



Setting the scene for a new global hydrological initiative: Prediction of Ungauged Land Surface Elements (PULSE)

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The IAHS initiative “Predictions in Ungauged Basins” (PUB) has focus on river basins and error reduction in river discharge estimation. An advantage of PUB is that the available datasets of discharge and other recordings allow testing of estimates of unknown basin hydrology from known basin hydrology. A disadvantage is only basin hydrology is incorporated. In particular, diffuse water transfer systems such as wetlands and arid regions do not suit a PUB framework. Also, both large scale continental hydrology and small scale patch water budgets are not basin units. A complimentary hydrological initiative is proposed: water budget Prediction of Ungauged Land Surface Elements (PULSE), encompassing the entire terrestrial hydrosphere. A precondition for any future PULSE initiative is the accumulation of ground truth water budget data sets from “gauged” land surface elements to allow extrapolation to ungauged elements. One approach is to come from the small scale with in-situ measurement of water budgets of land surface patches. This allows direct measurements of boundary water transfers such as net lateral groundwater flux. Two field techniques are presently available toward this end. Firstly, changes in patch water mass can be detected using sufficiently sensitive gravity meters located at ground surface or in existing deep underground laboratories. The second option is to set up geological weighing lysimeters (gwl) for direct measurement of surface water budgets from the subsurface. This area-integrated field method can be very accurate but has not yet been widely taken up. Principles of gwl systems are illustrated with a New Zealand case study, and a call is made for global site investigations to establish both gravity and gwl stations for

founding an international PULSE initiative for terrestrial hydrology.