



What Happened 5 Million Years Ago in the Alps ?

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There is rising evidence that some 5 million years ago a surface uplift event started in the Alps that caused a renewed and ongoing phase of tectonic activity in the orogen. This uplift event appears to encompass not only the Alps, but also the surrounding regions including the foreland basins (in particular the northern Molasse basin), the Styrian and Vienna basins in the east and parts of the Bohemian Massif. The event is particularly visible in the eastern half of the orogen where topography is lower, convergence is more active and pervasive Miocene strike slip tectonics provides a backdrop against which the Post-Miocene events may be evaluated more clearly than in the west. The evidence includes (i) young karst-cave formation ages at elevations high above current ground water tables, (ii) the indirect evidence of ancient fissions track ages at surface elevations above 2000 m, (iii) bimodal landscapes with substantial planation surfaces about 500 metres above current valley floors (iv) coalification and compaction studies in the sedimentary basins surrounding the eastern Alps, (v) current geodetic surface uplift rates, as well as: (vi) numerical modelling evidence that appears to indicate that the Alps are geomorphologically premature. Overall, it appears that some 1000 m of surface uplift occurred within the last 5 million years. Along the eastern margin of the Alps, the event has been described as an inversion event in the sedimentary basin and has been brought in connection with the cessation of a subduction zone underneath the Carpathian arc. However, the event appears to be associated with little horizontal tectonics and it is regionally widespread, so that we suspect that more deep-seated drivers are responsible.

The implications of the event for the discussion around tectonic versus climatic drivers as causes or consequences of young erosion and tectonics in the Alps are profound: Modern consensus holds that the global deterioration of climate some two million years ago is the principal driver for the youngest phase of uplift and erosion in the Alps. We argue here that the glaciation of the Alps was only possible because the 5 million year tectonic event uplifted the range enough so that an icecap could form. As such, we displace the "chicken or egg debate" (currently in the vogue of climatic drivers) one step back: We argue for a deep seated uplift event as the cause for glaciation in the Alps.