

Interactive comment on “Ice genesis and its long-term dynamics in Scărișoara Ice Cave, Romania” by A. Perșoiu and A. Pazdur

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Received and published: 9 December 2010

Response to comments and suggestions by V. Maggi

Comment: Figures are good, but the figure 5 need to be enhanced in quality (if possible). The table 1 is very difficult to understand. Please check! Personally the manuscript must be accepted, but only if the authors answer some comments here following.

Response: The resolution of Figure 5 has been improved (however, there seems to be a loss of quality when the original .tiff file is converted to a .pdf file). Table 1 was corrected and a depth-age model was added (fig. 4).

Comment: Page 8 -row 6 I suppose that “: : start to freeze from to bottom,..” means

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that the freezing start on the surface of the small “lake”, and ice crystals grown to the bottom. I suggest to ameliorate the sentence to improve the concept.

Response: The word “top” has been omitted in the initial manuscript due to a typing error. The phrase has been changed to: “a shallow lake that accumulates during the melting season starts to freeze from top to bottom, to form layer of ice approximately 10-15 cm thick”.

Comment: row 8 to 19 Not clear the mechanism of “floor ice”. The authors sentence “: : warmer and wetter weather leeds to water infiltration inside the cave,: :”. So, the water dripping, from the rock walls and roof during the winter time. But, because the snow layers, during the winter, cover the entrance for 150 to 180 days/year (page 4 - row 18), how the dripping water reaching the ice surface? And, can the snow melting provide the water for the “floor ice”? And, if the top of the deposit covered by snow, how the lakes can be formed? (maybe under the snowpack?)

Response: The text has been changed as follows: “On top of this layer of so-called “lake ice”, thinner layers of ice (termed “floor ice”) could form during the winter, when occasional warmer and wetter weather leads to water infiltration inside the cave (through the highly fractured and bedded rock ceiling directly above the ice block) and its subsequent freezing in the colder environment.” The lake forms on top of the ice block, at the edge of the snow pack, and is being fed by dripping water coming directly from the ceiling of the cave in summer. Rainwater reaches the snow pack at the bottom of the shaft (which is opened to the surface), but percolates through it and drains away in summer; while in winter in freezes within it, thus without feeding the lake. In winter, dripping water reaches the upper surface of the ice block directly (through the highly fractured and bedded rock ceiling above it). Nevertheless, some water from the melting snow pack feeds the lake in late summer.

Comment: Page 10 - row 4 to 26 Here the authors explain the conceptual model of the ice body formation in Scărișoara ice cave. Only one critical point. At the beginning

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(fig. 4a) the unique ice existing are located into the Great and Little Reservation depressions. So, we assume that during this phase only some lakes are present. Did the authors find evidences of lake in these depressions, that today seem to be void by ice (fig. 4d)? It is possible that the first ice will be located in the centre of the collapse doline, where snowfall and avalanches normally (on also in the past I suppose) drop in? Please, explain better this first phase, because is very important for the rest of the interpretation.

Response: A fine observation, thank you. The following phrases have been introduced at this point: "Two possible sites are good candidates for the inception of the ice: the upper part of the debris cone underneath the entrance shaft and in the Great Hall and the two lowermost sections of the cave. We do not think that a lake could have developed on top of the debris cone in the Great Hall, but, nevertheless, ice was developing as dripping water was freezing to form ice speleothemes and a thin layer of floor ice (an ubiquitous process observed in the cave over the past 60 years). In the deeper parts of the cave a similar processes must have acted (as it does today); and, additionally, water could have pooled on the rock floor and freeze to further form ice."

Comment: Page 11 - row 1-3 Here the authors discuss the ice flow velocity without any comments on the methodology used for the measurements. Please, include in the methods chapter a sentence on this way.

Response: The following proposition was added in the "methods" chapter: "Ice flow was assessed by monitoring the movement of a marker inserted in the upper face of the ice block against the rock wall in the Great Hall."

Comment: row 3-23 The discussion on the radiocarbon dates have some problems because the table 1, with the results of the ¹⁴C measurements and calibration is not clear. The SCL 1, SCL2 and SCL3 corrected dates, because the large overlapping, seem to be close one each other. The authors must present the data in more clear system, with the single dates separate and more easily to read. Indicate which part of

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the statistic use for the chronological discussion and which is the possible error. Helpful could be one depth-age graph.

Response: We have modified table 1 and added a depth-age model as fig. 4. Also, the following text was inserted at the beginning of the "Results and discussions" chapter: "Three samples were collected in the eastern side of the ice wall, and the remaining five in the central and western part of it (Fig. 5). All radiocarbon ages are in correct stratigraphic order, except for samples SCL 4 and SCL 8. Sample SCL 8 was collected from a disturbed section of the wall, where the ice folds due to differential flow velocities which cause overturning of the ice layers (see bellow) and was excluded from the depth-age model. Samples SCL1, SCL 2 and SCL3 were also excluded from the depth-age model as they are very closely spaced in time and partially overlap, and also because the thickness of ice layers is not similar in the eastern and western sides of the block and hence an exact stratigraphic correlation between the two sequences could not be made."

The order and numbers of figures has been changed as follows: Fig. 5 was renamed Fig. 3 as it is the next after fig 2 to be cited in the text (following text reorganization). The depth-age model is inserted as Fig. 4. Fig. 3 became Fig. 5. Fig. 4 became Fig. 6.

The radiocarbon ages have been recalibrated using the newer OxCal 4.1 and the INT-CAL09 dataset of Reimer et al. (2009).

Interactive comment on The Cryosphere Discuss., 4, 1909, 2010.

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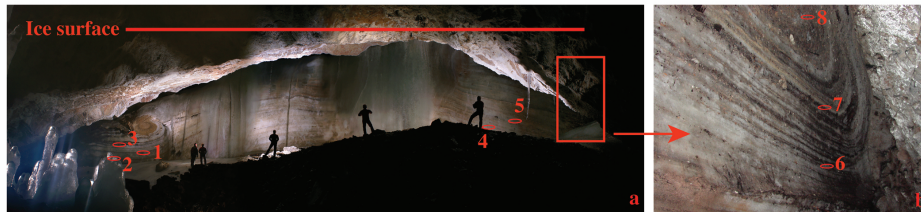


Fig. 1. Fig. 3 (formerly Fig. 5)

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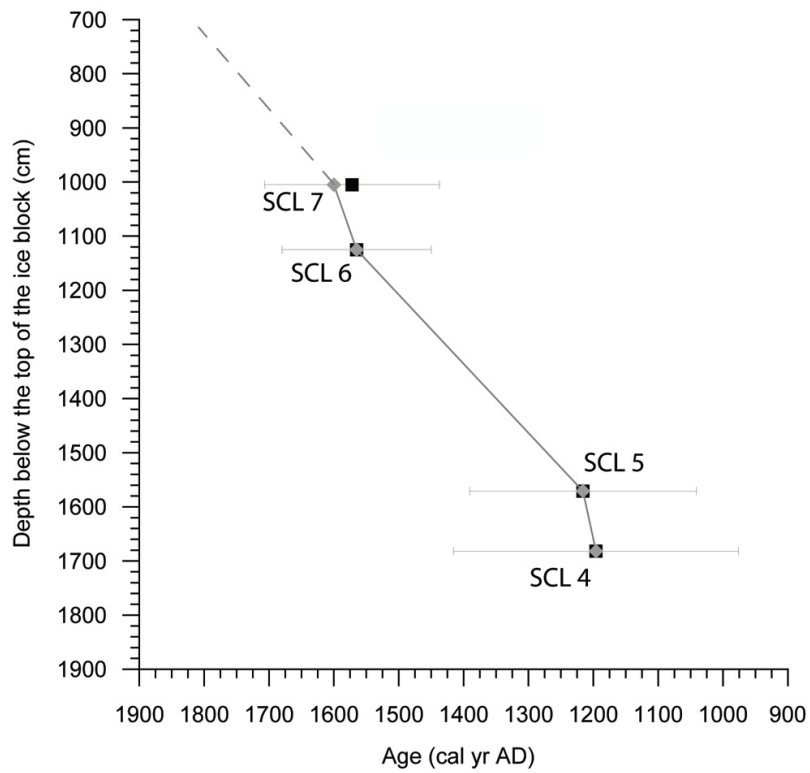


Fig. 2. Fig. 4. Depth-age model of the exposed ice wall in Little Reservation, Scărișoara Ice Cave.

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