



Foreland deformation in Altiplano-Puna Plateau: Insights from 3D numerical simulations of the orogen-foreland system

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The Altiplano-Puna Plateau in Central Andean orogen was formed with a pronounced N-S oriented deformation diversity including a broad thin-skinned Sub-Andean thrust belt in Altiplano and the thick-skinned deformation in the Santa Barbara system in south Puna foreland. Previous geological studies and 2D geodynamic models suggested that different deformation patterns might be controlled by the spatially and temporally variable lithospheric strength in the foreland. However, the system is accentually 3D and 3D aspect of how the lithospheric strength controls the foreland deformation styles during orogen-foreland collision remain largely unexplored. Here we present first results of 3D numerical geodynamic models of the orogen-foreland system in Central Andes to quantify deformation types in both the Altiplano Plateau foreland and Puna Plateau foreland simultaneously. Robust constraints from previous observations and models as well as our high-resolution 2D models are applied in the simulations. The lithosphere under the plateau is assumed to be thin and crust thick and felsic, while lithosphere is thicker and stronger and crust is thinner in the foreland. The lithosphere of Altiplano foreland is also set to be thicker than that in the south Puna. There are thick (>4 km) and mechanically weak sediments on top of the Sub-Andean Zone while such sediments are absent in the Santa Barbara system. We also implement different shortening rates for the north Altiplano and south Puna foreland, respectively. The preliminary model results show that the foreland is underthrusting beneath the Altiplano Plateau accompanied by a wide thrust belt in the sediment layer (i.e. thin-skinned deformation). Meanwhile, the thick-skinned structure with faults penetrating deep into the basement rocks is generated in the Puna foreland with little underthrusting. In addition, the lateral fault zone is formed in the Altiplano-Puna foreland boundary accompanied with the transition from north thin-skinned to south thick-skinned deformation. Future works will be focused on adding the subduction process on left boundary to the orogen-foreland system.