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Structural development of the onshore Otway passive margin (Australia): the interaction of rotating syn-sedimentary faults

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Within the context of long-term CO_2 storage integrity, we interpreted the faults within the 2.2 km thick, syn-rift, Late Cretaceous to Recent sediments below the CO2CRC Otway Project site in Australia using a detailed interpretation of a 3-D reflection seismic cube (32.3 km$\times$14.35 km $\times$ 4100 ms TWT). All the faults in the onshore Otway passive margin basin in this area were active to varying degrees during sedimentation, between ca. 120 and 50 Ma, before they died out. From analysis of fault juxtaposition and fault tip-line propagation maps, as well as analysis of individual stratigraphic thickness maps, we determine the direction and incremental amount of syn-sedimentary movement on each fault.

Thickening of the hanging-walls of the faults occurred, as is typical for syn-sedimentary faults. However, we also determine that substantial local footwall thinning took place. Although the syn-sedimentary behaviour of the faults was constantly maintained until 50 Ma, there were two main phases of footwall thinning, separated by a quiescent phase. We postulate that these phases of footwall thinning represent rotation of the fault blocks that correlate with prograding sediment pulses within the passive margin. The rotation of the fault blocks occurred simultaneously, i.e., they could only rotate if they interacted.