



Advanced seismic microzoning of the complex sedimentary basin of Martigny (Switzerland) by two-dimensional Aki-Larner method and three-dimensional spectral-element method.

Florent de Martin, Corinne Lacave, Emmanuel Chaljub, Jean-Daniel Rouiller

► To cite this version:

Florent de Martin, Corinne Lacave, Emmanuel Chaljub, Jean-Daniel Rouiller. Advanced seismic microzoning of the complex sedimentary basin of Martigny (Switzerland) by two-dimensional Aki-Larner method and three-dimensional spectral-element method.. Workshop Numerical Modeling of Earthquake Motions: Waves and Ruptures, Faculty of Mathematics, Physics and Informatics, Comenius University Bratislava and Geophysical Institute, Slovak Academy of Sciences, Bratislava, Jul 2015, Bratislava, Slovakia. hal-01142180

HAL Id: hal-01142180

<https://brgm.hal.science/hal-01142180>

Submitted on 14 Apr 2015

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

ADVANCED SEISMIC MICROZONING OF THE COMPLEX SEDIMENTARY BASIN OF MARTIGNY
(SWITZERLAND) BY TWO-DIMENSIONAL AKI-LARNER METHOD AND THREE-DIMENSIONAL SPECTRAL-
ELEMENT METHOD

Florent De Martin* - Corinne Lacave** - Emmanuel Chaljub*** - Jean-Daniel Rouiller****

*BRGM, French Geological Survey
3 av. Claude-Guillemin - BP 36009, 45060 Orléans Cedex 2, France
f.demartin@brgm.fr

**Résonance Ingénieurs-Conseils SA
21 rue Jacques Grosselin, 1227 Carouge, Suisse
corinne.lacave@resonance.ch

***ISTerre, Université J. Fourier
BP 53, 38041 Grenoble Cedex 09, France
Emmanuel.Chaljub@ujf-grenoble.fr

****CREALP
Rue de l'industrie 45, CH-1951 Sion, Suisse
jean-daniel.rouiller@admin.vs.ch

The region of Martigny (Valais, Switzerland) is located at the confluence of two ancient Alpine glaciers: the Rhone and Dranse glaciers. Such a confluence had for consequence the creation of a deep, steep-sided and complex three-dimensional (3D) valley reaching 1 km depth and spreading 3 km wide (at maximum, see Figure 1). The valley is filled with quaternary sediment formations whose shear-wave velocity structure has been determined by geophysical campaigns performed during former projects (e.g., geothermal prospection): the shear-wave velocities range from 250 m/s at the shallowest formation to 1350 m/s at 1 km depth. The underlying seismological bedrock's shear-wave velocity has been approximated to 3000 m/s. In order to determine elastic response spectra for the future seismic microzoning of the region, the "Centre de Recherche sur l'Environnement Alpin" (CREALP) mandated three institutes to perform two- and three-dimensional advanced numerical seismic wave propagations to quantify the complex basin's seismic response and its associated uncertainties. This presentation aims at showing: i) the semi-automatic meshing/refining technique developed for arbitrary 3D sedimentary basin surrounded by steep topography, ii) the medium homogenization technique to include arbitrary 2D sediment/bedrock interface in a 3D finite-element mesh and iii) the results obtained by a 2D Aki-Larner method code and two spectral-element method codes (SPECFEM3D and EFISPEC3D).

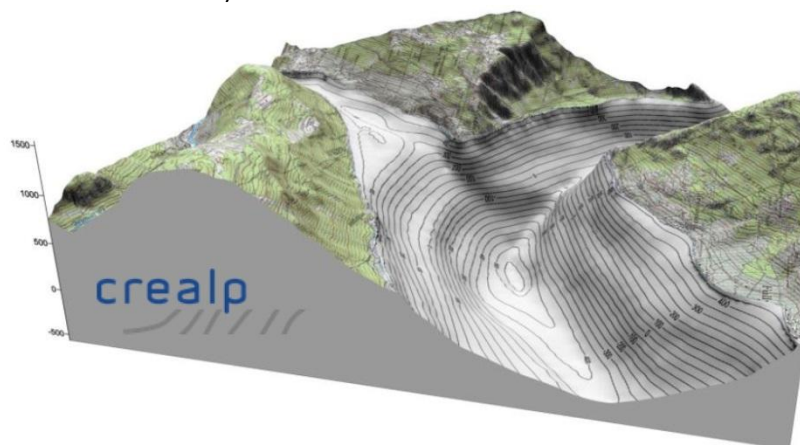


Figure 1: 3D view of the deep steep-sided basin of the region of Martigny.