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Preservation of dinosaur tracks beds in a synrift back-barrier system. Barremian Camarillas Formation, Galve sub-basin (northeast Spain)

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A total of ten dinosaur tracks-bearing strata have been found associated to clastic and carbonate levels of the synrift Barremian Camarillas Formation, in the Galve sub-basin (NE Spain). Based on the sedimentological study of seven stratigraphic sections, several facies associations have been differentiated in a mixed siliciclastic carbonate succession which belongs to a barrier-island lagoonal system. Sedimentation was highly influenced by synsedimentary tectonics; faults controlled the location of the carbonate lagoons and the spatial distributions of the siliciclastic barrier-island systems (probably located at the fault tips). Recurrent storms were also important, which eroded the barrier. They supplied clastic material to the lagoon forming extensive siliciclastic washover fans, which merged laterally with the lagoonal carbonates.

Dinosaur track casts appear mainly associated with siliciclastic washover fan deposits that fill and cover them, although they also appear associated with lagoonal carbonates. Washover fans deposits show a tabular or lenticular geometry, lags of quartzite and clay pebbles, through and planar cross-bedding, cross and parallel lamination, asymmetric ripples, vertical and horizontal bioturbation and in some case, bivalve fragments. The footprints have a sub-circular geometry (30-40 cm length and 15-35 cm depth) and in some of them, it is possible to see digit casts, parallel striae, scars, probable claw marks, vertebrate bones and gastrolith. One of these track-bearing strata can be followed laterally for more than 7 Km. The dinosaur marks that appear at base and top of carbonate strata show a variety of shapes and dimensions (from 15 cm to 70 cm length and less than 15-20 cm depths). Lagoonal carbonates (mudstone to wackestone) present mainly bivalves, ostracods, gastropods, benthic foraminifera and oysters.

In several cases, the tracks were formed on the lagoonal carbonates and then, filled and preserved by the siliciclastic washover facies. According to our interpretation, the dynamic of the depositional system favored the preservation of the animal tracks because washover fans sediments covered quickly the track marks made on the bottom of the lagoon by the dinosaurs.