Water resources impact of climate and land-use change in West Africa

S. Folwell, J. Meigh and C. Fung
Centre for Ecology and Hydrology (CEH), Wallingford, U.K.
ssf@ceh.ac.uk

The GWAVA model is a global-scale approach to hydrological modelling that has been developed to provide a consistent and realistic examination of water resources problems. By using linked 0.5 by 0.5 degree cells, global data sets can be applied and coverage of large regions becomes possible. The key output is a comparison of water availability and water demands at the scale of the grid cell, highlighting both temporal and spatial aspects of water scarcity. Surface flows are estimated using a conceptual rainfall-runoff model linking climate to river flows, and runoff estimates for individual grid cells are accumulated to give total flows at all points of interest. Water demands are based on population and livestock data, and information on irrigation schemes and industrial water use. Various indices of water availability are derived to compare the resource with the demand. Application of climate change scenarios, combined with population projections and possible water demand changes due to economic development, allows a range of scenarios of future water resources to be examined. An additional potential influence on hydrology is land use change, and recent developments of the GWAVA approach include the ability to model this impact. The model is being applied over the whole of West Africa, a region where land-use change is a significant issue and where major vegetation changes are ongoing (desertification in the Sahel, deforestation in more humid areas). A land-use classification, using four simplified categories (tree, shrub, grass, bare soil), has been derived based on data from IGBP-DIS, and scenarios of future land-use/vegetation cover developed. The results show that the model will allow the significance of the impact of future land-use change to be evaluated in comparison to the changes brought about by global warming and increasing water demands.

Wednesday IV (Talk)