

## Response to Referee #1's comments

Thank you very much for your comments. We will incorporate the suggestions in the revised version.

### Minor comments

1. p. 11722 Equation (1)

Second line should be better in this form.

$$C_f = \begin{cases} C_{frain} & (T_{grid} > T_{th}) \\ C_{fsnow} & (T_{grid} \leq T_{th}) \end{cases}$$

**Answer:** *The format of the equation will be revised.*

2. p. 11725 l.16-26, Figure 4

River discharge in 2003 is well-simulated, but the discharge is underestimated in 2001, 2002, 2004. What is the difference of snow features (snow distribution and snow events) in between 2003 and 2001, 2002, and 2004?

**Answer:** *It is obvious that the river discharge is well simulated in the calibration year 2003 since the snowfall correction factor (SCF) is optimized here. The discharge in other years are slightly underestimated as same SCF is used for validation of the approach. From Table 4, it is clear that the discharge volume underestimation is larger in 2001, 2002 and 2004 than in 2003. However, the SCF is well validated in 2002 and 2004. The reason for large underestimation in 2001 will be discussed in detail regarding the snow features in the revised version of the manuscript.*

3. p. 11722 l. 11

What is "ng"? Could you correct the word?

**Answer:** *'ng' is the number of rain gauge stations used in the interpolation. The sentence will be revised for clarification.*

4. Abstract and many sentences.

"4 yr" is not adequate for the paper. Please spell out "yr" to "year".

**Answer:** *This will be revised.*

5. p. 11722, Equation (3)

"where  $\alpha$  is the weight. Here,  $\alpha$  was taken to be 0.25, so it reflects an equal contribution of discharge and snow error components to the main objective function." Could you explain about the weight,  $\alpha$ ? Why does " $\alpha$  is 0.25" mean equal contribution of snow and discharge error? Please show us the ranges of values (i.e.,  $S_{err}$ ,  $Q_{err}$ ) and other related parameters.

**Answer:** *The main goal of the objective function is to achieve the total minimum error. The value of  $\alpha$  depends on the value of discharge error and snow pixel error components. Its value should be given in such a way that both error components give the equal weights so that none of the error components over-rule each other. The equation for  $\alpha$  is introduced for more clarification.*

$$\alpha = \frac{S_{Err}}{(S_{Err} + Q_{Err})}. \text{ for } 0 < (S_{Err}, Q_{Err}) \leq 1$$

*The detail equation for  $\alpha$  will be added in the revised version.*