

# ***Interactive comment on “Multi-method observation and analysis of an impulse wave and tsunami caused by glacier calving” by M. P. Lüthi and A. Vieli***

**Anonymous Referee #3**

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## GENERAL COMMENTS:

In my view the main contribution of this work is its potential to extend the validity of empirically derived formulas for small scales of tsunami wave properties and show how these formulas hold or do not, when not in idealized situation or outside of the experimental parameter regime. In case some of these formulas hold, it would be possible and useful to discuss potential scenarios for these waves, if however these potential scenarios were well justified to begin with. The authors refer to likely future scenarios but do not provide any basis for their inferences, for example supporting evidence from a numerical model of future possible scenarios – section 5.2 is highly

speculative.

The authors do not provide good scientific evidence that large tsunami waves are a new recent phenomenon. Their argumentation relies mainly on discussion with local people and speculation (e.g. page 6479) . While the documented event is a valuable new observation which can be used to validate empirically derived formulas from laboratory scale experiments, this unique but single data point cannot be used to make inferences about frequency of such events or their novelty on the scale of a century (e.g. section 5, page 6479).

Further, there is excessive emphasis throughout the manuscript on the discussion of the damage caused, which does not contribute to any better arguments or it does not help to answer any scientific question.

#### SPECIFIC COMMENTS:

6472-Line 10-14: These lines seems to indicate that it is concluded from observations of a single event, that there is a long term trend.

It would be useful to mention whether the studied glacier has melange or not and how that varies seasonally, since that could have potentially some influence on the waves.

Youtube links didn't work at some point, so I would suggest citing a more permanent and reliable resource.

6473-Line 7: The referenced article of Luethi et al. 2009 does not contain any information about the size of the calving waves at Jakobshavn, but in the manuscript it says they are of order of tens of meters, how was it determined?

What is the difference between the impulse wave and the tsunami wave? When generated the wave is referred to as impulse wave, when it arrives at the shore it is referred to as tsunami wave, but in my understanding it is the same wave – I find this terminology change through the paper confusing and it seems that one word should be sufficient.

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6476-Line 4: How is the friction coefficient determined? One could say that instead of having two independent estimates of the wave velocity, in reality, the second estimate really serves to fit the parameter  $f$  of the first method.

6476-Line 25: What is the error on the radar measurement? It was mentioned that the radar samples once a minute, therefore an estimate of 117 minutes traveling time of a wave can have quite large error when estimating other quantities later on. This should be clarified

6478-Line 13: Were there marks of the water reaching 10 vertical meters above the sea level, or was that measured with the pressure meter? If not, what reference did the eye whiteness have to be able to claim wave heights over 10 meters?

6479 – Line 20: How do you support what likely future scenarios are?

6481 – equation 9: what is  $h_0$  here? 20-30 or 110 m? How do such large variations in depth influence this formula is unclear, so the good agreement might be just a coincidence.

Conclusions are incorrect, it is said that all observed quantities agreed well, but on page 6478 in section 4.6 none of the observed wave periods agree with experiments.

Scaling issues (mentioned in conclusions) should be addressed in more detail.

It is not clear whether all the applied equations are valid for this 3D wave, for example Heller and Hager 2010 experiments are done in a channel.

A big part of this paper is due to a video made by the tourists, why are the tourists not thanked in the acknowledgments?

#### TECHNICAL COMMENTS/SUGGESTIONS:

Keep consistency in giving range 2-3 vs 2...3 keeps varying through out the manuscript, e.g. in 6475-Line 29

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6473-Line 26: what was the height of the ice front before the acceleration? Later you refer to 200m, not to 150-200m

6474-Line 28: 15m is maximum observed ever or during this documented event? In case of the first, how is that measured or what is the reference?

6474-Line 28: Why is that relevant for this article that the boat landing was destroyed? It doesn't add any value to the findings about the physical mechanism.

6474-Line 18-20: Is this description providing information relevant to data analysis, e.g. that the sensor was not moving and therefore the data is cleaner? If that is so, it maybe useful to emphasize that.

6475-Line 1: 200 or 150-200m high?

6475-Line 19: Was the 100 m change in vertical on average or was that the maximum?

6475-Line 18: What is s here?

6475-Line 20: Repetitive: details about the alternative names of boat landing are mentioned in discussion.

6477-Equation 2: What is  $a_c$  here? Height of wave crest? What is its assumed value to solve for h?

6477-Line 13: 'is' or 'can be'?

6476-Line 25: precise is not the same as accurate

6476-Line 20: 'unstable' in stead of 'instable'

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Interactive comment on The Cryosphere Discuss., 9, 6471, 2015.

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