Geophysical Research Abstracts
Vol. 12, EGU2010-13500, 2010
EGU General Assembly 2010

Peneplains – disregarded geomorphological evidence of periods of uplift and subsidence

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Peneplains are common features on all continents; they can be hilly or flat, sub-horizontal or tilted and they occur at different elevations in the landscape. Peneplains in resistant rocks need longer time to develop and are more resistant to destruction, and vice versa for peneplains developed in less resistant rocks. Fully developed peneplains usually cut across rocks of different age with little respect to differences in lithology, which shows that the peneplains were graded to distinct base levels. A peneplain which is uplifted relative to the base level will be incised by valleys that eventually will develop into a new peneplain, resulting in landscapes with stepped surfaces or valley generations graded to distinct levels. Re-exposed peneplains in basement rocks are of particular importance for tectonic applications. They often occur as tilted plains at low elevations. The detailed topography and characteristic saprolites can be identified at the contact with cover rocks. The re-exposed peneplain can be mapped by following the tilted plain, its characteristic relief and characteristic weathering remnants. Re-exposed surfaces are often cut off by younger, more horizontal peneplains, which are characterised by other types of weathering mantles and relative relief in the basement rock and without any covers. The erosion forming the younger peneplain at such settings must have involved both any cover of the older peneplain as well as the underlying basement rocks and formed a new epigene (never covered) peneplain. The re-exposed peneplains are important regional markers that provide evidence of former episodes of erosion, followed by subsidence and subsequent uplift. By analysing the cross-cutting relationships between re-exposed and epigene peneplains histories of repeated uplift and subsidence, tilting and faulting can be made. Further, the amount of recent rock uplift can be estimated using the elevation difference in altitude between former base levels.