

File : C1 – Journal articles

Journal Articles

The material listed below has been collected by Matt Steffan and Andy Banas, Engineering Geology students of Prof. Scott Burns at Portland State University (USA) in the framework of a students assignment. The material has not yet been screened and commented nor approved by the C16 chair and membership

1. Preparation of land use planning model using GIS based on AHP: case study Adana-Turkey

Journal	Bulletin of Engineering Geology and the Environment
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Pages	235-245

Sule Tudes¹  and **Nazan Duygu Yigiter²** 

- (1) Gazi Universitesi, Muhendislik Mimarlik Fakultesi, Sehir ve Bölge Planlama Bolumu, 06570 Maltepe, Ankara, Turkey
- (2) Haymana Yolu 12. km, 06830 Golbasi, Ankara, Turkey

Abstract

An environmental and earthquake sensitive planning approach requires a suitability evaluation based upon geo-environmental analysis before the planning phase. In land use evaluation analysis the local data from different disciplines must be synthesized as the priority and importance of the geo environmental criteria change according to the use of the site. Geographical information systems (GIS) using multiple criteria methods allow the determination of priorities and the importance of local/non-local data for the most efficient use of land. In this study six land use categories of Adana, one of the most earthquake prone provinces of Turkey, were determined by the use of an analytical hierarchical process (AHP) and GSI. These are high rise blocks, multi storey buildings, low storey buildings, industrial sites, waste disposal sites and green land.

2. Property attribution of 3D geological models in the Thames Gateway, London: new ways of visualising geoscientific information

Journal	Bulletin of Engineering Geology and the Environment
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Pages	1-16

K. R. Royse¹ , **H. K. Rutter¹** and **D. C. Entwisle¹**

- (1) British Geological Survey, Kingsley Dunham Centre, Keyworth, Nottingham, UK

Abstract

Rapid developments in information technology and the increasing collection and digitisation of geological data by the British Geological Survey now allow geoscientists to produce meaningful 3D spatial models of the shallow subsurface in many urban areas. Using this new technology, it is possible to model and predict not only the type of rocks in the shallow subsurface, but also their engineering properties (rock strength, shrink-swell characteristics and compressibility) and hydrogeological properties (permeability, porosity, thickness of the unsaturated zone or the likelihood of perched water tables) by attribution of the 3D model with geological property data. This paper describes the hydrogeological, engineering and confidence (uncertainty) attribution of high resolution models of the Thames Gateway development zone (TGDZ), east of London, UK, and proposes a future in which site investigation sets out to test a pre-existing spatial model based on real data rather than a conceptual model.

3. Review of approaches to mapping of hazards arising from subsidence into cavities

Journal	Bulletin of Engineering Geology and the Environment
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Issue	Volume 69, Number 2 / May, 2010
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Brian R. Marker¹ 

(1) 40 Kingsdown Avenue, London, W13 9PT, United Kingdom

Abstract

This is one of a series of papers presenting results of work by IAEG Commission No. 1 Engineering Geological Maps, on hazard mapping. Subsidence into cavities is a major constraint to development in many areas leading to damage and, sometimes, loss of life. Many events relate to former mining but subsidence associated with karst is also widespread. Proper assessment of hazard and risk is needed to safeguard property and investment and has an important part to play in planning the location and design of new development and site investigations. Documentation maps and inventories of information are an important starting point but interpretative maps are needed to assess the full extent of the potential hazard. Many decisions have to be made by planners and developers who may not be trained in geoscience thus simplified maps are needed to alert them to potential problems and to the need to seek expert advice as well as providing a basis for prioritizing rehabilitation initiatives. To date, few published studies address the issue of risk mapping.

4. Lineament mapping and its application in landslide hazard assessment: a review

Journal	Bulletin of Engineering Geology and the Environment
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Pages	215-233

M. F. Ramli¹ , **N. Yusof**¹, **M. K. Yusoff**¹, **H. Juahir**¹ and **H. Z. M. Shafri**²

(1) Department of Environmental Sciences, Faculty of Environmental Studies, Universiti Putra Malaysia, 43400 Serdang, Malaysia

(2) Department of Civil Engineering, Faculty of Engineering, Universiti Putra Malaysia, 43400 Serdang, Malaysia

Abstract

This paper presents an overview of the use of lineaments in landslide hazard mapping. The lineaments are normally derived either from aerial photographs or satellite imagery. The relative advantages and disadvantages of digital image processing and manual (visual) lineament interpretation are discussed. Most researchers prefer the manual technique, despite the fact it is more time-consuming and subjective, as it allows a higher degree of operator control. Ways of increasing objectivity in the interpretation are suggested. It is hoped that lineament mapping will increasingly be incorporated in landslide hazard assessment hence the paper emphasizes the need for care and a proper understanding of these methods and their limitations.

5. An application of the interaction matrices method for slope failure susceptibility zoning: Dogankent settlement area (Giresun, NE Turkey)

Journal	Bulletin of Engineering Geology and the Environment
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Issue	Volume 67, Number 3 / August, 2008
Pages	375-385

Nurcihan Ceryan¹  and **Sener Ceryan¹** 

(1) Gümüşhane Engineering Faculty, Department of Geological Engineering, Karadeniz Technical University, 2900 Gumushane, Turkey

Abstract

Large-scale instability phenomena frequently occur in slopes in such geologically complex areas as Dogankent in NE Turkey. This study presents an application of the interaction matrices (IM) methodology, as a semi-qualitative method sensitive to large-scale slope instability. For both rock and soil slopes, the main interactive factors were distance from faults, degree of weathering and slope angle. Using IM, a slope failure susceptibility map was created for the Dogankent area and checked against field evidence. The results indicated that IM could be a useful method for slope stability assessment.

6. GIS-based landslide hazard zonation: a case study from the Parwanoo area, Lesser and Outer Himalaya, H.P., India

Journal	Bulletin of Engineering Geology and the Environment
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Issue	Volume 67, Number 1 / February, 2008
Pages	129-137

Mukta Sharma¹  and **Ravindra Kumar¹** 

(1) Centre of Advanced Study in Geology, Panjab University, Chandigarh, India

Abstract

GIS-based landslide hazard zonation has been carried out for a tectonically active region of the Himalayas, which is under pressure for rapid economic development. Thematic layers of slope, fault, geology, land use, flow accumulation, drainage and roads were prepared based on topographic maps, satellite imagery, published geological maps and ground truth. Five classes of landslide hazard were identified; 24% of the total area falls into the Very high or High hazard zones where 54% of the observed landslides were recorded.

7. Engineering geological approach to the evaluation of seismic risk in metropolitan regions: case study of Patras, Greece

Journal	Bulletin of Engineering Geology and the Environment
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Pages	219-235

G. Koukis¹, N. Sabatakakis¹✉, G. Tsiambaos² and N. Katrivesis¹

- (1) Department of Geology, Section of Applied Geology and Geophysics, University of Patras, 26500, Patras, Greece
- (2) Department of Geotechnical Engineering, National Technical University of Athens, 9 Polytechniou Street, 15780 Zografou, Athens, Greece

Abstract

The city of Patras in western Greece has experienced several destructive earthquakes during the past centuries. The engineering geological conditions of the area have been analyzed and described using a relational geotechnical database management system including geotechnical and geological information obtained from exploratory boreholes, cone penetration tests and cross hole seismic prospecting. The foundation soils of the city were grouped into individual geotechnical units and several engineering geological maps and geotechnical cross sections were compiled. Criteria are proposed for the approximate evaluation of the effect of local soil conditions on ground motion, especially on the distribution of amplification features.

8. Geophysical and geological characterisation of karst hazards in urban environments: application to Orléans (France)

Journal	Bulletin of Engineering Geology and the Environment
Publisher	Springer Berlin / Heidelberg
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Issue	Volume 64, Number 2 / June, 2005
Pages	139-150

Pierre Thierry¹✉, Nicole Debeblia¹ and Ardnand Bitri¹

- (1) BRGM, BP6009 45060, Orléans Cedex 2, France

Abstract

Surface or shallow karst constitutes a significant problem for many cities, including Orléans, France. However, the detection of cavities in an urban environment presents numerous difficulties (buried networks, reworked soils, geophysical noise, etc.). A methodology has been developed to respond to this need based on the integration of four complementary methods: geological and geostatistical analysis of existing borehole descriptions, microgravimetry, spectral analysis of surface waves (SASW) and ground penetrating radar (GPR). This combination of different methods, applied to a test sector in the city of Orléans and validated by control borings, made it possible to locate the principal karstic conduits beneath the study area and identify a zone of mechanical weakness associated with one such feature. It also revealed that the presence of buried networks does not create significant gravity anomalies.

9. Assessing landslide hazard in GIS: a case study from Rasuwa, Nepal

Journal	Bulletin of Engineering Geology and the Environment
Publisher	Springer Berlin / Heidelberg
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Pages	99-107

G. Acharya¹, F. De Smedt¹  and N. T. Long¹

(1) Department of Hydrology and Hydraulic Engineering, Vrije Universiteit Brussel, Pleinlaan 2, 1050 Brussels, Belgium

Abstract

A slope stability analysis on a regional scale is presented for the northern part of the Rasuwa district in Nepal, covering 409 km². A physically based slope stability model coupled to a simplified groundwater flow model was used to estimate soil wetness, and safety maps were generated for three steady state and two quasi-dynamic conditions. The results show that only about half of the soils are unconditionally stable, characterised by slopes smaller than 22°. Some 7% of the study area is prone to failure under completely saturated conditions, where the slopes exceed 30° and the land-use is predominantly agricultural. Some deficiencies in the model are discussed, but nevertheless the study shows that based upon relatively coarse and limited data, useful landslide hazard information on a regional scale can be obtained.

10. Challenges and trends for geological modelling and visualisation

Journal	Bulletin of Engineering Geology and the Environment
Publisher	Springer Berlin / Heidelberg
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Issue	Volume 65, Number 2 / May, 2006
Pages	109-127

A. Keith Turner¹ 

(1) Professor of Geological Engineering, Colorado School of Mines, Golden, CO 80401, USA

Abstract

The successful execution of both large and complex construction projects and environmental and natural hazard assessments requires a precise definition of subsurface conditions. Over the past two decades, a series of sophisticated 3-D modelling technologies—collectively identified as geoscientific information systems, or GSIS—have been developed to address this subsurface characterisation need. Existing commercial systems reflect their historical origins. The modelling and visualisation process remains technically challenging. Rapid development of computer hardware and software, modern data base design concepts and expanded information transmission capabilities across the Internet are encouraging the greater use of GSIS technologies as they become cheaper and easier to use and integrate within corporate decision-support systems. The integration of GSIS with broader information management systems is not common, but limited initial experiences suggest that large benefits are likely to result.

11. Three and more dimensional modelling in geo-engineering

Journal	Bulletin of Engineering Geology and the Environment
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Pages	143-153

Robert Hack¹ , **Bogdan Orlic²** , **Senol Ozmutlu³** , **Sicai Zhu¹** and **Niek Rengers¹**

- (1) Department of Earth Science Analysis, International Institute for Geo-information Sciences and Earth Observation (ITC), Enschede, The Netherlands
- (2) Netherlands Institute of Applied Geoscience TNO (NITG-TNO), Utrecht, The Netherlands
- (3) Vryhof Anchors B.V, Krimpen ad IJssel, The Netherlands

Abstract

Full three-dimensional modelling has been developed and is implemented for many sites where engineering structures are built. Such computer models of the subsurface allow for a more sophisticated handling of subsurface data leading to, for example, better dimensioning of geotechnical units, the evaluation of hazard and risk, foundation design, tunnel routing, planning and building, etc. Other applications are the back-analysis for completed civil engineering projects to verify the correctness of assumed and estimated ground models and parameters, the verification of the correctness of constitutive models for ground behaviour and the use of back analysis to improve building methodologies or equipment. The paper illustrates some of these advantages with a number of state-of-the-art applications of three-dimensional modelling in engineering geology and geotechnical engineering, highlighting a number of key issues when computer-aided 3D modelling is used: the definition of geotechnical (homogeneous) zones, scale and detail, uncertainty and likelihood of the developed model.

12. Disaster risk management in development projects: models and checklists

Journal	Bulletin of Engineering Geology and the Environment
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Sergio Mora¹ , and **Kari Keipi¹** 

- (1) Inter-American Development Bank, 1300 New York Ave, Washington DC, NW 20577, USA

Abstract

In Latin America and the Caribbean, the available information about the causes and consequences of risk is scarce and barely meets the needs of project engineers and decision makers. Although local governments and communities typically who bear the brunt of the losses, they do not participate in the definitions and are not informed about the “acceptable” level of risk or how to reduce it. The formulation and adoption of risk management criteria (supported by engineering geological modelling), throughout the cycle of development/investment projects, should take account of the affected communities and how they can play a part in the decision making. This requires an increased awareness and understanding of both natural hazards and vulnerability. The paper analyses best practices based on experiences from Latin America and the Caribbean, which may be useful for the evaluation of hazards and vulnerability and lead to proactive risk management.

13. Landslide hazard and risk zonation—why is it still so difficult?

Journal	Bulletin of Engineering Geology and the Environment
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C.J. van Westen¹✉, T.W.J. van Asch²✉ and R. Soeters¹✉

- (1) International Institute for Geo-Information Science and Earth Observation (ITC), Enschede, The Netherlands
- (2) Faculty of Geosciences, Utrecht University, Utrecht, The Netherlands

Abstract

The quantification of risk has gained importance in many disciplines, including landslide studies. The literature on landslide risk assessment illustrates the developments which have taken place in the last decade and that quantitative risk assessment is feasible for geotechnical engineering on a site investigation scale and the evaluation of linear features (e.g., pipelines, roads). However, the generation of quantitative risk zonation maps for regulatory and development planning by local authorities still seems a step too far, especially at medium scales (1:10,000–1:50,000). This paper reviews the problem of attempting to quantify landslide risk over larger areas, discussing a number of difficulties related to the generation of landslide inventory maps including information on date, type and volume of the landslide, the determination of its spatial and temporal probability, the modelling of runout and the assessment of landslide vulnerability. An overview of recent developments in the different approaches to landslide hazard and risk zonation at medium scales is given. The paper concludes with a number of new advances and challenges for the future, such as the use of very detailed topographic data, the generation of event-based landslide inventory maps, the use of these maps in spatial-temporal probabilistic modelling and the use of land use and climatic change scenarios in deterministic modelling.

14. The provision of digital spatial data for engineering geologists

Journal	Bulletin of Engineering Geology and the Environment
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Pages	185-194

M.G. Culshaw¹ , **I. Jackson¹** and **J.R.A. Giles¹**

(1) British Geological Survey, Keyworth, NG12 5GG Nottingham, UK

Abstract

Until recently, most spatial geological information was in analogue (mainly paper) form, which made it expensive to store and often difficult to use because of its increasing fragility. However, with the rapid advances in information technology in the last 20 years, not only has it become relatively easy to digitise or digitally scan historical information but, increasingly, data suppliers are, themselves, producing the raw data in digital form. This brings with it a host of new problems for the acquisition, management and dissemination of the information. These issues include data collection (what, where, how and by whom), data management and security (metadata, validation, backup, access), data access (how, where and at what price) and the provision of value-added products based on the data tailored to the needs of specific users. For engineering geologists, the historical acquisition of geological data in various forms is on the verge of delivering a whole range of new products that should alter the way in which site investigation is carried out.

15. The Third Hans Cloos Lecture. Urban landslides: socioeconomic impacts and overview of mitigative strategies

Journal	Bulletin of Engineering Geology and the Environment
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Pages	1-27

Robert L. Schuster¹  and **Lynn M. Highland¹**

(1) US Geological Survey, Box 25046, Mail Stop 966, Denver, CO 80225, USA

Abstract

As a result of population pressures, hillsides in the world's urban areas are being developed at an accelerating rate. This development increases the risk for urban landslides triggered by rainfall or earthquake activity. To counter this risk, four approaches have been employed by landslide managers and urban planners: (1) restricting development in landslide-prone areas; (2) implementing and enforcing excavation, grading, and construction codes; (3) protecting existing developments by physical mitigation measures and (4) developing and installing monitoring and warning systems. Where they have been utilized, these approaches generally have been effective in reducing the risk due to landslide hazards. In addition to these practices, landslide insurance holds promise as a mitigative measure by reducing the financial impact of landslides on individual property owners. Until recently, however, such insurance has not been widely available and, where it is available, it is so expensive that it has been little used.

16. Enhanced NURBS modeling and visualization for large 3D geoenvironmental applications: An example from the Jinping first-level hydropower engineering project, China

- Abstract:

“Large engineering projects with complex underlying geologic structures require 3D geological integration and analysis. Presented is an example of a large hydroelectric dam, highlighting the need for 3D visualization and modeling as a requirement for the engineering design and construction process. Due to the complex nature of these projects, geological analysis using 3D modeling is commonly necessary. In this paper we present an integrated 3D geological modeling methodology for the analysis of large amounts of exploration data, and subsequent geological interpretation based on the non-uniform rational B-spline (NURBS) technique, the triangulated irregular network (TIN) algorithm and boundary representation. The procedural details and application of the proposed approach are demonstrated with reference to an actual hydropower engineering project. The new approach offered a good scheme to solve the inconsistencies among storage, accuracy and operational speed of the model. A 3D model was developed and validated using testing data from the engineering project. Visual analysis of the 3D model helps engineers to comprehend the complexity of geological structures, and enables arbitrary cutting, rock-mass quality classification, and digital drilling.”
- <http://portal.acm.org/citation.cfm?id=1296596>
- Source: Computers & Geosciences archive
- Volume 32 , Issue 9 (November 2006) table of contents
- Pages: 1270-1282
- Year of Publication: 2006
-

17. An Improved Horizons Method for 3D Geological Modeling from Boreholes

Abstract:

“3D geological modeling is often used to build solids for spatial information systems addressing environmental and geological problems. The paper presents some improvements and extensions based on the original horizons method, so as to optimize and extend the method for building solids directly from boreholes. When preparing the numbered boreholes, each horizon is constructed by moving upward the points of the initial bottommost horizon. The horizons are numbered when such an elevated horizon passes them. A virtual horizon is added if a horizon with a given number is absent on a borehole. In this way the resultant solids pinch out between boreholes. Unnecessary intersection lines are excluded so that the redundancy of solid data is reduced. The successful application of the presented method to the practical modeling of some area in Beijing demonstrates that the improved horizons method has eliminated the flaws of the original method, ensured the correctness as well as accelerated the modeling process.”

- <http://www.computer.org/portal/web/csdl/doi/10.1109/ESIAT.2009.138>
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