Nat. Hazards Earth Syst. Sci. Discuss., 2, C46–C48, 2014
www.nat-hazards-earth-syst-sci-discuss.net/2/C46/2014/

Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Real-scale investigation of the kinematic response of a rockfall protection embankment" *by* S. Lambert et al.

S. Lambert et al.

stephane.lambert@irstea.fr

Received and published: 10 February 2014

Before answering the comments from the reviewer, the authors would like to remind that this article mainly focuses on the response of the structure under a dynamic loading. Indeed, most of the presented results concern what happens within the structure. Of course, it is important to give values describing the applied loading. The maximum force and impact duration are often used for this purpose. These parameters are convenient in particular when designing structures considering pseudo-static approaches. But, on a mechanical point of view, this description is ambiguous as it depends on the mechanical characteristics of the structure. This is not the case for static loading conditions where the loading can be described independently of the tested system.

Basically, the dynamic loading may rather be described in terms of projectile velocity and mass. In our article, the acceleration of the projectile is mainly used to compute the displacement with time but the braking time (or time to reach a nil velocity value) is not really considered. Nevertheless, it is true that the kinematic response of the structure will depend on the braking time and consequently on the impact force. But, once again, this description of the loading is not fully satisfactory and we prefer using the data provided in table 1 for this purpose.

The results presented in table 3 concern previous and well-known experiments on embankments. These are detailed and cited in the literature. As mentioned in section 3.3, the only data that can be used for comparison purpose between all these experiments is the residual penetration. This results from the fact that the previous studies didn't involve the required equipment for measuring precisely the braking time.

Figure 6 shows the variation of the penetration with time, revealing the maximum and residual values, as given in Table 2. The penetration is defined as the displacement of the projectile with respect to the horizontal axis (see equation 1). Table 3 considers the only residual penetration, for comparison purpose. Finally, Figure 8a gives the norm of the acceleration vs. time. It is true that integrating twice the acceleration plotted in this latter figure will result in a different penetration, and consequently to a difference in braking time compared to what is announced elsewhere. But in fact, there is no discrepancy. The position of the projectile's accelerometer before impact is variable from one test to the other (see end of section 2.3). Besides, the projectile's trajectory is inclined with respect to the structure facing (see Table 1). For these reasons, the projectile's acceleration was recorded along 3 axis. In such a case, the velocity and displacement along each axis is computed from the three acceleration measurements separately, but not from the acceleration norm. It has been checked that the difference noticed by the reviewer results from this difference in computing the displacement. The first sentence of the second paragraph of section 2.4 explains that the three components of the velocity and displacement were computed from the acceleration measurement, implicitly

indicating that the integration was not based on the acceleration norm.

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 2, 491, 2014.