

**Response to reviewer's comments (Anonymous Referee #4)
(Hessd-2007-0142)**

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The comments are quite constructive and we appreciate the valuable contribution and suggestions from the reviewer. We appreciate the complimentary comments e.g. “.... *I credit the authors for their effort in communicating the importance of such an approach*” among others.

The reviewer made 5 main comments of which we address them accordingly.

Comments 1:

I would have preferred to read more of the author's opinion on how the participatory process of the network design and implementation

The authors noted this as an important comment with regard to relating the title and objective of the paper and what was actually detailed in the old manuscript. The manuscript has since been refurbished, in all sections, and more emphasis has been towards detailing the participatory engagement of the community with very scanty highlights on the technical aspects.

Comment 2:

I am not sure the configuration of Figure 1 really encompasses what the authors are advocating. Are not the local community and other stakeholders also end users? Figure 1 should be even more circular than it is currently with a feedback through local community members shown after Retrieval to Instrumentation. It could also include a box called Water resource decision making. The authors could consider editing the figure.

We have edited Figure 1, now Figure 4, to incorporate the reviewer's comments. Figure 4 is as shown below.

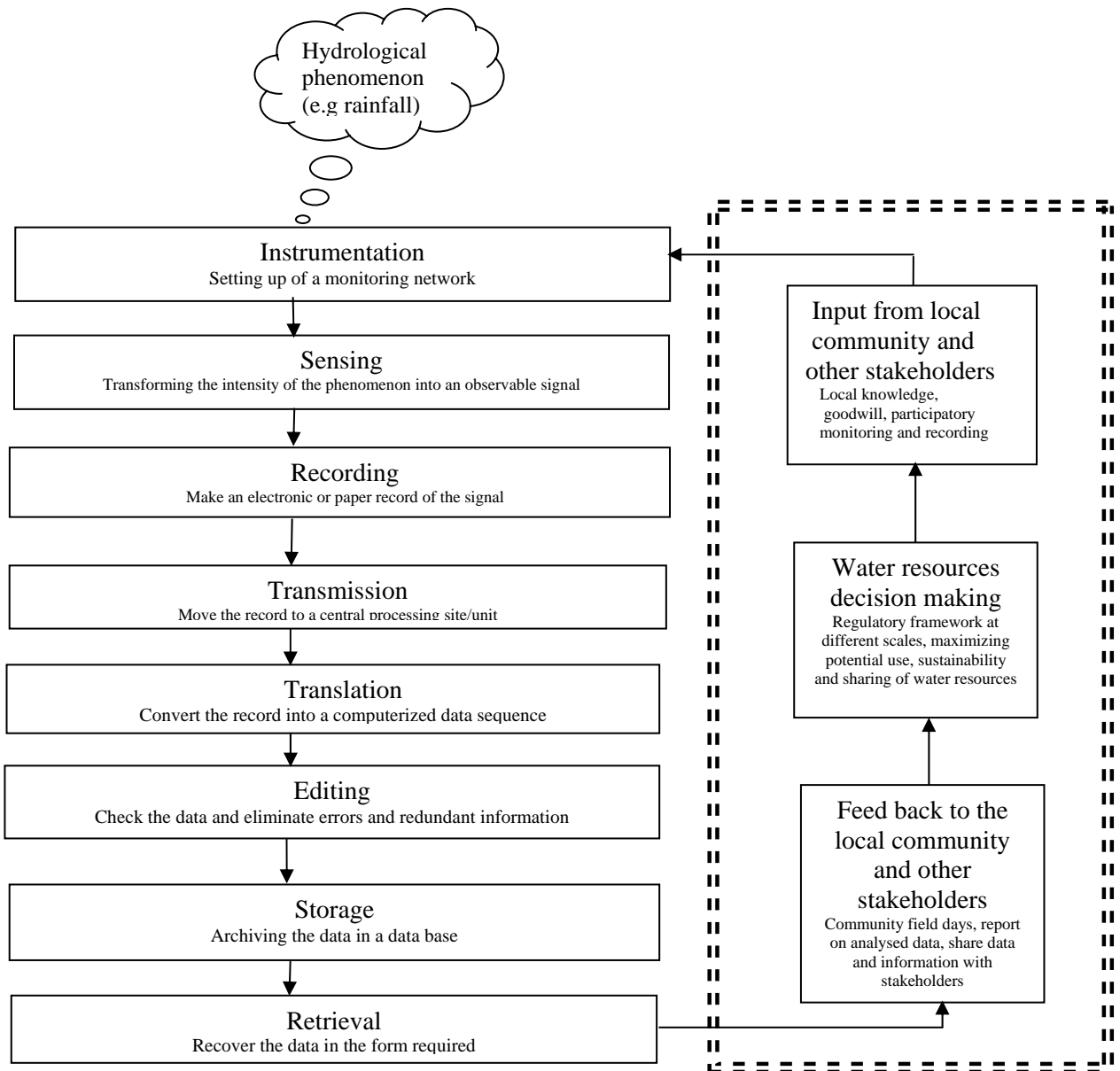


Figure 4 Hydrological measurement sequences with a participatory component indicating the role of the local community and other stakeholders

Comment 3:

Since a scintillometer only estimates sensible heat flux, with latent heat flux resolved as the residual of the energy budget, some discussion of how a large estimate of both net radiation and ground heat flux would be helpful.

Soil heat flux

The spatial measurement of soil heat flux, as implemented in the Potshini catchment, was by use of the methodology outlined in (Blight, 2002). The differential temperature at two depths of 0.2 and 0.25m from the surface was monitored at three different sites in the catchment. These sites represented the main landuse/landcover in the catchment, i.e smallholder farming and grazing (grassland). These sites were also

located along the LAS transect, from which the average soil heat flux was computed from the depth of soil heated diurnally (0.2m) by the incoming net radiation i.e:

$$G = Z_G (\overline{\Delta T}) C_G \rho_G \quad (1)$$

where G is the soil heat flux (kJ.m^{-2}), Z_G is the depth of soil heated in meters (usually 0.2 to 0.25m), $(\overline{\Delta T})$ is the average measured rise in temperature over depth Z_G , C_G is the specific heat of the soil ($\text{kJ.kg}^{-1}\text{.}^\circ\text{C}^{-1}$) and ρ_G is the bulk density of the soil (kg.m^{-3}). The specific heat capacity of the soil was computed using the method described in Campbell Scientific (1987), i.e:

$$C_G = C_{Gd} + wC_w \quad (2)$$

where C_G is the specific soil heat capacity ($\text{kJ.kg}^{-1}\text{.}^\circ\text{C}^{-1}$), C_{Gd} is the specific heat of the dry soil particles, C_w is specific heat capacity of water ($\text{kJ.kg}^{-1}\text{.}^\circ\text{C}^{-1}$), w is gravimetric water content of the soil mass (mass of water/mass of solids). C_{Gd} and C_w has values of 0.85 and $4.19\text{kJ.kg}^{-1}\text{.}^\circ\text{C}^{-1}$ respectively. The soil bulk density, measured at the three sites in the catchment where soil moisture measurements were undertaken, was found to be 1417, 1439 and 916.4kg.m^{-3} , and hence the average soil bulk density for the catchment was estimated to be 1257kg.m^{-3} .

Net radiation

Net radiation can easily be measured by using well calibrated net radiometer sensors as was done Potshini catchment. The community weather station had two radiometers that measured the incoming shortwave (facing upwards) and outgoing longwave radiation (facing downwards) and logged into a Mike Cotton System (MCS) data logger. The MCS radiometers were calibrated against a Net radiometer (Kipp and Zonen) with data logged to a Campbell Scientific CR1000 data logger. The calibration exercise took two weeks, with data recoded at a time step of two minutes. and the MCS system was calibrated at a time step of two minutes. It is useful to note that the location of the community weather station was along the Scintillometer transect. Kipp & Zonen Net radiometers are widely used for measuring net radiation. Thus, on can have these radiometers installed at different sites for a wide coverage. However, the Kipp & Zonen Net radiometers are expensive and hence often a challenge to many.

Comment 4:

It is a pet peeve of mine that climate towers are considered point measurements. All climate towers measure a dynamic pocket of upwind air that moves past the tower. The extent of this air is the footprint of the tower, and depending on the height, wind and surface roughness, can be quite large. I would choose an eddy correlation system mounted on a tall tower over a scintillometer

Climate towers have continued to be used over different land uses and provide accurate information on flux dynamics. A Large Aperture Scintillometer (LAS) measures sensible heat flux over a transect, typically less than 10km, with the measured values being averaged along the transect using a weighting function. Numerous studies, including Kite and Droogers (2000) and Meijninger (2003) have highlighted the “scale compatibility” of total evaporation (ET) estimates derived from

remote sensing techniques and LAS. The objective for using LAS in the Potshini catchment was to provide calibration measurements for the remotely sensed *ET* estimates derived from the SEBAL methodology.

Comment 5

In line 28 of conclusion, the authors state ... "a local, relatively poorly educated community". I find that though lacking formal education, people close to the land tend to know more about their environment than they are often given credit for.

We agree with the reviewer. This has been edited and given more emphasis in the revised manuscript. The authors note that much of the success realised in establishing the catchment monitoring network was as a result of incorporating local knowledge in the process.

Reference

Blight G.E. 2002. Measuring evaporation from soil surfaces for environmental and geotechnical purposes. *Water SA* Vol.28 No. 4

Campbell Scientific. 1987. Bowen Ratio System User Guide