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Controls on the evolution of carbonate landscapes in Provence, France using cosmogenic nuclides

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The Provence region located in South-Eastern France has registered significant earthquakes in the last 1000 years, some reaching intensities up to IX. It is currently undergoing a very slow tectonic deformation with little seismicity and long recurrence intervals for major earthquakes (such as the 1909 magnitude 6 Lambesc earthquake). Several West-trending ranges are an important part of the landscape, and the influence of tectonic uplift compared to denudation during the Pliocene-Quaternary is not yet fully understood in the region.
The geology of South-Eastern France is dominated by a thick Mesozoic series primarily consisting of carbonate rocks. The iconic ranges of Provence resulting from the Pyrenean orogeny (late Eocene) are mostly made up of uplifted lower Cretaceous. A minor reactivation occurred during the more recent Alpine late Cenozoic tectonic phase and contributed to the rejuvenation of the relief.
Carbonate rocks are prone to complete chemical dissolution and are thus highly sensitive to climatic forcings such as precipitation. Moreover, the elevation and the frequency of freezing and thawing are parameters strongly influencing the geomorphic evolution in such environments.
To investigate on this matter, 42 carbonate rock samples were collected for 36Cl denudation measurements on the Petit Luberon range. Denudation rates have been determined for both bedrock samples from the crest and sediments from rivers draining the southern and northern flanks of the range, allowing insights into long-term relief evolution. We observe a strong denudation contrast between the flanks lowering at 100-200 mm/ka and the summit surface, at around 30 mm/ka. These results suggest a transient evolution and a probable narrowing of the range.
In addition, we collected 23 carbonate bedrock samples from other Mesozoic ranges in Provence with a wide altitude range (from 150 up to 1800 meters high asl), for similar 36Cl analysis. Our objective in this study (CEA-Cashima) is to have a regional overview of the distribution of denudation rates in an area dominated by carbonate rocks and to evaluate the influence of altitude, climate and associated processes on erosion and eventually link it to a slow regional uplift.
Thus this study will allow a better understanding of the denudation processes in a carbonate dominated area characterized by slow tectonic deformations and moderate precipitations.