

## ***Interactive comment on “Rapid changes of the ice mass configuration in the dynamic Diablotins ice cave – Fribourg Prealps, Switzerland” by S. Morard et al.***

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### Specific comments

Referee: In the second sentence of the abstract the passage “. . . the entrance zone . . .” should be changed in “. . . the lower entrance zone. . .”.

. . .in 1991, the lower entrance zone. . .

Referee: The position of the arrows in fig. 1d suggests a laminated flow structure (floor/ceiling) or an air circulation which does not really exist (and is not intended to be shown in the figure). It would help to add to the title of the figure (“Airflow direction and

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velocity pattern”) the information that these data were taken by hand on different dates.

The arrows will only show the direction and intensity of the airflow on different dates. We split the previous Figure 1 in two figures (Fig. 1 and 2 in the new version of the paper). Figure 1 shows the location of the Ice Cave, the general map of the Gouffre des Diablotins karstic system and a photograph of the lower and upper entrances. Figure 2 shows the section and plan views of the Diablotins ice cave. We changed the title “Airflow direction and velocity pattern” in “Airflow direction and velocity pattern on different dates (hand measurements)” (Fig. 2B). Finally to improve the understanding of the different parts of the ice cave, we also precisely defined the extent of the lower gallery in Fig.2A. (see Figs. 1 & 2 in attachment).

Referee: Under 3.1 only one position for airflow measurement is mentioned but in fig. 1d there is one entry “Airflow temperature” near the lower entrance and one “Airflow temperature and relative humidity” at the ice plug. Was airflow measured there? Then, or if this relates to a mobile measurement, it should be stated in 3.1 and changed to “Airflow, temperature . . .” in the figure. If airflow was not measured it should be changed into “Air temperature” in the figure. Also there is an entry “Airflow velocity and direction” in the figure near the ice plug – was this measured with a data logger? Please clarify this in 3.1.

Airflow was only measured continuously at the ice plug location. That we called “Airflow temperature” is in fact “Cave air temperature”. So we clarified that in Fig.2 (devices) and in the text: “Airflow temperature” near the lower entrance was replaced by “Cave air temperature (Lower entrance)”, “Airflow temperature and relative humidity” at the ice plug was replaced by “Cave air temperature and relative humidity”, and “Airflow velocity and direction” was replaced by “Windmill anemometer (Airflow velocity and direction)”. These modifications were also made in the text under 3.1.

Referee: And finally the figure notes “External air temperature” near the lower entrance. When you refer to the external temperature in the text you normally mean the temper-

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ature at Moléson summit or not? Maybe you should change the text in figure 1d from “External air temperature” to “Air temperature” only.

You're right, it was not clear. We modified the text as follow under 3.1: “Air temperature and relative humidity provide from the Moléson summit (1974m. a.s.l.). A very good linear correlation ( $r^2 = 0.942$ ) was found between the external air temperatures measured directly outside the lower entrance and those from the Moléson summit (0.6°C warmer). Thus, due to the calendar problem of our meteorological station, data of external air temperatures presented in this paper were derived from the hourly data of the Moléson summit”.

Referee: It becomes confusing when you refer to external temperature in the text (title of table 2; section 3.2.2 “external air temperature crosses a threshold . . .”) whether you mean the temperature at the lower cave entrance or at Moléson summit. This is also true for the “Conclusions” where you mention the threshold of 2°C – please specify whether this is the temperature measured at the lower entrance or at Moléson summit.

The external air temperatures are measured at Moléson summit (see modifications just above).

Referee: Again: The airflow velocity and direction data shown in 5c was measured at the ice plug? Please mention this measurement point in 3.1.

Under 3.1: “The windmill anemometer is located at the “ice plug” and had an accuracy of +/-0.1 m/s and a sensitivity of about +/- 0.2 m/s”.

Referee: Photographs of the two cave entrances would be very nice.

A photograph was added in the new Figure 1 (see attachment).

Referee: Fig 1d: an additional scale for this figure would be good to quickly illustrate the dimensions of the displayed parts of the cave

A scale was added in Figure 2B (instead of 1D).

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Referee: Fig 3: the individual photos are very (too) small

I agree that in the discussion paper the photos are too small. But as the final paper will be in A4 format (portrait), the size of the photos will become big enough. So we didn't change the photos size.

Referee: Fig. 4: a second figure showing only the winter phase (Nov-May) in higher resolution (time wise) would be good

We added to Fig. 5 (instead of Fig.4 previously) the cave air temperatures records from the different part of the lower gallery. In other hand, Fig.4 (instead of Fig. 3 previously) only shows the air temperature outside the cave and the cave air temperature at the ice plug.

Referee: Fig 5b: the graphs for relative humidity are displayed with line signature and symbols, please leave out the symbols.

Symbols were leaved out (see Fig. 6b in attachment).

Referee: Fig 5c: switch the position of the negative and positiv y-axis for the airflow velocity (- at the bottom, + on top); use "inflow" as in other figures and tables instead of aspiration; the color of the zero-line is very similiar to the color of the airflow velocity graph, please choose a different color for the airflow velocity.

See Fig. 6b in attachment. The line for airflow velocity was plotted in dark yellow.

Technical comments

Referee: Tables and figures: the use of capital and small letters in the titles and texts of figures and tables is not constant (e.g. Fig.2 ..”(A): the ice plug . . . . (D): Ice well . . . .) Please change this.

We used capital letters for the legends of all the figures.

Referee: Table 1: a strictly numerical date format would support readability

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14. June 2009 was replaced by 14.06.09, and so on.

Referee: Fig. 1c: please explain the different colored signatures (grey, darkblue, light-blue) in a legend

“Rock is drawn in grey, ice mass in dark blue or in light blue when it occupied only the south-west part of the lower gallery.”

Referee: Figures 4 & 5: please add units to the x-axes (e.g. month.year)

See Fig. 5 & 6 in attachment.

Referee: References: under "Arenson ..." it should be "Sea to Sky..." instead of "See to Sky...".

You're right, it's Sea to sky...

Interactive comment on The Cryosphere Discuss., 4, 1035, 2010.

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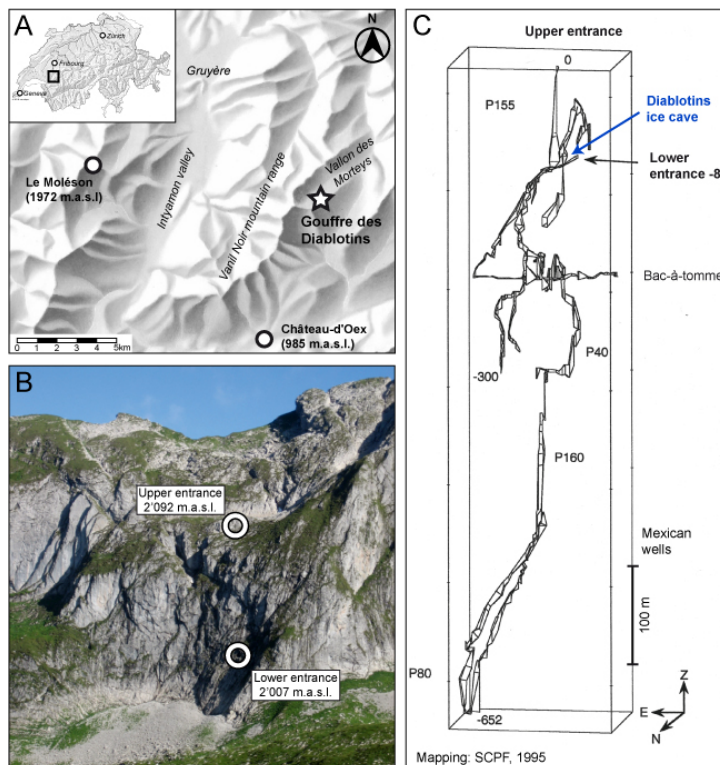


Fig. 1. Figure 1

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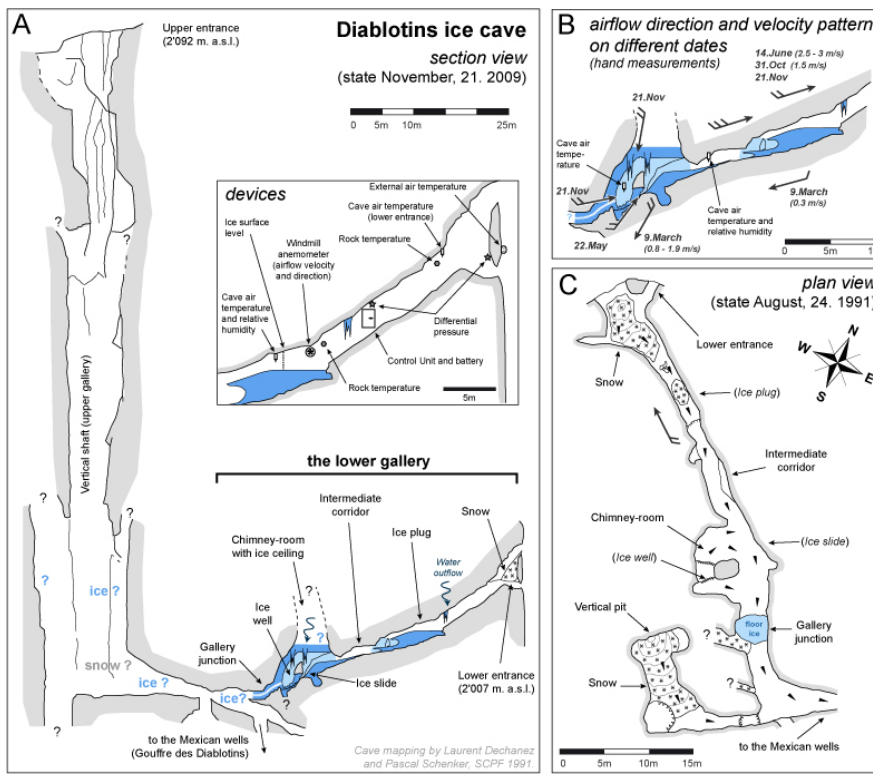


Fig. 2. Figure 2

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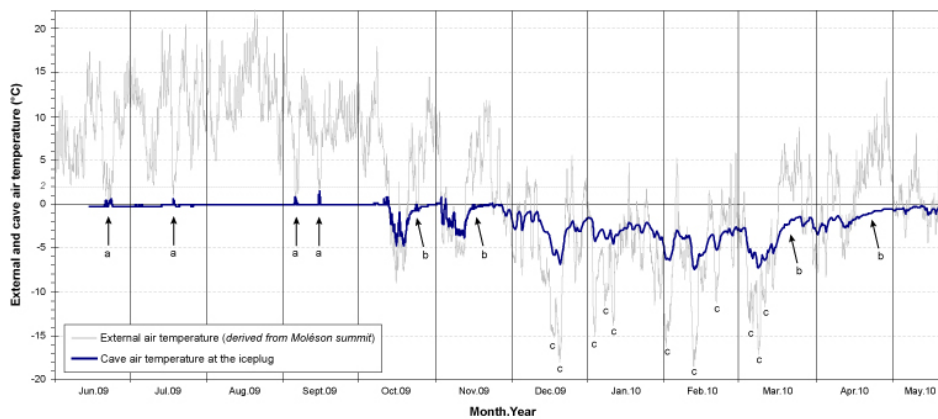


Fig. 3. Figure 5

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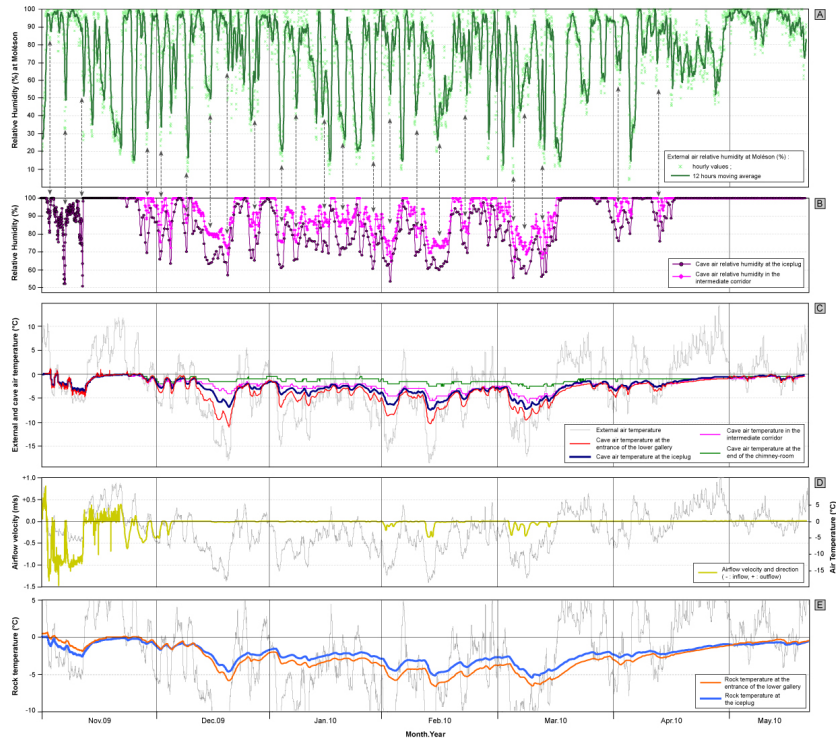


Fig. 4. Figure 6

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