

**Author response to comments on «57 years (1960–2017) of snow and meteorological observations from a mid-altitude mountain site (Col de Porte, France, 1325 m alt.)»
by Yves Lejeune et al.**

The authors are grateful to the 3 referees for the time they devoted to review the manuscript and for their useful comments. Below is a point by point response to each comments. Authors responses are in blue and changes in the manuscript are enlightened in **bold**.

Comment by R. L. H. Essery (Referee #1)

Additional changes in the manuscript :

The dataset of snow vertical profiles has been extended to March 2018 (April 2015 in the first version of the manuscript) and these profiles are now provided in caaml v6 format (caaml v5 in the first version).

The availability of such a long, comprehensive, well-maintained and well-documented dataset is important for snow modelling, and I am keen to see this paper published. I have only a few questions:

The authors are very grateful to R. Essery for his positive, careful and useful review of the manuscript. Below is a point by point response to each comments. Authors responses are in blue and changes in the manuscript are enlightened in **bold**.

page 2, line 14

It might be appropriate here to mention the important contribution of Col de Porte data to SnowMIP (doi:10.3189/172756404781814825) and ESM-SnowMIP (<https://doi.org/10.5194/gmd-2018-153>).

Thanks for the references that have been added in the manuscript which now reads : « ... (ONERC). **The CDP dataset has been used as driving and evaluation data in several snow model intercomparison projects : SnowMIP (Etchevers et al., 2004) and ESM-SnowMIP (Krinner et al., 2018).** »

The explicit reference to ESM-SnowMIP page 22 line 7 has been consequently removed.

page 2, line 20

The underlined text only covers instrument types and periods in tables. I do not think that the underlining is necessary.

The « track changes » with respect to the former description of the dataset (Morin et al., 2012) was requested so that the paper was referenced in the Living data process of ESSD. Since the two referees found it unnecessary and misleading, the underlining has been removed in the revised manuscript.

Section 2.1

It would be interesting to know a bit more about how the elevations and p_{occ} are measured.

The 1998 masks were measured using a theodolite and the 2018 ones using a compass and a clinometer. Values of p_{occ} were visually estimated. This information have been added in the text as follows :

“Table \ref{tab:driving} with 5° resolution in azimuth for two dates: July 1998 (using a theodolite) and June 2018 (using a compass and a clinometer). Masks are provided as a .csv file (\href{http://dx.doi.org/10.17178/CRYOBSCLIM.CDP.2018.SolarMask} {doi:10.17178/CRYOBSCLIM.CDP.2018.SolarMask}), they contain 3 values for each azimuth that correspond to: lower elevation, upper elevation and occultation percentage (p_{occ}), **visually estimated** defined as follows (Fig. \ref{fig:mask}).”

Figure 2 Some symbol indicating the direction of view would be preferable to the emoticons for camera locations.

The 3 cameras are hemispherical, this information was added in Figure 2 captions and the emoticons were replaced by dark blue asterisks. The caption now reads :

“Schematic view of the experimental sites with sensor locations. The sensors indicated in yellow are for meteorological variables. The sensors indicated in red are not used anymore as of 2018, and those in blue correspond to snow measurements. Areas 23 and 24 correspond to soil temperature and humidity measurements. The correspondance between numbering and sensors is indicated in Tables \ref{tab:driving}, \ref{tab:eval} and \ref{tab:quot}. **The three dark blue asterisks correspond to the three hemispherical Webcam locations.**”

New Figure 2 is shown below :

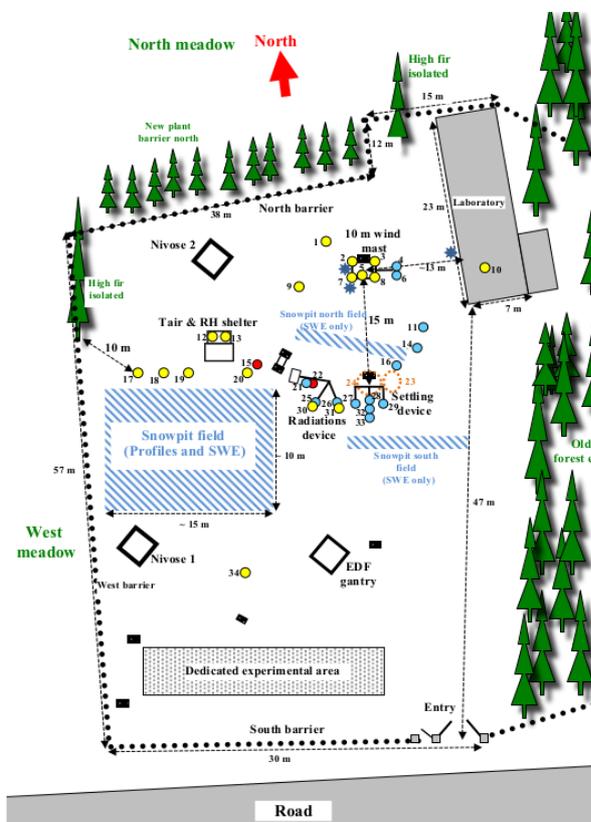
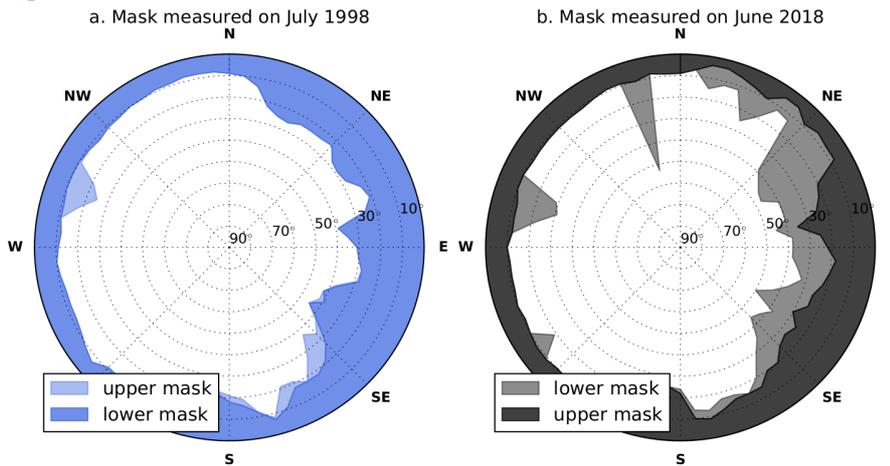


Figure 3 It is a little deceptive having the centre of the masks at 60 degrees elevation rather than

90 degrees.

Figure 3 has been modified, and the center of the mask is now 90° as shown below.



page 8, line 3 is “available in that study” intended, i.e. Morin et al. (2012)?

Yes, we changed the sentence accordingly.

« The meteorological hourly dataset over 1993-2017 is an extension of the meteorological dataset provided in \cite{morin2012b} in which an extensive description of the dataset is available.»

page 8, line 23 Equation (2) will simplify a bit; is there a reason why this is not done? Does it always have one and only one solution for η in reasonable ranges of ϵ and e_{air} ?

Thanks for this comment. There were several mistakes in Equations (1) and (2). The changes have been performed as follows :

“The first step of the procedure is to compute a cloudiness value, η (no unit, between 0 for clear sky and 1 for fully overcast) from measured air temperature T_{air} (K), longwave radiation LW_{down} ($W\ m^{-2}$) and specific humidity using Eqs. (\ref{eq:nebul1}) and (\ref{eq:nebul2}) from \cite{Berliand1952, etchevers2000}.

\begin{equation}

$$LW_{down} = 1.05 \epsilon \sigma T_{air}^4$$

\label{eq:nebul1}

\end{equation}

\begin{equation}

$$\epsilon = 0.58 + 0.9k(\eta) + 0.06\sqrt{e_{air}}(1 - k(\eta))$$

\label{eq:nebul2}

\end{equation}

\begin{equation}

$$k(\eta) = (0.09 + 0.2\eta)\eta^2$$

\label{eq:nebul3}

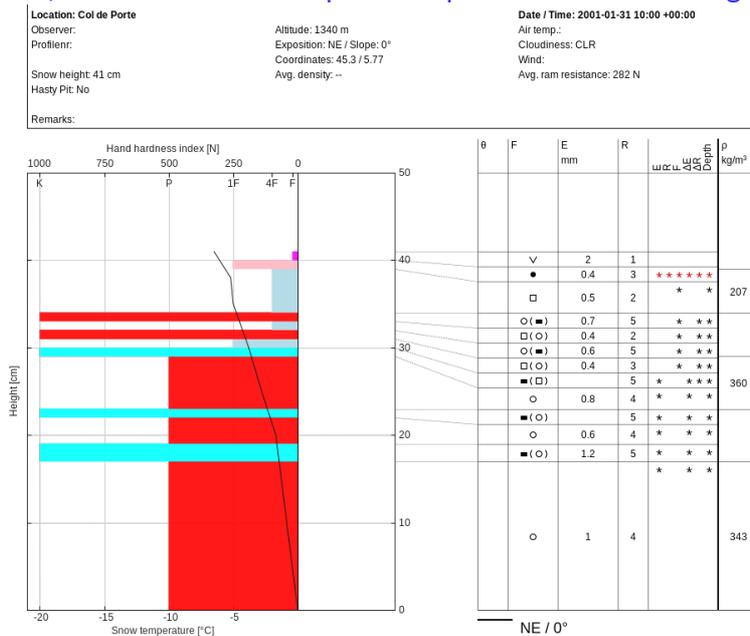
\end{equation}

where σ is the Stefan-Boltzman constant, and e_{air} is the water vapour partial pressure calculated from measured T_{air} and relative humidity, expressed in hPa. **The correction factor 1.05 in Eq. (\ref{eq:nebul1}) accounts for the additional longwave radiation**

that is reaching the sensor due to the presence of surrounding trees. Eq. (\ref{eq:nebul2}) solution does not necessarily range between 0 and 1, ξ must be bounded between 0 and 1 when solving the equation.”

page 9, line 7 The signs of the corrections are the wrong way round, aren't they?
 Yes, thanks for noticing. This had been corrected.

Figure 6 The red temperature line is impossible to see on the red hardness bars.
 Yes, the color of the temperature profile has been changed to black as shown below.

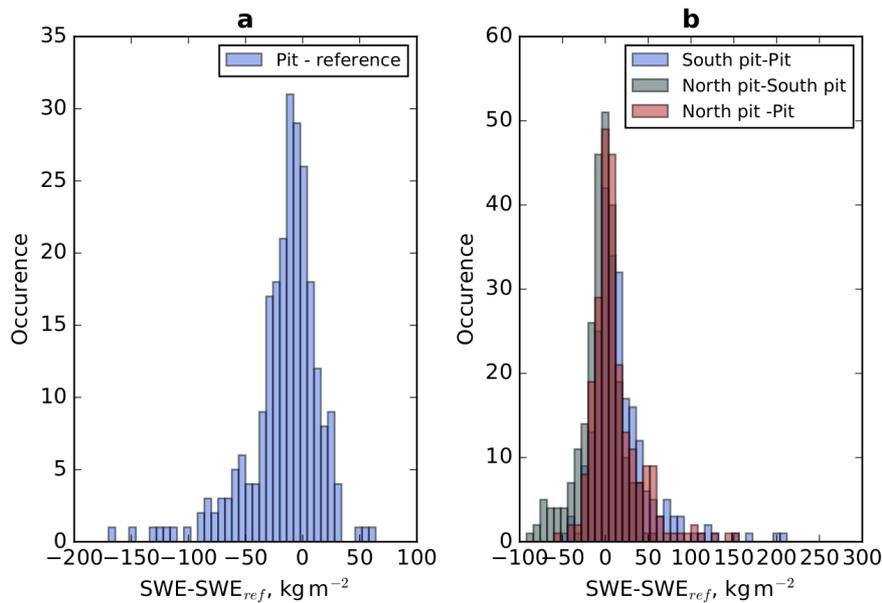


page 14, line6 I think that this means “mitigating the impact of undercatch”, not the impact of the undercatch correction.
 Yes, thanks for noticing. It has been corrected.

page 16, line 22 “mask measured in 2018”
 Yes, thanks for noticing. It has been corrected.

page 16, line 26 The location of the total and diffuse radiation measurements is given as 2 here and 5 in the Figure 7 caption.
 Thanks for noticing, the correct location is 5, it has been corrected in the text.

Figure 9 The (a) legend should be “Pit – reference”
 Yes, this has been changed as shown below.



page 20, line 9 References to the first and second columns of Table 7 do not seem to make sense. Yes. It has been modified. It is the first and second column of figure 10 not table 7. The sentences have been changed.

« The left panels in Fig. \ref{fig:soil} display the statistics of the different temperature probes at location 23 and spaced by roughly 10 cm. It indicates that the RMSD between the probes is lower than 0.25 K (Tab. \ref{tab:soil}). The right panels in Fig. \ref{fig:soil} compare locations 24 (old sensors) and 23 (new sensors) for two periods : summer (20 June to 10 October) and snow season (11 October to 19 June). During the snow season, the two locations show a small mean deviation of -0.11K and an RMSD of 0.42 K, while during summer the mean deviation is roughly -1.06 K leading to RMSD of 1.10 K (Tab. \ref{tab:soil}). Note that these two locations are spaced by only a few meters (see Fig. \ref{fig:scheme}). »

The writing is always clear, but I have sent the authors some minor corrections directly. Thanks a lot for taking time to do the corrections, all corrections have been accounted for and are enlightened in the track-change pdf of the manuscript submitted along with the revised manuscript.