A review of groundwater recharge estimation in humid and semi-arid African regions

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For the review of African recharge estimation, the distinct methods such as the geochemical approach, a method using groundwater level data, the streamflow method, and the water balance methods were first outlined. The major challenge of an African recharge study is the lack of basic data. Thus, this work suggests how to deal with this limitation and from future perspective using recently developed technologies such as RS, GIS, etc. With the rapid growth of information technology, more and more data, in terms of both volume and variety, are expected to be made available on the internet in the near future. RS technology has a great potential to revolutionize the groundwater development and management in the future by providing unique and completely new hydrological and hydrogeological data. However, at present, the RS data should be considered along with the conventional field data. In spite of the weaknesses of water balance methods in semi-arid areas, recently developed water balance methods combined with GIS technology are powerful tools for estimating groundwater re-charge, when spatial-temporal variability of components in water balance is taken into account (Lerner et al., 1990; De Vries and Simmers, 2002; Eilers et al., 2007).When enough data sets are available, integrated surface-groundwater modeling is recommended for more accurate estimation of groundwater recharge and discharge.