SUPPLEMENTAL

Monitoring Human Impact in Show Caves. A Study of Four Romanian Caves

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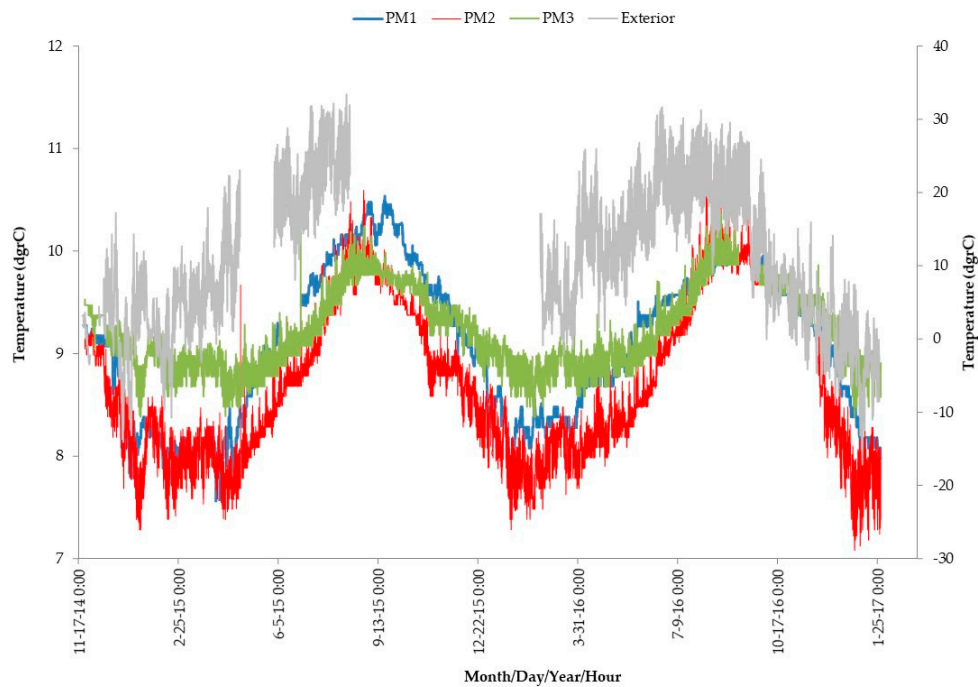***** Correspondence: silviu.constantin@iser.ro (S.C.); oanamol35@gmail.com (O.T.M.)

Figure S1. Temperature variation in the fixed monitoring stations of Muierilor Cave, PM1, PM2 and PM3, in comparison with the values recorded on the surface (Exterior; 2nd axis). The highest temperature variations are recorded in the PM2 station. Smaller variations are recorded in PM1, located in a side passage that is less frequently visited, as well as in PM3, located at the greatest distance from any of the two entrances.
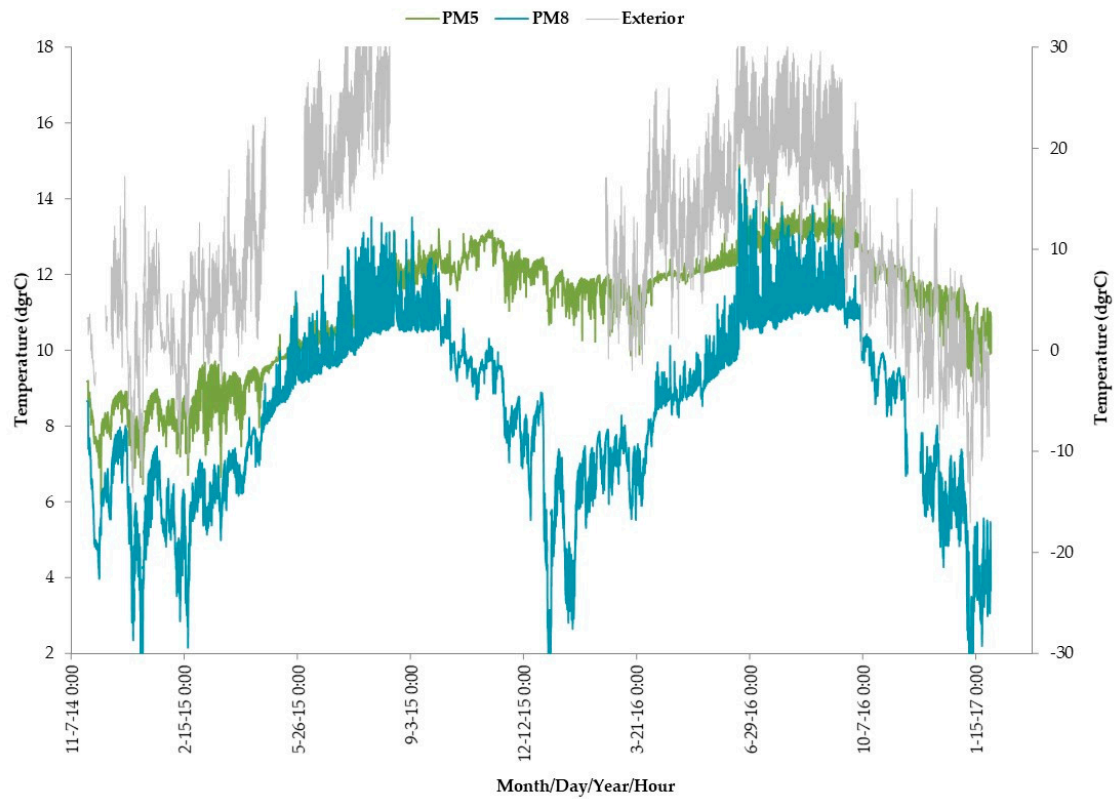
Figure S2. Temperature variation in the fixed monitoring stations of Muierilor Cave, PM5 and PM8 and the temperature recorded by the surface weather station (Exterior; 2nd axis). In the PM8 station the air temperature is much influenced by the variations of the surface temperature varying by about 10 °C between the lows recorded in January-February and the highs recorded in August-September.
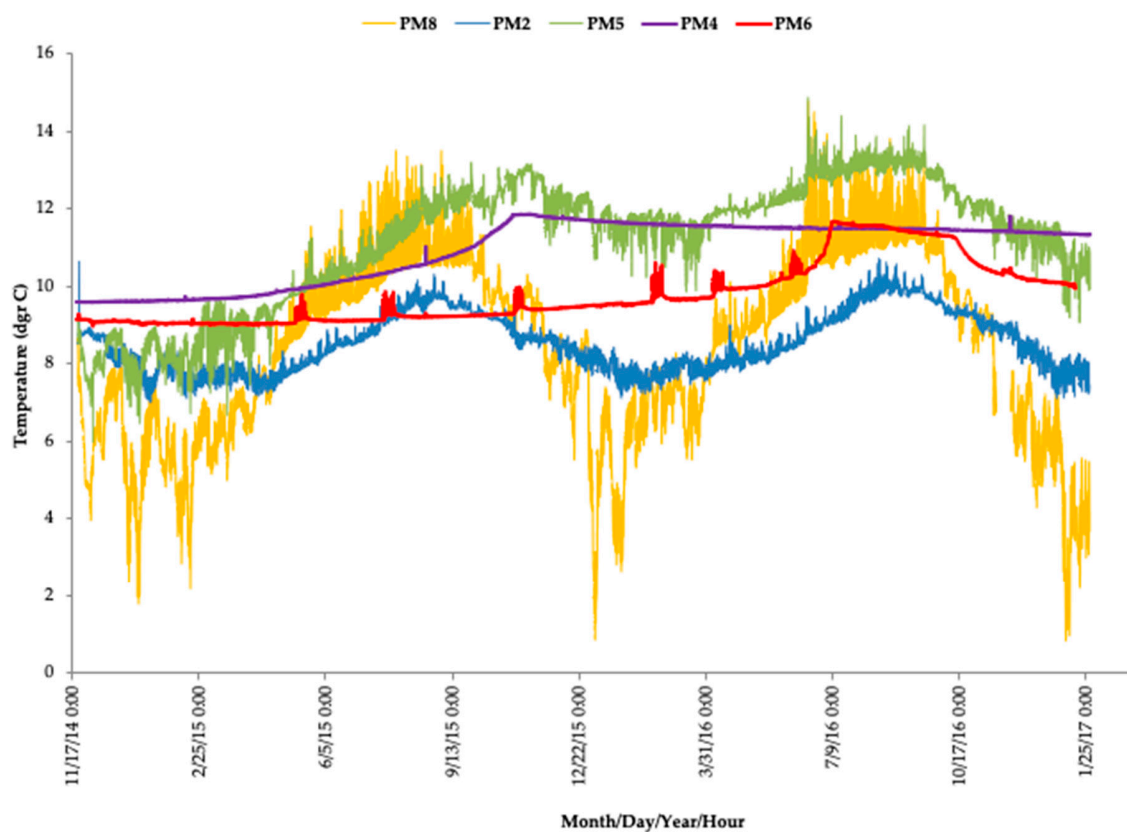
Figure S3. Temperature variation in Muierilor Cave stations PM2, PM4, PM5, PM6 (excavation place) and PM8 (exit gallery). The temperature increases recorded in point PM6 coincide with the 6 excavation campaigns carried out by ERIS researchers.
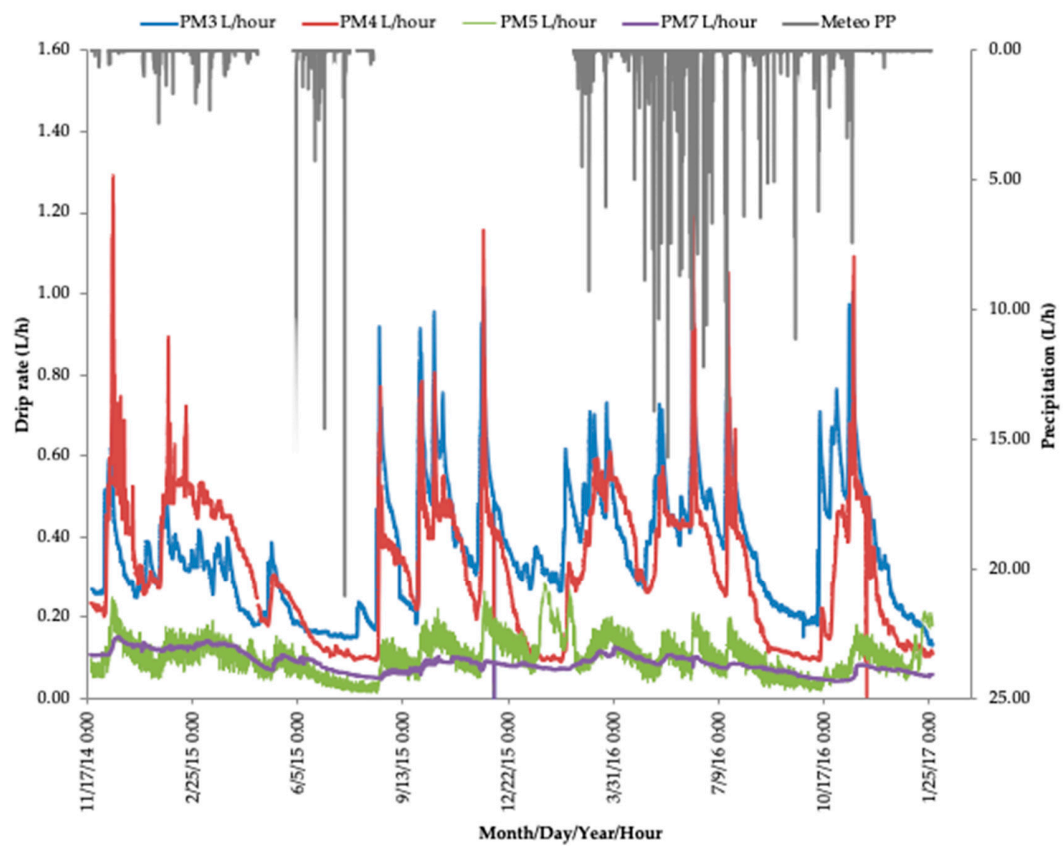
Figure S4. Variation of the drip rate in Muierilor Cave, PM3, PM4, PM5 and PM7 stations, compared to the precipitation values at Baia de Fier station.
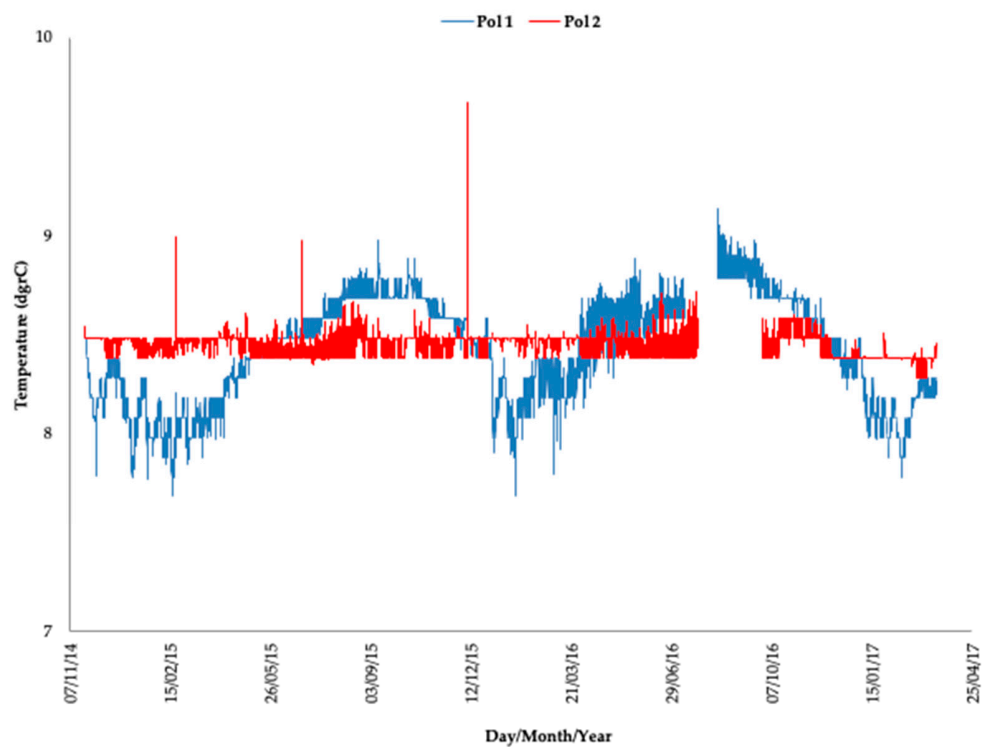
Figure S5. Temperature variation in the two monitoring stations in Polovragi Cave. The isolated temperature increases in the Pol2 station are due to the influence of the researchers during the monitoring visits. There were no influences of the surface temperature on the cave microclimate.

Figure S6. The variation of tourists' number in Pol1 station of Polovragi Cave compared with that of illumination (Lux) and air temperature (dgrC) values between December 2014-August 2015. The three parameters are represented on the same axis.
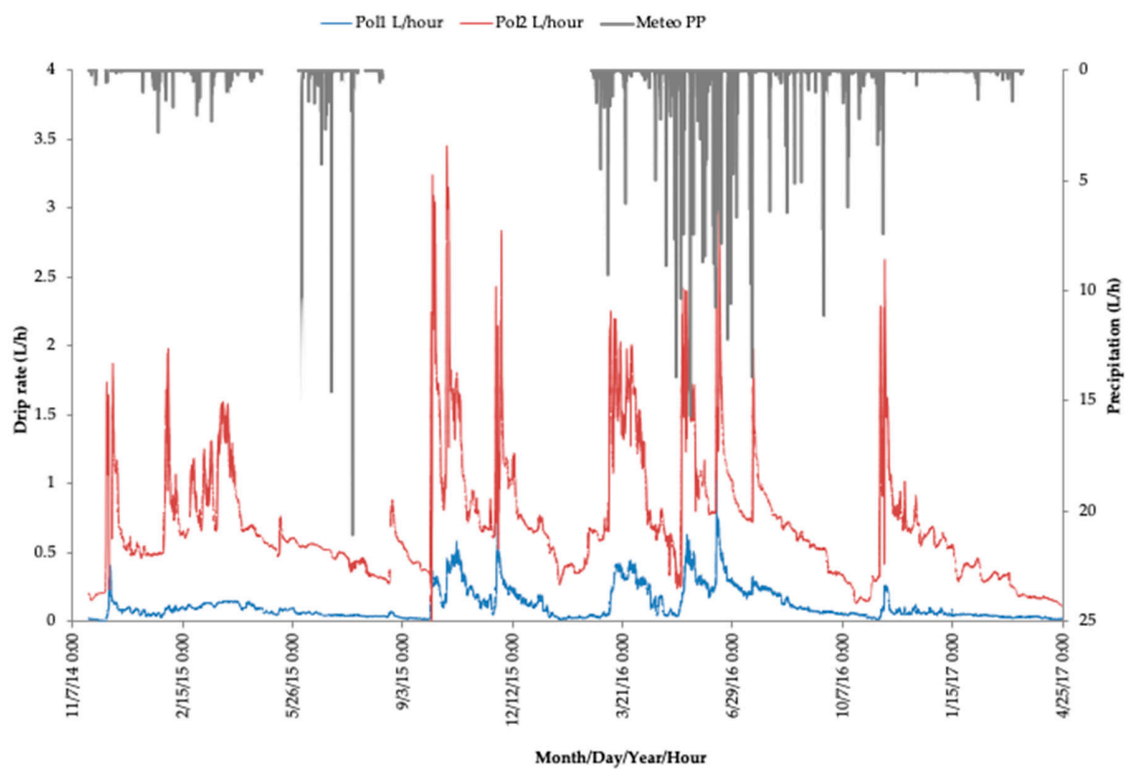
Figure S7. Variation of the drip rate in Pol 1 and Pol 2 stations of Polovragi Cave compared to the precipitation values at Baia de Fier climatic station.
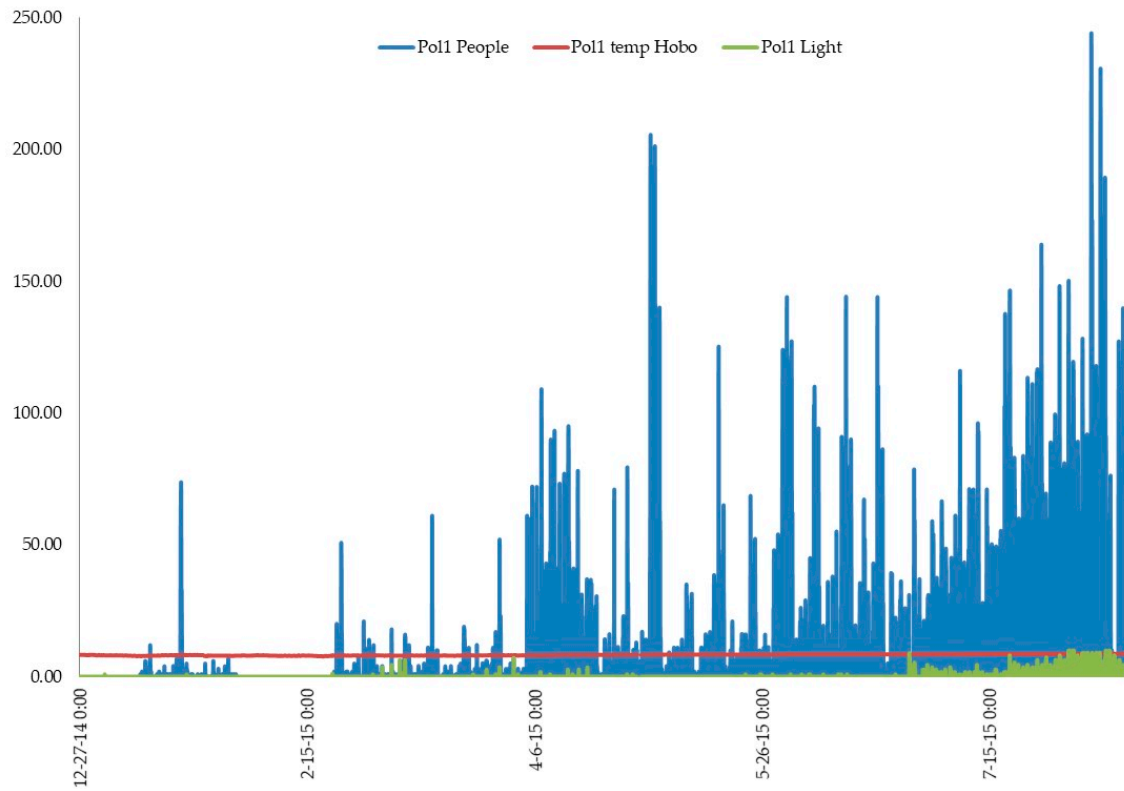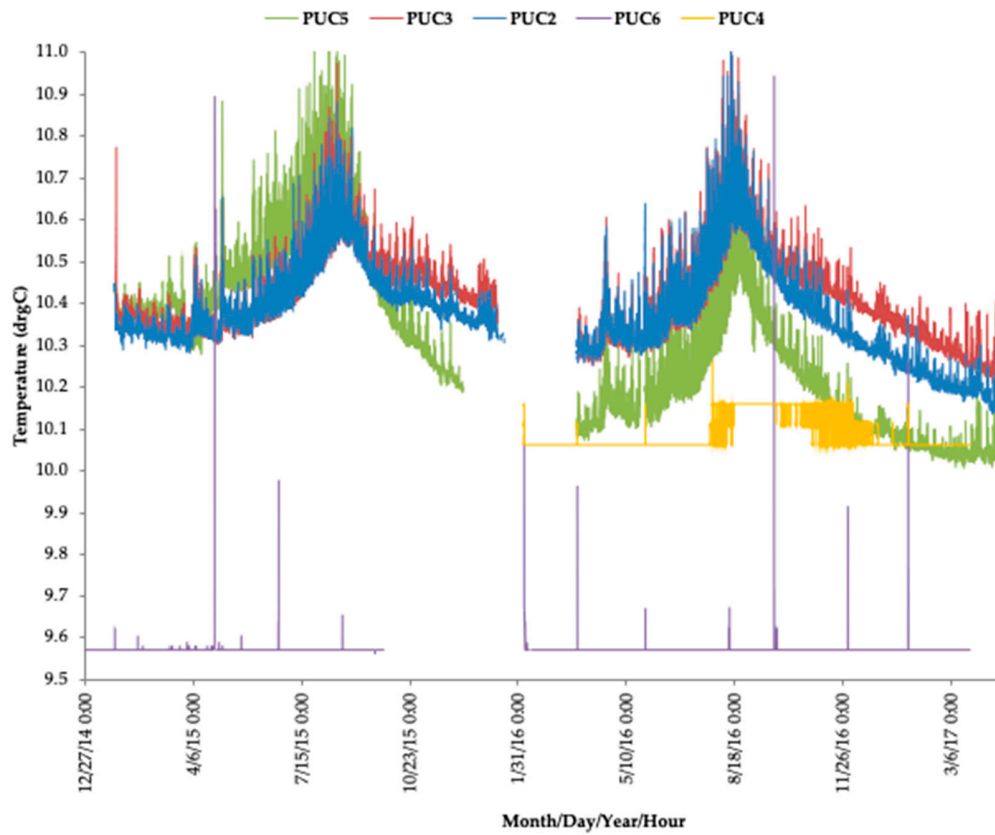
Figure S8. Temperature variation in the fixed monitoring stations of Ursilor Cave, PUC2, PUC3 and PUC5 (touristic trail) and PUC4 and PUC6 (Scientific Reserve). One may notice that the temperature along the touristic trail varies throughout the year while remaining constant in the Scientific Reserve. The isolated peaks in PUC6 and PUC4 stations in some days are due to the presence of the operator during the monitoring visits. Cave microclimate is not influenced by the surface temperature.
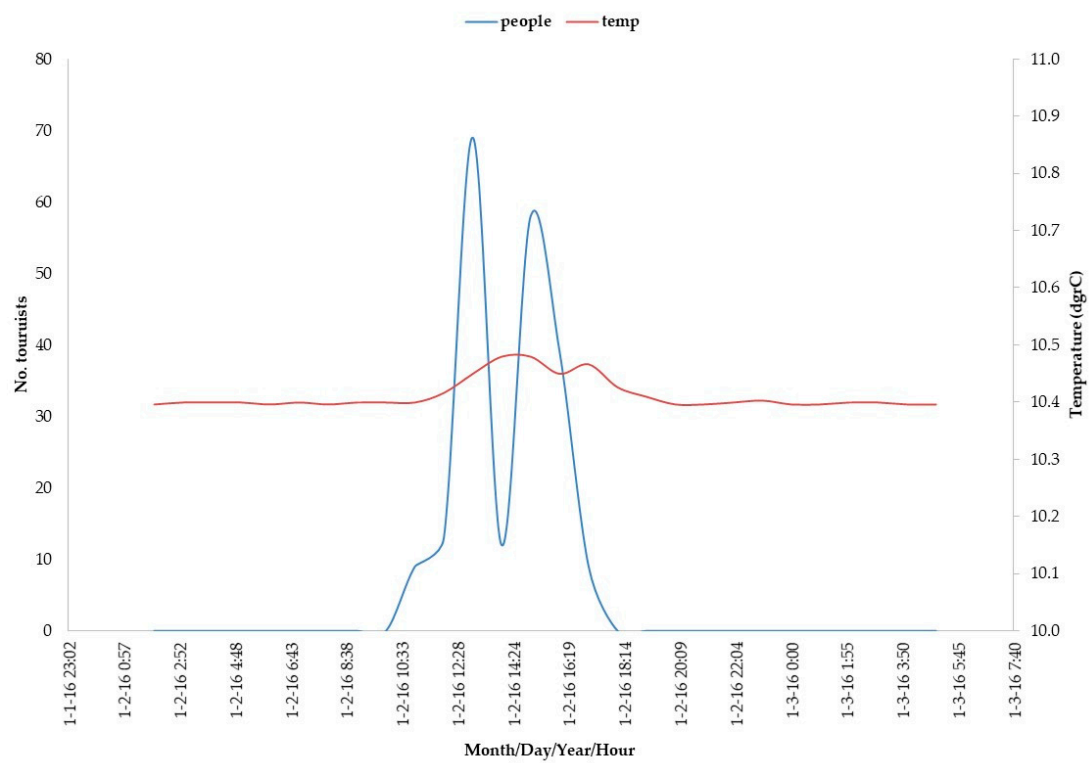
Figure S9. The variations of the air temperature in the PUC3 station of Urşilor Cave in the presence of two groups (50-60 people/hour) on January 21st, 2016.
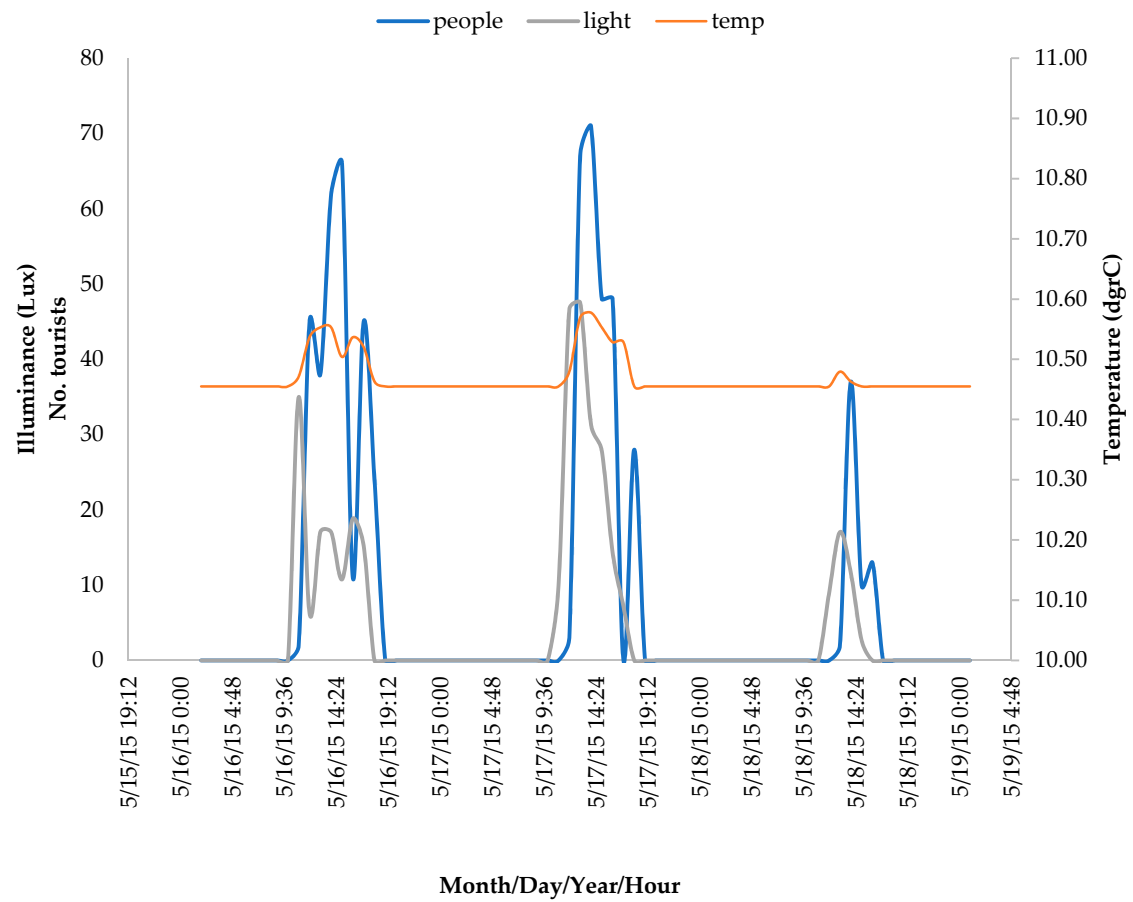
Figure S10. Temperature variation related to the registered traffic, respectively light intensity, in PUC2 station in Urşilor Cave, in the interval 16-18 May 2015.
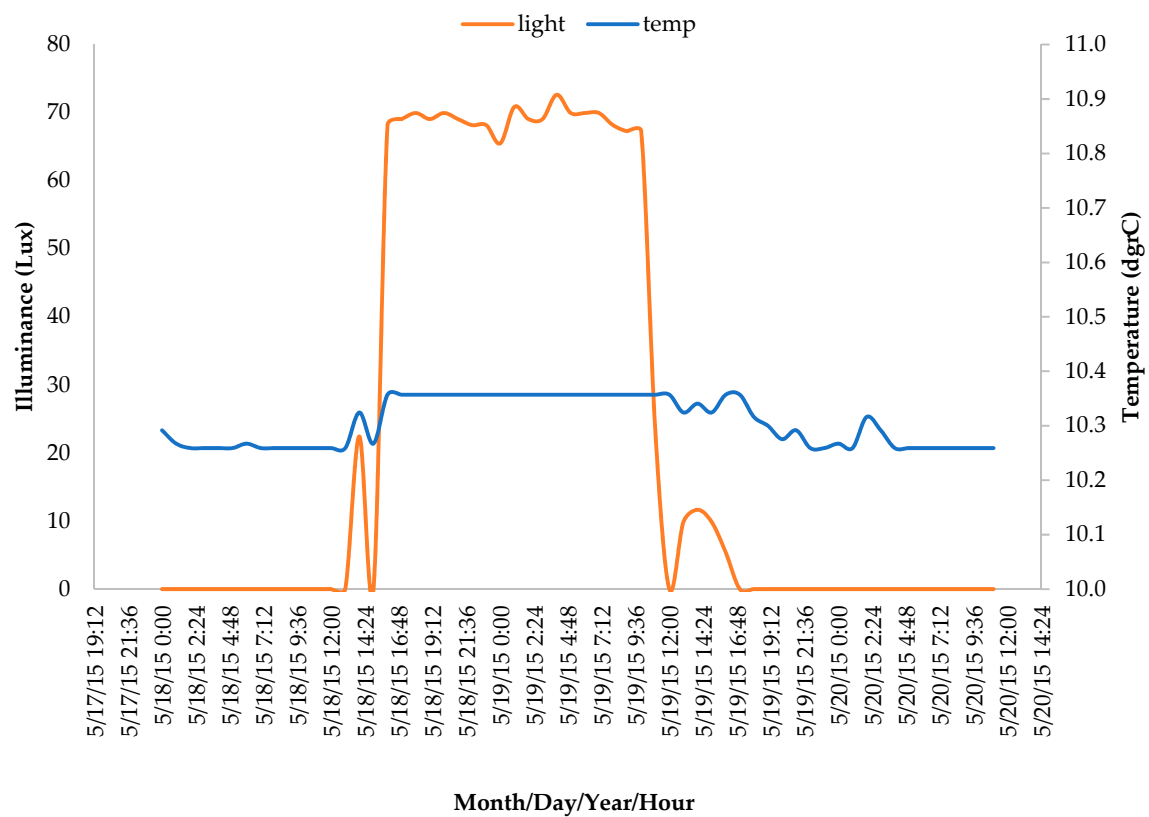
Figure S11. Temperature variation in the PUC2 station of Urșilor Cave correlated with the light in the absence of tourists. The light was allowed to operate on the night of May 18th to 19th 2015.
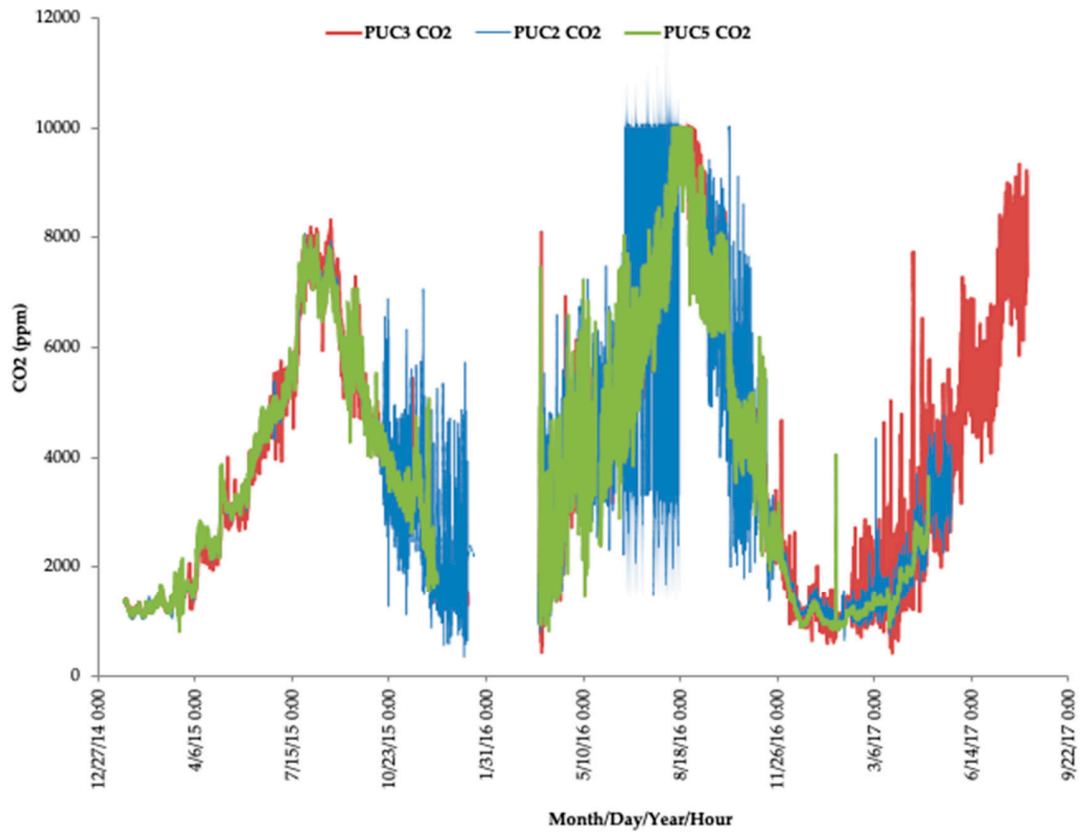
Figure S12. CO_2 concentrations measured continuously in Urşilor Cave, at PUC2, PUC3 and PUC5 stations. Values exceeding 10,000 ppm could not be measured accurately as they exceed the limits of the sensor. Humidity is constant and >95%.
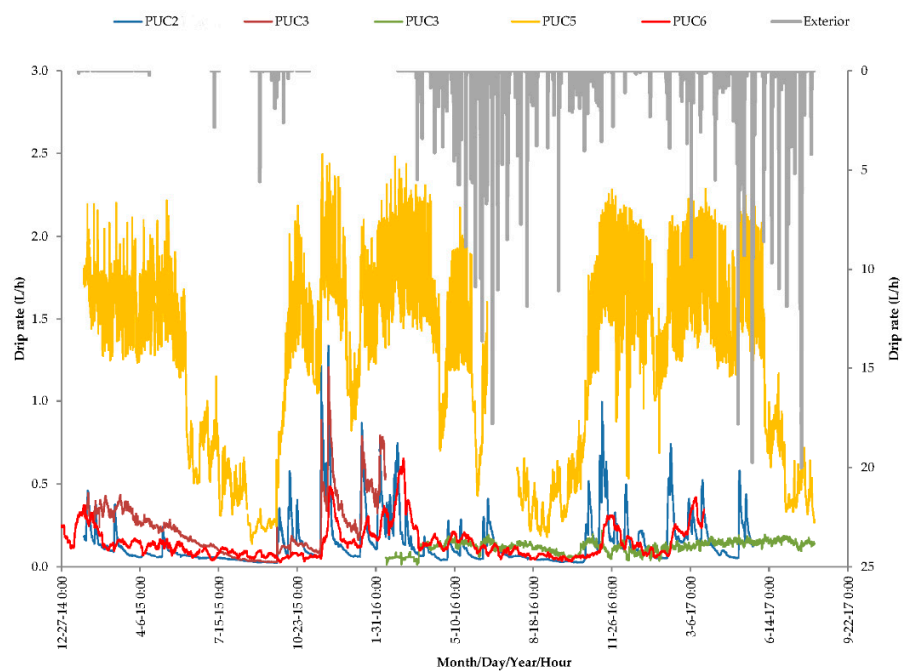
Figure S13. The variation of the drip rate in the stations PUC2, PUC3, PUC5 and PUC6 compared to the precipitation values at the Urşilor Cave weather station.
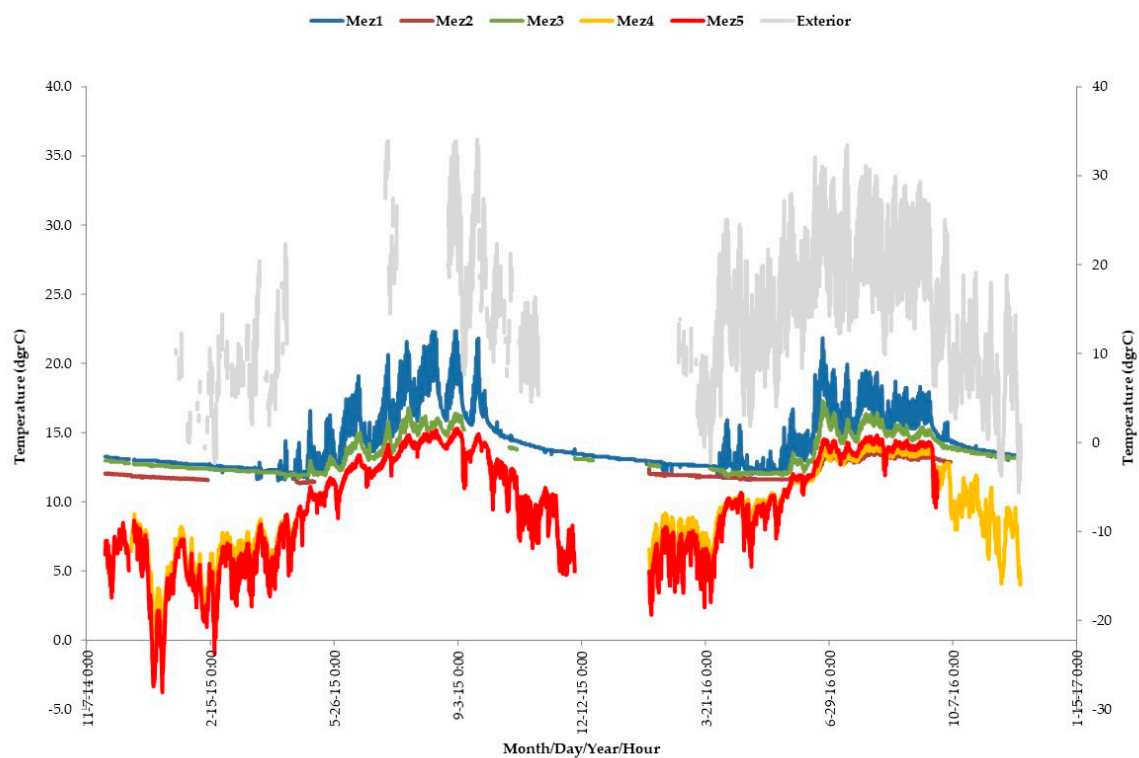
Figure S14. The temperature variation in the five monitoring stations from the Meziad Cave compared to the variation of the surface temperature registered at the Urşilor Cave weather station (Exterior; 2nd axis).
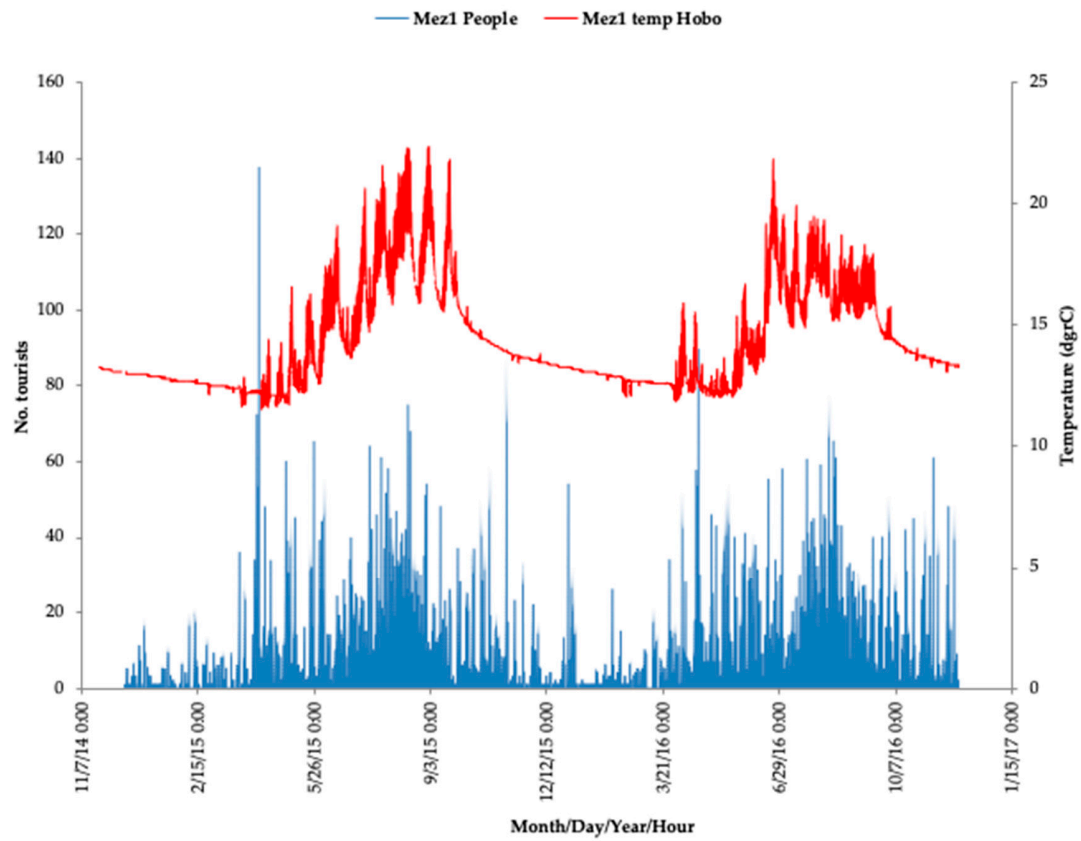
Figure S15. The variation of the tourist traffic in Meziad Cave, Mez1 station, in parallel with that of the air temperature between December 2014 and December 2017. No correlation could be observed between the two variables, the temperature values reflecting the seasonal variations.
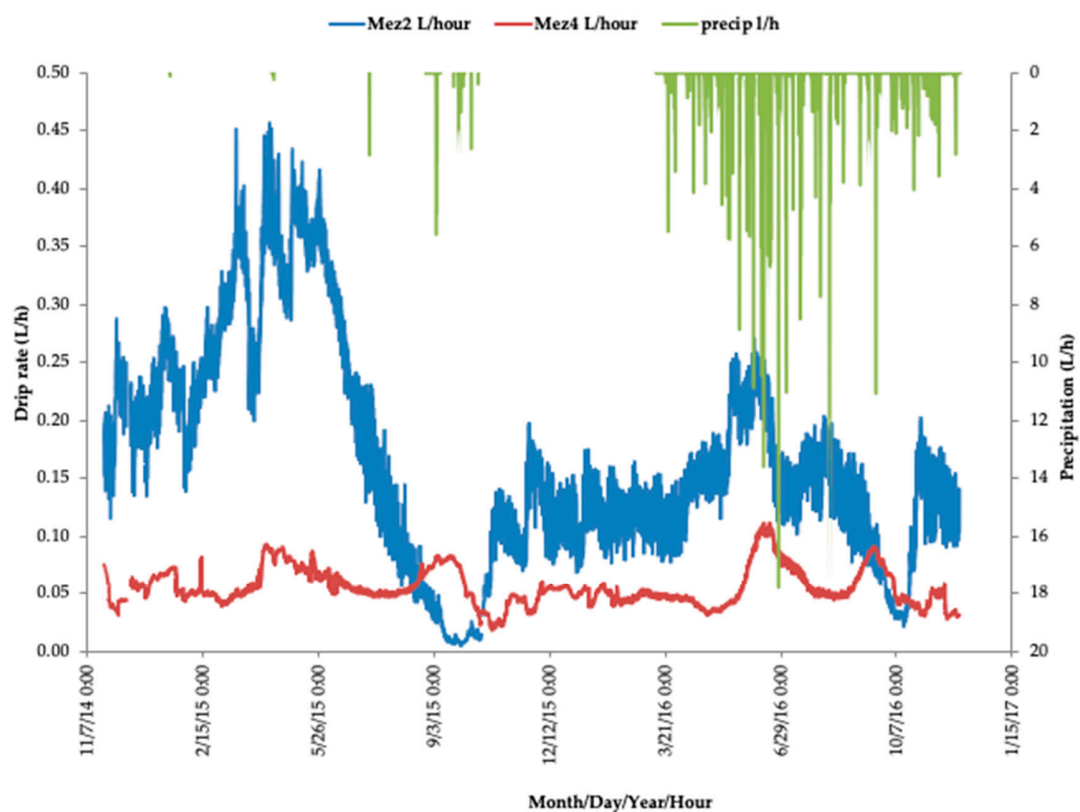
Figure S16. Variation of the drip rate in Meziad Cave, Mez2 and Mez4 stations, compared to precipitation values.

Table S1. The calculations of classes for the different stations in Muierilor Cave: W = winter (December-January-February); Sp = spring (March-April-May); S = summer (June-July-August); A = autumn (September-October-November).

STATION SEASON	PARAMETER								SCORE	CLASS
	Temp	RH	CO$_2$	SI	DR	Bats	Microorg.	Tourists		
PM1Sp	0	0	0			20	0	0	3	1
PM1S	20	0	0			0	10	0	5	1
PM1A	0	0	0			0	10	0	2	1
PM1W	20	0	0			20	0	0	7	2
PM2Sp	0	0	0			10	10	40	10	2
PM2S	0	0	0			0	20	40	10	2
PM2A	0	0	0			0	0	40	7	2
PM2W	20	0	0			10	0	40	12	3
PM3Sp	0	0	0	10	0	10	10	40	9	2
PM3S	0	0	0	0	20	10	20	40	11	3
PM3A	0	0	0	0	10	0	0	40	6	2
PM3W	20	0	0	10	0	0	0	40	9	2
PM4Sp	0	0	0	10	10	0	0	0	3	1
PM4S	0	0	0	0	20	0	10	0	4	1
PM4A	0	0	0	0	10	0	0	0	1	1
PM4W	0	0	0	10	20	0	0	0	4	1
PM5Sp	20	0	0	0	10	0	10	40	10	2
PM5S	0	0	0	0	20	0	10	40	9	2
PM5A	0	0	0	0	20	0	0	40	8	2
PM5W	20	0	0	10	20	0	10	40	13	3
PM6Sp	0			10	20	0		0	6	2
PM6S	0			0	20	0		0	4	1
PM6A	0			0	20	0		0	4	1
PM6W	0			10	20	0		0	6	2

Table S2. The calculations of classes for the different stations in Polovragi Cave: W = winter (December-January-February); Sp = spring (March-April-May); S = summer (June-July-August).

STATION SEASON	PARAMETER								SCORE	CLASS
	T	RH	CO$_2$	SI	DR	Bats	Microorg.	Tourists		
Pol1W	0	0	0	10	20	20	0	20	9	**2**
Pol1Sp	0	0	0	10	10	20	10	40	11	**3**
Pol1S	20	0	0	10	0	0	10	40	10	**2**
Pol2W	0	0	0	10	20	20	0	20	9	**2**
Pol2Sp	0	0	0	10	10	20	0	40	10	**2**
Pol2S	0	0	0	0	0	0	10	40	6	**2**
Pol3W	0	0	0			20	0	20	7	**2**
Pol3Sp	0	0	0			20	0	40	10	**2**
Pol3S	0	0	0			0	0	40	7	**2**

Table S3. The calculations of classes for the different stations in Urşilor Cave: W = winter (December-January-February); Sp = spring (March-April-May); S = summer (June-July-August); A = autumn (September-October-November).

STATION SEASON	PARAMETERS							SCORE	CLASS
	T	RH	CO$_2$	SI	DR	Microorg.	Tourists		
PU1Sp	0	0	0			0	40	8	**2**
PU1S	0	0	20			20	40	16	**4**
PU1A	0	0	0			10	40	10	**2**
PU1W	0	0	0			0	20	4	**1**
PU2Sp	0	0	0	0	20	10	40	10	**2**
PU2S	0	0	20	10	0	20	40	13	**3**
PU2A	0	0	0	0	20	10	40	10	**2**
PU2W	0	0	0	0	20	0	20	6	**2**
PU3Sp	0	0	0	0	0	0	40	6	**2**
PU3S	0	0	20	10	10	10	40	13	**3**
PU3A	0	0	0	0	20	10	40	10	**2**
PU3W	0	0	0	0	10	0	20	4	**1**
PU4Sp	0		0		0		0	0	**1**
PU4S	0		20	10	0		0	8	**2**
PU4A	0		0	0	0		0	0	**1**
PU4W	0		0	0	0		0	0	**1**
PU5Sp	0	0	0	0	0	10	40	7	**2**
PU5S	0	0	20	10	10	20	40	14	**3**
PU5A	0	0	0	0	20	10	40	10	**2**
PU5W	0	0	0	10	0	0	20	4	**1**
PU6Sp	0	0	0	10	0	10	0	3	**1**
PU6S	0	0	20	10	0	10	0	6	**2**
PU6A	0	0	0	10	10	10	0	4	**1**
PU6W	20	0	0	10	10	10	0	7	**2**

Table S4. The calculations of classes for the different stations in Meziad Cave: W = winter (December-January-February); Sp = spring (March-April-May); S = summer (June-July-August).

STATION SEASON	PARAMETER								SCORE	CLASS
	T	RH	CO_2	SI	DR	Bats	Microorg.	Tourists		
Mez1Sp	0	0	0			0	10	20	5	**1**
Mez1S	20	20	0			0	20	40	17	**4**
Mez1A	20	0	0			0	0	20	7	**2**
Mez1W	0	0	0			0	20	0	3	**1**
Mez2Sp	0	0	0	0	0	20	10	20	6	**2**
Mez2S	0		0	0	10	10	10	40	10	**2**
Mez2A			0	0	20	0	0	20	7	**2**
Mez2W	0	0	0	0	0	20	0	0	3	**1**
Mez3Sp	0	0	0			10	0	20	5	**1**
Mez3S	20	20	0			10	10	40	17	**4**
Mez3A	20		0			0	0	20	8	**2**
Mez3W	0	0	0			10	0	0	2	**1**
Mez4Sp	40	0	0	0	10	0	10	0	8	**2**
Mez4S	0	0	0	0	0	0	10	0	1	**1**
Mez4A			0	0	20	0	10	0	5	**1**
Mez4W	0	0	0	0	0	0	0	0	0	**1**
Mez5Sp	40	40	0			10	10	20	20	**4**
Mez5S	0	0	0			10	20	40	12	**3**
Mez5A	40		0			0	10	20	14	**3**
Mez5W	40	20	0			0	0	0	10	**2**