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Focussed erosion and possible flexural accommodation: A case study from the eastern edge of the Altiplano

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It is accepted that erosional unloading by focused incision might be accommodated by flexural rebound, which in turn potentially exerts a positive feedback on erosion. We argue that the Eastern Cordillera of the Bolivian Andes represents such anexample of focused erosional unloading. This is the case because the Rio La Paz and the Rio Consata, originating on the Altiplano, cut across the Eastern Cordillera immediately adjacent to the highest peak of the Cordillera Real of Bolivia (e.g., the 6438 m-high Illimani). The La Paz system has removed approximately 3950 km3 of material since the Late Miocene at the latest and has incised into the Cordillera Real by up to 3500 m. We anticipate that this focused erosion must modulate the general pattern of rock uplift. We identified two locations of enhanced surface erosion. These are the headwaters where landsliding has resulted in headward expansion of the drainage divide into the Altiplano, and the segment where the La Paz river cuts across the Cordillera Real and where fluvial incision has resulted in partial exposure of bedrock on the channel floor. We use morphometric data from these locations to illustrate the effects of such a feedback mechanism between erosion and crustal bending. Moreover, we quantify these effects with a flexural feedback model. This model explains why all drainages beyond the watershed disperse their waters to the Altiplano. It also provides an explanation for the presence of the highest peaks just next to the location where the La Paz River cuts into the bedrock across the Cordillera Real. The effects of feedback mechanisms between erosion and lithospheric deformation has been partly addressed in a global sense, but the dynamics and implications of this relationship at the scale of individual structures within an orogen are largely unresolved. Our study implies that the effects

are substantial at this scale, where flexural feedback mechanisms between erosion and rock uplift influences the morphometry of mountain belts and channel morphologies.