

Interactive comment on “Late Neolithic Mondsee Culture in Austria: living on lakes and living with flood risk?” by T. Swierczynski et al.

Anonymous Referee #1

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This manuscript treats a very timely topic that is the interplay between human cultural evolution and climate change, thus the topic is very appropriate for 'Climate of the Past'. The study focuses on the neolithic period and investigates the sedimentary record from Mondsee, a lake at the northern edge of the Alps in Austria, which is compared to the history of lake-shore settlements at the same site. In particular, the sediment record is investigated in terms of flood occurrence, so that regional-scale flood and debris flow deposits are compiled in a detailed runoff record reflecting Mid-Holocene precipitation events in the catchment. The study is also significant, as previous studies have linked the abandonment of lake-shore settlement to a single event, i.e. the impact wave caused by a major mass-movement that supposedly fell in the lake. The authors can disprove this theory, and instead, shed new lights into the potential influence of climate change (floods). The general outcome indicates that there is only little 'direct'

C2963

connection between the flood history and human history. Floods occurred frequently at various magnitudes and certainly affected the settlements. However, no obvious trend or direct influence can be shown, as the abandonments do not match 1:1 with changes in flood activity. The authors show nicely, that flood activities varied substantially. The study is well written and documented. I do have some general comments followed by some detailed comments.

General comments I contrast to the lake sediments, the chronostratigraphic durations (and in particular the time of settlement and abandonment) of the settlements are not that well constrained - a correlation to multidecadal flood periods remains thus uncertain, but this is what the article is focused on. The lack of accurate dating of human occupation is a bit a surprise, because usually archeologists date precisely such settlements in the Alpine realm with dendrochronology (these analysis may have not been performed for the Mondsee sites, despite them being archeologically famous). The 12 original radiocarbon samples cluster clearly around two radiocarbon windows, but it is not quite clear to me how long the settlement periods lasted really. Duration of these periods have been modeled, but on line 5902/27, the SP1 and SP2 phases are only given as <100 years windows, Fig. 3 shows them as ~500 year long period each. If they are only hundred years, then the uncertainty in age dating on an absolute scale makes correlation to multidecadal flood periods thus highly speculative. Most of the flood periods are indeed in the multidecadal periods, a fact that is pushing a bit the dataset, as mean recurrence rates are reported to be 67 (regional floods) and 333 (debris flows) years. The identified enhanced flood periods last about 50 years. They are characterized in average by flood recurrence of ~10 years, which nevertheless makes them significant as they contrast to periods of flood quiescence. The longer-scale signal, with the flood maximum in the mid Holocene (5900-4500 BP), is certainly chronostratigraphically more robust, but this long window somehow comprises initiation and abandonment of human occupation and can thus not be used to more accurately evaluate climate control on settlement history. I wonder whether charcoal analysis of the well-dated sediment record could pinpoint more precisely the

C2964

timing human occupation, as the settlements were certainly linked to fire and the distances of the shore to the coring site is small. There is for instance a recent study of neolithic lake-dwelling settlement on the shores of Lake Lucerne (Thevenon and Anselmetti, 2007; QSR), which shows enhanced content of charcoal and fly-ash particles in a basinal lake-sediment succession related to neolithic human activities. Maybe similar analysis are also available for the well-investigated Mondsee cores, which could verify a bit the timing of SP1 and SP2 settlement phases

5909 7ff. An impact wave would mainly affect the shores and likely would have deposited a tsunami layer in coastal sediment succession, as was shown on various studies of tsunami deposits. Has this been investigated? Are shallow-water cores available, in which deposits of such a impact wave could have been recorded? As the contradiction to the single-event history of previous studies is also a major finding of this study, I would welcome a bit an extended discussion on this issue, currently, this is treated very briefly and not in-depth.

5899/10: It is not mentioned, why the authors opted for a coring site not really in the deepest area (= depocenter for underflows caused by flood events) but chose a coring site that lies 6 m above the deepest part of the lake. They also should indicate the site on Fig. 1, or is this the white spot (not indicated in Fig. caption)? This would indeed not be the deepest spot, so some underflow events might be missed. This should be discussed, maybe there were some reasons, but this location might affect the completeness of the flood record.

This post 5000 BP dolomite signal (debris flow from south) is a bit hard to see on Fig. 5, I am not that convinced. On line 5908/26, the story is furthermore unclear or contradicting: it has been stated first that after 5000 BP the Mg increases, and that before the siliciclastic (Ti) content was high. Now they state here that there is a shift around 5000 BP to regional floods and an increase in siliciclastic material....., that is the opposite of the previous statement.....confuse, needs to be clarified!

C2965

Detailed comments

Repetitive use of 'varve year BP', could be abbreviate to vBP or similar

The term 'Lake Mondsee' sounds a bit weird, as 'See' means 'lake'. Maybe one can just use 'Mondsee' and indicate in the beginning that it is a lake.

5896/20 The lake's morphology does not support the definition of two basins, as there is only one basin and thus one sink for detrital underflows. Two basins would need to be separated by a sill, this does not seem to be the case.

5897/15: These lakes usually are not Alpine lakes, but perialpine, or prealpine. Mondsee is somehow an exception as it lies within the Alpine naps, but all the other quoted ones are outside the Alps. s. str.

5901: 13-18 should be deleted, plain repetition to method chapter just above.

5902: Rejected 14C age should also be displayed graphically on the plot of the age-depth models.

Figs. 4 and 5: What is the bar between 24 and 32 mm on the axis of the debris flow layer thickness?

5906: 1 ff. The age errors are in the range of plus minus 100 years, the correlation to these cold spells to some of the flood periods are thus a bit speculative.

5903/0-10: This is a bit a weird statement: the timber dates indicate construction and abandonment?

5907/15: the flysch-containing layer lies below the cultural layer!? But why should this then cause/coincide abandonment, as settling occurs afterwards? Unclear argumentation! Related to this: How do the flysch particles come to the outlet area, if the three flysch-dominated inflows feed the northern 'basin'? Over and interflows instead of underflows?

C2966

Fig. 1 Label names of archeological sites on Fig. 1, as numbers are not labeled.

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C2967