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Green's function approach towards modeling thermal anomaly of Eastern Anatolia High Plateau

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We present a robust semi-analytical approach for the solution of heat conduction equation by using Green's functions, where the complex geometries that might arise in geophysical applications are treated by using associated image series for applied boundary conditions. Since analytical models allow more control on the model and shed light to the physical process itself, this might be used instead of discretization based methods, such as finite differences and finite elements, that are more commonly used. Our approach can be particularly useful in basin analysis studies in which heat calculations need to be coupled with strain rate calculations. This method is also applicable to heat transfer issues in extensional regimes. A further advantage of the method is that it can treat discontinuous initial conditions which are very difficult to handle with discretized schemes such as finite differences. The algorithm is demonstrated by modeling the uplift of Eastern Anatolia High Plateau whose mantle lithosphere has been delaminated giving rise to a peculiar geometry in which a semi-elliptical lithospheric mantle cross-section has been removed and hot asthenosphere has filled the vacated volume. The thermoelastic evolution of the region is very much dependent on the heating by this unusually shaped heat source. In this work we show that we can model this and more complicated diffusive settings accurately using moderate CPU resources.