



Slab dragging

Wim Spakman (1,2) and Douwe J.J. van Hinsbergen (1)

(1) University of Utrecht, Faculty of Geosciences, Utrecht, Netherlands (w.spakman@uu.nl), (2) University of Oslo, Center of Earth Evolution and Dynamics (CEED), Norway

In the current subduction paradigm of plate tectonics, the surface motion of the subducting plate contributes to the sinking slab by plate motion perpendicular to the subduction trench. We recently discovered a new, potentially globally governing, role of subducting plate motion as driver of lateral transport of entire subduction systems. This occurs in the direction of the local 'absolute' motion of the subducting plate, i.e. plate motion in the mantle frame of reference. We call this process 'slab dragging', which represents the impact of the globally forced subducting-plate motion on regional subduction evolution.

In this presentation we present the concept of slab dragging, the few propositions since the early 80-ties, and some of the current evidence for slab dragging of the Gibraltar slab and the Tonga-Kermadec slab. The east-dipping Gibraltar slab is being transported to the NNE by the African plate at a rate of 6-7 mm/yr during the past ~8 Myr (Spakman et al. 2018). The west-dipping Tonga-Kermadec slab has been transported northward by trench-parallel absolute Pacific plate motion by more than 1000 km in the past 30 Myr, i.e. at a rate of ~30 mm/yr (van de Lagemaat et al. 2018). Such lateral transport of slab is locally resisted by the viscous mantle which in effect may impact on the tectonic evolution overhead as well as on slab morphology and subduction zone evolution. Lateral transport of slab has been largely overlooked since the advent of plate tectonics. We propose that slab dragging is a globally occurring process with potentially large impact on subduction evolution.