

12.12: Numerical Modeling of Sedimentation and Compaction with Creep

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ABSTRACT

We developed a one-dimensional numerical model of sedimentation with creep to investigate the rock compaction behaviors during burial. In our creep model, void ratio is a function of both vertical effective stress and strain rate (Fig 1). Creep causes void ratio to continuously decrease with time at fixed effective stress. As a result, we predicted lower porosity with creep compared with no creep at the same depth (Fig 2). This difference increases with depth and effective stress at nearly drained conditions. In addition, creep leads to higher overpressure at deep depths. These findings are important for field pore pressure prediction.

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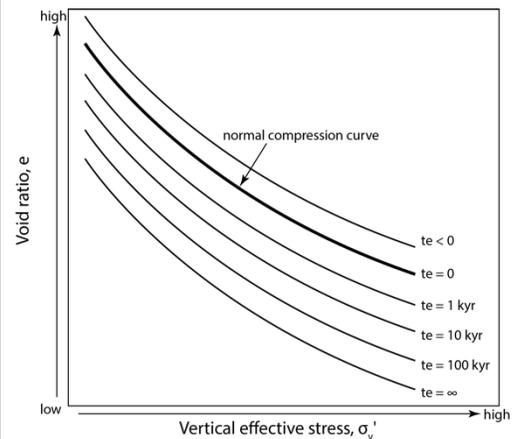


Fig 1: With creep void ratio is a function of both vertical effective stress and strain rate. t_e is equivalent time, which is different from real time or load duration. Lines of same t_e are lines of same strain rate.

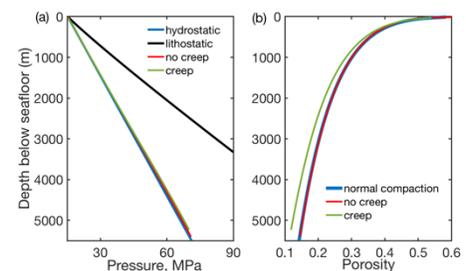


Fig 2: Predicted (a) pore pressure and (b) porosity distribution with depth. In Fig. 2a, the blue, black, red and green lines are the hydrostatic pore pressure, lithostatic pressure, predicted pore pressure with no creep and with creep, respectively. In Fig. 2b, the blue, red and green lines are the predicted porosity with hydrostatic pore pressure, with no creep and with creep, respectively.

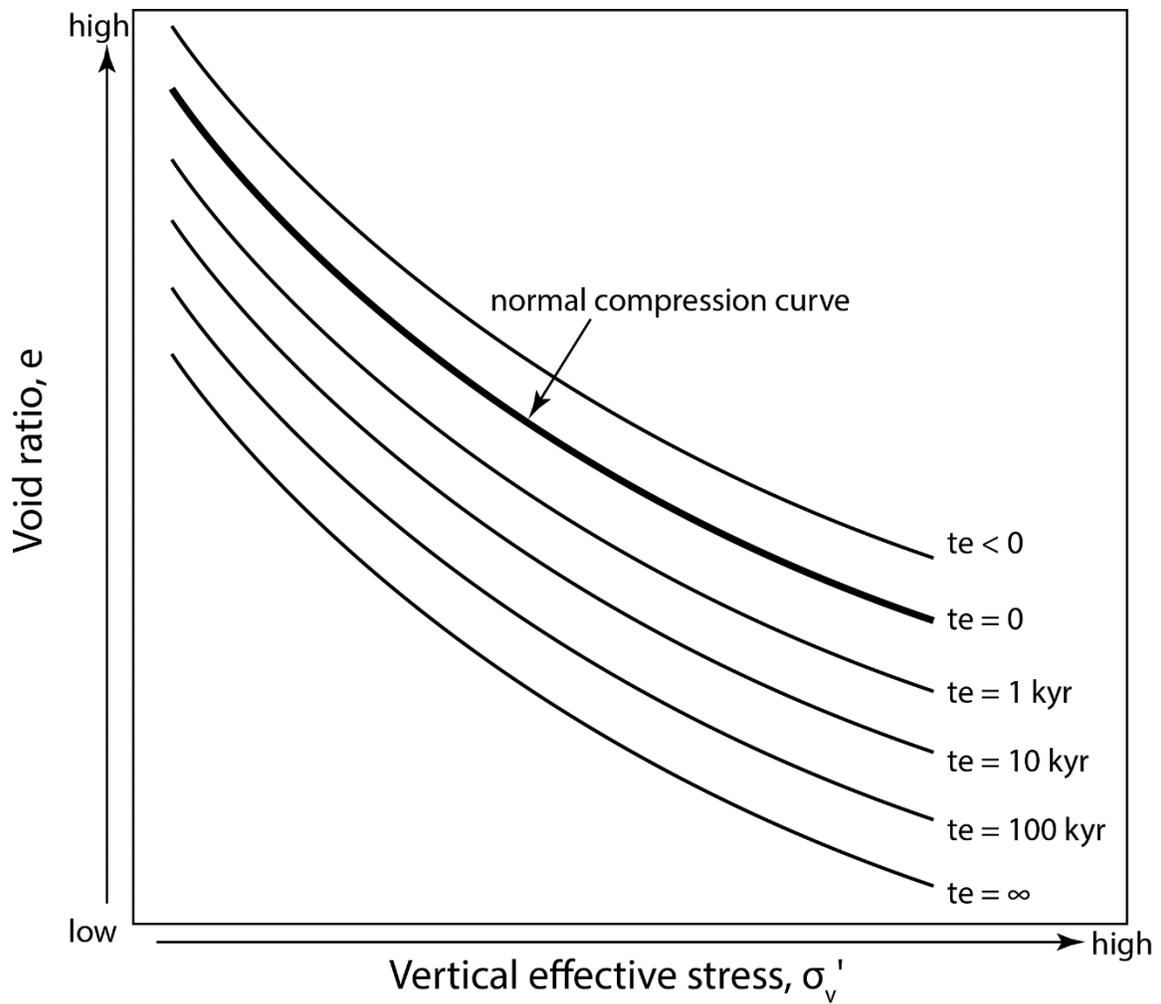


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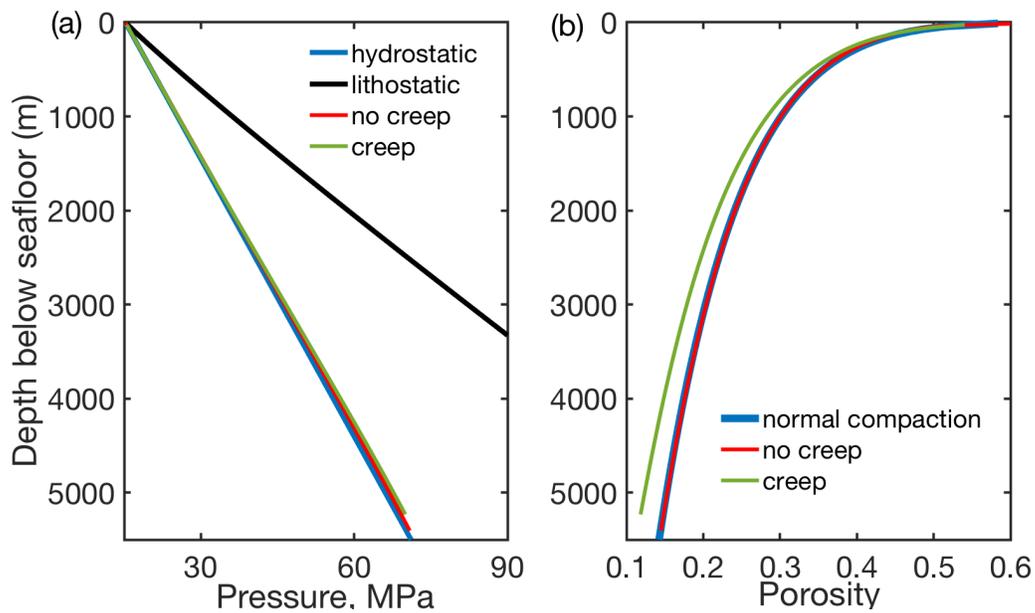


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