Upper Crustal Thermo-Kinematics and Lithosphere's Rheology, inferences on Vertical Motions from the SE Canadian Cordilleran Foreland Belt

N.J. Hardebol[1,2], J.P. Callot[1], G. Bertotti[2], and P. Fermor[3]
[1] Institut Français du Pétrole, 1-4 av. de Bois Préau, 92852 Rueil Malmaison cedex, France
[2] Faculty of Earth and Life Science, Vrije Universiteit, De Boelelaan 1085 1081 HV Amsterdam The Netherlands
[3] Devon Canada Corp., Calgary, Canada

The SE Canadian Foreland-Fold-and-Thrust Belt (FFTB) constitutes a regional scale study area to decipher the progressive development of an orogenic wedge, focusing on fault block thermo-kinematics and burial-exhumation histories. This study further aims at linking upper crustal thermokinematic history to lithospheric scale dynamics. The Canadian FFTB provide a valuable combination of structural work, rich thermal-proxy catalogues and ample deep seismic sounding studies for determining the deeper litho-astenosphere structure. The combination of these (near) surface structural and thermal characteristics with extensive geophysical remote sensing studies makes the Canadian Cordillera a qualified place for studying the lithosphere behavior at various scales in terms of thermicity, rheology and vertical motions.

Plate convergence along the North American western margin have caused the distortion of the lithospheric compositional and thermal structure across the southern Canadian Cordillera up to the FFTB. Vertical motions in the FFTB, operating on wavelengths of individual fault-blocks to the entire belt, are controlled by a mixture of foredeep flexure and deposition, thrustsheet displacement and erosion. Our thermal-proxy catalogue allows for the approximation of burial, uplift and exhumation patterns in the deformed belt. This integrated data, analytical, and modeling study reveals that uplift and denudation have not only affected the deformed Canadian Foreland Belt on the small wavelength of individual thrust sheets, but also involved severe tectonic unroofing in the Cordillera interior and the undeformed distal foreland, which are described at the scale of the belt through time. Ultimately, this study allows to link the response of the observed thinning of thermal lithosphere to the rheological stratification and to propose an upper crustal thermo-kinematic history, including its uplift and denudation history.