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# Neotectonics in the SW Pannonian Basin: Active faults in the Bilogora area (NE Croatia) and assessment of their seismogenic potential

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Identification of recently active faults and characterization of their geometrical and kinematic properties represents important dataset in seismic hazard analyses. To assemble fault quantitative constrains, construction of subsurface structural models is used. Such models with defined three-dimensional properties of the identified faults and stratigraphic horizons yields crucial insights into structure formation mechanisms and deformation processes that can be used in assessments of the recent tectonics and hence seismic hazards. Our study area, the Bilogora area (c. 2300 $km^2$), represents transpressional structure along the SW margin of the Drava Depression in the Pannonian basin in Croatia. With initial uplift during Pliocene by tectonic inversion of NW-striking Drava Depression boundary normal fault, Bilogora area was finally uplifted in Quaternary in a range between 300 and 550 m. Still ongoing tectonic activity is evidenced by historical and instrumental records of moderate seismicity with the strongest earthquakes I=VI°-VIII° MCS; $3.5 \leq M_L \leq 5.6$ that are associated to proposed steeply NE-dipping, and S-SW dipping seismogenic structures characterized by strike-slip and reverse motions.

In this work we aimed to constrain major seismogenic sources and their seismogenic potential using construction of a 3D subsurface structural model and definition of fault and stratigraphic horizon geometry and kinematics. This involved in particular structural analysis of 72 seismic reflection sections and exploration well dataset using Schlumberger Petrel$^{TM}$ Seismic to Simulation software. Results show that 19 designed fault planes were identified as active faults during Plio-Quaternary time, both cross-cutting and offsetting Plio-Quaternary unconformity or deforming Plio-Quaternary strata above their tips forming fault-related folds in their hangingwalls. Vertical offsets along these faults are in range between 20-400 m, indicating a slip rate of $\leq$ 0.1mm/year. With application of empirical geometrical fault-scaling relationships (RA and RLD) we estimate that some of these faults could generate earthquakes with magnitudes up to 6.8. Using computed magnitude values we assumed that identified faults could also accommodate average and maximal coseismic surface displacements up to 0.80 and 1.35 m, respectively. Considering importance of the assessment of precise locations of active fault surface traces and their correlation with the seismicity distribution in the study area we also conducted preliminary near-surface strata 2D GPR profiling at six locations. Reflection patterns, radar facies and truncations indicate near surface deformation at four locations with vertical displacements of $\leq$ 1 m. At two sites, profiles did not show truncation of near surface strata, however, elevation difference of about 10 m between identified paleostream channels along one of the profile could pinpoint uplift accommodated by a mapped fault. These results indicate recent fault activity in the Bilogora area which should be tested by paleoseismological investigations.