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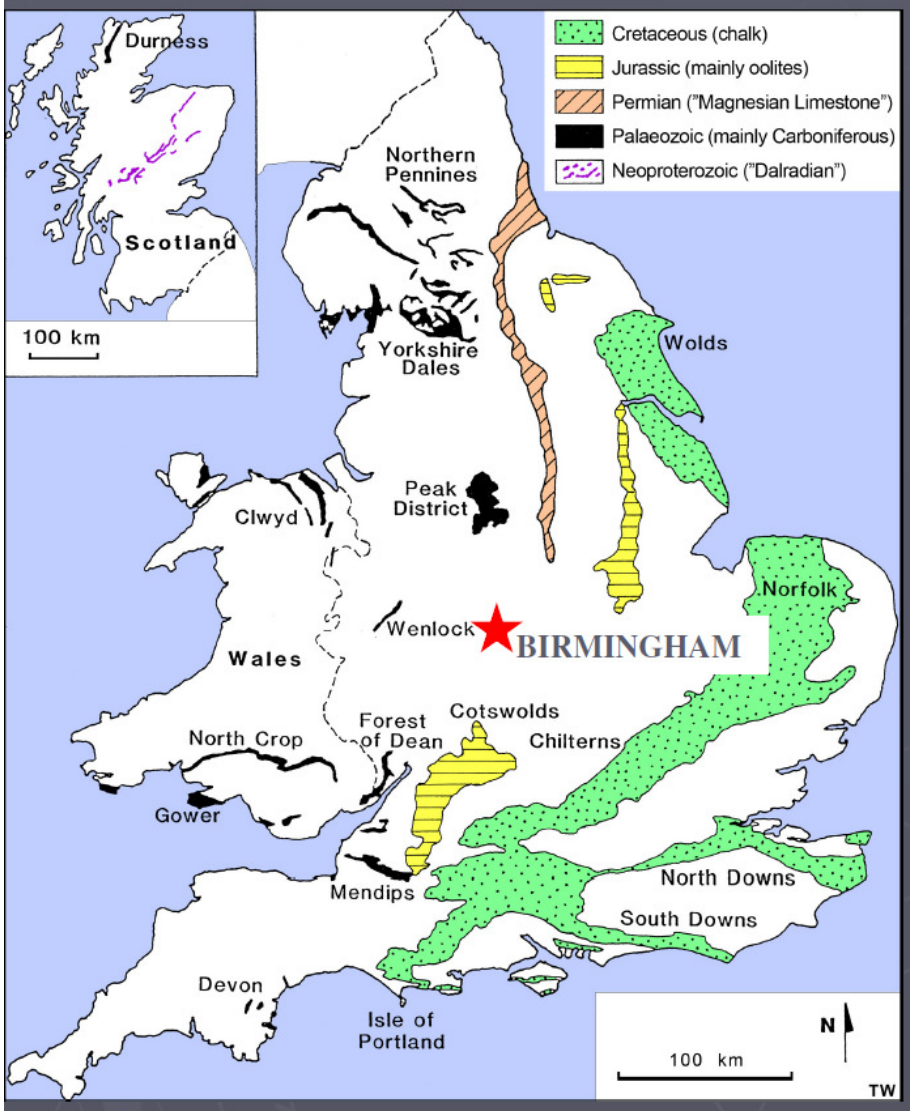
PROGRAMME & ABSTRACTS



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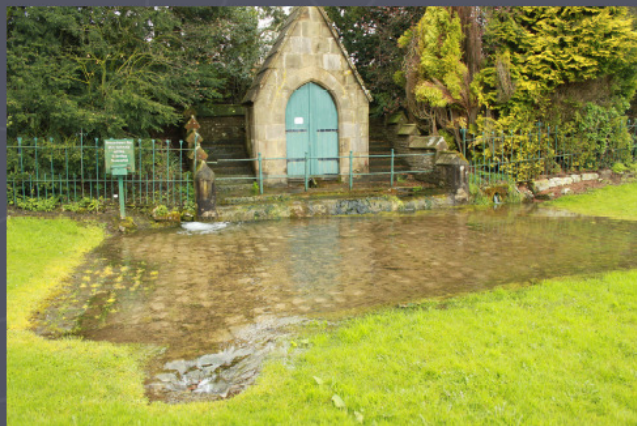

Influence of Faulting and Relay Ramp Structures on Groundwater Flow in the Karstic Edwards and Trinity Aquifers, Central Texas, USA

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The Cretaceous-age Edwards and Middle Trinity Aquifers of central Texas are critical groundwater resources for human and ecological needs. These two major karst aquifers are stratigraphically stacked (Edwards over Trinity) and structurally juxtaposed (normal faulting) in the Balcones Fault Zone. Studies have long recognized the importance of faulting on the development of the karstic Edwards Aquifer. However, the influence of these structures on groundwater flow is unclear as groundwater flow appears to cross some faults, but not others. This study combines structural and hydrological data to help characterize the potential influence of faults and relay ramps on groundwater flow within the karstic Edwards and Middle Trinity Aquifers.

Detailed structure contour maps of the study area were created from a geologic database (n=380) comprised of primarily geophysical and driller's logs. The data were then contoured in Surfer® (Kriging) with no faults. Structure contour surfaces revealed detailed structural geometries including linear zones of steep gradients (interpreted as faults) with northeast dipping zones of low gradients (interpreted to be ramps) between faults. Hydrologic data (heads, dye trace, geochemistry) were overlaid onto the structure contour maps in GIS. Results for the Middle Trinity Aquifer suggest relay ramps provide a mechanism for lateral continuity of geologic units and therefore groundwater flow from the Hill Country (recharge area) eastward into the Balcones Fault Zone. Faults with significant displacement (>100 m) can provide a barrier to groundwater flow by the juxtaposition of contrasting permeabilities, yet flow continues across faults where they have relatively minor displacement, or where permeable units are juxtaposed with other permeable units. In the Barton Springs segment of the Edwards Aquifer the primary flow path defined by dye tracing and heads is coincident with a relay ramp dipping to the northeast.

This work addresses the lateral continuity (intra-aquifer flow) of these two karst aquifer systems, which has importance for conceptual models and ultimately resource management. A recent water-development controversy from a company proposing to pump a large volume of groundwater from the Middle Trinity Aquifer in the Balcones Fault Zone underscores the issue. Structures that influence groundwater flow will also influence the anisotropy of impacts (drawdown) due to significant pumping.