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On the slow waves and oscillations in a terrestrial crust and seismoionospheric relations

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Abstract

Well-known stick-slip model with constitutive expressions of D. Dieterich (namely “rate and state friction law” giving the dependence of dry friction coefficient on sliding velocity along contacting surface) is involved again to explain the effect of generation of slow dissimilar motion or low frequency oscillations in fault zones occurring on the background of steady shift of fault sides. Beside these expressions, currently referred as “rate and state friction law”, energy exchange between fault zone and surrounding medium is taken into consideration in terms of auxiliary parameter of effective volume stiffness. So, the closed system of equations may be obtained and applied to establish “stick-slip” criterion versus parameters of fault zones, as that used initially. Stability analysis of this system (by Lyapunov technique) showed that long period oscillations can occur when a system is close the point of marginal stability, and the decrement (rate of damping) of oscillations is several times less than their frequency at least. Being occurred before strong earthquake such oscillations are able to contribute to generation of internal waves in atmosphere, which propagate to ionosphere (as it is described by piston model for its vertical extension). The effect of this oscillation also may be relevant to anomalies in electromagnetic waves of VLF range of frequency, which are running in wave guide between Earth surface and lower boundary of the ionosphere.

Keywords:

slow motion, blocks contact, dry friction,
instability criterion, oscillations frequency.

References

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