

The temperature effect on the treeline and its application to the terraformation of Mars

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The available empirical evidence supports the vision of the treeline as a thermal boundary for the growth and form processes (Körner, 2003). The tops of the mountains, like the deserts, are some of the environments where life is limited by the climatic severity. The biological systems—at least the ones known on Earth—are regulated by the basic thermodynamic parameters of pressure and temperature. Temperature produces simultaneous changes in both volume and thermal energy. Körner (1998) has hypothesized that treelines are limited by the potential investment: growth and development. Nitrogen is a key constituent of living beings. A plausible hypothesis for treeline position at thermal gradients is that bacteria can no longer fix atmospheric nitrogen due to low soil temperatures. Körner (1998) has hypothesized that treelines are limited by the potential investment: growth and development. In order to explore the role of microorganisms in treeline formation we carried out a sampling program inside and outside the treeline of the south face of Pico de Orizaba (Callegan et al., 2004). The data currently available indicate that there is a correlation between treeline and microbial composition of the soil. The understanding of this interaction between trees and microorganisms may provide important insights for the colonization of Mars.

In this report we present some results up to date related to the continuing statistical analyses performed to some meteorological variables measured in the neighborhood of the treeline area of the Pico de Orizaba during two years (2004 and 2005). The list of variables include: air temperature, air relative humidity, dew point, soil temperature, etc. The procedures are of the exploratory type showing real direct data patterns as well as indirect data patterns via cross correlations. Also, we discuss the relevance to the terraformation of Mars.