Geophysical Research Abstracts
Vol. 13, EGU2011-11794, 2011
EGU General Assembly 2011
© Author(s) 2011

Heterogeneities in near-surface geological settings and seismic velocity distribution: a case study from the Paris Basin, France.

Paola Sala (1), Adrian Pfiffner (1), Bradley Birkelo (2), and Oscar Quezada (2)
(1) Institut für Geologie, Bern, Switzerland (sala@geo.unibe.ch), (2) Spectraseis AG, Zürich, Switzerland

A detailed near-surface mapping and 3D model building project was initiated over an area of the Paris Basin near Chémery, France as part of a larger project investigating the use of low-frequency (LF) passive seismic data to map reservoir fluid parameters in an underground gas storage reservoir. The purpose of the near-surface mapping was to develop a 3D geologic model focused on the upper 100 m. The model could then be used to test for the impact of the near-surface geology on the earth's ambient wave field recorded at the surface by the LF seismic survey.
Work for this project consists of compiling publicly-available geologic data, field mapping and sample collection, defining a near-surface stratigraphic and structural framework, and population of the framework with interval velocities. Data available publicly from Bureau de Recherches Géologiques et Minières (BRGM) includes lithology logs, shallow borehole velocity data, and a published geologic map and stratigraphic column (Fleury, 1997). From these data, a series of shallow wells reaching the top of the Cenomanian chalks was studied in order to document horizontal and vertical lithologic variations, to delineate the structural setting of the area, and to understand the variation of the velocity with depth.
Field work was focused on collecting samples of the different lithotypes, documenting the outcrops in the area, and mapping the surface geology across the site. Only a few rock samples could be collected in the immediate project site due to scarcity of outcrops and mature cultural development in the area. Good quality outcrops were available 20 km south of the area in calcareous cliffs near the Cher River and these served to refine the correlations and the lithology descriptions for the near surface. Rock samples collected will be analyzed for geologic and geophysical parameters and the BRGM lithology logs will be interpreted based on the observed relationships.
Our study of the well data revealed that the near surface stratigraphy is particularly complex, owing to rapid lateral changes and to erosional gaps in the record. The areal distribution of the near-surface lithology points to the existence of paleotopography at the Chémery site. A local high with a core of Cretaceous rock was recognized in the published BRGM data, overlain by a detrital Eocene-aged cap (Fleury, 1997). On the flanks of the main structure, the near-surface geology includes Miocene sediments not recognized on top of the structure. Near-surface mapping is complicated by variable-thickness weathered chalk and local resedimentation of the weathered chalk from topographic highs. Our cross-sections show faults not mapped at the surface, but that can be correlated with a deeper fault system recognized in previously acquired seismic data (Fleury, 1997).
The final 3D model with the detailed near-surface geologic framework will be populated with velocity data calculated from the shallow boreholes and from the geophysical analysis of the collected samples. The final 3D model will serve as an important tool to analyze the LF seismic data recorded at this site.

References
Fleury, 1997 - Carte géologique de la France. Notice explicative de la feuille Romorantin à 1/50000