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TITLE: Braiding, Sediment Supply, and Paired Strath Terrace Formation *(Invited)*

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ABSTRACT BODY: In many settings rivers alternate between carving wide valley bottoms (straths) and cutting narrow gorges over time, thereby creating longitudinally continuous paired bedrock strath terraces along valleys. Strath terraces are used ubiquitously in geomorphology and active tectonics, however how and why they form remains poorly understood. In alluvial channels rapid growth in valley width can occur with a change from single threaded to braided channel conditions, a situation often triggered by increased sediment supply. Here we hypothesize that planation of straths in weak rock is also triggered by transition from meandering to braiding in bedrock channels, whereas incision into straths (and thus terrace formation) follows a return to single thread meandering conditions. To test this hypothesis, we focus on Arroyo Seco in the central California Coast Ranges, USA. Mapping of terrace levels using an objective LiDAR-based terrace identification algorithm reveals that lateral planation in upstream bedrock reaches occurred while channels were aggrading in downstream alluvial reaches. In turn, bedrock terrace formation in upstream bedrock reaches was coincident with vertical incision into alluvial deposits downstream. Thus changes in relative sediment supply (as opposed to downstream base-level change) appear to have controlled the planation and abandonment of the most recently formed strath in Arroyo Seco. Hydraulic modeling reveals that the width of the most recently formed strath terrace is comparable to the width of currently braided river reaches, supporting the idea that strath planation is triggered by braiding. In contrast, the channel width of active and cutoff bedrock meanders is a fraction of the braided channel width, supporting the idea that terrace formation occurs upon transition from braiding to meandering. Additionally, in locations where the modern channel is currently braided terraces are poorly preserved, suggesting that evidence for past episodes of braiding, in the form of paired strath terraces, is apparently largely destroyed by subsequent episodes of braiding. Lastly, much of Arroyo Seco's modern channel is currently braided and is presumably forming a strath despite apparently lower sediment supply than the last episode of strath planation. This shows that terrace planation and incision, like braiding, may not have a unique climatic trigger.

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