The Pacific Ocean: License to kill... Cratons!

*Daniel Pastor-Galán[1], Tatsuki Tsujimori[1], Cedric Thieulot[2]

1. Center for North East Asian Studies, Tohoku University, 2. Utrecht University

Cratons contain the oldest and thickest lithosphere on the Earth (>2 Gyr old and over 180km), are generally considered immutable through geologic time and are the basic units of plate restorations. Not surprisingly, their extraordinary longevity is subject of an intense research and hot debate. However, at present day we can observe several processes of craton break up (Arabia-Nubian shield) or cratons that lost or are loosing their sturdy and long-lived root: North China Craton and NW America. The latter examples have been part of the Pacific ocean type orogeny for, at least the whole cycle of Pangea amalgamation and break-up.

Differences in water content are a potential source of additional viscosity contrast between cratonic roots and ambient mantle owing to the well-established hydrolytic weakening effect in olivine, the most abundant mineral of the upper mantle. Recent research pointed towards an extremely dry mantle lithosphere as the cause for cratonic stability. We hypothesize if mantle hydration is as well the cause for cratonic dismissal. However, the water contents of the mantle have been poorly constrained. We’ll present an integral study including a review of the Pacific plate kinematics, geochemestry and geophysical properties that can lead to a hydration of the mantle. In addition we have modeled with ELEFANT (an user-friendly multipurpose geodynamics code) how a hydrated mantle can lead the foundering of the cratonic lithosphere without any other driving force.

Keywords: Cratons, Pacific Tectonics, Supercontinents

