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Earthquake swarms and reactivation of seismicity associated with the 2015 Mw 7.8 Gorkha earthquake in Nepal.

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The earthquake activity of central Himalayas is monitored continuously since 1994 by the national seismic network of Nepal (NSC) comprising 21 seismic stations. Most of the recorded seismicity nucleates along the downdip-end of the locked fault segments of the Main Himalayan Thrust fault, the shallow dipping mega-thrust between Indian plate and Tibetan Plateau. After April 25, 2015, Gorkha earthquake, more than 40,000 events were located within the study area and there were 30462 events with ML$\geq$2.3, including 7 events with ML$\geq$6.0, and one large aftershock with Mw 7.3 on May 12, 2015. There is no clear evidence of foreshocks or other pre-seismic patterns. In 2018, the seismicity rate in the ruptured area is still about 5 times higher than the background seismicity before the Gorkha Earthquake. The Gorkha earthquake is the first large Himalayan earthquake allowing a detailed analysis of its aftershocks and the associated relaxation processes. The evolution of these aftershocks shows a general decrease in frequency and magnitude, with a general exponential relaxation trend following the post-seismic slip, as recorded by GPS stations, both being modulated by seasonal variations. In addition, several global reactivations and anomalous bursts of earthquakes, sometimes organized in clusters, have been observed from a few days to several years after the mainshock. Some of these clusters are located outside the rupture zone either in Nepal or on the southern part of the Tibetan Plateau. Most of them appear to be controlled by geological structural complexities of the Main Himalayan Thrust fault, but the temporal shift also suggests stress transfers and fluid diffusion. A peculiar swarm has initiated in August 2017 in the Himalchuli zone, about 20 km North-West of the rupture area with more than 6000 events in 3 months. This major swarm, which reactivated in 2018, is probably caused by fluid intrusion in the upper crust but it is still unclear if it can be linked with to the Gorkha Earthquake. These various patterns of seismicity are important to study to understand the seismic cycle and the seismic hazard in the Himalayas and constrain the location and occurrence probability of the next megaquake in the region.