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Update of the tectonic model for the Pannonian basin: a contribution to the seismic hazard reassessment of the Paks NPP (Hungary)

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The planned construction of two new units at the site of the Paks NPP requires a comprehensive site investigation including complete reassessment of the seismic hazard according to the Hungarian as well as international standards. Following the regulations of the Specific Safety Guide no. 9 (IAEA 2010), the approved Hungarian Geological Investigation Program (HGIP) includes integrated geological-geophysical studies at different scales.

The regional study aims at to elaborate a new synthesis of all published data for the whole Pannonian basin. This task is nearly completed and the main outcomes have already been published (Horváth et al. 2015). The near regional study is in progress and addresses the construction of a new tectonic model for the circular area with 50 km radius around the NPP using a wealth of unpublished oil company seismic and borehole data. The site vicinity study has also been started with a core activity of 300 km^2 3D seismic data acquisition, processing and interpretation assisted by a series of additional geophysical surveys, new drillings and geological mapping.

This lecture will present a few important results of the near regional study, which sheds new light on the intricate tectonic evolution of the Mid-Hungarian Fault Zone (MHFZ), which is a strongly deformed belt between the Alcapa and Tisza-Dacia megatectonic units. The nuclear power plant is located at the margin of the Tisza unit near to the southern edge of the MHFZ. Reassessment of seismic hazard at the site of the NPP requires better understanding of the Miocene to Recent tectonic evolution of this region in the central part of the Pannonian basin.

Early to Middle Miocene was a period of rifting with formation of 1 to 3 km deep half-grabens filled with terrestrial to marine deposits and large amount of rift-related volcanic material. Graben fill became strongly deformed as a consequence of juxtaposition of the two megatectonic units leading to strong compression and development of large scale transfer faults due to differential movements. The beginning of Late Miocene saw an event of basin inversion resulting in uplift and remarkable erosion of the synrift strata. Pliocene through Quaternary has been a period of gradual change in the regional stress field and formation of a series of basin-scale sinistral strike-slip faults usually by reactivation of half-graben bounding normal faults.

A most important subject of the HGIP for seismic hazard assessment of the Paks NPP is to determine the timing and amount of displacement of this fault system, as well as its potential capability in the vicinity of the site.

References:

IAEA (2010): Seismic hazard in site evaluation for nuclear installations. International Atomic Energy Agency Safety Standards, SSG-9, Vienna, p. 60.

Horváth, F. et al (2015): Evolution of the Pannonian basin and its geothermal resources. Geothermics, 53, 328-352.