



4.6. Morphometry and formation of asymmetrical dolines in the Central Styrian Karst

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Abstract: The Central Styrian Karst (CSK) encompasses the occurrence of karst formations in carbonate rocks near Graz, Austria. Unlike in Alpine regions, this area remained unaffected by Pleistocene glacial erosion. Given the absence of glacial erosion and the dominance of subaerial processes, (karst-)morphological features are presumed to exist since a long period of time. Consequently, the CSK is a prominent area to investigate landscape evolution in a non-glaciated Alpine area where karstifiable rock were also affected by periglacial processes during the Pleistocene. In addition, the landscape comprise numerous planation surfaces grouped into several levels dating to several Mio. yrs BP. So far unknown for the CSK are the asymmetries of many dolines detected recently due to airborne lasercanning data. These dolines exhibit a NW-SE elongation, with steeper slopes facing S-to-SE, and flatter ones facing N-to-NW. Some authors have attributed asymmetric dolines in other regions to tectonic influences. However, dolines in close proximity to main fault systems in the CSK do not display these peculiar asymmetries. On the other hand, dolines further away from the main fault systems show obvious asymmetries. These asymmetries occur at various levels (possibly indicating different ages). This contradicts a syngenetic origin of elongation and suggests subsequent re-shaping after primary formation of dolines. Similar asymmetries observed in the Northern Calcareous Alps have been interpreted as the result of snow-patches, where prevailing wind directions cause snow accumulation in the lee of doline rims. This type of karst is known as nival karst, which requires the absence of glacial erosion and permafrost to impede subsurface drainage. The CSK satisfies the climatic conditions for the development of nival karst during colder periods of the Pleistocene. We hypothesize that the morphometry and formation of asymmetric dolines in the CSK must be seen in relation to a severe periglacial influence.

