



Lessons learned from the study of 68 Cenozoic occurrences of subduction initiation

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To address the question of the triggers and mechanisms involved in the process of subduction zones formation, we have explored all available clues attesting for subduction initiation (SI) during the Cenozoic. We have defined several stages starting from incipient-diffuse, incipient-localized, achieved to self-sustained subduction. We have also included prematurely extinct, i.e., aborted, subduction attempts in order to better understand the reasons for the stoppage of subduction process, and thence to specify the conditions of success. This comprehensive study led us to observe that new subductions regularly initiate at a mean rate of about once per million years. Two third of those initiated during the Cenozoic are still active. A majority initiated at the transition between an ocean and a continent, a plateau or a volcanic arc. Lithospheric forces are needed for SI with the help of mantle forces in one third of the cases. Multiple triggers, like a collision followed by a slab breakoff, are common. The stress at SI is compressional in most cases if not all and oriented oblique to the nascent plate boundary in more than half of the cases. The nascent plate boundary generally reactivates a former lithospheric fault, most often with a change in its kinematics (conversion of spreading center, normal or detachment fault or transform fault) or using the same kinematics when reactivating former subduction faults. There is no rule regarding the age of the subducting plate which varies from 0 to 140 Ma in the studied examples. In the same vein, the subducting plate is not necessarily older than the overriding plate. Both situations are equally observed.