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Global subduction volume fluxes in the Cretaceous and Cenozoic

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The volume of subducted oceanic lithosphere changes over geological time as seafloor of different mean age distributions is subducted at with different rates. This has potential implications for the spatio-temporal dynamics of mantle convection and especially dynamic topography induced by negatively buoyant material in the mantle as well as the time-dependence of the related mantle return flow. We use global plate kinematic models and paleo-oceanic age grids to analyse the subduction volume fluxes over time and compare our results with global mantle convection models and observations from key regions which are known to have experienced significant changes in vertical motions due to mantle convection-induced dynamic topography. We find the global subduction volume flux decreases substantially from the Late Cretaceous to the present day from about 350 Mm3/Myr to 100 Mm3/Myr, reflecting a long-term decrease in oceanic crustal production. In addition we find peaks in global subduction volume flux around 75, 55 and 20 million years, whose origin can be related to the regional evolution of particular subduction systems.