Geophysical Research Abstracts
Vol. 13, EGU2011-7865, 2011
EGU General Assembly 2011

Impact of climate change on snow avalanche activity: contribution of a continuous 1338-2010 dendrogeomorphic reconstruction (Queyras massif, French Alps)

Christophe Corona (1), Lopez Saez Jérôme (1), Edouard Jean-Louis (2), Rovéra Georges (3), and Berger Frédéric (1)

(1) CEMAGREF, UR EMGR, Saint-Martin d'Hères Cedex, France (christophe.corona@gmail.com), (2) Centre Camille Julian - UMR 6573 CNRS Maison Méditerranéenne des Sciences de l'Homme BP 647, 5 rue du Château de l'Horloge 13094 Aix-en-Provence cedex 4, (3) Institut de Géographie Alpine, Université Joseph Fourier, Grenoble 1, 14 bis avenue Marie Reynoard, 38100 Grenoble, France.

Snow avalanches are mainly ruled by temperature fluctuations, heavy precipitations and wind regimes, so that climate change is likely to modify the frequency and magnitude of both ordinary and extreme events. Papers dealing with this question generally analyze the evolution of the snow cover rather than the changes in avalanche activity. Some authors propose a potential increase in wet-snow avalanches due to more frequent and intense melting periods and an elevated snow/rain limit, but the same authors also believe that, looking at the annual mean, these changes would be almost imperceptible. Analyses of real avalanche data generally focus on the last few decades (Eckert et al., 2010). Schneebeli et al. (1997) have for instance seen no change in the number of catastrophic avalanches around Davos, Switzerland, during the 20th century. Some chronicles dating back to the 16th century have been realised by using historical documents reporting damages to buildings and inhabitants. However this kind of analysis cannot be used to assess the evolution of natural events because only catastrophic events, which lead to damages, are reported and detailed.

In wooded avalanche paths, early dendrogeomorphic studies date back to the late 1960s and the method has been used extensively in the United States and in Canada ever since. The use of tree rings was demonstrated to greatly help documentation of past events. It may allow reconstruction of chronologies of major avalanche activity over considerable periods of the past with an annual resolution. In that respect, we started, within the context of the Interreg Paramount program a dendrogeomorphic study on snow avalanche slopes in the Queyras massif (France). Many efforts were devoted to the reconstruction of multi-centennial snow avalanche chronologies.

The study site, the Praroussin forest, is located on the western slope of the Guil valley (44°45′N, 7°00′E), on an avalanche slope. The particularity of this mixed larch-cembran pine forest is that many of trees are several hundred years old (Touflan et al., 2010). In this preliminary study, a total of 72 European larches (Larix decidua Mill.) with clear signs of snow wasting events was analyzed and growth disturbances (GD) related to avalanche activity was assessed, such as tangential rows of traumatic resin ducts, the onset of compression wood or abrupt growth suppression and release. In total, 191 GD were identified in the tree-ring samples indicating that 30 high-magnitude avalanches occurred between AD 1338 and 2010. The mean return period of snow avalanches was $\sim$22 years with a $\sim$4 % probability that an avalanche occurs in any particular year. On a temporal plan, no significant event was reconstructed since 1947 but this trend is not statistically significant.