AHW025-01   Room:202   Time:May 22 14:15-14:30

Development of Hydro3D - a three dimensional hydrological modeling approach

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In order to develop hydrological model suitable for Karstic region, the traditional two dimensional approach may not be suitable due to the presence of many cracks and associated percolating water which flow into the surface hydrological regime at a certain distance. Also for the mountain region, hydrological processes in steep slopes are not identical to those in a gentle slope. In this study we propose a three dimensional hydrological modeling approach entitled as Hydro3D which combine 3D networking model for subsurface flow including percolating water and surface 1D-network and 2D shallow water modeling approach. The Hydro3D also include three dimensional hydraulic module which can illustrate lakes and reservoir in the continental region and bays/estuaries at the river mouth. The downsides of this modeling approach are- relative expensive computational resources when generating grids for whole catchment zone, difficulty in assuming appropriate dataset, and grid generation in vertical directions.
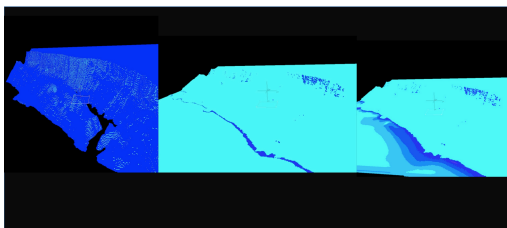
Keywords: Hydro3D, percolating water, hydrological processes, distributed model, reservoir

AHW025-02   Room:202   Time:May 22 14:30-14:45

A study of the vegetation change and climate memory in Africa using a dynamic global vegetation model

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Various vegetation types are distributed in African continent, and those are results of interaction between land surface and the atmosphere. In particular, precipitation change strongly affects vegetation. Vegetation has a system, 'climate memory', that holds effect of precipitation anomaly even after it has been occurred. Vulnerability is also important concept for prediction of vegetation change because it is used for indicator of ecosystem stability. In this study, we applied a dynamic global vegetation model, SEIB-DGVM, to African continent and examined the effect of precipitation change on vegetation structure (e.g., LAI and tree height) and carbon / water balance. Then, we examined the vulnerability of vegetation among seven sites using the Sensitivity Index and Resilience Index. In the model, spatially explicit virtual forest is placed; growth, competition and decay of individual trees can be calculated. Input data is daily climatic data from 1979 to 2004 obtained from NCEP/NCAR reanalysis data. The spatial resolution of this data was coarse (192*94 global points); thus, the data was linearly interpolated for targeted site. However, NCEP/NCAR precipitation was corrected by monthly precipitation data by GPCP. The atmospheric CO_2 concentration was set to 358.6 ppm, which is the global mean from 1979 to 2004. We selected the seven sites in African continent from CarboAfrica. Climate memory and vulnerability for precipitation change was differed among the seven sites and it was thought as characteristics for each site. It caused by differences of climate zones, biome and plants characteristics (such as the root depth) in each site.

Keywords: Vegetation, Africa, Climate Memory, Vulnerability, Numerical Model

AHW025-03   Room:202   Time:May 22 14:45-15:00

Factors contributing to precipitation changes simulated by IPCC-AR4 models under the A1B scenario

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Different processes can be responsible for mean precipitation changes under increased greenhouse gas conditions, including the direct effect of air temperature change on saturation vapor pressure, but also changes in surface evaporation, relative humidity and large-scale atmospheric circulation. In this study, we analyze precipitation changes simulated by the IPCC-AR4 models between the last two decades of the 21st and 20th centuries based on the A1B scenario. Using daily output, the climatological-mean moisture flux divergence and surface evaporation terms at every grid point are decomposed into contributions from the individual factors mentioned above, in order to access their relative contributions and their seasonal and geographical dependency. Early results indicate that all the contributions are important for understanding mean precipitation changes in the models.

Keywords: precipitation changes, IPCC-AR4, modelling, intercomparison

AHW025-04   Room:202   Time:May 22 15:00-15:15

Effect of heterogeneity of hydraulic conductivity on groundwater flow and spontaneous potential

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Spontaneous potential(SP) is the electrical potential mainly generated by thermoelectric, chemical and streaming potentials in the subsurface. The flow of groundwater is often recognized as a dominant source of SP. Using this feature, many attempts have been done to quantify groundwater flows in the soil.

The SP anomalies according to the groundwater are often associated with the direction of groundwater flow as a primary interpretation. Therefore, it is believed that the inverted gradient of SP corresponds with the direction of groundwater flow. However, the distribution of SP is influenced by not only the direction of groundwater flow but also the inhomogeneous of subsurface. Actually, the previous studies show that inhomogeneity of permeability and coupling coefficient has an effect to the SP anomaly. Thus, the distribution of SP is influenced by the existence of subsurface heterogeneity, but the detailed studies are few.

In this study, we developed the numerical codes for SP simulation: we simulated the natural groundwater flow and the distribution of SP according to the flow along a topographic slope. We discussed the effect of parameters, such as permeability and slope angle on the groundwater flow to the distribution of SP. Our simulation shows that the SP anomalies appear just above the boundaries of permeability. These anomalies are due to the charge that occur on the boundary- where the flow passes. This effect was prominent in case that the permeability contrast was large. In addition to this effect, our simulation results show that the additional SP anomaly appears at the discharge of groundwater caused by the effect of slope angle and permeability. Our simulation suggests that the SP is influenced by the groundwater flow and inhomogeneity of permeability and we suppose a new method to obtain the information of groundwater flow and permeability from the SP observation.

Keywords: spontaneous potential, hydraulic conductivity, groundwater flow

AHW025-05 Room:202 Time:May 22 15:15-15:30

A study on effect of accuracy of topographical information to flood risk assessment in urban lowland: Barajima district

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A number of cities in Japan are located in plains and lowlands. Recently, many municipalities publish flood hazard maps because it has become hard to control flood disasters in urban regions with banks and so on. The manual that describes how to make a flood assumption zone map (basic map of flood hazard map) specifies the basic size of a ground height data to 50m grid (Flood Control Division, River Bureau, MLIT, 2005). Although, this size is not enough to depict topography of an area, especially in lowland. On the other hand, a flood assumption zone is highlighted in a flood hazard map. However, it is necessary to show flood risk including population, land use and others. From the above, this study aims to verify the accuracy of ground height data used in a flood hazard map and to clarify its effect to a flooding area or depth in Barajima district in Akita city, Akita prefecture. Barajima district is located along the Omono River and is in the lowest area of Akita city. In this district, elevation is relatively high in the central part and is relatively low in the western and eastern part. Land use of this district is composed of industrial area (western part), commercial area (central part) and residence area (eastern part). The Authors reconsidered several previous flood hazard maps and reassessed flood risk including land use and others in Barajima district.

To verify the accuracy of the 50m grid data used to make the Omono River flood assumption zone map that was the basic map of the flood hazard map of Akita city, the authors made a new TIN surface model by using a city planning maps with a scale of 1 to 2,500 and fieldwork. Then, we evaluated the differences about the area and the depth of flooding between the Omono River flood assumption zone map and new TIN surface model. ArcGIS 9.3.1 was used to analyze.

As a result, there were some differences between the Omono River flood assumption zone map and the new TIN surface model. This difference was considered to be caused by the accuracy of ground height data and procedure of surface modeling of the map. Thus, the flood assumption zone in the map had a margin of error, and there was a possibility that the residents and employees in industries misunderstood the flood risk. Considering that the factories and houses in Barajima district were concentrated in the relatively low altitude area and were much vulnerable to flood damage, residents and industrial activities will be damaged seriously by a flood and inundation.

Keywords: urban flood disaster, risk assessment, flood hazard map, DEM, land use, GIS

AHW025-06 Room:202 Time:May 22 15:30-15:45

Analysis of hydrological circulation along to Shiratani River in The Yakushima Island

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The Yakushima Island has a large amount of precipitation. It is easy to analyze water cycle because of symmetrical conical shape. However, in the Yakushima Island, there are not enough data for river flow rate although it is important to measure river flow rate at the condition of high precipitation. Therefore, flow rates of river in the Yakushima Island are measured to estimate the amount of groundwater. The amount of groundwater is estimated from the surface runoff, evapotranspiration and precipitation and the water cycle is clarified at the granite island under the condition of high precipitation.

Precipitation and flow rate are measured along the Shiratani River to estimate the amount of groundwater. As a result, infiltration rate at small catchments from 200 to 1000m in height are about 70 % on average. The maximum and minimum infiltrate rates are 90 and 50 % respectively. Generally, infiltration rate is 35 % at the forest and 10 % with no trees. Although infiltration at the weathered granite rock and forest area is generally high, the estimated infiltration rate is too high. River flow rate is too small because the measuring day is almost fine day for safety and it changes with rain. Therefore, infiltration rate reaches high. Next, river flow rate depends on position along a small river. As most of water once infiltrates into soil and then effluents, river flow at the monitoring site between recharge point and discharge point is changeable and although each catchment is the same size and adjacent, infiltration rate may range from 50 to 90 %. At the next measuring, fresh basement with river flow must be selected as a monitoring site because small water between recharge and discharge migrates and almost recharged water discharges before the point.

Keywords: yakusima, hydrological circulation, groundwater, quantity of flow

AHW025-07　　　　　　　　Room:202　　　　　　　　Time:May 22 15:45-16:00

Hydrochemistory of non-volcanic springs, Yamanashi Prefecture, Japan

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Hot springs have great significance as local promotion and so on.

In this study, 29 samples of water from twenty four wells, four springs, and from a river were collected to analyze major chemical components and isotopic compositions of oxygen, hydrogen, sulfur to discuss recharge mechanisms, Water-rock interaction processes to make chemical properties of the fluids and flow system of deep fluids. Precipitation at altitude of 330 to 2360m were also collected to calculate the altitude effect of delta ^{18}O and delta D. Respectively, the effect was -0.41per mill/100m and -3.7per mill/100m.

AHW025-08 Room:202 Time:May 22 16:00-16:15

Research on outflow of nutritive salt from field in river

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It is at 1999 that the nitrate nitrogen and the nitrite nitrogen in the river were provided in our country as a health item of environmental standards (10mg/L). A lot of underground water pollutions are reported regardless of the inside and outside in the country. However, the report of surface water is few. Then, we investigated two rivers where with a vast field in the valley.

[Research]
It is a clement climate that faces both valleys and the Pacific Ocean, and the farm production is an active region. Especially, it centers on the production of the outdoors vegetables such as the cabbages.
The valley in both rivers was surveyed, and obtaining water, pH, EC, and the flow measurement were done.

[Result and consideration]
At Ttakada river, the density of nitrate nitrogen exceeded standard 10mg/l excluding part. Having been polluted by the nitrate nitrogen with a high density the entire valley became clear. At Umeda river, it was standard value 10mg/l or less in the environmental standards point. However, in the point that flowed in the region where the field extended, the point where the standard value was greatly exceeded became clear.

Keywords: Non-point source, Nitrate Nitrogen, Surface Water

AHW025-09 Room:202 Time:May 22 16:30-16:45

The behavior of vanadium between water and basalt

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Dissolved chemical compositions in ground water and river water in the area, where is not contaminated by human, are derived mainly from rains, soils and rocks. A regional water quality could be characterized by them. In the surrounding area of Mt. Fuji, it has been reported that vanadium concentration is relatively high 0.05-0.1(mg/l) in ground water and river water, due to the dissolution of vanadium from basalt. This concentration is 50 to 100 times high compared to the normal concentration of vanadium in natural waters. However a relationship between inland waters and rocks has not been reported. The reason is that most previous studies examined the relationship between land and water and rocks, which applies to water pollution. Vanadium is not considered a contaminant in the water. Therefore, this study examines the behavior of vanadium between basalt and groundwater, and the behavior of vanadium in groundwater in the surrounding area of Mt. Fuji. In the experiment, the basalts samples of different ages were used and the dissolution experiment between them and water was performed. The behavior of vanadium dissolved in aquifers in Mt. Fuji area was considered. The results of the dissolution experiments showed that the dissolved vanadium species in water were affected by pH and dissolved oxygen. In addition, the vanadium in basalts is considered to be contained in magnetite, in pyroxene and in the glass and to have adsorbed onto each minerals surface. The experiment of extracting vanadium from them revealed the existing forms of vanadium in basalts.

AHW025-10   Room:202   Time:May 22 16:45-17:00

WATER BALANCE OF GLACIERIZED CATCHMENTS IN BOLIVIAN ANDES

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The continuous worldwide glacier retreat since 1850s rapidly and greatly affects the availability of fresh water, for domestic, agricultural and industrial use in the regions where depend on glacier-melt. The situation is particularly acute in South America, which has about 99% of worldwide tropical glaciers in Andes Mountains. In the joint project "GRANDE (Glacier Retreat impact Assessment and National policy DEvelopment)", Glacier Condoriri, Tuni and Huayna Potosi in Cordillera Real (68.12W, 16.13S) are under study as which are the main water resources of human consumption and hydropower generation for the city of La Paz and El Alto in Bolivia.

In this study, glacierized area change in Cordillera Real was observed using semi-automated method extracted from Landsat Thematic Mapper (TM) scenes from 1980s to 2007 using a band ratio as TM4/TM5. The analysis results illustrated that the glacier melting process is accelerated in the past 20 years and disappearing around 2030 to 2050. Meanwhile, based on limited meteorological and hydrological data, water balance in this region was analyzed. The results proved the glacier melting acceleration observation and how glacier melting water behaved as major water recourse in the study region. Among all 3 glacierized sub-catchments, Condoriri has the biggest runoff coefficient (runoff depth (mm) / precipitation (mm)), which was as high as 2.02 in 2004 to 2005, while Tuni has the smallest runoff coefficient, which was 1.39 in 2004 to 2005. However, the area of Condoriri and Huayna Potosi each is more than twice as much as Tuni. According to the percentage lost of Tuni glacier observed in the latest 20 years, Tuni is predicted to be the first disappeared.

Keywords: glacier, water balance, Landsat, band ratio

Stable isotope and chamber method to separate evapotranspiration components of Nile Delta farmlands

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Nile delta is faced with future water shortage. To make use of available water, it is necessary to reduce consumptive use of evaporation of farmlands. To investigate into possible strategies for this aim, we estimated evapotranspiration *(ET)* by eddy correlation method, and separated *(ET)* into soil evaporation *(E)* and transpiration *(T)* by chamber and stable isotope ratios measurements. From summer intensive measurements, preliminary results on *T/ET* ratio relation with LAI, irrigation methods, farmland management, and soil moisture were obtained.

Keywords: Chamber method, Stable isotope ratio, Mulching, Drip irrigation

AHW025-12   Room:202   Time:May 22 17:15-17:30

Interaction between surface water and groundwater in Sbiba,Tunisia

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The purpose of this work is to understand the process of groundwater recharge from the surface water in semi-arid area using the tracer elements and stream flow observation.

The Sbiba basin is semi-arid area located in inland region, nothern Tunisia. In the downstream area, there is the drawdown of groundwater and the disappearance of river as the result of the overexploitaion for irrigation.

The groundwater flow in Sbiba basin was estimated by disslove inorganic ion. There is interaction between shallow aquifer and surface water from upsteram to downstream. The another aquifer exists in deeper layer which have poor connection with other aquifers. For these reasons, upstream well, midstream river, and dam are estimated to be the end-member of the downstream groundwater. The contribution of the dam to the groundwater is estimated to be 38.4% by end-member mixing analysis.

The ratio of outgo to input flow in the river is also estimated with tracer elements and measured stream flow. The evaporation rate from the river is estimated to be 4.7~11.5% of input flow, groundwater recharge is 30.0%, and artificial withdrawal for irrigation is 53.6%.

Keywords: semi-arid, groundwater recharge, end-member mixing analysis, tracer, Sbiba

AHW025-13 Room:202 Time:May 22 17:30-17:45

Groundwater and surface water interaction in Ulaanbaatar capital city, Mongolia

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In order to clarify relationship between groundwater and river water exchange, we perform water quality survey and quantitative evaluation in Tuul river basin, aroud Ulaanbaatar city.An investigation of groundwater level on floodplain in Ulaanbaatar, it showed that the groundwater flowing to the east along southwest along Tuul river. This indicates the importance of the Tuul river as a source of groundwater recharge. It seems that groundwater from the north tributaries and south mountains flows into the floodplain. The floodplain groundwater quality showed a concentration of Tuul river water quality. This is considered to support exchange of groundwater and river water shown with groundwater level. North tributary groundwater concentration was higher than Tull river water. Since, effect of north tributaries showed in the floodplain, it is seemed to be important factor in the floodplain inflow from the north tributaries.

The results of oxygen and hydrogen isotopes, in the floodplain, north tributaries and south mountain groundwater showed different trends. This shows that the different recharge process in each areas. Isotopes in north and south tributaries showed values between Tuul river water and precipitation. This suggests that groundwater in the tributaries are mixture of river and precipitation. The north tributary groundwater showed a small influence of evaporation. In the floodplain groundwater were confirmed with the lower delta value water than Tuul river water, north tributary groundwater and south mountain groundwater. Winter precipitation as a precentage of the total precipitation is very small, although winter precipitation values have lower delta values, it suggest the possibility that effective for groundwater recharge. Furthermore, using tracer of HCO_3^- and SiO_2, End Member Mixing Analysis determined the relative contribution of origin waters in the floodplain groundwater. Consequently, the floodplain groundwater originate from 46% to 95% of Tuul river water, 2% to 54% of groundwater of north tributary, 0% to 14% of groundwater of south mountain.

Keywords: groundwater recharge, relative contribution, EMMA, semi-arid region

Arsenic contamination of groundwater at recharge area in Sonargaon, Bangladesh

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Formation process of arsenic contaminated groundwater at a recharge zone in Sonargaon, Bangladesh
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(1Fac. of Sci., Osaka City University, 2Jessore Science and Technology University)
Arsenic contaminated groundwater had been expanding in Asia. Particularly serious health problems have been reported from various area of Ganges delta, where reductive dissolution of Fe oxyhydroxide via biodegradation is the consensus model to explain the mechanism of dissolution of arsenic into groundwater. However throughout the research work in Sonargaon, Bangladesh, we suspect since highly arsenic contaminated groundwater appears in a recharge area where the groundwater has dissolved oxygen. We can observe the earliest stage of formation of arsenic contaminated groundwater in this area. In this study, groundwaters were collected from household tube wells in September and December 2010. Twelve test Tube wells in a recharge zone were drilled at three different depths (5 ,10 and 15m) in the September, and the groundwaters were collected from those wells.

Total arsenic concentration of groundwater collected from the test tube wells increases with increasing depth. Arsenic concentration exceeds 0.2mg /L at 5m depth, indicating that dissolution of arsenic starts just after groundwater in infiltrated into the aquifer. Arsenic concentrations at depth 10 and 15m are approximately 0.8mg/L. Arsenic concentration of an adjacent tube well exceeds 1mg/L at 30m depth. Therefore, the arsenic is most actively released into the groundwater between 5 to 10 m depth. Arsenite/arsenate ratio changes with depth, As (3):As(5) = 4:6 at 5m depth, 1:9 at 10m depth, 0.5:9.5 at 15m depth, and 0.5:9.5 at 30m depth. Reduction of arsenic seems to be completed at 15m depth.

Reduction of groundwater would not be an important to release arsenic since dissolved oxygen is present in the groundwater at 30m depth. Highly arsenic contaminated groundwater appears in a circled area of 150m radius. Arsenic-free groundwater is present around the arsenic contaminated area.

The previous study documented the three sedimentary layers were present beneath this area, i.e., Holocene sand layer (upper aquifer) including high arsenic groundwater as an aquifard , and Pleistocene sand layer (lower aquifer) . However, the mud layer does not appear beneath the recharge zone where high arsenic contaminated groundwater appears, and the Holocene and Pleistocene sand layers directly contact. Presumably, the uptake of groundwater for irrigation from the Pleistocene aquifer promotes the downgoing flow of groundwater, and such a flow promotes release of the arsenic into the groundwater.

Keywords: Arsenic, groundwater, Bangladesh, Sonargaon, Arsenite/arsenate, oxyhydroxide

AHW025-P02   Room:Convention Hall   Time:May 22 16:15-18:45

Chemical forms of arsenic in the arsenic polluted groundwater aquifer

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To identify the host phase(s) of arsenic in eolian sediment taken from the Punjub, Pakistan, where arsenic polluted groundwater is found in an aerobic environment, concentration of arsenic and the related elements and chemical forms of the arsenic were analyzed.

To analyze the chemical forms of adsorbed arsenic onto the sediment particles, the sediment samples were shaken in a centrifugation tube with the solution, of which pH was adjusted using hydrochloric acid or nitric acid and sodium hydroxide. Filtrated supernatant was used to quantify total arsenic concentration using ICP-MS and different chemical forms of the arsenic using HPLC/ICP-MS, and the related elements (Fe, Si, and Al) were analyzed by ICP-AES. Sequential extraction of arsenic was also tried; the sediments were shaken with 6M hydrochloric acid and the residual sediments were shaken with the mixture of 1M sodium hydroxide and 0.1 M sodium chloride at room temperature. The extracted arsenic in hydrochloric acid and sodium hydroxide solutions were analyzed using HPLC/ICP-MS. Mineral composition of the residual sediments was analyzed by XRD. Ionic valency of arsenic of the bulk sediment and separated chlorite were determined using XAFS at SPring-8.

Total arsenic concentration of bulk sediment was 35.4 mg/kg. As(III):As(V) ratio of the bulk sediment was 0.14:0.86, and that of goethite bearing chlorite was 0.31:0.69. Extracted arsenic in the solution of pH1 to 14 was only arsenate. Although the arsenic concentration extracted in the solution pH ranging 4 to 8 is less than 1 mg/kg, it increases in the solutions pH <3 and >9, in which the arsenic concentration is >8 mg/kg, and 31 mg/kg at the maximum when the pH was 14. Only arsenate was extracted in the 6M hydrochloric acid solution, however, arsenite was also extracted in the sodium hydroxide and sodium chloride mixing solution. The concentrations of As(III) and As(V) were 2.6 and 4.0 mg/kg. Most of arsenate is not adsorbed onto Fe-oxyhydroxides and/or the other particles, since it is not extracted in the solution ranging pH 2 and 8, where the arsenate is most preferable to be adsorbed.

Goethite can be dissolved in hydrochloric acid solution, as noted by the previous researchers, while it cannot be decomposed in neutral and alkaline solution. Chlorite was decomposed in alkaline solution, assured by XRD. Iron (0.3% as Fe_2O_3) was dissolved in the solution pH<2, while it does not considerably dissolved in the solution pH>3. Silicon (1% as SiO_2) was dissolved in the solution pH<2 and >11. Aluminum gave the similar trend of dissolution; 0.4 % of Al_2O_3 was dissolved in the solution pH<2 and >11. Thus, the goethite was decomposed in the solution pH<2, and chlorite was pH>11. Arsenic concentration is higher in the solution pH>11 than in that <2, indicating that a part of arsenic is fixed in the chlorite.

Based on the above results, the As(V) is fixed in both Fe-oxyhydroxides and chlorite, while the As(III) is fixed only in the chlorite.

Keywords: arsenic, pH

Estimation of evapotranspiration, transpiration and soil evaporation in three crop fields with different irrigation

Takahiro Fukuda[1]*, Michiaki Sugita[1]

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Projected increase of water consumption due to the planned expansion of agricultural land in Egypt is one of the problems for the sustainable agriculture. Control of evaporative water consumption is suggested as one of the water-saving measures to remedy this issue. Thus it is important to verify the effect of such control measures. Three fields covered with maize within the Nile delta were the target of the study. Two fields employ conventional fallow irrigation while one uses drip irrigation method. Also one of the conventional filed was covered with mulching. At three fields, eddy correlation system with relevant meteorological, hydrological and vegetation measurements was installed in June of 2010. Together with data obtained in an intensive measurements in the summer of 2010, data were applied to the Deardorff model to separate evapotranspiration into transpiration and soil evaporation during growing season of maize. Some initial findings will be presented.

Keywords: Nile delta, soil evaporation, transpiration, irrigation

AHW025-P04   Room:Convention Hall   Time:May 22 16:15-18:45

Atmospheric water balance and cloud formation over Nile Delta

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Application of the atmospheric water balance approach allowed determination of evaporation (E) over and around Nile Delta. It was found that E from Nile Delta was larger than that of the deserts, probably because of the extensive irrigated farmland in Nile Delta region. The moisture flux from the surface (i.e., evaporation) could generate larger amount of clouds and they can have positive and negative feedback to climate on a regional scale. However, the relative contribution of evaporation to the cloud formation of the area was in general smaller than that of moisture convergence in atmospheric columns, except for summer season when former influence was large.

Keywords: Nile Delta, evaporation, atmospheric water balance, cloud formation

AHW025-P05　　　　　　　　　　Room:Convention Hall　　　　　　　　　Time:May 22 16:15-18:45

Windbreak trees for water-saving agriculture in Nile delta: are they effective?

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Measurements of sapflow and sapwood area of windbreak trees (Casuarina) in Nile delta allowed determination of transpiration. Relation between tree transpiration and characteristics of sample trees such as DBH or height, and detailed meteorology was examined. It was found that a good correlation exists between transpiration and vapor pressure deficit and downward short-wave radiation. Thus Penman-Monteith equa-tion was employed to estimate long-term transpiration. By applying results of previous studies on the performance of windbreak trees of various densities, an estimate was made on the effectiveness of windbreak tree for water saving in Nile delta farmland. The results shows that the transpiration of windbreak trees occupies only 0.28 % of the total evapotranspiration of the farmland, whereas evaporation reduction by the intro-duction of windbreak trees could be as large as 20-24% of the total evapotranspiration.

Keywords: Windbreak trees, Casuarina, sapflow measurements, Evaporation reduction

AHW025-P06   Room:Convention Hall   Time:May 22 16:15-18:45

Correlation of a groundwater discharge with a tephra layer in Tottori sand dune

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The Tottori sand dune is located in the Sanin Kaigan national park. In this sand dune, there is a groundwater discharge point called an oasis. The oasis is grows after the rainfall, and an important factor of a natural landscape in the dune. Because the Tottori sand dune is registered in the global geoparks network, it is necessary to clarify the geoscience phenomenon of the dune academically. The sedimentary structure of the dune are researched. However, the generation mechanism of the oasis is not clarified. The purpose of this research is to clarify the generation mechanism of the oasis with the resistivity tomography method.

Non-polarizing Ag-AgCl electrode was used for resistivity tomography. The electrode interval was set to 3m, and the depth was analyzed up to 20m. The water level of the oasis was measured with pressure type level gauge. Precipitation was measured with rain gage.

The water level change of the oasis corresponded to precipitation by the day. The oasis disappeared when the no-precipitation day continued. From the past research result, it is suggested that groundwater that is shallower than 5m forms catchment of the oasis. From the resistivity tomography model, the low resistivity material below 200 ohm deposit horizontally at several meters depth from surface. The detected low resistivity material is thought to be a volcanic ash layer, for example, DKP (Daisen Kurayoshi pumice fall deposit). The old dune deposit under the loam layer.

A clear groundwater table was not detected from this result. This cause is thought not to be able to divide a volcanic ash layer and the upper aquifer. It is suggested that the catchment aquifer to the oasis is very thin and the perched groundwater that is holding on volcanic ash layer.

Keywords: Groundwater discharge, Tephra layer, Tottori sand dune, Resistivity tomography

AHW025-P07   Room:Convention Hall   Time:May 22 16:15-18:45

Hydrochemistry and isotopic composition of fossil seawater rich hot springs in the eastern Kanto Plain, Central Japan

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Major chemical, oxygen, hydrogen and sulfur isotopic compositions of the high chloride waters from six wells of the eastern Kanto Plain, additionally rock samples from four wells for mineral constituents, were analyzed to discuss water-rock interaction processes to make chemical properties of the fluids and flow system of deep fluids. The d34S value ranges between +16.1 and +51.2 permil, interpreting that sulfur is originated by several potential sources (sulphate reduction processes, anhydrite dissolution).

Keywords: fossil seawater, eastern Kanto Plain, hot springs

Hydrochemistry and genesis of volcanic hot springs around the Haruna volcano

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Major chemical and isotopic (d18O, dD and d34S) compositions in hot spring waters from thirteen wells and four spring waters around the Haruna volcano, Gunma Prefecture were analyzed to discuss water-rock interaction to make chemical properties of deep fluid. The chemical compositions of the waters described in terms of relative concentrations of ions allow us to distinguish chloride-type (Na-Cl, Ca-Cl) and bicarbonate-type (Na-HCO3, Ca-HCO3) waters. The major chemical compositions of the waters are controlled by the following mechanisms: (1) formation of kaolinite by weathering of plagioclase (2) dissolutions of calcite, gypsum and anhydrite.Fluid- mineral interaction calculation results show that most deep fluids in the field are supersaturated with kaolinite, and undersaturated with calcite and anhydrite.

Keywords: Haruna volcano, Hydrochemistry, genesis, hot springs, water-rock interaction

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The behavior of heavy metals in river water around the Tada silver mine, southwestern Japan

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Heavy metal concentrations in river water around an abandoned mine site are important for environmental conservation as well as understanding elemental behavior in nature. In this study, heavy metal concentrations of river water samples around one of the most historical abandoned mines in Japan, the Tada silver mine, were studied to understand the elemental behavior around the closed mine at regional levels. The Tada silver mine is located in the eastern part of Hyogo prefecture, southwestern Japan. The mine is classified as Cu-Sn and Zn-Pb polymetallic vein deposit including silver[1], and it was closed in 1973. A total of 38 river water samples were collected around the Tada silver mine. Water temperature and pH were measured at the sampling site. All samples were filtered with 0.45 um filter. Seven heavy metal elements (Cr, Mn, Ni, Cu, Zn, Mo, Pb) were analyzed with inductively coupled plasma mass spectrometer (ICP-MS), and six anions (Cl^-, NO_2^-, NO_3^-, Br^-, PO_4^{3-}, SO_4^{2-}) were analyzed with ion exchange chromatography (IC). Behavior of heavy metals in river water is mainly controlled by adsorption reaction. Adsorption rates of heavy metals are different among the elements, and are affected by the dissolving forms and pH. Cu, Zn and Pb in river water are commonly dissolved as cation, and are easily adsorbed when pH is high[2]. Near the Tada silver mine, Cu (102 ppb), Zn (323 ppb) and Pb (59.9 ppb) concentrations are higher than the other river water samples far from the mine. These higher concentrations might be affected by the Tada silver mine. As increasing the distance from the mine, Cu, Zn and Pb concentrations decreased rapidly. Concentration of Cu becomes stable within 2,700 m away from the location of its maximum concentration. Zn concentration becomes stable at 6,400 m away from the location of its maximum concentration. Concentration of Pb becomes stable within 2,100 m away from the location of its maximum concentration. The distance to the stable concentration point of Zn is longer than that of Cu and Pb. This is concordant with the fact that Zn adsorption rate is lower than that of Cu in same pH condition. Mo concentration slightly increases with increasing the distance from upsteam to downsteam and correlates with the anion content, especially SO_4^{2-}. This might be because that : 1) Mo dissolves as anion ; 2) Mo adsorption rate is low in pH 7.5 - 8.0 [3]; and 3) Mo is supplied from the sediments.

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Keywords: heavy metals, adsorption, Tada silver mine

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Nitrogen and sulfurisotope analysis of anthropogenic nitrate pollution of river at the Tatebayashi city

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To identify anthropogenic sources of nitrogen in the Tsuruuda river of the Tatebayashi City, Gunnma Prefecture, stable isotope composition of nitrogen (d15N) and sulfur (d34S) as well as the nitrate concentration in eleven river water were determined. The high proportion of Cl- + SO42- + NO3- in the total anion concentration suggests strong influence of human activities on the groundwater quality. The d15N values of NO3- in the river range from +7.9 to +11.2 permil, suggesting that the NO3- contamination (2.4 to 7.9 mg L-1) was caused by domestic sewage. The d34S values of sulfate in the river were in the narrow range from +1.4 to +2.8 permil, and suggest that the contaminant sulfur was also originated from domestic sewage and detergents(-2.9 to +3.6 permil). These results demonstrate that simultaneous analysis of d34S and d15N is very useful for reliable estimation of the origin of NO3- in river.

Keywords: pollution of river, stable isotope, Tatebayashi

Environmental evaluation using the attached and drifting diatom assemblage :A case study in the Ai River, Osaka

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Diatom assemblage is an excellent bioindicator for river environment. Many water quality indices have been established based on the attached diatom assemblages. Meantime, drifting diatom assemblage as an environmental indicator has not been verified enough. We compared epilithic and drifting diatom assemblages in term of their nature of environmental indices in the Ai River flowing through Osaka prefecture in Japan. The species compositions of epilithic diatom assemblages varied between sites and they well represent the water environment in situ. In contrast, a saprophilous diatom *Nizschia palea* was usually dominant in the drifting diatom assemblage despite the oligo- to beta-mesosaprobic water. Its dominance can be explained by the inflow from the paddy fields in the watershed. Therefore, we conclude that the drifting diatom assemblage is less effective as a water quality indicator, but it may be good indicator for geographical configuration and the land use of the watershed.

Keywords: river enviroment, diatom assemblage, bioindicator, environmental parameters