the plate kinematics. In the NBNE segment, hardening in the CMB led to localization of deformation into the NSZS during the Carboniferous.

Coupling between surface processes and various modes of continental compressional deformation

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Models of tectonic deformation commonly neglect the surface processes and subsurface heterogeneities such as lateral variations in the crustal composition, minor or healed faults, assuming that they are negligible with respect to the effects of the topography and tectonic forces. Recent problems with estimation of lithospheric strength in cratons and common problems with simultaneous reproduction of realistic vertical tectonic velocities and surface geometries in the mechanical tectonic models suggest that the above factors may play a leading role in many cases. Using a forward numerical approach allows to account for brittle-elasto-ductile rheologies, erosion and non-predefined faults, we demonstrate the crucial importance of the account for the surface processes and distributed faulting in modelling of compressional deformation and orogeny. Erosion allows to obtain 10times higher vertical tectonic rates than for the conventional models, and significantly influence the evolution and distribution (spacing) of faults, finite amplitudes of tectonic movements and even the subsurface structure of the lithosphere. In contrast to the traditional opinion, our model show that volumetric shortening, folding instabilities associated with long-distance transmission of far-field tectonic stress and faulting can actually co-exist for a very long time, partly thanking to the stabilizing feedback with the surface processes. The importance of coupling between the surface and deep processes was also demonstrated in our HT-HP rock exhumation models in which we test three basic mechanisms presumably responsible for ultra-rapid exhumation, compressional instability, RT-type instability in the subducted crust, and crustal squeezing.

Mechanisms involved in the formation of the Tertiary Piemonte Basin in a collisional setting and relations between source area and basin infill from $^{40}Ar/^{39}Ar$ dating

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The Tertiary Piemonte Basin (TPB) is a syn-orogenic basin located in an area of convergence straddling the junction of the Alpine and Apennine chains. The TPB contains >4000 m of clastic transitional/marine deposits with subsidence and deposition starting in the Oligocene and continuing until the Late Miocene. During this time span important events were taking place in the surrounding areas like the continental collision between the Adrian and European plates and the opening of the Liguro-Provencal basin. Despite this, the TPB has not suffered major deformation and it is not separated by major faults from the surrounding orogen. Subsidence analyses have been carried out in order to establish the tectonic evolution of the basin and to investigate the mechanisms involved. Two main periods of subsidence are detected: the first in early Oligocene time and the second, stronger event, in middle Miocene time. The beginning of the subsidence coincides in time with the backthrust of the Brianconaise zone on the Gran Paradiso nappe, which occurred in the Western Alps 30-35 Ma ago.

To derive further information on the exhumation/erosion history of the orogen surrounding the basin and on the basin depositional pattern, $^{40}Ar/^{39}Ar$ dating has been applied to white micas from clastic sediments. The entire basin stratigraphy (early Oligocene-upper Miocene) was sampled and up to 10 grains from each sample dated. A first order age distribution shows that the con-