[EE] Evening Poster | A (Atmospheric and Hydrospheric Sciences) | A-HW Hydrology & Water Environment

[A-HW20]Materials transport and nutrient cycles in watersheds; Human and climate impacts

convener:Mitsuyo Saito(Graduate School of Environmental and Life Science, Okayama University), Shin-ichi Onodera(Graduate School of Integrated and Arts Sciences, Hiroshima University), Takahiro Hosono(熊本大学大学院先導機構, 共同), Adina Paytan(University of California Santa Cruz)
Mon. May 21, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)
This session aims to synthetize watershed sciences in order to understand dynamical processes of materials transport and nutrient cycles in watersheds from headwaters to coastal seas focusing on human and climate impacts. The session will be integrating a variety of research disciplines including limnology, ground water hydrology, coastal oceanography, meteorology, pedology, sedimentology, forestry, agriculture, fishery, social science and more. The watershed sciences also challenge us to solve environmental issues emerged in the watersheds through our profound understanding of relations between humanity and nature. For instance, on one hand, human land uses alter water resources, dynamics of sediments, nutrients and pollutants in waters and soils on watershed scales, while changing climates may alter water cycle, the frequency and intensity of materials transport and natural disaster, sometimes having catastrophic effects on the watershed systems. This session also calls for ideas on new methods for the watershed sciences, such as tracer and molecular technique, hydrological modeling, paleontological approaches, laboratory and field experiments, social-scientific evaluation of ecosystem services and social-ecological systems, and so on, in order to elucidate physical, chemical and biological mechanisms for shedding light on natural phenomena and their changes over time in complex and dynamic watershed systems. Through this session, we would like to facilitate interdisciplinary collaboration among participants to create new knowledge on watershed sciences.

[AHW20-P04]Attempt to quantify the water resource storage function of company-owned forests —A case study of "Asahi no Mori"—

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To aim for achieving sustainable development goals (SDGs) adopted by the United Nations in 2015 and realizing environmental management focused on water, Asahi Group Holdings, Ltd. (Asahi GHD) is performing various environmental activities. One of them is maintenance and management project of company-owned forest "Asahi no Mori" located in Shobara City and Miyoshi City, Hiroshima Prefecture. Although there are many companies which conduct forest conservation activities as part of CSR and social contribution activities, few companies quantify the contribution of the forest that they preserve to regional water resources. Therefore, this study aim to quantify how much forests that they own impact on regional water resources by conducting field survey, water balance analysis, water quality analysis, and so on. In this way, we aim for quantification of social contribution through high social corporate activities.
"Asahi no Mori" is generic name for fifteen forests owned by Asahi GHD, and its total area is 21.7 km^2. The bedrock of the forests are largely classified as granite and Takata-rhyolite. Flow rate

observations of major rivers in forests were conducted from April 2017 to November 2017. From observation results, it became clear that the flow rate varies depending on the type of bedrock. Water balance analysis was conducted for Gono-kawa River basin that encloses "Asahi no Mori" for the purpose of estimating groundwater recharge in forest area. The method suggested by Ogata et al. (2017) is suitable for planar evaluation of evapotranspiration rate in forest, we used it for water balance analysis. This method can consider canopy interception evaporation, soil evaporation and transpiration and be suitable for the target area where much snowfall and snow cover is observed in winter because snowfall, snow accumulation and snowmelt process were modeled. In water balance analysis, the target area was divided into 1 km mesh and precipitation amount, evapotranspiration rate and groundwater recharge were estimated by month. Groundwater permeability necessary for estimating the amount of water infiltrating the bedrock was set based on field observation data and runoff analysis results by the tank-model. The validity of the water balance analysis model has been confirmed by obtaining discharge observation data for Gono-kawa River and comparing observed value and estimated value.

As a result of the water balance analysis carried out based on the field survey results, annual groundwater recharge throughout "Asahi no Mori" was estimated at 9.58 million m^3. This is about 40% of the water resources consumption of Asahi GHD in 2016. Also, groundwater recharge in the forest where bedrock is granite resulted in high amount (average 684 mm/yr), whereas groundwater recharge in the forest where bedrock is Takata-rhyolite resulted in low amount (average 395 mm/yr). It is thought that this is because weathering of granite is more advanced than Takata-rhyolite and granite is a structure that is easy to penetrate inside the bedrock through cracks. Thus, according to this study, the importance of considering geology in the evaluation of the water resource storage function became clear.