



Water budget estimation on a data limited wetland: The case of the Ciénaga Grande de Santa Marta, Colombia

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At the end of the 20th century, the combination of climatic and anthropogenic developments resulted in hyper salinity conditions and subsequent massive mangrove mortality in the wetland Ciénaga Grande de Santa Marta (CGSM) at the Caribbean coast of Colombia. Although salinity concentrations are generally related to the type and quantity of water entering and exiting a wetland and to its internal hydrological dynamics, there have been up to date no hydrological studies on the CGSM. Here we show how a water budget approach can be used as a first-order of approximation to describe the CGSM's hydrology, despite data limitations. We collected hydroclimatic data to calculate and analyze the fluxes of water entering and exiting CGSM and their corresponding uncertainties. We find that the water budget is mostly affected by precipitation, being the largest water budget parameter. Thus, precipitation largely controls the hydrological output of the wetland at its outlet to the Caribbean. The influence of precipitation on the wetland water budget and noticeable changes in ENSO (El Niño Southern Oscillation) frequency and intensity from mid 70's might have severely affected the CGSM hydrological regime and consequently mangrove mortality. Scenario analyses show that currently the contribution of freshwater from the streams coming down from the Sierra Nevada Mountain Range on the eastern side of CGSM is now larger than that of the channels draining from the Magdalena River on the west, in contrast to what occurred before under natural hydrological conditions. However, Monte Carlo simulations suggest that changes to the eastern freshwater inflow cannot significantly affect the hydrological response of CGSM. These results outline the need to increase understanding of the internal connectivity and circulation of CGSM and develop a hydrologic monitoring network in this wetland.