Figure S1. Cumulative CSA observed discharge against cumulative precipitation recorded at different stations located inside and outside of CSA.
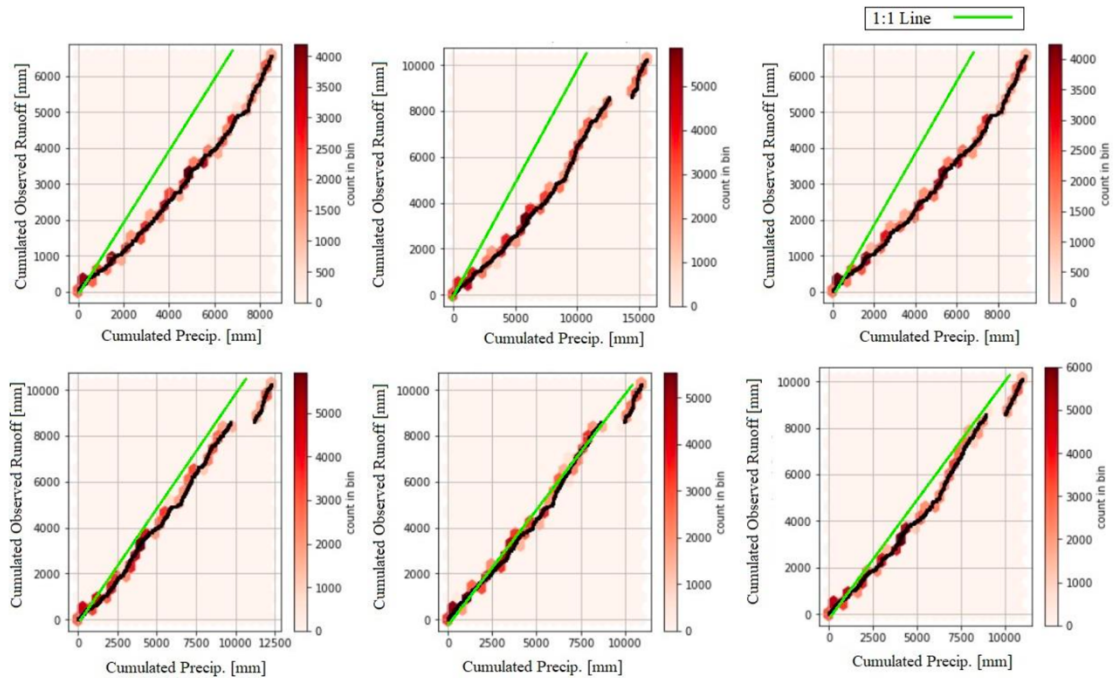

Figure S2. Cumulative Visso observed discharge against cumulative precipitation recorded at different stations located inside and outside of the basin.
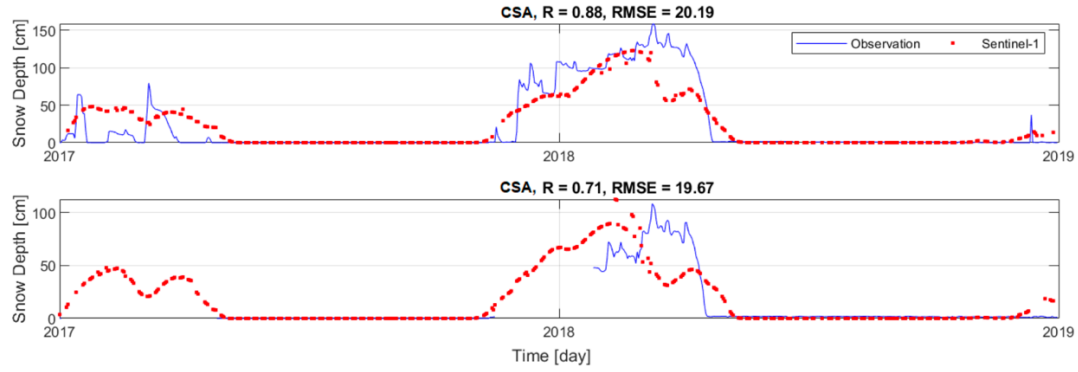
Figure S3. A comparison between Sentinel-1 and in-situ snow depth related to different stations located at CSA. The performance of Sentinel-1 is relatively good.

Table S1. Calibrated model parameters for CSA, Ussita, and Visso

Parameters	Description	CSA	Ussita	Visso
α_r	Adjustment coefficient for the rainfall measurements errors [-]	0.99	1	0.76
α_s	Adjustment coefficient for the snow measurements errors [-]	0.91	1	0.77
Melting Temperature	Melting temperature [°C]	1.07	0.21	-0.98
Combined Melting Factor	Melting factor [mm/°C/day]	0.23	1.50	2.23
Freezing Factor	Freezing factor [mm/°C/day]	1.35	0.47	0.19
Radiation Factor	Coefficient for the computation of the maximum liquid water [-]	6.77E-4	4.18E-4	9.32E-4
α_l	Coefficient for the computation of the maximum liquid water [-]	1.19	0.60	0.98
kc	Coefficient canopy out [-]	2.37	0.67	1.62
p	Partitioning coefficient free throughfall [-]	0.89	0.62	0.12
$s_{rootZoneMax}$	Maximum value of the rootzone water storage [mm]	641.58	1058.11	7648.84
g	Maximum percolation rate [-]	5.68	2.61	4.92
h	Exponential of non-linear reservoir model [-]	0.12	2.05	1.66
$pBsoil$	Degree of spatial variability of the soil moisture capacity [-]	6.68	9.17	13.36
c	Coefficient of the non-linear reservoir model [-]	10.16	8.24	8.27
d	Exponent of the non-linear reservoir model [-]	2.8	3.92	4.01
$s_{RunoffMax}$	Maximum runoff storage [mm]	62.02	27.62	94.88
e	Coefficient of the non-linear reservoir model [-]	0.44	11.21	11.69
f	Exponent of the non-linear reservoir model [-]	1.71	8.71	10.94
$s_{GroundWaterMax}$	Maximum groundwater storage [mm]	2824	3027.30	10794.25