A Study on the Enhancing Earthquake Frequency in Northern Pakistan: Is the Climate Change Responsible?

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In northern Pakistan, the collision between Indian and Eurasian plates has resulted in the formation of
many faults. The concentration of ruptures, in this regime, probably makes it sensitive to the localized
changes in the stress. The current climate changes have caused an increase in the rainfall and variation in
the mass of glaciers, present in the northern Pakistan. The rainfall and glacial runoff has potential to erode
and transport sediments thus can change the balance of load across faults. On the other hand, glacial mass
loss or gain also has potential of iso-static rebound or compression of crust, respectively. All these factors
have been observed in the northern Pakistan. The seismic data of the duration 1965 to 2004 has been obtained from Pakistan Meteorological Department (PMD) and the sedimentation data has been acquired from Tarbela Dam Project (TDP). The study indicates a gradual increase in the earthquake frequency for
the magnitudes 4.1-5.0(Mb). The epicental distributions show that these events gradually cluster in the
central Karakorum and Hindukush areas. The depth analysis suggests the earthquakes with the foci 0-60km are gathering in the central Karakorum and shocks with depth 0-120 are clustering in the Hindukush areas. The FMS study exhibits the dominance of normal faulting in the central Karakorum after 1999 and these characteristics do not correspond with behavior of previous mapped Raikot Fault,
lying in the vicinity. The known significant variables during the study period are the different geological
processes associated with climate change, which have potential to alter the load across faults and can
possibly result in enhancing earthquake frequency by releasing stresses at some local scale.

Keywords: Climate change, glacial mass change,, rising earthquake frequency

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