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Coupling tectonic modelling and geomorphological modelling.

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The physically based landscape evolution model APERO (Progressive Analysis of EROsion) was developed to model the interaction between tectonics and erosion at length scales of several 10's of km and at time scales ranging from several thousands to millions of years. This model accounts for multi-directional water flow, sediment production by bedrock-soil conversion, alluvial transport in rivers, bedrock incision by rivers, non-linear diffusive transport on hill slopes, simplified elastic isostasy, and 3-D kinematics of tectonic surface displacement.

Here we present the methodology used to couple APERO with 3D tectonic modelling in order to get a more realistic tectonic signal. The mechanical code is a 3-D finite element code for elasto-plastic deformation with frictional contact. We discuss the variables that must be transferred from one model to the other and the consequences of the different techniques of interpolation.

The geomorphological modelling addressed the evolution of the landscape in response to tectonic movements, which were predicted by mechanical modelling for synthetic wedge-type models, and highlights the capture of the hydrographic network. Coupling between erosion and tectonic movements was examined through simple erosion power laws depending on local gradients and water discharges.