Water table dynamics of tropical peatlands

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Tropical peatlands are ecosystems in which woody organic matter accumulates because of waterlogging in areas with high water tables. This feedback between waterlogging and landscape morphology generates land forms with special hydrologic characteristics. We develop an approach to handling the unusual hydrologic characteristics of tropical peatlands. In natural peatlands, the water table is always near the surface and infiltration is almost immediate. Therefore it is possible to develop a simplified approach to simulating groundwater dynamics based on the Boussinesq equation. Our simplified approach still has its challenges: in most unconfined aquifers, changes in the thickness of the saturated zone result in variations in transmissivity of 20% or so, whereas in a tropical peatland the transmissivity can vary by four orders of magnitude with fluctuations in the water table. We show how a change of variables makes it possible to overcome these challenges, and how the parameters for tropical peatland water table simulations can be obtained from spatially sparse water table and precipitation data.