口頭発表 | セッション記号 A （大気海洋・環境科学） | A-HW　水文・陸水・地下水学・水環境

[A-HW28_30PM2]流域の水及び物質の輸送と循環－源流域から沿岸域まで－

コンビーナ:*知北 和久(北海道大学大学院理学研究院自然史科学部門)、入野 智久(北海道大学　大学院地球環境科学研究院)、小野寺 真一(広島大学大学院総合科学研究科)、中屋 眞司(信州大学工学部土木工学科)、小林 政広(独立行政法人森林総合研究所)、齋藤 光代(岡山大学大学院環境生命科学研究科)、吉川 省子(農業環境技術研究所)、奥田 昇(京都大学生態学研究センター)、座長:小野寺 真一(広島大学大学院総合科学研究科)

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本セッションでは、流域での水・物質輸送および物質循環に関する研究発表および分野横断的な議論を期待する。例えば、流域（土壌/斜面）物質輸送、懸濁物質輸送と溶存物質相互作用、地下水流動系と混合・輸送、土壌／斜面スケールの評価と流域へのスケールアップ、不均一性や非定常性、気候変動や人間活動の影響など長期スケールでの研究などである。さらに、リン・窒素などの循環、汚染物質の起源や輸送、河川－地下水交流、トレーサー技術の開発、堆積物の解析などについても重要である。以上のような課題を含む研究発表を通して、学会／分野横断的な議論を目指したい。

17:15 〜 17:30

[AHW28-P06_PG]SWATおよび HYDRUSモデルを用いた沿岸農業流域の水収支解析

ポスター講演3分口頭発表枠

*金 广哲[1]、清水 裕太[2]、小野寺 真一[1]、齋藤 光代[3]、松森 堅治[2] (1.広島大学大学院総合科学研究科、2.(独)農業・食品産業技術総合研究機構・近畿中国四国農業研究センター、3.岡山大学大学院環境生命科学研究科)

キーワード：Ikuchi Island, SWAT Model, HYDRUS Model, groundwater recharge rate, water balance

Quantify the rate of ground water recharge and clarify the water balance in watersheds is basic and important for efficient ground water resource management. It is particularly important in regions with little rain which face with the risk of water shortage. However, the rate of aquifer recharge is one of the most difficult factors to evaluate. Especially, the former method of groundwater recharge estimation, are normally subject to large uncertainties and easily to cause errors. Recently, there are several attempting for estimation of groundwater recharge using distributed hydrological models in the world.

The Soil and Water Assessment Tool (SWAT) Model is one of a physically based and quasi-distributed continuous time hydrological model used to estimate water budget in previous researches around the world. SWAT Model has been implemented for watershed hydrology related issues such as estimation of surface water flow and groundwater recharge rate. We could more specific testify the groundwater flux combined SWAT Model with HYDRUS Model which is a software package for simulating water, heat, and solute movement in two- and three-dimensional variably saturated media. The objective of this research is to estimate water balance and to clarify the groundwater recharge parameter in an agricultural catchment in the Seto Inland Sea, using the SWAT Model, and to estimate the groundwater flow using the HYDRUS Model.

The study site is located on the southern part of Ikuchi Island, which is one of the islands in central Seto Inland Sea. The orange groves cover approximately 50% of the total catchment area. Due to the small annual precipitation (approx.1000mm/y) with large inter-annual variation, Ikuchi Island is facing a risk of water shortage in the serious dry year.

As input to SWAT Model, topographic data (10 m grid), soil map (1/25000), land use map (1/25000) and weather information were used to build and calculate the SWAT Model. Evaporation was estimated by

the Penman-Monteith method. Simulation time periods is 2000-2013, including warm up period of 2000-2003 and calibration period of 2003-2004. The calibration was conducted using the Sequential Uncertainty Fitting (SUFI2). The reproducibility of daily discharge in calibration period by the model was found to be acceptable (NSE=0.69, RSR=0.56, PBIAS%=18, R^2=0.75). Amount of groundwater recharge is accounted as the water discharge into aquifer except the flows which are eventually discharged from aquifer, such as return flows into river and amount of water moving into the vadose zone.
The result shows spatial difference in groundwater recharge rate. About 10 times higher groundwater recharge rate was found in middle and downstream areas. While middle and downstream area are indicated the main groundwater recharge area, upstream is small recharge rate due to steep slope. Groundwater recharge shows smaller volume than river discharge, it comprise about 17% of total precipitation in annual average consideration. From the comparison of water balance calculation, it is found that both of river discharge and groundwater recharge fluctuated in high precipitation year of 2011 (1,527mm), low precipitation year of 2005 (781mm) compared to average balance. In high precipitation year, groundwater recharge rate increased about 6 times than in low precipitation year, the increasing of river discharge is at about 2.5 times.
Consequently, it was confirmed that spatial and temporal variation of groundwater recharge rate in long term. And we could estimate the long term water balance base on these information. However, it is noted that this result may include some uncertainty and chance to improve. Seat model could not reflect the groundwater flow, simulated with HYDRUS Model on the groundwater flow could provide us with the groundwater data. In the presentation, more detailed data cover long time periods and results testifying groundwater level variation with HYDRUS Model will be displayed.