Monitoring prehistoric painted caves: a scientific and technical challenge for heritage preservation.

Bourges F., *GEConseil, 30 rue de la République, 09200 St Girons, France, geconseil@wanadoo.fr*

Genty D., *LSCE, UMR CEA/CNRS 8212, L'Orme des Merisiers CEA Saclay, 91191 Gif/Yvette cedex, France, dominique.genty@lsce.ipsl.fr*

Genthon P., *IRD/HSM, Univ. Montpellier II, Case MSE, 34095 Montpellier, France, pierre.genthon@ird.fr*

Mauduit É., *Service Régional de l'Archéologie, Direction Régionale des Affaires Culturelles de Midi-Pyrénées 32, rue de la Dalbade, 31080 Toulouse, France, eric.mauduit@culture.gouv.fr*

Perrier F., *Institut de Physique du Globe de Paris, Sorbonne Paris Cité, Univ Paris Diderot, CNRS, F-75005 Paris, France, perrier@ipgp.fr*

Lartiges B., *Observatoire Midi-Pyrénées, Géosciences Environnement Toulouse, Université Paul Sabatier, bruno.lartiges@get.obs-mip.fr*

Isambert A., *Institut de Physique du Globe de Paris, Univ Paris Diderot, CNRS F-75005 Paris, France, isambert@ipgp.fr*

Girault F., *Institut de Physique du Globe de Paris, 1, rue Jussieu, F-75005 Paris, France , girault@ipgp.fr*

Bouquerel H., *Institut de Physique du Globe de Paris, 1, rue Jussieu, F-75005 Paris, France, bouquerel@ipgp.fr*

D. D'Hulst. *GEConseil, 30 rue de la République, 09200 St Girons, France, geconseil@wanadoo.fr*

Prehistoric painted caves host the most fragile and ancient testimonies of humanity. Environmental monitoring provides vital information for their conservation. The quality of the information collected relies on the choice of proper parameters to measure and on the quality of the devices and monitoring operations.

In these sites, archaeological remains are inseparable of a natural karstic system that buffers the outside influence and guarantees an optimal protection. Nevertheless, modifications of surface conditions, of exchange rates or direct human impacts can disrupt microclimates or biological balances. From the Chauvet, Pech Merle, Villars and Niaux caves long series (18 to more than 30 years), we show how complementary data from the underground and the surface (climatic parameters, stable and radioactive isotopes on water and air) are analysed and interpreted in order to preserve, or restore conservation properties, or to prevent harmful events.

Monitoring operations have to be parsimonious and respectful of the site. They must provide long term and continuous data collection. Sensors have to withstand the rough cave conditions. Their resolution must be sufficient to draw information in very stable environments as in the Chauvet inner galeries where 0.03°C represents the typical annual thermal amplitude. New temperature sensors with increased stability (better than 0.002°C per year) and resolution (0.0001°C) allows now to detect minor thermal drifts due to local or global climate evolution. Examples of this new high quality monitoring will be given.