PHYSICS-BASED RUPTURE MODELS FOR FAULT DISPLACEMENT ASSESSMENT OF SURFACE-RUPTURING EARTHQUAKES FOR NUCLEAR INSTALLATIONS

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Surface-rupturing faulting is usually expected from large earthquakes, but this phenomenon has been also observed in moderate earthquakes. The coseismic fault displacement associated to earthquakes can seriously compromise the safety of critical infra-structures located near faults, such as bridges, dams, pipelines, nuclear installations (NI) and nuclear waste repositories. The IAEA specific safety requirements (Site Evaluation for Nuclear Installations No.SSR-1, DS484) requires that the capability for surface faulting shall be assessed for the site of a NI. But current practices of fault displacement hazard assessments (FDHA) are in general very challenging and quite limited because recorded fault displacement data are very sparse, as such, at present very few empirical models with large uncertainty are available for this purpose. IAEA has already recognised this issue and currently is making the effort to implement the physics-based rupture modelling in practice for FDHA. These efforts have been discussed through different international working group activities, being the most outstanding two international workshops on Best Practices in Physics-based Fault Rupture Models for Seismic Hazard Assessment of Nuclear Installations (BestPSHANI) in 2015 and 2018. And currently we are writing an IAEA-TECDOC (Technical Document) on Probabilistic Fault Displacement Hazard Analysis (PFDHA) in Site Evaluation for Existing Nuclear Installations. In this TECDOC we are explicitly describing the use of physics-based dynamic rupture models for PFDHA. Here we discuss the feasibility of the use of Physics-based rupture models for FDHA and the current implementation in an IAEA-TECDOC, as well as we present couple of examples of fault displacement prediction of past earthquakes