

Author's response to editor (July 8, 2024)

Mesoscale permeability variations estimated from natural airflows in the decorated Cosquer Cave (SE France)

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Dear Pr. Gerrit de Rooij,

We would like to express our sincere appreciation to the editor for the time you dedicated to review our article.

Please, find below our responses to the editor's comments (*in italic*). Comments with their answers are listed below and referenced by line number of the reviewed manuscript.

Yours sincerely,

Hugo Pellet

[1] **l.13** *Perhaps briefly explain this is caused by bubbles carried by the sea water into the cave?*

Short explanations are added : "Although the cave air is confined by the rock and the seawater, there are also external air inflows during short pressurization events, *in connection with waves that can produce and force air bubbles to flow along submarine open fissures or karst conduits inside the massif.*"

[2] **l.147** : *Replace "anti-correlated" by "negatively correlated"*

Corrected

[3] **l.159** : *Why 'On the other hand'? This suggests conflicting observations, but they are in agreement: waves, not rain, occur whenever pressurization occurs. I suggest "Thus, some pressurization..."*

Corrected

[4] **l.160** : *This is consistent with the observed rising water levels during the summer months, when there is no significant wave activity.*

Corrected

[5] **l.162** : *Well, not really, is it? But I agree it would be too much to ask you to go out and observe it. You cannot send divers out under these conditions, and to install some kind of underwater camera system to film bubbles just for the sake of this paper is not realistic. I think you can safely delete this sentence without running the risk that you will be asked to back up your hypothesis with direct observations. Bubbles have higher than atmospheric pressure by definition - they are under water after all. Wave activity causes more air to dissolve in the water, increasing the likelihood of bubble formation and slowing down their dissolution in water. All in all there is quite a bit of physics to back up your hypothesis, even without direct observations.*

Thanks for the suggestion, the sentence was deleted.

[6] **l.254** : *In summer, the sea water temperature rises, therefore the solubility of nitrogen and oxygen gas will increase. Could it be that some dissolution of the two main components of air in the warming sea water also contributes to the depressurization in summer?*

Solubility of air nitrogen and oxygen actually decrease with the increase in water temperature (Battino et al., 1984; Fernández-Prini et al., 2003). This phenomenon has not been considered.