Analog modeling of large-transport thrust controlled by evaporitic décollements: The sub-Andean Huallaga case study

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Abstract

The Huallaga Basin is one of the foreland basins of the sub-Andean fold and thrust belt at the northern Peruvian Andes. It shows a particular thin and thick-skinned deformation system with a large overthrust, the Chazuta thrust, with more than 40 km displacement detached on Late Permian evaporites. It has been large demonstrated, that salt is a first order controlling factor on structure of fold and thrust belts around the world, well-known as the most effective detachment level for thrusts. Only in particular cases, spectacular large-thrusts with a net slip of 10 km or more happen, (eg. Cotiella and Montsec thrusts in the Pyrenees; Dinar thrust in the Zagros; the Chazuta thrust in the sub-Andean Huallaga basin; or the Salt Range thrust in the Potwar Plateau among others). This kind of structure mainly seems to be controlled by four geological parameters: overburden thickness, salt thickness, syntectonic sedimentation and salt basin geometry. In order to provide insights that will help to shed light over the role that these parameters play on large-transport thrusts formation and evolution, an experimental approach based on scaled physical models has been designed. Moreover, to create more realistic models, the experiments presented here are based on the Chazuta thrust case study. The experimental programme consists on four experiments that have been run in order to understand the effect of each parameter previously detailed. According to the experimental results it is possible to conclude that syntectonic sedimentation, thick salt and a thick overburden are first order parameters that enhance and play a critical role on the formation of large-transport thrusts. It's important to highlight the necessity of coexistence of all these parameters in order to form these structures. The experimental results can be applied to other salt-bearing fold and thrust belts with large transport thrusts.