Surface processes above subduction zones – importance, interactions and implications

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The role of subduction and plate convergence in driving the evolution of topography is well-recognised. Consequently, tectonically-driven variations in relief and topography over a range of scales play important roles in determining the boundary conditions for both surface processes and basin sedimentation in convergent margins. However, the important role of two-way feedbacks and dynamic interactions between surface processes and tectonic driving forces has been increasingly recognised in the last twenty years. For instance, surface processes can significantly modify topography and redistribute mass within an orogen, changing horizontal and vertical stresses. These effects may influence the locus and timing of active faulting, the shape of the orogenic wedge at a large scale, and according to some authors, even mantle-level processes. Moreover, sustained erosion, including orographic effects has been argued to drive localised exhumation in a number convergent settings, while slab break off can lead to complex interactions between uplift, topography, erosion and sediment dispersal. Numerical modelling has played a critical role in exploring these interactions. However, field and geologic data also have an important role, not least because mass redistribution in such settings happens via sediment routing systems, which may transport and deposit sediment significant distances from source regions. This talk explores the roles of surface processes above subduction zone settings from these perspectives, including examples from Taiwan, the Apennines and the Spanish Pyrenees.