Using math formulas to predict earthquakes

July 13 2020, by Bob Yirka

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A team of researchers at Lyell Centre in Edinburgh, has developed a way to use math formulas to help predict when an earthquake is likely to happen. In their paper published in *Journal of Geophysical Research: Solid Earth*, the group describes translating the movement of a particular type of rock to mathematical equations, which led to the creation of a

predictive formula.

A lot of time and effort has been spent over the past several decades trying to figure out a way to predict when a major earthquake will strike, but to date, such efforts have come up short. In this new effort, the researchers have taken another approach to the problem: using math.

The researchers began their effort with evidence that certain types of rock play a key role in earthquakes. They make up a group called phyllosilicates, and they form in sheets or plates. Earthquakes happen, theory suggests, when such rocks slide against one another. The researchers noted that frictional strength is a crucial factor in such slippage. It is defined as the force required to push one of the sheets or plates against another sheet or plate. And frictional strength is something that can be calculated. To come up with useful calculations, the researchers studied many samples of phyllosilicates and the ways in which they interact with one another under different conditions. They used what they learned to develop equations that would describe the behavior of such rock deep underground, where they could not be directly tested. Next, they factored in other variables such as humidity levels, fault movement and the speed at which the ground can move in fault zones. After much work with the equations, the researchers developed a formula that they believe can be used in real-world situations to predict when an earthquake might occur in a given location.

The researchers point out that their formula is still a work in progress, noting that scientists are still working out how phyllosilicates behave under different scenarios. As one example, they note that in some unusual places, phyllosilicates can actually stand in the way of earthquakes happening.

More information: J. Liu-Zeng et al. Postseismic deformation following the 2015 Mw7.8 Gorkha (Nepal) earthquake: new GPS data,

kinematic and dynamic models, and the roles of afterslip and viscoelastic relaxation, *Journal of Geophysical Research*: Solid Earth (2020). DOI: 10.1029/2020JB019852