Topics category : Distributed hydrological modeling

Mathematical countermeasures to difficulty in indentifying distributed permeabilities and in enhancing sensitivity of updating parameters from observed data

Toshio HAMAGUCHI and Eiichi NAKAKITA

Disaster Prevention Research Institute, Kyoto University
Gokasho, Uji, Kyoto 611-0011, JAPAN

Phone : +81-774-38-4262; FAX : +81-774-38-4262;
E-mail : hamaguti@urh.dpri.kyoto-u.ac.jp

ABSTRACT

This paper proposes the distributed model of permeabilities in geostatistics and shows its identified solution is unique through a numerical test. A hypothetical aquifer divided into twenty piecewise zones is designed. Twenty constant-permeabilities are individually identified and some of those permeabilities result in inaccurate solution. The difficulty of an inverse problem with ill-posedness prevents us from getting the stable, unique and accurate solutions of identified permeabilities. A distribution model of permeabilities mapped from a geostatistical model is herein proposed. From observed data, the sensitivity of the updating parameters to be identified is then enhanced over the whole area. The mathematical foundation for the advances of the sensitivity is also investigated and discussed. It can be proven that the proposed approach is greatly helpful in identifying a spatial distribution of piecewise permeabilities with accuracy and in overcoming the mathematical difficulty in that inverse problem.