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GLACIER EQUILIBRIUM LINE ALTITUDES AS PALAEOCLIMATIC INFORMATION SOURCES - EXAMPLES FROM THE ALPINE YOUNGER DRYAS.

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Equilibrium line altitudes (ELA) and flucutations of the ELA (dELA) of well dated glacial advances are valuable terrestrial sources for palaeoclimatic information, which are physically well understood (Kuhn 1981, Kaser and Osmaston 2001). Values of dELA can be used to infer quantitatively standard climatic parameters like precipitation and precipitation change.

ELAs of former glaciers are usually calculated from maps of the glacier topography based on the moraines and related geomorphological features. Then either the analytical glacial-meterological model for ELA fluctuations by Kuhn (1981) or the statistical parameterization of the climate at the ELA in terms of "summer temperature" and "precipitation" by Ohmura et al. (1992) can be used for palaeoclimatic interpretation. As dELA is influenced both by factors governing accumulation and ablation, some external climatic information on one parameter is necessary to obtain the other.

Moraines of the Younger Dryas "Egesen-Stadial" can be found throughout the Alps. Early Younger Dryas (Egesen-I, Ivy-Ochs et al. 1996) dELAs show a distinct spatial pattern. They were highest (ca. 450-600 m against "present-day") in areas exposed towards the West and Northwest. In the central valleys, it was in the order of -300 m and less. Presently, almost 200 data points are available.

Summer temperature depression (dTs) can be derived from the Younger Dryas timberline depression and other proxy data (Ammann and Oldfield 2000). It seems to be in the order of -3.5 K in the central Alps. Along the northern and western fringe of the Alps, it may be somewhat larger (-4 to -4.5 K). dELA and dTs values are then used to calculate precipitation change (dP).

Early Younger Dryas climate in the central valleys of the Alps seems to have been considerably drier than today (dP -30%). In areas open to the West and Northwest, precipitation seems to have been the same as today or even slightly higher (dP 0 - +10%). These results agree well with the results from permafrost-climate studies (Sailer et al. 2000) and the qualitative information from biological proxy data. They also support the results from Atmospheric General Circulation models for the Younger Dryas in Europe, which point towards a more zonal type of circulation.

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