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Advances in geological knowledge in the transboundary outcrop area of the Guarani Aquifer System, Artigas city and surroundings, Uruguay

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The Guarani Aquifer System (GAS) is one of the most important transboundary aquifer in the world. Its extension includes part of Argentina, Brazil, Paraguay and Uruguay, being used in those countries both for human consumption and for agricultural and recreational activities. Particularly in Uruguay, it is found in an unconfined or confined form (covered by the basalts of the Arapey Formation). In Uruguay, the GAS is constituted by the Mesozoic sandstones represented by the Tacuarembó and Rivera formations, found as an unconfined aquifer in two regions of the territory and, in a confined way, when covered by extensive eocretaceous basalts of the Arapey Formation. The purpose of this contribution is the stratigraphic and structural analysis of the GAS outcrop area located in the extreme east of the department of Artigas, an area in physical continuity and bordering Brazil, which places the cities of Artigas (Uy) and Quarai (Br) within the Cuareim Basin. Here, groundwater is used largely for human consumption (sometimes the only source of drinking water) and also contributes to the development of agricultural activities. The outcrop area of the GAS constitutes an elevated block controlled by a NW-oriented regional structure (Cuareim lineament), limited by normal faults in the NNE direction (showing continuity towards Brazilian territory), while towards the South, it exhibits control through of a zone of strike-slip faults almost EW oriented. This elevated block allowed erosion to subtract part of the basalt cover, exhuming the sandstones from the top of the GAS, thus giving rise to the so-called "Window of Artigas". On the other hand, surface and subsoil geological advances made it possible to define that, under this structural configuration, part of the sandstones belonging to the Arapey Formation (intertrapps) were considered, and therefore included in the geological maps, as part of the GAS. In this way, and with a clear impact on hydrogeology, the results obtained showed that the outcrops of the GAS in this region are significantly lower than that recorded in the cartographic antecedents. In summary, these defined stratigraphic and structural features made it possible to conceive a very different conceptual geological model that influences the understanding of GAS dynamics in this transboundary region and, therefore, the management and care of this groundwater.

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