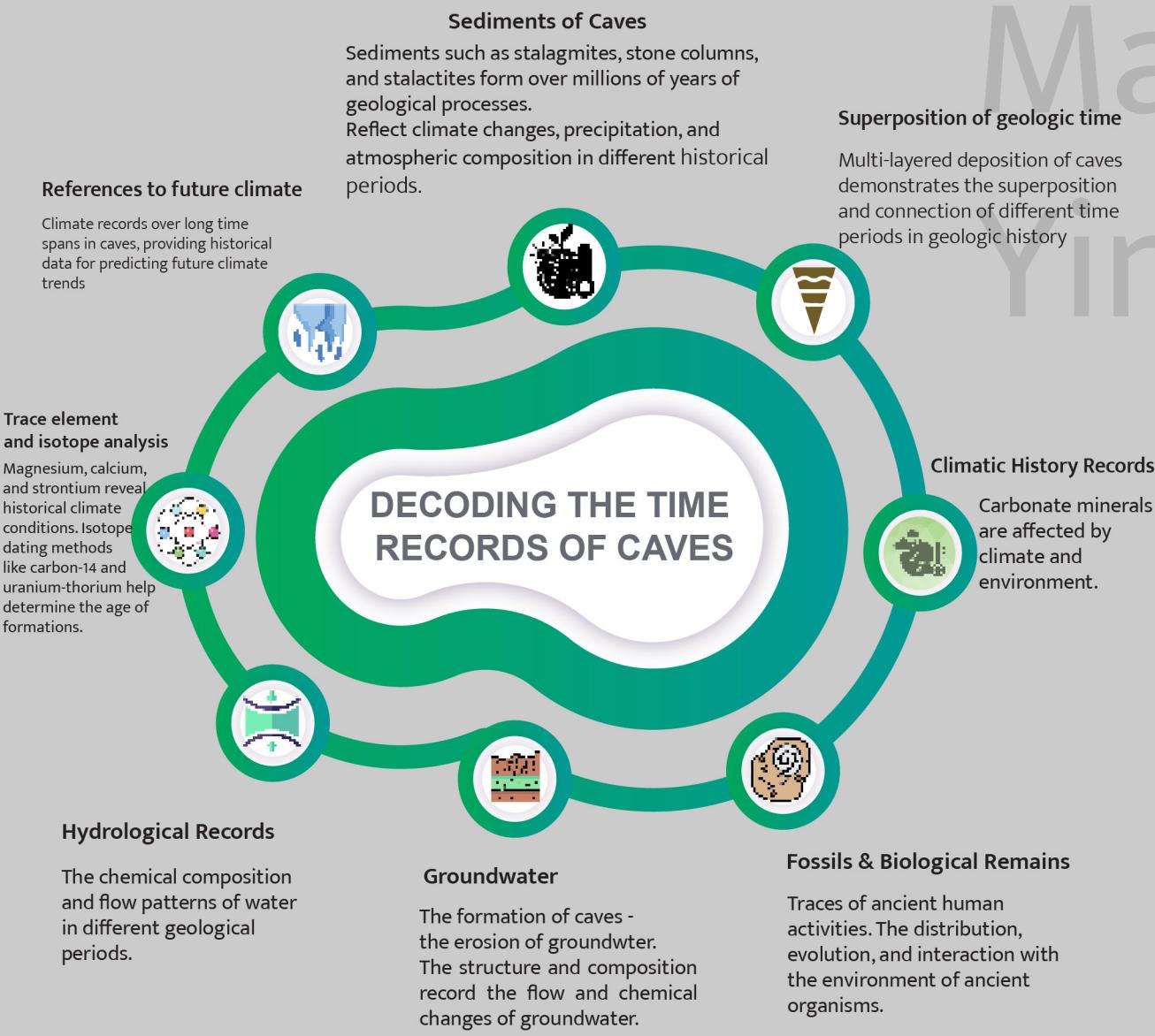


# BACKGROUND RESEARCH

Caves serve as natural archives, formed over millions of years, with each sediment layer representing a chapter in Earth's extensive narrative. This project aims to create a 'Time Archive' of geological structures, capturing the complexities of these underground environments.

These traces of time highlight the delicate balance between natural systems and human activity, revealing the intricate interactions among geological processes, climate patterns, and ecosystems across vast timescales.

## UNCOVERING EARTH'S PAST - RECORDS PRESERVED IN CAVES



# CAVE RESEARCH AND TECHNOLOGY

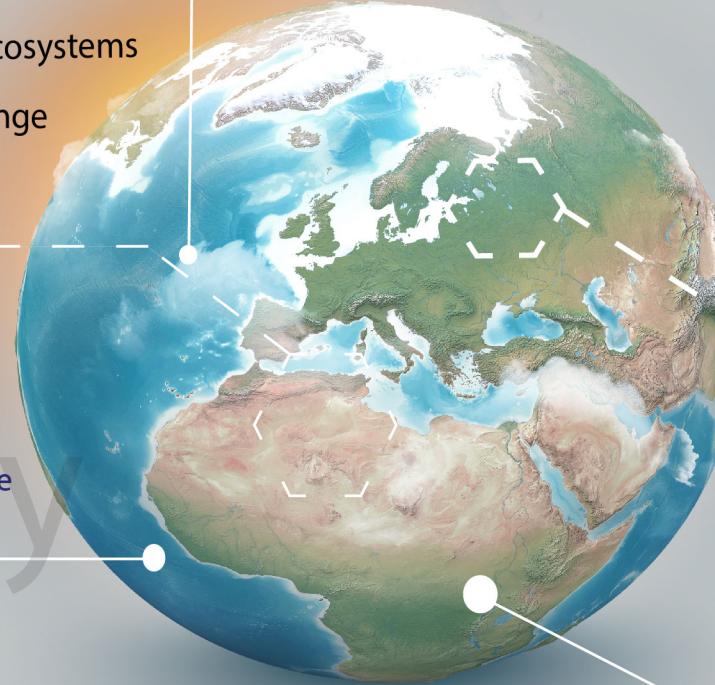
## EARTH SYSTEM INTERACTIONS

### Opportunities and Challenges in Cave Research

*Research data from the International Union for Conservation of Nature (IUCN), the National Speleological Society (NSS), and the Journal of Cave and Karst Studies.*

- \*Data Scarcity
- \*Uniqueness of Cave Ecosystems
- \*Threat of Climate Change to Cave Ecosystems

➤ Climate data is scarce for many remote regions, but caves can serve as natural archives of ancient climate information.



➤ Changes in temperature and humidity may disrupt the microenvironments within caves, impacting the species that depend on them. It is estimated that around 20% of cave species worldwide face survival threats due to climate change.

➤ Approximately 30% of species inhabiting caves are endemic, existing only in specific cave environments. Cave research can provide data to support the conservation of these unique ecosystems.

## POINT CLOUD DATA TECHNOLOGY

### Technological advancements in 3D scanning and isotopic analysis

Point cloud data, captured through high-resolution scanning technologies, provides detailed spatial models of cave structures (map geological formations, sediment layers, and mineral deposits accurately). Combined with isotopic analysis, these tools yield critical insights into geological processes, environmental resilience, and the effects of human activity on these delicate natural systems.

