Impacts of spreading ridge subductions on Cenozoic Andean-type Cordilleras

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Résumé

We investigate the link between age of subducting oceanic lithosphere and growth of elevated cordilleras versus extension-dominated arc regions. At the scale of the peri-Pacific subduction boundaries, a negative correlation exists between the elevation of the continental crust over the subducting oceanic lithosphere and the age of the oceanic lithosphere at the trench. Low elevations subduction belts are found in the west Pacific regions where the descending lithosphere is of Mesozoic age while high elevation cordilleras such as the Andes are found along the eastern Pacific regions where the subducting lithosphere is Cenozoic in age. At a more regional scale, when considering the relations between the elevation of the Andean crust and the age of the oceanic lithosphere at the trench, the negative correlation is changed into a positive correlation. The highest and widest elevation of the Andes occur where the oceanic lithosphere is the oldest and by contrast, the lowermost segments of the Cordillera are found in Patagonia where the active Chile Ridge enters the trench. At the latitude of the Chile Triple Junction, our studies show that the subduction of active ridge and the development of an asthenospheric slab-window induce thermal doming, a shift in the magmatic signature, crustal extension and attenuation of the former Cordillera. An exceptional example is observed at the Antarctica-South America connection where three active ridge subductions induced the disruption of a former continous Cordillera during the opening of Drake passage. Throughout the entire peri-Pacific region, subduction of spreading ridges has occurred since Cenozoic times. Based on a synthesis of Cenozoic plates configuration and tectono-magmatic evolution of worldwide examples, we examine the role played by the subduction of active spreading ridges and the associated development of slab-window on the evolution of subduction belts. Active ridge subduction induces lithosphere thermal erosion and related crustal extension in the upper plate. We purpose that a causal link exists between the attenuation and eventual disappearance of subduction cordilleras and the opening of slab windows due to spreading ridge subduction.

Mots-Clés: Cordilleras, active spreading subduction, slab window, extensional tectonics, attenuation

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