# 3-D Geological Maps: A Pioneering Tool for Underground Geology

**Damien Dhont[1], Pascal Luxey[2], and Janine Somma[3]**
[1] CNRS- UMR 5212: Modélisation et Imagerie en Géosciences - Pau, CURS-IPRA, Université de Pau et des Pays de l'Adour, avenue de l'Université, 64013 Pau cedex, France
[2] Dynamic Graphics Inc., 1015 Atlantic Avenue, Alameda, CA 94501-1154, USA
[3] Laboratoire de Télédétection, Département de Géographie, FLSH, Université Saint Joseph, BP175 208 Beirut, Lebanon

Modern geology needs accurate representation of underground volumes. Because 3D geological modelling has been so far based on the interpretation of expensive 2D and 3D seismic surveys for the oil industry, it has not been much used in water exploration and exploitation. We present a way to generate accurate and efficient 3D geological maps using already existing and inexpensive data sets, in a context of fresh water management in the Beirut watershed (Lebanon). Our approach is based only on surface information coming from a published geological map, remotely sensed data, and a Digital Elevation Model (DEM). In order to generate the 3D geological map, we used a 3D geological modeller that combines and extrapolates the surface information into a coherent 3D data set, to represent volumes. We also simulate the porosity of one potential aquifer as an example of a method to quantify groundwater reserves.

Middle East and North African regions are recognized as the driest and most water scarce in the world. This lack of water is increasingly affecting economic and social development. This area represents 5% of the world population with less than 1% of available world's freshwater resources. While conventional water availability remains relatively constant, the demand is increasing sharply as a result of population growth, increase in household income, and irrigation development. To meet this increasing demand, groundwater is being extracted well beyond the renewal rate. Knowledge of underground geology, directly linked to underground water resources, is therefore a key factor for industrial growth and social welfare. It will soon become crucial in societies under development. Our pioneering technique provides for the first time a unique way to qualify and quantify fresh water reservoirs, allowing decision makers to plan ahead for appropriate water exploitation.

Key words : 3D, modelling, water, resources