Porosity and Permeability as a Function of Effective Stress (Depth) Through Resedimentation

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ABSTRACT

We find that compression index, C_c, and a reference void ratio at 1MPa, e_{ref}, of resedimented mixtures, composed of Boston Blue Clay (BBC) and silt, linearly increase with increasing clay fraction. Using these two linearizations we express void ratio (porosity) as a function of vertical effective stress and clay fraction. This allows us to predict compaction trend and, in combination with the geometric mean model (see other Schneider abstract), also effective permeability of any clay fraction versus vertical effective stress (depth). How porosity and permeability evolve in realistic sediment mixtures during burial are of critical importance for understanding the generation of overpressure and how mudstones seal CO_2 or hydrocarbons.

CLICK ON IMAGE FOR LARGER VIEW

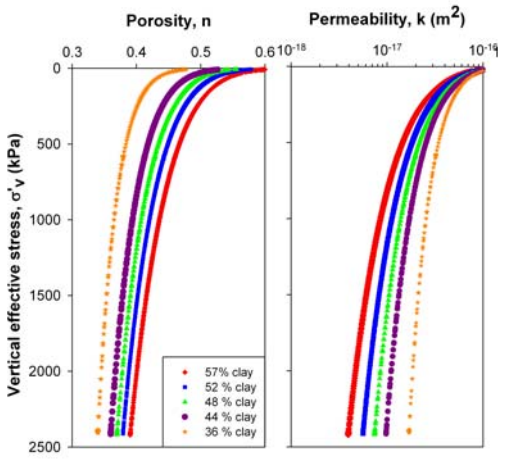
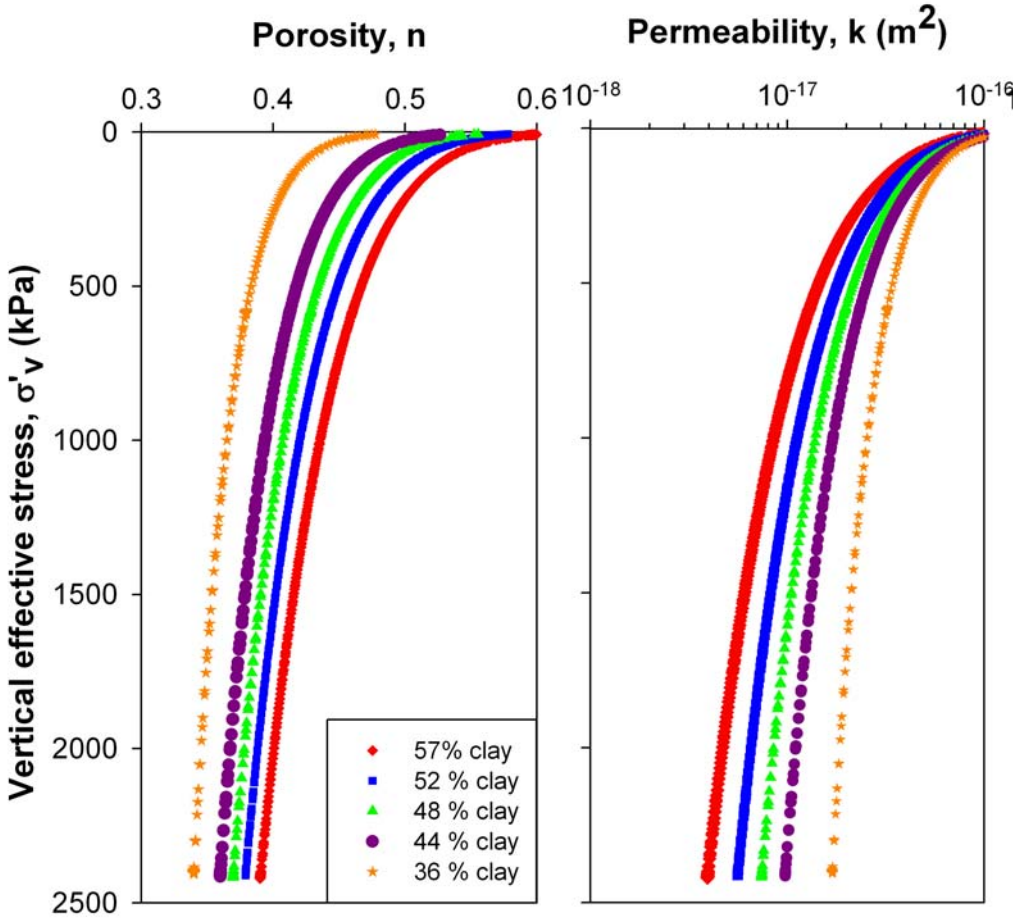


Fig. 1: Compaction trend and permeability decrease during burial of Boston Blue Clay (BBC) and silt mixtures. Diamonds (red) = 57 % clay (pure BBC), squares (blue) = 52 % clay, triangles (green) = 48 % clay, circles (purple) = 44 % clay, stars (orange) = 36 % clay. Percentages represent fractions of solid mass < 2μm.



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