

Porosity and permeability enhancement in unconfined carbonate aquifers as a result of dissolution.

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Solution processes in carbonate aquifers that are unconfined produce networks of channels. To characterize the enhancement of porosity and permeability by dissolution, we examine four examples that are highly contrasted in their lithologic characteristics and topographic settings:- a Paleozoic dolostone near Niagara Falls, Ontario; the Mill Hole basin in Paleozoic limestone in Mammoth Cave National Park, Kentucky; the Mesozoic chalk escarpments of southern England, and late Tertiary-Quaternary limestones of the Caribbean coast of the Yucatan Peninsula, Mexico.

In all four cases it is found that the channels add little to the bulk porosity but that they enhance the permeability of the fractured rock by one to three orders of magnitude. Similar porosity and permeability changes are predicted for all unconfined carbonate aquifers, limestone or dolostone, in both autogenic and allogenic settings, and in carbonate rocks of all ages.