A bioclimatic characterization of high elevation habitats in the Alborz mountains of Iran

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Author(s) Noroozi, Jalil; Körner, Christian
Author(s) at UniBasel Körner, Christian ;
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The Alborz mountains in N-Iran at 36ř N rise from the Caspian Sea to 5671 m a.s.l., with warm-temperate, winter-deciduous forests in the lower montane belt in northern slopes, and vast treeless terrain at higher elevation. A lack of rainfall (ca. 550 mm at high elevations) cannot explain the absence of trees. Hence, it is an open question, which parts of these mountains belong to the alpine belt. Here we use bioclimatic data to estimate the position of the potential climatic treeline, and thus, define bioclimatologically, what is alpine and what is not. We employed the same miniature data loggers and protocol that had been applied in a Europe-wide assessment of alpine climates and a global survey of treeline temperatures. The data suggest a potential treeline position at ca. 3300 m a.s.l., that is ca. 900 m above the upper edge of the current oak forest, or 450 m above its highest outposts. The alpine terrain above the climatic treeline position shows a temperature regime comparable to sites in the European Alps. At the upper limit of angiosperm life, at 4850 m a.s.l., the growing season lasted 63 days with a seasonal mean root zone temperature of 4.5 řC. We conclude that (1) the absence of trees below 2850 m a.s.l. is clearly due to millennia of land use. The absence of trees between 2850 and 3300 m a.s.l. is either due to the absence of suitable tree taxa, or the only potential regional taxon for those elevations, Juniperus excelsa, had been eradicated by land use as well. (2) These continental mountains provide thermal life conditions in the alpine belt similar to other temperate mountains. (3) Topography and snow melt regimes play a significant role for the structure of the alpine vegetation mosaics.

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