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EARLY SYN-RIFT EVOLUTION IN THE WEST CAMEROS BASIN (UPPER JURASSIC, NW IBERIAN RANGE), SPAIN and PEDOGENETIC CALCRETES IN EARLY SYN-RIFT ALLUVIAL SYSTEMS (UPPER JURASSIC, WEST CAMEROS BASIN), NORTHERN SPAIN—DISCUSSION

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ALLUVIAL FANS

The Brezales Formation, originally defined as the Señora de Brezales Formation (Platt 1986, 1990; see also Martín-Closas and Alonso Millán 1998; Clemente Vidal 2010), comprises a syn-rift alluvial fan succession displaying strong lateral and vertical facies changes.

Sacristán-Horcajada et al. (2015) primarily relate these variations to drainage area and basin-scale tectonics. They suggest that "source area lithology can be considered as a constant factor." In this regard, it is not clear why Sacristán-Horcajada et al. fail to discuss the work of Platt (1995), which showed how sedimentation and clastic supply was strongly controlled by subcrop geology as well as kilometer- and outcrop-scale faulting. Deposition across the area recorded progressive erosion and unroofing of the underlying succession and varying subcrop beneath the complex Cimmerian unconformity.

In the south of the basin, a "progradational" (coarsening-upwards) facies trend noted by Sacristán-Horcajada (2015) reflects local reworking of upper Oxfordian sandstones at the unconformity, leading to the deposition of red-bed sandstones in the basal section of the Brezales Formation. Only later did erosion of deeper-lying marine Jurassic limestones result in the deposition of conglomerates. An example occurs at Espejón, where the Brezales Formation is not absent as suggested by Sacristán-Horcajada et al. (2015), but features a basal sandy section overlain by a spectacular conglomerate channel complex which was described in detail by Platt (1995).

Across the northwestern sector of the basin, the Brezales Formation rests unconformably on marine Jurassic carbonates atop a faulted, channel-scoured surface, with paleokarst developed on the interchannel areas between them (Platt 1995). The syn-rift succession begins with channelized basal conglomerates which contain abundant clasts of the underlying Jurassic limestone and are progressively overlain by mudstones and sandstones, defining a "retrograding" (fining upwards) facies trend noted in this area by Sacristán-Horcajada et al. (2016).

The difference between the successions in these areas, with sandstones passing upwards into conglomerates across most of the south, and basal conglomerates and paleokarst passing upwards into finer-grained redbeds in the northwest, can therefore be seen to be driven not specifically by differing alluvial-fan processes but rather by the subcrop geology, which determined the sediment supply available.

Faulting plays a fundamental role in controlling sedimentation at a range of different scales. Coarse basal breccias and conglomerates at Jaramillo Quemado (Platt 1995; Sacristán-Horcajada 2015) locally show a nearly jigsaw fit, reflecting both *in situ* karstification and limited reworking of lower Callovian limestone clasts near the Jaramillo–Covarrubias Fault (Platt 1990). Sacristán-Horcajada (2015) note this as one of several major NE–SW transfer faults dividing the basin into major depocenters, but do not record the pervasive influence of synsedimentary faulting on a kilometer- and outcrop scale.

In fact, many of the sections studied by Sacristán-Horcajada et al. (2015), as for example at La Gallega, Pinilla de los Barruecos, and around Quintanilla de las Viñas, lie in lows defined by synsedimentary faults, where alluvial-fan facies are largely confined within fault-bounded lows and channels, which were separated by karstified highs in between. The work of Platt and Pujalte (1994) and Platt (1995) showed how parallel sets of smaller NE–SW faults control the subcrop and channel development as well as abrupt lateral changes in facies and thickness in the Brezales Formation as it is mapped in detail across the area.

LAMINAR CALCRETES

Sacristán-Horcajada et al.'s (2016) analysis of the calcrete paleosols raises three critical issues: the interpretation of the laminar calcretes as analogous to those from the late stages of some calcrete chronosequences, their failure to cite earlier studies and different interpretations, and their confusion over the term alveolar septal fabric.

Calcretes in the Brezales Formation commonly display reticulate fabrics and are succeeded progressively by tabular stacked laminar calcretes and pedogenetically modified palustrine carbonates in the overlying Tithonian and Berriasian succession. We refer the authors to detailed descriptions by Wright et al. (1988), Platt (1989), and Wright et al. (1995).

Sacristán-Horcajada et al. (2016, p. 275) interpret the laminar calcretes as chronosequences comparable to "Stage IV from Gile et al. (1966), Stage V from Machete (1985), and Stages 4–5 from Alonso-Zarza et al. (1998)." Laminar calcretes in such chronosequences develop in the later stages of profile differentiation, linked to the formation of hardpans (petrocalcic horizons), yet Figure 7 and images Figure 6C and 9C show that these laminar carbonates did not form on petrocalcic horizons. Wright et al.'s (1988, 1995) work on the Brezales Formation interpreted these laminar calcretes as calcified root mats whose formation was, critically, unrelated to

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petrocalcic horizons and led to the development of distinct chronosequences.

The Wright et al. (1988) article was reprinted in a volume from which the authors cite another paper (Wright and Tucker 1991) cross-referencing the calcretes in the Brezales Formation. It is unclear why Sacristán-Horcajada et al. (2016) did not refer to this earlier study on the same rocks, and if they disagree with previous interpretations they should explain their reasons.

Sacristán-Horcajada et al. (2016) illustrate microtextures identical to those shown in Wright et al. (1988; their figure 10A), misleadingly describing these as "alveolar-septal microfabric." Alveolar septal fabric consists of arcuate septa of needle-fiber calcite (commonly recrystallized) in pores such as root or root hair molds, with the needle-fiber calcite likely induced by fungal processes (Wright 1986). Sacristán-Horcajada et al.'s (2016) Figure 5E shows not alveolar septal fabric but the typical microtexture seen in calcified root mats (biogenic laminar calcretes) as described from the Brezales Formation by Wright et al. (1988).

CONCLUSIONS

We request that Sacristán-Horcajada et al. provide explanations for the absence of discussions in their papers (2015, 2016) of earlier studies which a) demonstrate the importance of subcrop geology as well as kilometer- and outcrop-scale faulting in controlling alluvial-fan deposition and paleokarst development across the western Cameros Basin, and b) provide detailed descriptions of the pedogenetic carbonate facies and offer a different interpretation for the distinctive and widespread biogenic laminar calcrete profiles in these rocks.

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