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Sustainable community-based hydrological monitoring and its applications in sub-Saharan Africa

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Less developed countries within tropical regions of the world have some of the most challenging water management issues, which are coupled with problems of data scarcity. In sub-Saharan Africa, both raingauge and river monitoring networks are declining, while there is a severe lack of data on groundwater levels, particularly shallow groundwater on which much of the rural population depends. While remote sensing hydrological products are becoming increasingly readily available and have the potential to address data gaps, they still require reliable networks of ground-truth data.

Results from an ongoing series of studies on the collection and use of community-based hydrological observations in Ethiopia and Tanzania to supplement formal networks are described. Rainfall, river levels and flows, and shallow groundwater levels have been collected at a sub-daily level over a period of several years. Statistical comparisons against data from formal monitoring networks and internal self-consistency checks have shown that community-sourced data can be of comparable quality to observations from formal networks. This establishes a basis for use of such datasets for local scale water abstraction and land-use planning, as well as for ground-truthing remote sensing data. The data have been used in Ethiopia with high spatial resolution physically-based modelling to support assessments of shallow groundwater potential.

Establishment of the wider sustainable use of community-based monitoring requires appropriate technologies, as well as sound management. Experiences with the use of different levels of technology are described, together with issues relating to the roles of communities and governance bodies which have led to development of the concept of a parahydrologist as an intermediary between community-based observers and governance and technical support organisations. This research supports the potential for improved data availability in the context of evaluation of watershed management interventions and larger scale water resources management.