

## Charge and Inversion, Illizi Basin, Algeria

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### ABSTRACT

Palaeozoic intracratonic sag basins across North Africa often have relatively simple tectonic histories. However, when significant amounts of stratigraphy have been eroded due to exhumation or uplift, reconstructing the burial history of a basin is a challenging task. This is important, as a critical factor is timing of hydrocarbon generation and migration. The development of discrete traps and trap modification by later uplift, and mechanisms for charge in such inverted basins is a critical element for understanding exploration risk. In South-Eastern Algeria, the Illizi basin has endured a complex history of multiple phases of burial and uplift. Extensive new data, collected from the Ain Tsila (Isarene) field in the Illizi Basin, a multi-Tcf gas-condensate field with gas reservoired in Ordovician sandstones, has been analysed to constrain the burial and thermal history of the region. Hydrocarbon generation in the overlying lower Silurian source rock is interpreted to have occurred during the Carboniferous (pre-Hercynian uplift) and during the Late Cretaceous–early Eocene (pre-Eocene uplift). Structural reconstructions suggest that the Ain Tsila field was initially located on the southern flank of a long-lived Paleozoic paleo-high, and that the large low-relief closure that defines the present-day accumulation only formed during the Eocene uplift of the Hoggar Massif and associated tilting of the Illizi Basin. Therefore, the timing of trap formation at Ain Tsila post-dates the main hydrocarbon generation events, suggesting alternative hydrocarbon charge mechanisms are required for the field. This suggests that our long-held models for the critical moment of relative timing of hydrocarbon generation and trap formation may in some cases need to be re-assessed in petroleum systems analysis. This study indicates considerable potential to charge up-dip traps on the flanks of exhumed petroliferous basins across North Africa via the re-distribution of the pre-existing hydrocarbon budget within the basin.