The Savoy Experimental Watershed (SEW) is a University of Arkansas (UofA) property of approximately 1250 hectares (ha) in Northwest Arkansas, within the central United States. The SEW occurs on a mantled (regolith-covered) karst, and is the site of an integrated research effort between the UofA, Arkansas Department of Pollution Control and Ecology (ADPCE), Agricultural Research Service (ARS) of the U.S. Department of Agriculture (USDA), and the U.S. Geological Survey (USGS) to develop a long-term, interdisciplinary field laboratory for the in situ quantitative determination of processes, controls, and hydrologic and nutrient-flux budgets in surfacewater, soilwater, and shallow groundwater environments in response to specific, near-surface anthropogenic (agricultural) activities and land uses. Comprehensive research at SEW encompasses the detailed aspects of flow and solute budgets 1) from precipitation, 2) from near-surface anthropogenic activities, 3) in runoff, 4) from within the soil zone, 5) at the epikarst, 6) from within identifiable components of the shallow karst aquifer, and 7) at spring resurgences. This study is limited to selected elements of budget terms 5), 6), and 7), with the objective of relating areal, stratigraphic, and temporal variations in flow and water quality to identifiable groundwater processes and controls.

Continuous hydrologic monitoring at SEW during storms includes measuring precipitation in .01 inch increments,and measuring interflow, epikarst flow, streamflow, water levels in wells, spring discharge, and appropriate water-quality parameters, all at 15-minute increments with automated probes and samplers. Discrete samples of groundwater from the previously mentioned sources are also collected throughout the storm hydrograph (~ 1-hour increments) for analyses of water-quality constituents not easily measured by existing sensors. These data provide a wealth of information that allows mass-balance calculations, boundary-flux determinations, and water-quality evolution, all within a well-constrained areal and temporal framework amenable to numerical simulation at a site-specific scale. Temporally random sampling not keyed to specific hydrologic flow conditions is of little value, and does not characterize important transport features of the system. In addition to documenting system variability and helping formulate sampling rationale, preliminary data from continuous monitors and discrete hydrologic event sampling is providing valuable information on budget contributions from these complex springs.

CALCULATION OF INDUCED GROUNDWATER RECHARGE FROM THE SLOPES OF TIME-DRAWDOWN DATA

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The rate of induced groundwater recharge from surface water bodies was calculated by two approaches. These are the well-known image-well theory approach, and a new simple approach that utilizes the slopes of time-drawdown data plotted on semi-logarithmic graphs. The new approach is based on the Cooper-Jacob method. The new approach calculates the rate of induced recharge as a function of the pumping rate, the slope of the time-drawdown data before recharge, and the slope of the time-drawdown data after recharge. The two approaches were applied to data obtained from five observation wells used in an unconfined aquifer test conducted to investigate the possibility of inducing groundwater recharge from the Arkansas River in the Ingalls area, Kansas, USA. The two approaches yielded substantially similar results. The image-well approach gave an induced recharge rate of 3.37×10^{-2} m^3/sec, and the new proposed approach gave 3.22×10^{-2} m^3/sec. The validity of the proposed approach was verified by recalculating the aquifer's transmissivity using equations of the proposed approach. The transmissivity value obtained with the proposed approach is identical to the original value that was calculated by another author using a different method. The simplicity of the proposed approach is its main advantage over the image-well approach. The image-well approach requires development of steady-state conditions, and determination of the aquifer's transmissivity, the aquifer's storativity, and the effective distance from the pumped well to the hydraulic boundary. None of these are required in the proposed approach; only the two slopes described above are required.

A SPATIAL DISTRIBUTION AND HISTORIC EVOLUTION OF THE PIEZOMETRIC LEVEL IN THE BLANCA-MIJAS HYDROGEOLOGICAL UNIT (COSTA DEL SOL AREA, SOUTH SPAIN)

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Blanca and Mijas mountains make up the most important hydogeological unit in the touristic area of the Costa del Sol, it supplies a population of 250,000 persons. This unit has 170 km^2 in surface and average resources of 50 hm^3/year, but the average discharges are superior in nearly 15 hm^3/year because of the pumping which is produced in Sierra Mijas.

The aquifer material is a carbonated formation 00 m thick, made up of white-dolomitic marbles toward the bottom and blue-calcareous marbles toward the top. The geological structure is very complex and permits differentiating three sectors: western Sierra Blanca with an interference of N-S and E-W folds, eastern Sierra Blanca with a tabular structure and Sierra Mijas with ESE-WNW folds. This folded structure is truncated by fractures NNE-SSW and NNW-SSE.

The geological structure and mineralogical composition of the marbles have conditioned the existence of different piezometric levels-distinct systems- and different aquifer behaviors. Thus, the western Sierra Blanca systems, are made up of blue-calcareous marbles with a large speleologycal development, the springs of this sector present hydrogrammes with very marked peaks and variations in the water chemistry and temperature of the waters. So the western Sierra Blanca aquifers are conduit flow systems, they have a scarce natural regulation.

Eastern Sierra Blanca and Sierra Mijas are principally formed by white-dolomitic marbles, little karstified but very fractured, drained by springs which present variations slightly marked in the outflow, in the temperature and in the chemical compositions of their waters. Therefore eastern Sierra Blanca and Sierra Mijas aquifers have a very inertial and a diffuse flow behavior.

In the Blanca-Mijas unit, numerous boreholes have been drilled, some of them by different Spanish Public Organizations which today are included in the Environmental Ministery. These boreholes corroborate the above mentioned interpretation about the hydrogeological behavior of the systems. Thus the boreholes of western Sierra Blanca have specific yields less than 1/l/s/m, so normally they are not exploited, and in the eastern Sierra Blanca and Sierra Mijas ones the specific yields are superior reaching even 225 l/s/m, which are very exploited for the urban water supply.

The boreholes have permitted delimitating eight aquifer systems which have been distinguished in the unit and also controlling the piezometric evolution in time, some of these, since 1979. This historic evolution shows, in western Sierra Blanca a natural functioning with the piezometric level, always above the height of the spring, whereas in eastern Sierra Blanca and, above all, in Sierra Mijas the evolution presents a piezometric decrease (reaching 100 m) because of the exploitation but the level being almost recovered with the rainwater.

LOW-ANGLE NORMAL FAULTS AS CONTROLLING STRUCTURES FOR PROTRACTED FLUID FLOW, MASSIVE DISSOLUTION, AND COLLAPSE

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