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雪上滑走型岩石なだれの長距離運動条件に関する考察
Long-traveling conditions for the rock-on-snow avalanche: insights from the field and laboratory evidences

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On March 12, 2011, a large earthquake induced rock avalanches in Nagano and Niigata prefecture Japan. These rock avalanches travelled long, about 1 km to 1.5 km sliding on snow with apparent friction angle of 6? to 17.1?. It looks uncommon phenomena. Because rock avalanches often stop on snow covering steep slope. We hypothesized that the nature of snow dominate the mobility of the rock-on-snow avalanche, and flew rocks on snow 3.5-m-long slope varying snow hardness, and then we flew a rock and earth of 6 ton on 28-m long snow covering slope. Snow is low friction material but its aggregates is effective cushion by self-deformation, so travelling on normal autochthonous snow cover and mixing snow into the falling material do not contribute such long travelling. However, hardened and consolidated snow provide it because of ice-like low friction and impermeability. The consolidated snow is formed at the contact surface on snow cover by impulsive compressing. Hence, when a falling material plunge into lower thick snow cover, consolidated snow is formed. Then, falling material slide on it by pushing following flow. When the forming consolidated snow basement, water and air are expelled from snow to upper falling material, and they probably reduce friction. As the consolidated snow is impermeable, frictional heat and heart transferring produced snowmelt are kept on the consolidated snow, and it reduce further friction. With downsizing of falling material, the resistivity against forehand snow cover decreases, and it leads to stopping. In addition, with lessening pressure of the falling material to underlying snow cover, forming impermeable consolidated snow stops, and water pressure disappear, and it leads to stopping. Wet and granular snow is likely to be consolidated. Thus these snow covered area and/or season are preferable condition of the long travelling rock-on-snow avalanches.

キーワード: 積雪, 雪上滑走型岩石なだれ, 雪崩, 落石, 地震災害
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