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Unusually fast waves in geomaterials with sliding layers

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Wave propagation in stratified geomaterials with sliding layers is strongly anisotropic. However the conventional anisotropic model is insufficient, as it does not take into account the layer bending, whose effect in the case of sliding layers can be significant. In particular, in a 2D situation three types of waves can propagate: the usual longitudinal and transverse (shear) waves and a new one – the rotational (bending) wave (in 3D there could be 2 rotational waves). The velocities of the longitudinal and transverse waves depend upon the direction of their propagation with respect to the layering. Opposite to this the rotational (bending) wave is strongly dispersive: its velocity increases proportionally to the wavelength, but marginally depends upon the propagation direction. A prominent feature of the rotational wave is its unusually high velocity that can be considerably greater than the velocity of longitudinal wave propagating in the material of the layers. This high velocity can be used in geophysics to distinguish the rotational waves. Furthermore, this property allows detecting areas of sliding.