10.16: Velocity-based pressure prediction in Nankai thrust belt

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ABSTRACT

We have developed a generalized velocity-stress approach to predict stress and pore pressure in complex geologic settings. Our approach relates velocity to vertical effective stress incorporating the frictional resistance and compressibility of mudrocks. The velocity-stress relationship is a function of stress ratio K (ratio of minimum to maximum principal effective stress) to account for non-uniaxial stress states. We apply this approach to predict pressure in the Nankai fold-and-thrust belt (Fig. 2b). We divide the field into 3 zones (Fig.1, 2a): 1) the area in front of the wedge and the footwall, where the stress ratio is uniaxial (K=K_0); 2) the critical wedge, where the stress ratio is defined by the frictional resistance of mudrocks (K=f(ϕ)); and 3) the transition zone, where the stress ratio varies from its uniaxial to its critical-state value. Our method offers a unified workflow to predict pore pressure in fold-and-thrust belts as a function of the in-situ stress state.

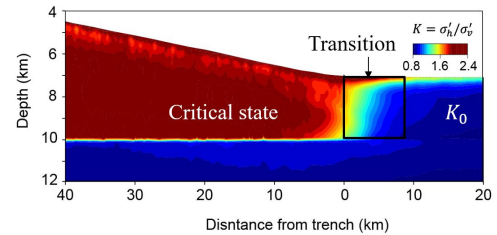**CLICK ON IMAGE FOR
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Fig. 1: Geomechanical model result illustrating variation of shear stress ratio from uniaxial to critical state value. Based on the values of the stress ratio, the thrust belt is divided into 3 zones: uniaxial, transitional and critical state.
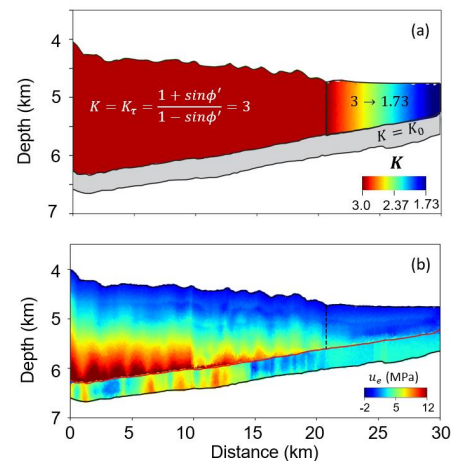

Fig.2: (a) Zones of uniaxial (gray), transitional (rainbow) and critical (red) stress states in the Muroto Tansect (Nankai fold-and-thrust belt). (b) Predicted overpressure (**u_e**) distribution.
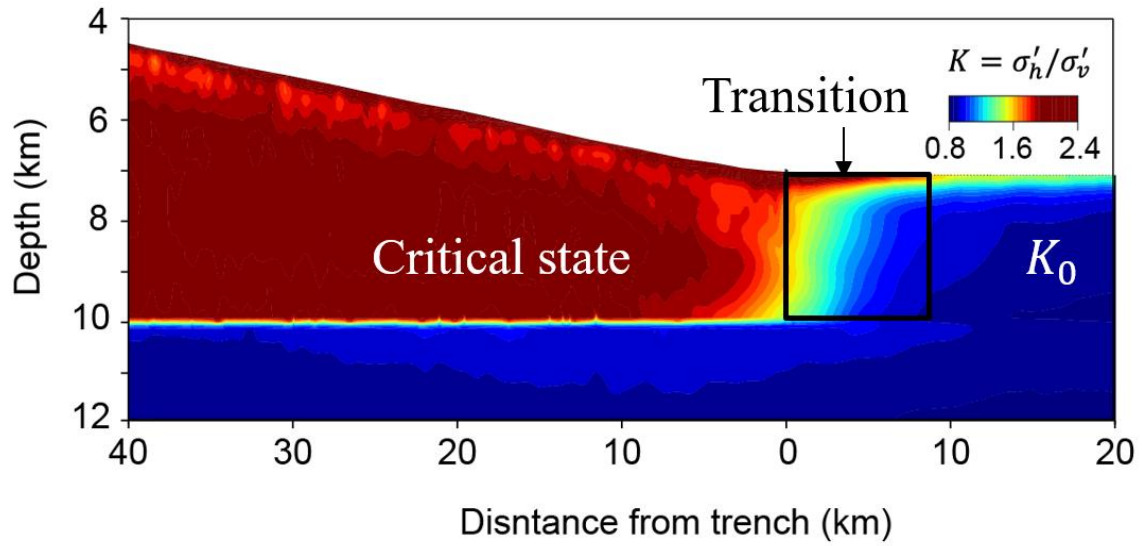
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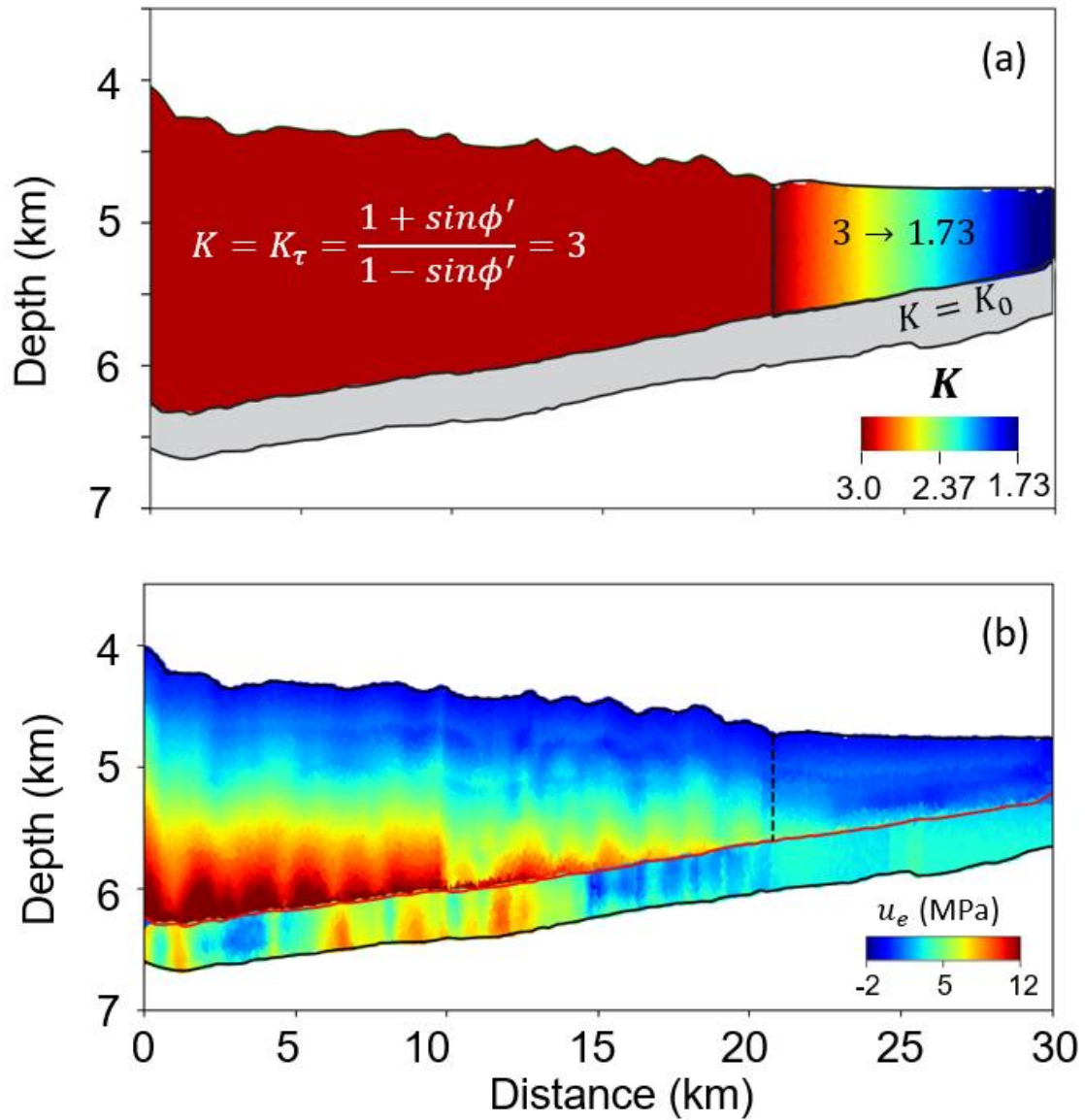
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