A transient climate scenario carried out by the regional climate model COSMO-CLM is analyzed to assess the elevation dependency of 21st century European climate change. A special focus is put on the European Alps. The analysis of climate change signals suggests that 21st century climate change might considerably depend on elevation. Over most parts of Europe and in most seasons, near-surface warming significantly increases with elevation. This is consistent with changes of the free-tropospheric air temperature but can only be fully explained by taking into account regional-scale processes involving the land surface. In winter and spring, the anomalous high-elevation warming is typically connected to a diminishing snow cover, indicating a strong influence of the snow albedo feedback. In order to assess this factor in detail, a second climate scenario is carried out in which the surface snow cover is prescribed to today’s conditions. It can be shown that the snow albedo feedback is responsible for large parts of the high-elevation warming anomaly in the European Alps. Further factors that contribute to the elevation dependency of future temperature changes, in the European Alps as well as in other regions, are changes in cloud cover and soil moisture and the proximity of low-elevation regions to the sea. The amplified warming at high elevations becomes apparent during the first half of the 21st century and results in a general decrease of temperature lapse rates. For precipitation, only few consistent signals valid over a range of regions arise.