



Transition between « Archaean-type » to « Modern-type » orogenic belts: insights from Palaeoproterozoic times

F. Cagnard (1,2), **D. Gapais** (2) and P. Barbey (3)

(1) BRGM Orléans (French Geological Survey), Orléans, France, (2) Géosciences Rennes, UMR 6118 CNRS, Univ. Rennes 1, 35042 Rennes cedex, France (3) CRPG-CNRS, Nancy-Université, BP 20, 54501 Vandoeuvre les Nancy cedex, France (florence.cagnard@gmail.com)

The application of modern tectonic processes to Precambrian orogens remains a matter of intensive discussions. On one hand, many Archaean or Paleoproterozoic orogenic domains have been interpreted in terms of modern collision belts where lithospheric plates are stiff and characterized by a resistant sub-Moho mantle. For such conditions, the compression results in strain localisation along major thrust-systems. On the other hand, many ancient orogens have been interpreted in terms of “Archaean-type” orogens where gravitational forces prevailed. Such models involve diapiric processes, with burial of heavy greenstone belts within the less dense underlying granitic crusts, leading to “domes and basins” geometries.

Physical parameters that control the set up of prevalent “modern-type” orogenic processes remain poorly constrained and the modalities of the transition between the two deformation modes have to be characterized. To illustrate this, we propose to focus on Palaeoproterozoic times that are assumed to represent a “key” transitional period. In this paper, we present a compilation of structural and metamorphic data within different Paleoproterozoic orogens: the Svecofennian orogen (Finland), the Lapland Granulite Belt (Finland), the Thompson Nickel Belt (Canada), the Terre Adélie craton (east Antarctica), the Trans North China orogen (China) and the Birimian orogen (West Africa). Results show that Paleoproterozoic orogens may show “ancient” as well as

“modern” characteristics, as a function of the rheological state of continental lithospheres involved in compression. From this, we emphasize that the transition from “Archean-type” orogens to “modern-type” orogens may have been gradual in space and time and was strongly dependent on the thermal state of continental lithospheres which were deformed during compressional event. Results further emphasize that the disappearance of widespread development of greenstone belts during late Archean times is not a major threshold in terms of dominant tectonic processes. From Archean to Phanerozoic, the general decrease of temperatures and associated strengthening of continental lithospheres allowed a progressive installation of “modern-type” orogenic processes. Nevertheless, within some Phanerozoic orogenic domains, especially within high plateaus where thickened continental crusts may be particularly hot, ancient-type orogenic processes might probably develop.