Geophysical Research Abstracts
Vol. 18, EGU2016-5711-1, 2016
EGU General Assembly 2016

Late Cenozoic exhumation of New Zealand: inversion from bedrock thermochronological ages

Ruohong Jiao (1), Frédéric Herman (1), and Diane Seward (2)

(1) Institute of Earth Surface Dynamics, University of Lausanne, Switzerland (ruohong.jiao@unil.ch), (2) School of Geography, Environment & Earth Sciences, Victoria University of Wellington, New Zealand

In the SW Pacific, the present subaerial land area of New Zealand straddles the boundary between the Australian and Pacific Plates. This margin has been converging since the mid-Eocene–late Oligocene, leading to a period of widespread crustal deformation and exhumation. During the past decades, the exhumation of the New Zealand basement has been the basis of many thermochronological studies, resulting in a large number of data from the Palaeozoic and Mesozoic bedrocks. We compiled the cooling ages from multiple thermochronological systems (i.e. apatite and zircon (U-Th)/He, apatite and zircon fission-track, K-feldspar, muscovite, biotite and hornblende 40Ar/39Ar or K-Ar) that yielded cooling events younger than 25 Ma, and formally inverted this data set to estimate the large-scale temporal and spatial variations in the exhumation rates of New Zealand during the late Cenozoic. The exhumation results show good agreement with the predicted off-shore sedimentation rates, while the thermal model used in the inversion is in part constrained by the present-day observed surface heat flow. The modelling results indicate crustal exhumation from the earliest Miocene (just prior to 20 Ma). But from $\sim$10 Ma, a moderate acceleration of exhumation is observed at most sites, coincident with an important change in the orientation of the Pacific motion relative to the Australian Plate. Since the Quaternary, rapid exhumation has occurred in the Southern Alps along the west coast of South Island, with the highest rates in the central part of range. In this region, our estimates of the million-year-scale exhumation rates are in general coincidence with those previously estimated over shorter (i.e. 0.1 Ma and 10 ka) time scales, as well as with the contemporary rock uplift rates derived from GPS data, confirming exhumational steady-state in the orogeny. In contrast in eastern North Island, the predicted Quaternary exhumation rates are much lower than the recent rock uplift rates measured over shorter periods (<0.1 Ma).