

ABSTRACT
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The Geological Investigation of the Limestone Caves in South Korea

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The limestone caves in South Korea have been mostly developed within the Cambro-Ordovician carbonate rocks (the Joseon Supergroup), and there appears to be more than 1,000 caves in South Korea. The limestone caves in South Korea are distributed throughout the peninsula, however, most of them are concentrated in the eastern-central part of the peninsula.

Most of the caves have formed by the dissolution of groundwater along joints and bedding planes, and the strike and dip directions of the joints mostly dominate the development of the caves. So far known, the longest cave in South Korea is a Hwanseon Cave, which is about 10 km long. The deepest cave is the Yumundong Cave, which is ca 200 m deep.

The limestone caves in South Korea include a variety of speleothems such as soda straw, stalactite, stalagmite, column, curtain (and bacon sheet), cave coral, helictite (and heligmite), moonmilk, cave shield, cave bubble, cave raft, rimstone, shelfstone, cave pisolite, etc.. All the speleothems are composed of calcite or aragonite, or both. However, aragonite, calcite, gypsum, halite, hydromagnesite, huntite, and dolomite were reported within moonmilk. Textural examination reveals that the speleothems show a variety of microstructures. These are; 1) Normally oriented, isopachous fibrous texture, 2) Randomly oriented, fibrous texture, 3) Normally oriented, isopachous bladed texture, 4) Normally oriented, isopachous columnar texture, 5) Spherulitic fibrous texture, 6) Spherulitic columnar texture, 7) Equant texture, 8) Basket-weave texture, 9) Reel-like texture, and 10) Feathery texture. The difference in texture appears to result from the rate of crystal growth and the saturation state of fluids with respect to carbonate minerals (aragonite and calcite).

The speleothems, composed of aragonite, tend to show higher Sr compositions than calcitic ones, whereas Mg contents in aragonitic speleothems are lower. All the speleothems from different caves show distinctive Sr and Mg compositions, indication that the local supply of trace elements influenced on the trace element contents of the speleothems.

The oxygen isotopic compositions range from -9.4 to -4.0 per mil (vs. PDB). Considering the oxygen isotopic compositions of freshwater, the data suggest that the most of the speleothems formed in oxygen isotopic equilibrium except for some enriched aragonitic ones. The carbon isotopic values are highly variable from -10 to -5 per mil (vs. PDB), and these values are between the carbon isotopic compositions of the organic matter in overlying soil and the surrounding limestone. Using the simple mass balance equations, the influence by two end members is calculated.