Volume change behavior of arid calcareous soils

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Abstract: Arid climate, alkaline environment, and geology govern the formation and behavior of coastal calcareous sediments in the Arabian Gulf region. The presence of clay and nonclay minerals in these sediments causes geotechnical hazards of variable nature and intensity. Alternating volume change due to phase transformation and solubility of calcium sulfate adds to the severity of problems associated with the host expansive clay strata. Based on laboratory investigation, this paper gives an account of the volume change behavior of calcium sulfate-rich calcareous soils of eastern Saudi Arabia. Laboratory testing conducted on identical samples containing equal amounts of clay and anhydrous calcium sulfate shows that sample hydration leads to volume increase, whereas fluid permeation through the samples causes collapse under load. Volume decrease is more pronounced in an alkaline environment that favors easy removal of Ca2+ and SO42- ions.