AOGS 2005

The role of seismogenic activities on the fluvial sediment flux of Gorgan-Rud River in the active Alborz mountain belt, NE Iran: A new approach to long-term earthquake prediction

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In the eastern Alborz Mountain, Gorgan-Rud River passes through the Gorgan-Rud watershed and discharges to the east of Caspian Sea, where build up the Gorgan-Rud delta. The catchment with an area of about 6210.26 km^2 constitutes one of the most fertile basins of the country, so that the river plays a credible role in the economic development of the region. The Gorgan-Rud River is characterized by an annual discharge of about 482.630 cms and length of 135 km, which extends from Alborz Mountain to the Caspian Sea. Average annual suspended load of the Gorgan-Rud River has been measured 2582.82 mcm, according to the collected data of more than 16 hydrologic stations from the upstream to the river mouth over the past 35 years. Whereas the highest suspended load fluxes typically occurred during the typhoons and high water discharge of the river, but reliable daily measurement over sufficiently long time reveals a reasonable temporarily increase of the sediment fluxes in rivers draining the epicentral regions after the seismogenic activities. Therefore, rapid bedrock and topographic relief uplift of the region due to seismic activities, which also trigger landslides under saturated conditions, enhance the denudation and erosion rate of the catchments. Although the pattern of erosion has changed over time in response to the migration of localized tectonic deformation, erosion rate of Gorgan-Rud watershed is estimated from modern river sediment loads. Modern, decadal erosion rates correlate with historical seismicity and storm-driven runoff variability.

According to the detailed temporal-spatial patterns of high suspended sediment flux of Gorgan-Rud River, prone areas of future earthquakes, where have not been associated with the catastrophic earthquakes, are suggested. In addition, by using erosion rate data we can improve our understanding of co-seismic sediment supply and onward transport in river channels.

In conclusion, not only anthropogenic activities such as construction of reservoir dams and typhoon but also seismogenic activities especially in the last decades have influenced the fluvial sediment fluxes of the Gorgan-Rud River. Thus, by determining locations and recurrence intervals of earthquakes a long-term forecast can be made and efforts can be undertaken to reduce seismic risk.

References

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