Land use change influences continental water cycle

June 28 2011

Forests, and tropical forests in particular, play an important role in the global water cycle. Delft University of Technology PhD researcher Ruud van der Ent (TU Delft, The Netherlands) has recently shown that evaporation from the Amazon forest is for more than 50% responsible for the rainfall in Peru, Bolivia, Argentina, Uruguay, Paraguay and southern Brazil, where it feeds crops and rivers. Similarly in Africa, the Congo forest exports tons of water through the atmosphere to the West-African countries. Van der Ent also shows that land use changes such as irrigation, dams, and deforestation can alter evaporation patterns in a region, potentially affecting water resources in distant regions. With his research, Van der Ent has won the 2011 WMO (World Meteorological Organization) Research Award for Young Scientists.

Van der Ent won the WMO prize for his *Water Resources Research* paper 'Origin and fate of atmospheric moisture over continents', co-authored by Prof. Huub Savenije, Bettina Schaefli en Susan Steele-Dunne (all TU Delft). The paper shows that water falling as precipitation in one region may have originated in a distant region, or that it may be recycled moisture that originated as evaporation within the region. Global wind patterns, topography, and land cover all play a role in moisture recycling patterns and the distribution of global water resources. Land use changes such as irrigation, dams, and deforestation can alter evaporation patterns in a region, potentially affecting water resources in distant regions.

Many studies of moisture recycling have had a regional focus up until

now. To provide a global perspective, van der Ent et al. created global maps showing the sources of atmospheric moisture for various regions. The researchers estimate that on average 40% of terrestrial precipitation originates from land evaporation, and 57% of all terrestrial evaporation returns as precipitation over land. They found that some regions rely on recycled water from within the region, while others get moisture from different regions. For instance, water evaporating from Eurasia is responsible for 80% of China's water resources, and the Rio de la Plata basin in South America gets 70% of its water from evaporation from the Amazon.

Related research by recent TU Delft PhD graduate Miriam Gerrits looked into the way forests evaporate their water to the atmosphere. Gerrits found that forest floors are for a large part responsible for evaporation in forests. Removal of forests will thus not only reduce the evaporation from the trees, but will also reduce the evaporation from the forest floor. The resulting local decrease of evaporation is very likely to have global consequences for rainfall, water resources and food security.

More information: 'Origin and fate of atmospheric moisture over continents' in *Water Resources Research*, Vol. 46, W09525, 2010 www.agu.org/journals/wr/wr1009/2010WR009127/

Provided by Delft University of Technology