



Modelling of Observed Deformation in Lithosphere-Asthenosphere System During Aseismic Periods in Seismically Active Regions

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Occurrence of earthquakes in seismically active regions is repetitive in nature. Two major seismic events are separated by a long aseismic periods which were supposed to be static in nature even in a few decades ago. But, regular geodetic observations indicate that there are small ground deformations (strain of the order of 10^{-6} or even smaller) during these aseismic periods. Such deformations may be looked upon as the effects of the tectonic forces generated by the mantle convection on the lithosphere – asthenosphere system. In the present paper, a mathematical model has been developed incorporating in it, the essential features of the mechanism of the observed ground deformations under the action of such tectonic forces. The lithosphere - asthenosphere system has been represented by a multi – layered elastic / viscoelastic model. A vertical strike slip fault is taken to be situated either in the elastic / viscoelastic layers or in the viscoelastic half space which slips suddenly when the accumulated stress near the fault due to the action of the tectonic forces exceeds the frictional and cohesive forces across the fault. Suitable boundary conditions have been introduced noting that the strains at the surfaces of separation remain continuous under the action of the tectonic forces. Mathematical techniques have been developed for the solution of the resulting boundary value problem. Exact solutions for displacement, stresses and strains in the layers and in the half space are obtained both before and after the fault slip. The rate of stress accumulation in the near region obtained from this solution may be utilized in finding out the time to the next major seismic event and thus the results are expected to be useful in formulating an effective programme of earthquake prediction.