



Definition of the temporal occurrence of rock fall events in the Central Alps (Adamello Group) by means of dendrochronology

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Rockfalls are widely distributed in the mountain regions, where they represent one of the main factors in the slope evolution by controlling the rock-wall retreat, the debris production and the talus development. When large boulders suddenly become detached from a cliff and travel downslope, the damages on the slope depend on the boulders size and on the capability of remaining coherent or breaking during the bouncing on the slope. The dating of rock falls is possible by means of dendrochronology, using the scars left on trees, which constitute one of the most frequent indicators of the impact of boulders on the trunks, and the dating of trees fallen or uprooted by the boulders. Here we present the reconstruction of the temporal and spatial evolution of a rock fall occurred in the Avio Valley (Adamello Group, Italy), where we found the evidence of the fall of large boulders, which are located on the Malga Caldea composite debris cone. The size and velocity of the boulders was sufficient to form large impact craters, where trees are prostrated. Finally, boulders caused the death of some trees, which have been still lying below them at our survey. The dendrochronological analysis of these trees led to date their death, and its burying by the boulders, at 1994. These results revealed that the large boulders have been detaching during the same event and contributes to determine the release area of each boulder, thus suggesting this fall has been a particular case, being usually the fall of several smaller blocks and/or debris the dominating process here. Moreover, the temporal definition of the event is used to infer on the possible triggering cause of such a great rockfall, searching for severe events occurred during the analyzed period. Indeed, in other part of the same valley some large rockfall occurred more recently, suggesting a possible link to

the changing of the environmental conditions.