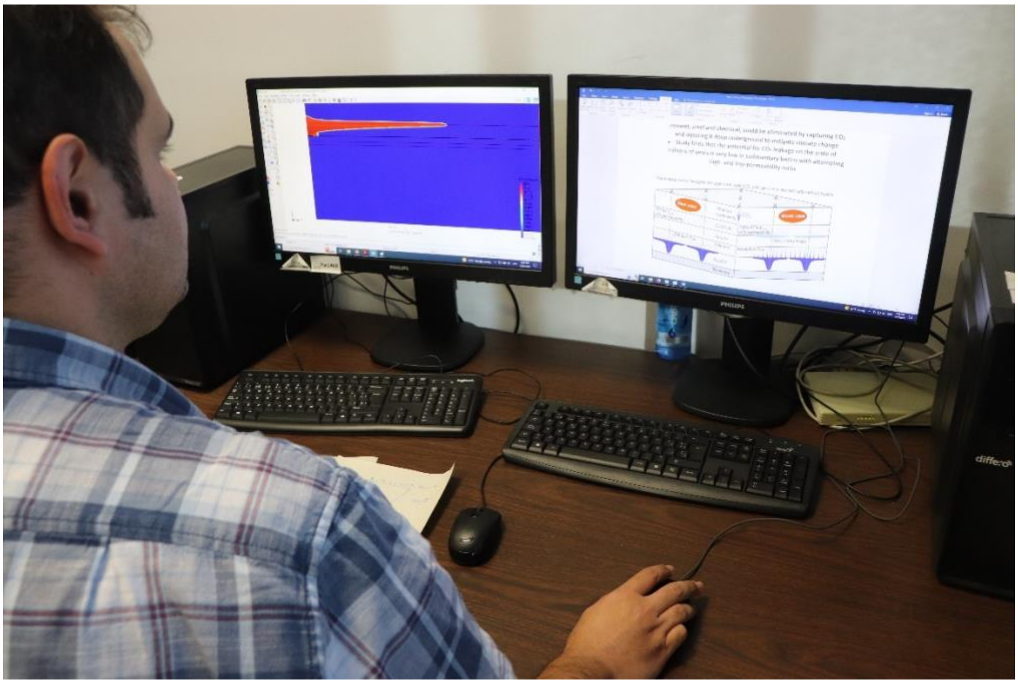
# A CSIC-led study shows that storing $CO_2$ underground is a safe technology to mitigate climate change

- **Researchers from IDAEA-CSIC and IMEDEA (CSIC-UIB) have developed a novel methodology to calculate the effects of injecting billions of tonnes of $CO_2$ underground over millions of years**

- **The study shows that there is a low risk of $CO_2$ leakage back to the surface, ensuring a safe technology to achieve carbon neutrality**



The computing methodology has shown that injecting billions of tonnes of $CO_2$ underground has a low risk of leakage back to the surface. Source: Alicia Arroyo

**Madrid / Barcelona, January 31, 2023.** A study led by the Institute of Environmental Assessment and Water Research (IDAEA) and the Mediterranean Institute for Advanced Studies (IMEDEA CSIC-UIB), both belonging to the Spanish National Research Council (CSIC), has shown that injecting billions of tonnes of atmospheric $CO_2$ (carbon dioxide) underground has a low risk of leakage back to the surface. According to the simulations, the $CO_2$ would remain deep in the subsurface for millions of years, even if the overlying low-permeability rocks were fractured. These results indicate that this technology, called geological $CO_2$ storage, can be safely undertaken to mitigate climate change.

The study, published in the journal *Geophysical Research Letters*, has been carried out in collaboration with the Lawrence Berkeley National Laboratory and the University of Illinois at Urbana-Champaign. This interdisciplinary research has developed a novel methodology to calculate the probability of $CO_2$ leakage considering billion tons of $CO_2$ injected underground over a time scale of millions of years, much larger than what had been investigated until now.

“The objective of $CO_2$ storage is to take this greenhouse gas from the hard-to-abate industry and inject it deep underground. For the gas to remain at depth, it must be injected into rocks with high permeability and porosity, such as sandstones. However, there is a risk of $CO_2$ leakage, as $CO_2$ is less dense than the saline water that fills the pores at great depth, so it can float upwards and leak back to the surface”, explains the IDAEA-CSIC researcher **Iman Rahimzadeh Kivi** and first author of the study.

To calculate the risk of $CO_2$ leakage, researchers predicted the gas flow to the surface after its injection at 1.550 m deep (the common depth to store the gas underground) using numerical transport models in two different scenarios.

“Our predictions show that, in the best-case scenario, when the underground rock properties remain intact, the $CO_2$ would only rise 200 m upwards after one million years. In our worst-case scenario, when the rocks present a large number of fractures, $CO_2$ would rise 300 m upwards”, indicates **Victor Vilarrasa**, researcher at IMEDEA-CSIC-UIB and principal author of the study. “This means that even in the worst possible scenario, the $CO_2$ would be indefinitely contained in the subsurface at 1250 m depth for millions of years”, highlights **Rahimzadeh Kivi**.

The authors highlight this study is relevant to increase confidence in the security of underground $CO_2$ storage to achieve carbon neutrality and mitigate the effects of the climate emergency. "The scenarios proposed by the Intergovernmental Panel on Climate Change (IPCC) to achieve zero emissions, and even net-carbon removal from the atmosphere, require geological $CO_2$ storage. And this study shows that permanent $CO_2$ storage can be safely achieved" concludes **Vilarrasa**.

This work has been developed in the framework of the project EASY GEO-CARBON (PCI2021-122077-2B) funded by the MCIN/AEI/10.13039/501100011033 and by the European Union NextGenerationEU/PRTR.

This result is also part of the GEoREST project that has received funding from the European Research Council (ERC) under the European Union’s Horizon 2020 research and innovation programme.

Grant agreement No. 801809

Kivi, I.R., Makhnenko, R.Y., Oldenburg, C.M., Rutqvist, J. and Vilarrasa, V., 2022. Multi-layered systems for permanent geologic storage of CO2 at the gigatonne scale. Geophysical Research Letters, 49 (24) e2022GL100443. DOI: 10.1029/2022GL10044

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