# Interaction beetween tectonics and erosion in Taiwan: insights from analogue models

Limoncelli Marta[1], Malavieille Jacques[2], Molli Giancarlo[3]

[1]Dipartimento di Scienze Geologiche e Geotecnologie, Università di Milano Bicocca, Piazza della Scienza 4, 20126 Milano, Italy

[2]Géosciences Montpellier, University Montpellier 2, 34095 Montpellier, France

[3]Dipartimento di Scienze della Terra, Università di Pisa and CNR Istituto di Geoscienze e Georisorse, Pisa Via S.Maria 53, I, 56126 Pisa, Italy

This study examines the role of erosion on tectonic exhumation and deformation history of accretionary orogens. Our focus is on Taiwan, where interaction between active tectonics, earthquakes and cyclonic storms, are responsible for the highest erosion and deformation rates in the world. Two experiments are used to investigate the effects of erosion in the active bivergent orogenic wedge of Taiwan. The first model of thrust wedge without erosion is used as reference model. The second has been submitted to erosion under flux steady state conditions (1), to simulate an erosion pattern close to what is expected in Taiwan. First model shows the structure, morphology and evolution of classical high friction thrust wedges. Analytical measurements of the second model with high basal friction submitted to erosion, outline that the presence of weak layers (made with glass microbeads) that mimic *décollements* in the entering sequence, favors strain partitioning. Basal accretion of thrust units develops an antiformal nappe stack, whose growth and location is enhanced by erosion. A rapid uplift of underplated material occurs in the rear part of the wedge whereas frontal accretion characterizes the front of the growing prism. A zone of high exhumation develops in the retrowedge and migrates toward the *backstop* with continued shortening. This model is compared to the recent morphostructural evolution of Taiwan. In Taiwan, underplating characterizes the core of the orogenic wedge, where continental units from the subducting eurasian margin develops a regional scale antiformal nappe stack (in the Central Range), (2). Here, metamorphic rocks have been rapidly exhumed (in less than 4 Ma.) from depth of about 15 km due to combined effects of basal accretion and erosion. Our results emphasize the role of crustal décollements the internal dynamics of thrust wedge and how the coupling between tectonics and surface processes controls this dynamics, particularly the exhumation processes.

References

1 – S.D. Willett, Brandon, M.T., 2002. Geological Society of America, v.30, no. 2, p. 175-178
2 – C.Y. Lu and Malavieille J., 1994. Earth Planet. Sc. Lett., v.121, p.477–494