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# Redundant information in the rainfall-runoff relationship.

This work aims at exploring in a common framework the information content of forcing variables (e.g. rainfall), prognostic variables (e.g. discharges) and hydrological processes knowledge information (e.g. models and parameter values). It will be shown that some of the common hydrological problems are embedded within this '3D information space'. As an example, simulation process is embedded in the 2D plane defined by a prognostic variables information content (one of the three axis) equal to zero. As another example, model set-up procedure is embedded in the 2D plane defined this time by a hydrological processes knowledge (the second one of the three axis) equal to zero. Many unusual problem such as inverting rainfall given observed discharges and calibrated model are also embedded in this framework (indeed the 2D plane defined by a forcing variable knowledge - the third axis - equal to zero).

One interesting result when exploring this 3D framework may be to be able to define for a given hydrological issue a 'minimal information content surface'. Indeed, splitting available information in separate partial components - forcing variables information, prognostic variables and a-priori knowledge on catchment behavior - may help to replace an available information set for a given hydrological problem in this common framework and to qualify this available information content. Above this surface means that the available information content contains somehow redundant information while an available information data set below this surface would mean that the adressed hydrological problem is bad constrained. This may help to revisit a-priori ideas on information content on ungauged or weakly gauged catchments.

Some examples will be detailed. For example, it will be shown how rainfall hourly time-series and parameter values of different hydrological models can reasonably be inverted from observed discharges time-series alone from southern France catchments. This means that within these catchments, discharges data have a significantly greater information content than a priori thought. As another example it will be shown that rainfall time series and river heights informations are enough information to rebuild rating curves and model parameter values. As perspective, clues to calibrate model within this common framework using non-concomitant rainfall and discharges time-series will be detailed.