Geophysical Research Abstracts
Vol. 13, EGU2011-8231, 2011
EGU General Assembly 2011

Sinkers and floaters: Modern analogues of allochthonous accreted terranes

Joya Tetreault and Susanne Buiter
NGU, Trondheim, Norway (joya.tetreault@ngu.no)

The North American Cordilleran and Southeast Asia are typical examples of accretionary orogens; where crustal growth occurs by accretion of allochthonous terranes. Accreted allochthonous terranes are units that are geologically and tectonically distinct from their neighbours, were transported on a subducting plate, and subsequently accreted or obducted to the overriding plate. This process typically occurs in accretionary orogenesis, where the subducting plate continues to subduct while transferring allochthonous units to the overriding plate. Crustal sections of units such as island arcs and oceanic plateaus are detached from the subducting plate and accreted onto the overriding plate. We use the term “future accreters” to represent the modern unaccreted analogues of allochthonous terranes. This begs the question: what parameters control whether a future collider subducts (sinks) or accretes (floats)? Unfortunately, examples of active terrane accretion are limited to the Yakutat terrane and Taiwan, thus observations on accretionary processes and mechanisms are rare. Geological observations of ancient accreted terranes indicate that lithospheric buoyancy, rheological stratification, and surface topography are the main parameters of the future accreter affecting its ability to sink or float.

We divide future accreters into four groups and assess parameters controlling subduction/accretion for each of them. The four groups are (1) island arcs, (2) oceanic plateaus, (3) seamounts and other submarine volcanics, and (4) continental fragments and composite terranes. Average crustal thicknesses, crustal structures, density structures, and rheology for each group are determined from a compilation of geological and geophysical studies of future accreters. We compared thicknesses of allochthonous terranes to these modern analogues to determine the amount of crust that is accreted and subducted. Geologic observations of accreted terrane thicknesses and sutures indicate that rheological decoupling or detachment is more important than buoyancy as an accretionary mechanism.

This review provides the background for our numerical models of terrane accretion. We use thermo-mechanical models (SULEC) to examine the importance of lithospheric buoyancy, rheological stratification, and surface topography in accreting future accreters. We will present our initial findings on the fate of island arcs, oceanic plateaus, seamounts and continental fragments when encountering a trench along an active continental margin.