Geophysical Research Abstracts
Vol. 18, EGU2016-9077, 2016
EGU General Assembly 2016

Subduction in fancy: stripping young slabs as a result of similar crust-mantle rheologies

Philippe Agard (1,2), Philippe Yamato (3), Mathieu Soret (1), Cécile Prigent (1,4), Stéphane Guillot (4), Alexis Plunder (1,6), Benoît Dubacq (1), Patrick Monié (5), and Alain Chauvet (5)

(1) Sorbonne Universités, UPMC Univ Paris 06, ISTEP, UMR UPMC-CNRS 7193, Paris, France (philippe.agard@upmc.fr), (2) Institut Universitaire de France, F-75005 Paris, France, (3) Géosciences Rennes, Univ Rennes 1, CNRS, F-35042 Rennes, France, (4) ISTerre, Université de Grenoble Alpes, CNRS, F-38041 Grenoble, France, (5) Géosciences Montpellier, Univ Montpellier 2, CNRS, F-34095 Montpellier, France, (6) Department of Earth Sciences, University of Utrecht, Heidelberglaan 2, 3584 CD Utrecht, the Netherlands

Understanding subduction rheology in both space and time has been a challenge since the advent of plate tectonics. We herein focus on "subduction infancy", which corresponds to the first ∼0-2 My immediately following subduction nucleation, when a newly born slab penetrates into the overriding plate mantle and heats up.
The only remnants of this critical, yet elusive, geodynamic step are thin metamorphic soles, commonly found beneath pristine, 100-1000 km long portions of oceanic lithosphere emplaced on top of continents (i.e. ophiolites). In this study, we show how, during subduction infancy, transient mechanical properties of both the mantle and crust across the subduction plate interface (during ∼100s ky) control and hinder the penetration of tectonic plates into the mantle, and how this results in strong peaks of resistance and even slicing of their surface — leaving behind thin, chopped-off metamorphic slivers (i.e. metamorphic soles).
These findings constrain the mechanical behaviour of the subduction plate interface (with implications for coupling processes and earthquake generation) as well as the properties of the crust and mantle. They also highlight the role of fluids in enabling subduction to overcome this early resistance.