



Capture zone of a pumping well in an unconfined aquifer between a segmental inflow boundary and a linear discharge boundary

Haixiang Li (1) and Xu-Sheng Wang (2)

(1) China university of geosciences, School of Water Resources and Environmen, Beijing, China (lihaixiangcugb@foxmail.com), (2) China university of geosciences, School of Water Resources and Environmen, Beijing, China (wxsh@cugb.edu.cn)

Abstract:

Unconfined aquifers beneath piedmont pluvial fans are widely distributed in front of mountains and proper for water supply with pumping wells. However, the catchment zone and capture zones of a pumping well in such an unconfined aquifer is not well known. We develop a conceptual model of the flow between a segmental inflow boundary and a discharge boundary of constant head. The catchment zone is delineated from dimensionless numerical results via MODFLOW and MODPATH. Sensitive analyses are conducted with lumped parameters. The shapes of the catchment zone are classified into 4 types according to different connections to the boundaries and quantitatively analyzed with typical shape factors. Capture zones with respect to special travel times are identified from travel time distribution in the catchment zone. The modeling results are compared with previous analytical solutions for special simple cases. As indicated, the size of a capture zone is not larger than that of the same travel time but in an infinite confined aquifer with uniform regional flow.

Keywords: Water table, piedmont pluvial fans, catchment zone, travel time, numerical modeling