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# Constraining uncertainties in water supply reliability in a tropical data scarce basin

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Assessing the water supply reliability in river basins is essential for adequate planning and development of irrigated agriculture and urban water systems. In many cases hydrological models are applied to determine the surface water availability in river basins. However, surface water availability and variability is often not appropriately quantified due to epistemic uncertainties, leading to water supply insecurity. The objective of this research is to determine the water supply reliability in order to support planning and development of irrigated agriculture in a tropical, data scarce environment. The approach proposed uses a simple hydrological model, but explicitly includes model parameter uncertainty. A transboundary river basin in the tropical region of Colombia and Venezuela with an approximately area of 2100 $km^2$ was selected as a case study. The Budyko hydrological framework was extended to consider climatological input variability and model parameter uncertainty, and through this the surface water reliability to satisfy the irrigation and urban demand was estimated. This provides a spatial estimate of the water supply reliability across the basin. For the middle basin the reliability was found to be less than 30% for most of the months when the water is extracted from an upstream source. Conversely, the monthly water supply reliability was high (r>98%) in the lower basin irrigation areas when water was withdrawn from a source located further downstream. Including model parameter uncertainty provides a complete estimate of the water supply reliability, but that estimate is influenced by the uncertainty in the model. Reducing the uncertainty in the model through improved data and perhaps improved model structure will improve the estimate of the water supply reliability allowing better planning of irrigated agriculture and dependable water allocation decisions.