HYDROGEOLOGICAL PROBLEMS OF ARGENTINA'S PAMPAS

EDITOR'S MESSAGE

by

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I would like to offer a brief account of a rather singular hydrogeological feature that occurs in vast regions in the central-eastern part of Argentina, the pampas, where most of the country's primary productive activities (such as agriculture and cattle-raising) are carried out. The negligible surface relief and the moderately humid climatic regime (mean annual rainfall is about 1,000 mm) cause the overall water budget to be different from that normally observed in most regions of the world. Indeed, 90-95 percent of the region's water budget is incorporated in vertical transfer terms (infiltration and, mostly, evapotranspiration). Inasmuch as evapotranspiration (ET) is very difficult to estimate within reasonable levels of precision, water-budget errors are usually large, and uncertainties arise whenever estimates of effective groundwater recharge are made.

Recent developments in satellite-image processing would probably help to assess regional ET, although in many countries such methodologies cannot be applied, because ready access to such satellite images is lacking. This problem was recently discussed in a comprehensive report by the Commission of the European Communities. Until a functional strategy is implemented to solve the problem, a primary goal to be pursued in the Argentine pampas is the cross-validation of existing methodologies for estimating ET, such as development of detailed (and properly upscaled) water balances, estimation of pan-evaporation coefficients, and application of tracers (such as chloride and tritium).

Another uncertainty in the pampas derives from a lack of knowledge of the geometry of aquifers and the conspicuous occurrence of multi-layered water-bearing zones. Groundwater regimes in the region are probably governed by the interplay of regional, semi-regional, and local flow systems (Tóth's model), but this conceptual model cannot be proven because most of the wells tap only the first few meters of the saturated zone. As a result, this two-dimensional picture is a great oversimplification (prone to be wrong) of a three-dimensional system. Many problems in this respect could be solved by conducting dedicated deep-drilling programs and by utilizing geophysical methods, but the current outlook is not very attractive, because of the unavailability of funds.

The pampas region is also characterized by alternating cycles of annual deficit and surplus of water. Since the beginning of this century, Argentina's Federal Government has paid much more attention to the latter aspect, triggering the early construction of several drainage channels, some as long as 700 km. Those drains proved to have very low efficiency, because 1) the meager surface slopes do not promote fast evacuation of the excess water, and 2) a progressive disinvestment has led to a general disregard of routine maintenance of the channels.

As for the drought periods, it was not until ten years ago that farmers realized that groundwater resources could be used for irrigation purposes. Today, there is a strong drive toward using groundwater for irrigation, with unpredictable impacts on the system. The present utilization of groundwater is on a "first come, first served" basis, an approach that can only be managed by issuing a clear set of rules and norms. Unfortunately, such are not currently available. Appropriate regulations should address the fact, among other aspects, that hydrogeologists can only be useful to society when they have the basic information needed for their studies. Furthermore, the networks of recording stations for any relevant variable (climatic parameters, river flows, groundwater levels, water quality, etc.) are clearly insufficient, given the size of the region involved.

A final annotation should be made about the profile of Argentinian hydrogeologists. Most of them are geologists, and just a few hold higher-level degrees in hydrogeology. What should set off an alarm is the fact that only 50-100 individuals are working on hydrogeological problems in an area of about 3,000,000 km². This area is the most productive region in Argentina, from which greater than 70 percent of the gross national product is derived.

The paucity of hydrogeologists can also be viewed in a positive sense: Argentina needs highly skilled, experienced hydrogeologists, and the region offers a whole set of interesting hydrogeological challenges. Will anybody out there take a chance on it?