Risk in Water Resources Management (Proceedings of Symposium H03 held during IUGG2011 in Melbourne, Australia, July 2011) (IAHS Publ. 347, 2011). 224-229

Physically-based groundwater vulnerability assessment using sensitivity analysis methods

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Abstract Management of water resource systems requires adequate decision making to protect the water-related functions of fundamental importance to human life, ecosystem preservation and economic development. Groundwater vulnerability assessment studies are useful tools for land-use planning and groundwater protection. A generalized physically-based method using numerical models of groundwater flow is proposed for quantifying the impact on groundwater resources to external pressures, in terms of both quantity and quality. The proposed method is based on the definition of groundwater state sensitivity and groundwater vulnerability coefficients. The vulnerability coefficient is defined as a ratio that reflects the "distance" between the current state of degradation of the water resource system and the "damaged state". Different numerical methods are proposed to compute the sensitivity coefficients. The uses of these concepts in risk assessment for groundwater resources are discussed and the computation algorithms are illustrated using a simple, yet insightful case study.

Key words vulnerability; sensitivity; physically-based; artificial recharge; risk assessment