The role of vegetation as feeder of precipitation on a continental scale

*Shigeki Murakami[1]

1. Tohkamachi Experimental Station, Forestry and Forest Products Research Institute

Precipitation in a continent reduces with increasing the distance from the ocean. However, there is an exception; in the continents covered with forests as in Amazon, Congo and the northern Eurasia precipitation is constant or increases with the distance from the ocean over a few thousands of kilometers. Makarieva and Gorshkov (2007, HESS) and Makarieva et al. (2013, Theor Appl Climatol) hypothesized that forest transports water vapor from the ocean to inland continents (the biotic pump), although they did not specify the hydrological processes.

Evaporation of canopy interception, CI, typically some 20% of annual precipitation, makes forest the greatest evaporative surface on the earth. CI is proportional to the amount of rainfall due to evaporation of splash produced by raindrops impacting onto the canopy (Murakami, 2006, J Hydrol; Murakami and Toba, 2013, HRL).When it is raining around 20% of rain water on the forest cover gets back into the atmosphere in the form of water vapor that can feed constant amount of rainfall over the continents.

Nevertheless, CI is not peculiar to forest, and some studies show ca. 20% of CI was observed in field crops and artificial trees with heights of about 2 m. Though most studies reported that CI declined after thinning of forest stand, on the contrary, Murakami and Toba (2013) observed increase in CI after thinning of an artificial tree stand with a height of 1.1 m (2.3 m above the ground).

These results imply that not only forest but also field crops or shrubs can work as the biotic pump, though it is unknown how the vegetation structure affects CI. Even such short vegetation may contribute increase in precipitation if the vegetation coverage is large enough.

Keywords: canopy interception, biotic pump, vegetation, rainfall, precipitation, splash droplet

©2017. Japan Geoscience Union. All Right Reserved.