Set-membership estimation from poor quality data sets: modelling ammonia volatilisation in flooded rice systems

ABSTRACT

A set-membership (bounded-error) estimation approach can handle small and poor quality data sets as it does not require testing of statistical assumptions which is possible only with large informative data sets. Thus, set-membership estimation can be a good tool in the modelling of agri-environmental systems, which typically suffers from limited and poor quality observational data sets. The objectives of the paper are (i) to demonstrate how six parameters in an agri-environmental model, developed to estimate NH3 volatilisation in flooded rice systems, were estimated based on two data sets using a set-membership approach, and (ii) to compare the set-membership approach with conventional non-linear least-squares methods. Results showed that the set-membership approach is efficient in retrieving feasible parameter-vectors compared with non-linear least-squares methods. The set of feasible parameter-vectors allows the formation of a dispersion matrix of which the eigenvalue decomposition reflects the parameter sensitivity in a region.

Keyword: Set-membership approach; Bounded-error; Parameter estimation; Uncertainty analysis; Model calibration; Ammonia volatilisation; Flooded rice