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Intermontane Basin and Landscape Evolution in the Eastern Cordillera of NW Argentina – S Humahuaca Basin (23-24° S)

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Intermontane basins are important repositories for sediment storage, documenting the tectonic, climatic, and sedimentary evolution of orogens in time and space. The Quebrada de Humahuaca in the Southern Central Andes of NW Argentina is an ideal setting to study the evolution of an intermontane depositional environment, which is located within a very narrow section of the Eastern Cordillera between 23-24°S. Elevated due to progressive shortening and associated surface uplift during ongoing orogeny, accompanied by successive aridification due to orographic barrier uplift, this basin has accommodated and retained a variety of late Miocene to Quaternary deposits, documenting the late Cenozoic basin evolution, e.g., the transition from an open foreland to an intermontane basin environment. Here we present new U-Pb zircon ages and clast imbrication-based paleocurrent reconstructions, suggesting that prior to ∼4.3 Ma, the Qda. de Humahuaca was an integral part of a continuous foreland basin, whose fluvial network was subsequently decoupled from the foreland due to basement-block uplifts in the course of an eastward-migrating deformation front. Subsequently, the basin experienced at least three cycles of hydrologic isolation and re-capture, resulting in repeated filling and re-excavation. The ultimate basin-filling episode between ∼800 ka and <40 ka was followed by episodic incision, leading to abandoned fluvial terraces and pediments up to 350 m above the present-day base-level. This seems temporally consistent with the latest basin-fill history from the neighboring Toro basin. This coincidence may be related to superposed, climate-driven processes that affected intermontane basins in NW Argentina on a regional level. Detailed observations regarding sedimentary lithologies reveal a general pattern of out-of-sequence deformation within the basin, associated with the different cycles of alluviation and basin evacuation. Renewed evidence for faulting, regional unconformities, and deformed landforms suggest that reactivation of basin-bounding faults and structures within the basin may have been caused by reduced lithostatic stresses in the course of enhanced sediment removal from the basin.