Nat. Hazards Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/nhess-2017-154-AC1, 2017

Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Brief communication: The curious case of the large wood-laden flow event in the Pocuro stream (Chile)" *by* Diego Ravazzolo et al.

Diego Ravazzolo et al.

lmao@uc.cl

Received and published: 24 July 2017

General comments

Reviewer quote 1: Ravazzolo et al. have provided access to an informative and thought-provoking video for the ever-growing community of scientists, engineers, and ecologists interested in roles and movement of wood in rivers. This valuable resource and their interpretations of the phenomenon will hopefully stimulate more work on the topic. I am reminded of the flurry of sharing of videos and movies of debris flows several decades ago from sites around the world; perhaps this paper will prompt more sharing of videos of congested wood movement events, although they are much rarer.

Many of the best videos of debris flows were made in channels with repeated events (e.g., in cases fed by chronic landslide movement or runoff from tephra-mantled hillslopes), which made filming an event much more likely, but greatly reduced the potential to involve much wood, because the repeated flushing precluded substantial wood accumulation in the channel.

Answer quote 1: We appreciate the comment and fully agree with the reviewer. There is an increasing interest in improving understanding of wood dynamics in rivers, which has been often neglected for different reasons. Home movies are a very valuable source of information in this regard. In fact, currently there is an ongoing community effort to collect and analyze more videos in order to extract as much information as possible.

Reviewer quote 2: The authors present some interpretations of properties of the observed event, but admittedly fall short on description of conditions within the watershed that led to its occurrence. It is surprising to have so much wood in a runoff event from a watershed with such a small fraction of the area in forest and a recent wood-flushing event (reportedly in 2016). It seems that simple analysis of remote sensing imagery would reveal possible roles of landslides from hillslopes and/or entrainment of wood from riparian forests along the downstream flowpath. Interpretation of the potential of such events as hazards would also be informed by more comment on the influence of the setting; the recent channelization of the study reach created a straight channel with a simple cross section, and possibly with constructed berms on both sides. All these factors can contribute to long runout. If such an event emerges from a steep, narrow channel onto a natural alluvial fan, advance of the flow might thin, spread laterally, be retarded by vegetation, and dewater, causing it to quickly stop. Might channelization to facilitate water runoff exacerbate potential hazards posed by wood-rich flood waters?

Answer quote 2: Thank you for this observation. We definitely think that exploring at the basin scale the most likely sources of large wood would shed some light on the processes and temporality involved in the recruitment and transport of those logs.

Plus, this kind of analysis could help local decision-makers to take evidence-based choices on how to manage in-channel large wood and potentially unstable hillslopes connected to the river network. We will try to include some of these elements in the manuscript, even if this could be a bit out of the scope of this brief communication. The surveyed artificial channel did not feature any berms and a visual inspection of two selected upstream river reaches rather supports the hypothesis that LW was mainly freshly recruited from the adjacent river banks. By taking as reference the phenomenon with a similar one occurred in the Elqui River (Coquimbo region, Chile) where five homemade videos allow a partial reconstruction of the flow dynamics. It is plausible that between the recruitment reaches and the confined river stretch where the wood laden flow was observed, several channel outbursts led to a net loss of water volumes at the front of the flood wave. These outburst processes apparently did not abstract significant wood volumes from the main flow path. This might have possible influenced the preferential displacement and concentration of a large amount of LW pieces (in the central part of the free surface where velocities are highest) to the front.

Specific Comments

Reviewer quote 1: The leading front of the flow is referred to as a “rather dry mass of logs” and shown in Fig. 2 as having no interstitial water or coarse, inorganic sediment. However, might the flow front has contained a great deal of water and some sediment? The advancing front appears to be faster than the stream water it is overrunning, so it must have been ingesting water from the streambed. There appear to be splashes of water from the streambed, although the amount of water may be trivial compared to the volume of the frontal phase of the flow. In addition to the assumption that no water was in the leading front of the flow, it seems possible, if not probable, that a significant component of inorganic sediment was present within the advancing front. The inorganic material may have been a small enough fraction that it does not appear when viewed from the surface in the video. If landslides were a source of wood, one would expect a significant component of the flow to be gravel and boulders. However,

no root systems with soil are observed in the video. Perhaps modeling of the physics of the flow will reveal the possible significance of water and sediment within the leading edge of the flow.

Answer quote 1: Many thanks for this perceptive observation. Form the video we can appreciate that prior to the arrival of the wood there was very little liquid discharge in the channel. We can only assume that the front of the event must have been relatively dry because of that, but a certain amount of water must have been there. We will change the text in order to acknowledge this degree of uncertainty in our observation. As to the amount of sediments transported on the front, unfortunately we don’t have much evidence to exclude the presence of high sediment transport rates. However, post-event field observation allowed us to see that the channel remained virtually unchanged after the flood, as little patches of herbaceous vegetation was still growing in most of the cross-section. We will add this observation in the text of the paper.

Reviewer quote 2: The term “mobile organic dam” and “dam-break floods” have been used for phenomena like this in the Pacific Northwest of the USA (https://www.ce.washington.edu/sites/cee/files/pdfs/research/hydrology/water-resources/WRS138.pdf). Are these useful terms for making the distinction with congested flow which has much higher water content?

Answer quote 2: We really appreciate this comment. We will definitely consider using these terms in defining this event.

Reviewer quote 3: The information on p 3, lines 18-20 is somewhat confusing as to what velocity estimates pertain to which phases of the flow. What is the significance of higher velocity of later phases of the event; what are the mechanisms that lead the phases to be separated and why has the later phase not caught up with the leading phase?

Answer quote 3: Thanks for pointing out this weakness. We will make the point clearer, even if we probably won’t be able to accommodate a proper discussion of the mecha-

nisms probably involved in this increase of velocity in this brief communication.

Reviewer quote 4: In reference to wood production at a rate of 0.3 m3 ha-1 on p. 3 line 21, what is the area referred to? Is it the entire watershed or only the forested portion or some other?

Answer quote 4: In this case we used the area of the surveyed channel.

Reviewer quote 5: P. 4, lines 3-5: statements attributed to Johnson et al and Swanston and Swanson are not entirely clear. Johnsons et al found zones of severe disturbance to riparian vegetation downstream of confluences where debris flows from tributaries delivered batches of big wood, thereby creating a brief period of congested wood movement in the mainstream channel that could severely disturb riparian vegetation. Concerning reference to “debris torrent” in Swanston and Swanson, that was a case where the term had common use in the region, but without concise definition, and thereafter the community moved to use the internationally accepted term debris flow.

Answer quote 5: Thank you for pointing this out. We will correct the statements, and probably remove the mention to “debris torrent”.

Technical corrections

Reviewer quote 1: Although the manuscript is very readable, it would benefit by some editorial assistance by a native English speaker. Answer quote 1: We will ask a native English speaker to polish out all the text and make it more readable.

Reviewer quote 2: The name of the river is misspelled in the caption for Fig. 3. Answer quote 2: Many thanks for noticing it. We will correct this in the revised version of the manuscript.

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2017-154, 2017.