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On the Concept of Hydrologic Space

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Forests provide a number of important water-related ecosystem services including water purification and flood mitigation. We illustrate that the forest role in precipitation recycling and the regulation of the hydrologic cycle must also be clearly recognized as an ecosystem service. Deforestation leads to more local runoff and reduced precipitation. However, the importance of afforestation in contributing to the flow of atmospheric moisture and thus promoting precipitation recycling is underappreciated. Since much of the evapotranspiration from forests falls again as precipitation, the terrestrial, forest-based production of atmospheric moisture has important consequences, both for local and downwind precipitation and water availability. We emphasize the importance of inter-basin connectivity: what happens in one basin cannot be separated from what happens in others. This spatial interconnectedness is poorly reflected in the study of land-atmosphere interactions and the contribution of forests to the hydrologic regime. Focusing on the supply-side characteristics of rainfall, we define and develop the concept of hydrologic space and apply the concept to the derivation of the catchment basin water balance. Conventional approaches to the c-basin water balance typically fail to consider the import and export of atmospheric moisture as a principal determinant of locally and regionally available water supply. Land use modification has important implications for the availability of atmospheric moisture, the production of precipitation, the re-export of available moisture and the availability of runoff: the total amount of water available for productive and consumptive purposes. These consequences are not adequately recognized in most policy efforts at multiple scales and levels of governance.