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Long term strength of the western part of Northern Anatolian Fault

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What can the GPS data and gravitational potential energies calculated under Airy isostasy assumption tell us about the long-term strength of various portions of the North Anatolian Fault (NAF) ? To what extent does the strength vary from east to west ? In this work we have tried to develop some approaches to attack these question by setting up an inverse problem to quantify the depth-integrated deviatoric stress field acting within the seismogenic portion of the crust. The solution method is standard, we solve the force balance equations where the forcing is simply the horizontal gradients in gravitational potential energy per unit area (GPE). This is equivalent to calculating the Green's function for the Stokes equations for a viscous, non-accelerating thin-sheet continuum. We then exploit the linearity of the problem to solve for the stress boundary conditions to reach a style match between the stresses and the strain rates (calculated using a GPS dataset) within the domain. In this preliminary work we assumed Airy isostasy and assumed no lateral density variations within the crust. Such strength calculations are obviously strongly dependent on the integration depth for the dynamical quantities. In order to keep the inversion as simple as possible our parametrization of the fault strength is solely based on the friction coefficient and long term pore pressure. One interesting outcome of our calculations is that, irrespective of the stress integration depth, the fault friction coefficients in the Marmara zone are larger than the rest of NAF to the east. As the stress integration depth increases, the zone that characterizes the "large friction" Marmara zone extends slightly to the east. Assuming a brittle-ductile transition depth of around 15-17 km, we see that the faults in western Turkey have friction coefficients of around 0.1-0.2 (under long-term hydrostatic pore pressure conditions) which is similar to most of California whereas in the eastern part of NAF the values are around 0.1 or less. Coincidentally, eastern portion of NAF is also characterized by less seismicity than the western portion. When we look at the fault strength, rather than solely the friction coefficient, we see a stronger variation in the rest of the NAF, strong Sinop zone being confined from the west and from the east by less strong zones.