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NOTA DE PRENSA

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It is a process that leads to the formation and destruction of continents

Relamination is described, a mechanism that has been shaping continents for billions of years

- The study redefines the evolution of continents and provides a framework for interpreting the geochemistry of major mountain ranges
- The fragments of crust that are buried during collisions help reconstruct the continents from the Earth's depths

Madrid, May the 5th,2026 An international team led by researchers from the National Museum of Natural Sciences (MNCN-CSIC) has identified a key mechanism that has shaped Earth's continents over billions of years. This mechanism is the deep re-lamination of subducted continental crust, a process that explains the origin of certain magmas and offers a new perspective on continental evolution from the Archean (between 3.8 and 2.5 billion years ago) to recent times. The study, published today in the journal Nature Geoscience, combines numerical geodynamic modeling and high-pressure experiments to unravel how fragments of continental crust can give rise to hybrid magmas that fuel major magmatic events following continental collisions, generating new crust..

During continental collisions, one plate sinks beneath another—a process known as subduction. This study demonstrates that the less dense crust breaks away from the subducted plate and rises again, becoming integrated into the lithospheric mantle of the overlying plate in a process called relamination. The relaminated material mixes mechanically with the mantle, creating a hybrid reservoir from which characteristic magmas emerge—known as post-collisional magmas—that form large granitic batholiths such as the Sierra de Gredos and Guadarrama in Central Spain. These processes, in which two continental masses collide, are what produce mountain ranges or orogens. "What we have learned from this research is why these magmas are found in both modern orogens and in formations dating back to the Archean," explains Daniel Gómez Frutos, a researcher at the MNCN who is currently working at the University of Portsmouth. "Our models show that relamination is a recurring process in continental collisions. Fragments of subducted crust do not disappear; they are reincorporated into the continent and leave a very clear chemical signature in the magmas produced millions of years later.new crust".

A model for simulating continental movements

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The team supplemented the numerical models with high-pressure, high-temperature melting experiments, in which they mixed varying proportions of peridotite (mantle) and continental crust, reproducing the physical interaction described by the simulations. "The results were conclusive: the experimental melts reproduce the geochemical signature of post-collisional magmas, primarily granitic; features that cannot be explained by simple mantle melting or by the differentiation of basaltic magmas," explains MNCN researcher Antonio Castro. An example of this type of magma is sanukitoids, a variety of granitic rocks with a high magnesium content found in environments at the margins of continental tectonic plates that have undergone collision processes. "The experiments make it clear that without the deep incorporation of continental crust, the magmas we observe in mountain ranges around the world cannot form.

The key lies in this intimate and solid mixing between re-laminated crust and mantle peridotite," says Castro. Relamination is an ancient driver of continental growth. The process described is currently active and has been fundamental since the dawn of plate tectonics. The presence of Archaean sanukitoids, which are very similar to modern post-collisional magmas, supports the idea that relamination was already occurring more than 2.5 billion years ago. In addition, the team has compiled global isotopic data for 87Sr (strontium) and 143Nd (neodymium) that demonstrate that post-collisional magmas retain the "memory" of the previously subducted crust. "Relamination not only explains where these magmas come from, but also offers a way to trace what type of crust was subducted in each past collision," notes Taras Gerya of ETH Zurich. "It is a direct window into the fate of those continents that, apparently, disappear upon colliding with others," he continues.

The work redefines our understanding of continental evolution and offers a mechanism that explains the reincorporation of crust, contributing to its expansion and rejuvenation. "Relamination allows us to understand why we find Archean and Proterozoic magmas in certain places, something we had previously been unable to explain," concludes Gómez Frutos.

The full paper includes high-resolution 2D numerical geodynamic simulations, piston-cylinder melting experiments, detailed geochemical analyses, and an extensive global database of post-collisional rocks. The study, led by Daniel Gómez-Frutos together with Antonio Castro, Attila Balázs, and Taras Gerya, was conducted by researchers from the MNCN-CSIC, ETH Zurich, and the University of Portsmouth.

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