Past, present and future of the Amazon Basin hydroclimate

R. Avissar, R. Ramos da Silva and D. Werth

Civil and Environmental Engineering, Duke University, Durham, North Carolina, USA
(avissar@duke.edu/Phone: +1-919-660-5458)

Regional and global climate models are used in conjunction with socio-economic scenarios of land use / land-cover change in the Amazon basin, to estimate potential changes in the water cycle inside and outside of the basin. Four scenarios are produced with the NASA-GISS Global Climate Model (GCM) II and the Regional Atmospheric Modeling System (RAMS): (1) a "current land cover" scenario, which also serves as the "control" case; (2) a "Year 2030" scenario; (3) a "Year 2050" scenario; and (4) a "total deforestation" scenario that simulates the land cover in the Amazon basin after all its tropical forest has been removed and replaced with degraded land, pasture, agriculture and urban areas. The GCM scenarios are produced with current CO_2 concentrations and with "business as usual" emissions for the 21st Century. RAMS is used at a high resolution (20 km grid size) and very-high resolution (1 km grid size) over the Amazon Basin and is forced at its lateral boundaries with NCEP reanalysis for four different years (wet - 1997, dry - 1998, and two "normal" years – 1999 and 2000 that have similar domain-average precipitation but different spatial distributions). Thus, the combined impacts of deforestation and El Nino and La Nina years are also explored as part of this numerical experiment. The combination of these different simulations reveals significant impact of the evolving deforestation in the Amazon Basin on the regional and global hydroclimate.