3D brittle and lithological models of Olkiluoto

M. Paananen[1]*, S. Paulamäki[1], J. Engström[1], I.aaltonen[2], J. Mattila[2], P. Kosunen[2], S. Gehör[3], A.Kärki[3]and K.Front [4]

[1]*Geological Survey of Finland*
*(*correspondence: markku.paananen@gtk.fi)*
[2]*Posiva Oy*
[3]*Kivitieto Oy*
[4]*VTT*

In Finland, Posiva Oy is preparing for the final disposal of spent nuclear fuel waste deep in the crystalline bedrock. As a result of extensive site selection programme and preliminary and detailed site investigations, Posiva proposed Olkiluoto as the site of the final disposal facility. In December 2000, the Government made a decision in principle in favour of the project, and in May 2001, the Parliament ratified the Government's policy decision. From that on, the investigations have been focused solely on Olkiluoto.

The geological and geophysical studies at Olkiluoto have been continued over 20 years. In addition to extensive geological mappings, a wide range of geophysical methods, including airborne, ground and drillhole surveys in 57 deep drillholes have been applied. As a part of the investigations, an underground rock characterisation facility, the ONKALO, was constructed at Olkiluoto over the period from 2004 to 2012.

The geological and geophysical investigations have resulted in 3D geological model of the Olkiluoto site. The geological model consists of four sub-models: the lithological model, the ductile deformation model, the brittle deformation model and the alteration model. This paper introduces two sub-models, the lithological and brittle model of the site. The lithological model presents the general lithological properties of definite rock volumes or units that can be defined on the basis the migmatite structures, textures and modal compositions. The model is aimed to describe the spatial distribution of genetically related bedrock units, which have sufficiently constant properties. The brittle deformation model describes the products of multiple phases of brittle deformation, fault zones and other fractures. The model shows the localities and orientations of specific brittle fault structures and is aimed to illustrate all significant fractures created by long-lasting evolution of brittle deformation.