

The timberline as result of the interactions among forest, abiotic environment and human activity in the Babia Góra massif, Western Carpathians

Adam Lajczak

Institute of Geography, Pedagogical University, Krakow, Poland (alajczak@o2.pl)

The timberline is one of the clearest and most easily discernible boundaries in nature (Troll 1973). Among the existing conceptual models clarifying the complex nature of the relationship between the timberline and the environment and human impact, the fullest seems to be the one presented by K. Holtmeier (2009). The quoted author comprehensively characterizes the timberline, taking into account its course, appearance and ecological characteristics. The aim of the work is to quantitatively assess the factors influencing the course of timberline and its changes over the last ca. 400 years in the Babia Góra massif (1725 m a.s.l.), the highest flysch ridge in the Western Carpathians, which is formed as an asymmetric ridge of kuesta type. Forests mainly in the upper montane zone have preserved their natural character in many areas. Old spruce tree growths are a particular advantage of the Babia Góra Mt., being there on the predominant section of the altitude zone of the timberline. In the rest of this zone, spruce forests have been under a direct or indirect influence of changes resulting from grazing with its 400-year history and forestry taking place about 100 years ago. The 60 m difference between the average altitude of the timberline on the northern (1335 m a.s.l.) and the southern slope (1395 m a.s.l.) on the Babia Góra Mt. can be explained with climatic conditions of these areas. The average gradient of the slope within the timberline ecotone on the southern slope of the massif is by 100 smaller, and the amount of solar energy delivered during the growing season is 40% higher (960 kWh/m²) than on the northern slope. The higher position of the timberline on the windward southern slope is favored by the dominant winds from S-W sector, thinner snow cover and earlier melting due to the lower precipitation on the slope and also due to the winnowing of snow onto the steep northern slope of the ridge. On the southern slope of the ridge there are no larger snow avalanches. Soils in this part of the massif are richer in nutrients which due to the small inclination of the slope are flushed on a smaller scale. Because it is on the southern slope of the massif that timberline has been significantly lowered due to the old grazing, it can be expected that in the future the timberline can achieve even higher position than at present. Lower position of the timberline on the northern slope of the massif is also due to frequent falling winds of foehn type, much thicker snow cover and its longer existence. In many places the most important role play in this matter frequent and long snow avalanches, and in local scale landslides and debris flows and also edaphic conditions. The work has been conducted as part of the research project of the Polish National Science Centre N N306070540.