

A study from IDAEA-CSIC proposes an innovative method of CO₂ storage to mitigate climate change

- The study identifies for the first time the physical conditions of pressure and temperature that increase the safety of underground CO₂ storage
- These conditions are found in shallow volcanic areas
- With this methodology, each injection well could store CO₂ emissions equivalent to those produced between 75,000 and 1.1 million people



Volcanic area where the temperature and pressure conditions for the safe underground storage of CO₂ can be found | Source: Víctor Vilarrasa

Madrid / Barcelona, 1st December 2020. Researchers from the [Institute for Environmental Assessment and Water Research \(IDAEA-CSIC\)](#) and the Technical University of Freiberg, Germany, propose an innovative method to store CO₂ underground in a feasible and safe way. The work, published in the journal [Geophysical Research Letters](#), is proposed as a possible solution to mitigate the effects of climate change.

Carbon dioxide (CO₂) capture and storage is one of the strategies in the battle against global warming. This technology has been in development for 25 years, but there are still many challenges to address.

"Around 20% of CO₂ emissions come from industrial processes, such as cement, steel or ethanol production, which will continue to generate CO₂ even if all the energy they consume came from renewable sources", explains the researcher and author of the study Víctor Vilarrasa. To achieve carbon neutrality, this technology proposes to capture CO₂ and store it underground. This process, however, has a high risk of leakage. Employing current methods in porous and permeable rocks located between 1 and 3 km deep, CO₂ is less dense than water and floats. This is one of the main obstacles encountered in the CO₂ storage strategy.

Using analytical solutions and computer simulations, the recently published study demonstrates that CO₂ could be safely stored if injected into wells where supercritical conditions exist. Supercritical conditions are found where the temperature and pressure are above 374°C and 218 atmospheres, respectively. "In this state, the density of CO₂ is higher than that of water, so it sinks", clarifies Dr. Vilarrasa.

These conditions are found around 3-5 km deep in volcanic areas, and below 13 km in other areas. Drilling at 13 km is not technically possible at present, so volcanic areas seem to be a more feasible option. "We found out that each well could store emissions equivalent to those emitted between 75,000 and 1.1 million people", says the researcher.

Countries such as Spain (in the Canary Islands), Italy or Turkey, whose territories have volcanic areas, have great potential to develop this technology. In Iceland, they found these conditions in a volcanic area about 4.5 km deep in 2016, so the proposal seems realistic.

"However, many questions remain to be resolved, such as the development of techniques to locate areas with supercritical conditions, the risk assessment in volcanic areas, the improvement of drilling techniques and the adaptation of measurement devices to such high temperature", Víctor Vilarrasa points out.

This work is part of the [GEOREST](#) project, funded by the European Research Council, and whose objective is to develop a methodology to predict and mitigate earthquakes induced by fluid injection into the subsurface for the development of geothermal energy.

Francesco Parisio, Víctor Vilarrasa. **Sinking CO₂ in supercritical reservoirs**. *Geophysical Research Letters*, 47, e2020GL090456, [DOI: 10.1029/2020GL090456](https://doi.org/10.1029/2020GL090456)

Alicia Arroyo / IDAEA-CSIC Communication