The cross-correlation between categorized SOI and corresponding precipitation data are calculated with their lag times.

The results show that the correlation increases with increasing SOI absolute values. The highest correlation coefficient -0.49, which is statistically significant at 1% level, is obtained for the lag time 4 months under the category E). Significant negative correlations are also obtained for the lag time 3 and 4 months under the category A). From scatter plots and box-whisker diagrams between categorized SOI and the corresponding precipitation for the above mentioned lag times, the following tendency is obtained: the stronger the La Nina event, the less precipitation in Fukuoka 4 months later; the stronger the El Nino event, the bigger the variation of precipitation we have 3 to 4 months later.

H52C-03 1605h

Geographical Analysis on Snow Cover in Estimating Potential Water Reassures

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Japan is very famous as snow country. Heavy snow interrupts the life style of the people who live in snow affected regions. Studies have been carried out to investigate the damage cause by snow cover. Presently researchers are more interested toward the utilization of snow cover as a potential water resources. Due to the property of storing water, we called snow as white dam. Snow is treated as prospective water resources during the transition period of winter and rainy season. Distributed snow cover databases are necessary for its effective utilization. Initially the monthly distribution of snow was estimate. It is difficult to observe the snow distribution in wide area manually. Remote sensing technology was used a tool in estimating the snow distribution. Advanced Very High Resolution Radiometer (AVHRR) data of National Ocean and Atmospheric Administration (NOAA) satellite was used for snow observation in the research., Snow area maps were created combining NOAA satellite and 30 arc second resolution elevation data. The evaluation of the snow depth distribution was carried out using Automated Meteorological Data Acquisition System (AMeDAS) data and developed snow area maps. The distribution of the snow density was estimated using the above mention result and the snow density function. The methodology was carried out during the winter seasons, starting from the year 1989 to 1999 in East Japan. Results give us comprehensive information of temporal and spatial variation of snow area in the east Japan. The potential water resources from snow was estimated during the above mention period. Finally classification for similar behavior points were evaluated considering temporal variation water resources potential throughout the season.

URL: http://kaigan.civil.tohoku.ac.jp

H52C-04 1620h

A Third Independent Estimate of Runoff Over the Mississippi Basin Based on Coupled Water and Energy Balance and Top-of-Atmosphere Radiation

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