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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Characteristics and frequency of large submarine landslides at the western tip of the Gulf of Corinth" *by* Arnaud Beckers et al.

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Overview The paper describes the frequency and characteristics of small volume submarine landslides in the Gulf of Corinth over the past 130 ka. The landslides have the potential to generate hazardous tsunamis, with one historical event recorded. Potential landslide preconditioning and triggers are discussed. Six major landsliding events are recognised, of which three are relatively large volume. The age of the events are dated by their relationship to two regional seismic horizons interpreted as major flooding events and dated at 130 and 10-13ka. Most slide events (four) are identified as Holocene, with two others older than 10 to 12 ka. Although the volumes of most slides

are quite small (largest 1km3) one, in historical times (1995), generated a significant tsunami. The paper is a dense read, because of the number and complexity of the landslide failures and the relationships to triggering mechanisms and preconditioning. Comments The strengths of the paper are in the seismic data and its interpretation. The weakness is the lack of sample data to identify the sedimentology of the slides and their ages, which are based on the slides relationships to the two regional horizons. As with all submarine landslides, earthquakes are proposed as the most likely trigger. Earthquake records (from sediments) are confined to the past 17 thousand years, with frequencies of 400-500 years for the period 12-17ka in the central Gulf of Corinth and in the western Gulf (from palaeoseismology) 200 to 600 years. Preconditioning factors are identified from events in other regions outside the western Gulf. Focussing on the science, I am surprised that the dated regional horizons are not used more fully to understand sedimentation rates and the potential rates of sediment recharging in the western basin. These might better inform on the local differences between the glacial and post glacial environments that would influence slide failure. I am also surprised that there is not more consideration of the major difference between the glacial and Post glacial sea levels in the context of the slides and their headscarps. Consideration of Figure 1 suggests that lowering sealevel by 60 metres makes a major difference in some regions that may influence sedimentation and sliding. Whether the difference in sealevels is important or not, it would be informative to see the effects on a figure. It would also help the reader if some of locations of data which underpin the interpretations, which are outside the area were identified on a map. These include the Philious Basin (Page 13, lines 457-458) and the Alkyonides basin (Page 113, Line 467). Identifying the location of these would identify their relevance. The interpretation of the earthquake triggering of the landslides is undoubtedly reasonable, but the evidence is very sparse. It seems that only the 1995 earthquake triggered the MTD at the foot of the Meganitis fan, but this is hypothetical. What was the trigger of the 1963 landslide which caused a major tsunami, was it just sediment loading? The following discussion of the relationships between earthquake frequency and landsliding is also question-

able, because it is assumed that the earthquake frequency for the glacial period is the same as for the Holocene (page 12, lines 416-418) which seems to me to be unlikely. This is quite a jump in the interpretation as it underpins much of the subsequent discussion on triggering and preconditioning – but that is always the problem with MTDs. I guess it doesn't invalidate the interpretations too much. Regarding my comment on the complexity of the paper, I make some suggestions. There are geographical names mentioned in the text which are not on the figures, e.g, Delphic Plateau, Canyon basin, possibly others. With regard to the organisation of the paper, I found it hard to understand the full setting of the GoC from the background sections because back ground material is distributed later in the paper. Other material which should be presented early on in the Background includes; the stratigraphic framework (Page 2 lines 90-95) and the palaeolake levels (Page 13 lines 477-485). Including these would provide a broader picture to background the environmental changes over the 130 ka time period. Conclusions Apart from my above comments, this is an interesting paper identifying the potential hazard from submarine landslides in an enclosed basinal area, where future events, if of sufficient volume would be a tsunami hazard. It is well organised and well written. The remote data set is good, the temporal controls on the events are weak, but the innovative approach, using the (sparse) data applicable to this, results in a plausible story which should be published with some modification.

David Tappin 14th February 2018

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