

WATER AND ENERGY BALANCE ESTIMATION IN PUERTO RICO USING SATELLITE REMOTE SENSING

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Management of water resources relies on estimates of the hydrologic water balance within defined areas, such as, for example, watersheds, catchments, areas characterized by similar climate and/or similar land use. Components of the water balance include precipitation, actual evapotranspiration, surface runoff, aquifer recharge and the change in soil moisture storage. Estimating the hydrologic water balance using remote sensing techniques represents a distinct advantage over traditional methods that rely on point measurements for important variables. In this study, a methodology was developed for estimating the surface water balance, based on remotely sensed data for Puerto Rico. In the methodology, the surface energy budget is first solved implicitly in terms of the effective surface temperature, after which the latent and sensible heat flux terms are derived. The estimated net radiation is, in part, based on a newly available satellite remote sensing solar radiation product for Puerto Rico (1-km spatial resolution), derived from the visible band of the Geostationary Operational Environmental Satellite (GOES-12). The actual evapotranspiration is determined by multiplying the latent heat flux by the latent heat of vaporization constant (2.45 MJ/kg of water). Surface runoff is estimated using the Curve Number method. Total daily precipitation is obtained from NOAA's Advanced Hydrologic Prediction Service (AHPS). Estimation of aquifer recharge and the change in soil moisture storage are estimated based on the concept of soil field capacity. This research represents a preliminary step in the development of a suite of remote sensing products for PR, and is a potentially valuable tool for conducting water resource studies in the Caribbean Region.