VEGETATION CHANGES AT AN HIGH ELEVATION SITE OF THE ALPS SINCE 1950 IN THE CONTEXT OF CLIMATE AND LAND USE CHANGE

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Global air temperature warmed by an average of 0.6±0.2°C since the beginning of the 20th century. Climate change impacts on biotic and abiotic environmental components are expected to be greater at higher altitudes and latitudes. In the Italian Central Alps, at Stelvio Pass, a phytosociological map of the vegetation located at elevations above 2200 m a.s.l. was drawn by Giacomini and Pignatti (1955). In 2003 a new phytosociological map was drawn (Cannone), using the same survey criteria of Giacomini and Pignatti (1955) to assess and quantify by GIS the changes experienced by vegetation. Our data show that in the period 1953-2003 the vegetation experienced changes in area which are mainly related to climate change impact (Cannone *et al.* 2007). At our site, the mean annual air temperature increased of about +1.0 °C, with a more pronounced rise since 1980. Shrubs showed rapid expansion, with the highest rates (of +5.6% per decade) at altitudes between 2400 m and 2500 m. The expansion of shrubs mainly occurred at the expenses of the alpine grasslands, which exhibited a shift towards higher elevations and resulted in a net decrease (> 8%) of the grasslands coverage in the whole area. Above 2500 m, vegetation coverage exhibited unexpected patterns of regression associated with increased precipitation and permafrost degradation. As these changes follow a sharp increase in both summer and annual temperatures after 1980, we suggest that vegetation of the alpine (2400–2800 m) and nival (above 2800 m) belts respond in a fast and flexible way, contradicting previous hypotheses that alpine and nival species appear to have a natural inertia and are able to tolerate an increase of 1–2°C in mean air temperature. In addition, vegetation data and changes are analyzed for each phytosociological association comparing its areal distribution and floristic composition in 1953 and 2003 and discussed in the frame of the three main adaptation strategies suggested by Theurillat and Guisan (2001) in response to climate change impact: a) persistence; b) migration; c) extinction.

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