

[Home](#) > [Journal](#) > [Earth & Environmental Sciences](#) > [IJG](#)[Indexing](#) [View Papers](#) [Aims & Scope](#) [Editorial Board](#) [Guideline](#) [Article Processing Charges](#)[IJG](#) > Vol.3 No.4, September 2012

OPEN ACCESS

Geophysical and Geotechnical Investigations of a Landslide in Kekem Area, Western Cameroon

PDF (Size: 1352KB) PP. 780-789 DOI: 10.4236/ijg.2012.34079

Author(s)

Pouyon Dieudonné Epada, Ganno Sylvestre, Tabod Charles Tabod

ABSTRACT

Geophysical and geotechnical surveys were conducted in the Western Cameroon (Kekem area) following a landslide on argillaceous material in order to understand the triggering processes and mechanisms of this landslide and to assess the stability of the slope. The geophysical soundings consisting of vertical electrical soundings with the Schlumberger electrode array configuration were carried out to monitor the behaviour of electrical resistivity in the landslide. Geoelectrical data showed a zone of low resistivity values identified as a clayey sand-filled aquifer. This aquifer played an important role in the triggering process of the landslide. Geotechnical soundings showed that the aquifer had a thickness of 7.0 m. The depth from the landslide crest level to the failure surface reached 3.0 m and 20.6 m. Laboratory tests were then carried out in order to evaluate the cohesion of the soil and the angle of internal friction, and to calculate the safety factor in view of making a stability analysis. The laboratory results exhibited a soil with low consistency, almost doughy. The mean value of the safety factor (1.4) been lower than the slope stability coefficient (1.5), revealed that the slope is unstable, likely to know at any moment a reactivation of the slide. This study showed that electrical soundings coupled with geotechnical surveys are useful tools for the characterization of landslides.

KEYWORDS

Landslide; Resistivity; Argillaceous Material; Basal Undercutting; Kekem; Cameroon

Cite this paper

P. Epada, G. Sylvestre and T. Tabod, "Geophysical and Geotechnical Investigations of a Landslide in Kekem Area, Western Cameroon," *International Journal of Geosciences*, Vol. 3 No. 4, 2012, pp. 780-789. doi: 10.4236/ijg.2012.34079.

References

- [1] T. Glade, P. Stark and R. Dikau, "Determination of Potential Landslide Shear Plane Depth Using Seismic Refraction—A Case Study in Rheinhessen, Germany," *Bulletin of Engineering Geology and the Environment*, Vol. 64, No. 2, 2005, pp. 151-158. doi:10.1007/s10064-004-0258-1
- [2] V. Agnesi, M. Camardab, C. Conoscentia, A. Di Maggio, I. Dilibertoc, P. Madoniac and E. Rotiglianoa, "A Multidisciplinary Approach to the Evaluation of the Mechanism That Triggered the Cerda Landslide (Sicily, Italy)," *Geomorphology*, Vol. 65, No. 1-2, 2005, pp. 101-116. doi:10.1016/j.geomorph.2004.08.003
- [3] J. P. T. Caris and Th. W. J. Van Asch, "Geophysical, Geotechnical and Hydrological Investigations of a Small Landslide in the French Alps," *Engineering Geology*, Vol. 31, No. 3-4, 1991, pp. 249-276.
- [4] V. Lapenna, P. Lorenzo, A. Perrone, S. Piscitelli, E. Rizzo and F. Sdao, "2D Electrical Resistivity Imaging of Some Complex Landslides in Lucanian Apennine Chain, Southern Italy," *Geophysics*, Vol. 70, No. 3, 2005, pp. 11-18. doi:10.1190/1.1926571
- [5] T. Lebourg, S. Binet, E. Tric, H. Jomard and S. El Bedoui, "Geophysical Survey to Estimate the 3D Sliding Surface and the 4D Evolution of the Water Pressure on Part of a Deep Seated Landslide," *Terra Nova*, Vol. 17, No. 5, 2005, pp. 399-406. doi:10.1111/j.1365-3121.2005.00623.x

- [Open Special Issues](#)
- [Published Special Issues](#)
- [Special Issues Guideline](#)

[IJG Subscription](#)[Most popular papers in IJG](#)[About IJG News](#)[Frequently Asked Questions](#)[Recommend to Peers](#)[Recommend to Library](#)[Contact Us](#)

Downloads: 165,256

Visits: 394,020

[Sponsors, Associates, and Links >>](#)

- [6] V. Bogoslovsky and A. Ogilvy, " Geophysical Methods for the Investigation of Landslide," *Geophysics*, Vol. 42, No. 3, 1977, pp. 562-571. doi:10.1190/1.1440727
- [7] D. Cummings and B. R. Clark, " Use of Seismic Refraction and Electrical Resistivity Surveys in Landslide Investigations," *Bulletin of the Association of Engineering Geologists*, Vol. 25, No. 4, 1998, pp. 459-464.
- [8] F. Bruno and F. Marillier, " Test of High-Resolution Seismic Reflection and Other Geophysical Techniques on the Boup Landslide in the Swiss Alps," *Surveys in Geophysics*, Vol. 21, No. 4, 2000, pp. 333-348. doi:10.1023/A:1006736824075
- [9] H. J. Mauritsch, W. Seiberl, R. Arndt, A. Romer, K. Schneiderbauer and G. P. Sendlhofer, " Geophysical Investigations of Large Landslides in the Carnic Region of Southern Austria," *Engineering Geology*, Vol. 56, No. 3-4, 2000, pp. 373-388. doi:10.1016/S0013-7952(99)00120-9
- [10] O. Meric, " Etude de Mouvements de Terrain par Méthodes Géophysiques," Ph.D. Thesis, Joseph Fourier University, Grenoble, 2006.
- [11] J. P. Nzenti, " Pétrogenèse des Migmatites de Yaoundé (Cameroun): Eléments Pour un Modèle Géodynamique de la Chaîne Pan-Africaine Nord-Equatoriale," Thèse Nouveau Doctorat, University of Nancy I, Lorraine, 1987.
- [12] J. P. Nzenti, P. Barbey, J. M. Bertrand and J. Macaudière, " La Chaîne Panafricaine au Cameroun: Cherchons Suture et Modèle," 15ème Réunion des Sciences de la Terre, Abstract, Nancy, 26-28 Avril 1994.
- [13] J. P. Nzenti, B. Kapajika, G. Wörner and R. T. Lubala, " Synkinematic Emplacement of Granitoids in a Pan-African Shear Zone in Central Cameroon," *Journal of African Earth Sciences*, Vol. 45, No. 1, 2006, pp. 74-86. doi:10.1016/j.jafrearsci.2006.01.005
- [14] T. Ngnotué, J. P. Nzenti, P. Barbey and F. M. Tchoua, " The Ntui-Betamba High Grade Gneisses: A Northward Extension of the Pan-African Yaoundé Gneisses in Cameroon," *Journal of African Earth Sciences*, Vol. 31, No. 2, 2000, pp. 369-381.
- [15] V. Ngako, P. Affaton, J. M. Nnange and T. Njanko, " Pan-African Tectonic Evolution in Central and Southern Cameroon: Transpression and Transtension during Sinistral Shear Movements," *Journal of African Earth Sciences*, Vol. 36, 2003, pp. 207-214. doi:10.1016/S0899-5362(03)00023-X
- [16] E. L. Tanko Njiosseu, J. P. Nzenti, T. Njanko, B. Kapajika and A. Nédelec, " New U-Pb Zircon Ages from Tonga (Cameroon): Coexisting Eburnean-Transamazonian (2.1 Ga) and Pan-African (0.6 Ga) Imprints," *Comptes Rendus Géosciences*, Vol. 337, No. 16, 2005, pp. 551- 562. doi:10.1016/j.crte.2005.02.005
- [17] J. Penaye, S. F. Toteu, W. R. Van Schmus and J. P. Nzenti, " U-Pb and Sm-Nd Preliminary Geochronology Data on the Yaoundé Series, Cameroon: Re-Interpretation of the Granulitic Rocks as the Suture of Collision in the Centrafrican Belt," *Comptes Rendus de l' Académie des Sciences de Paris*, Vol. 317, No. 6, 1993, pp. 789-794.
- [18] J. P. Nzenti, P. Barbey, P. Jegouzo and C. Moreau, " Un Nouvel Exemple de Ceinture Granulitique Dans une Chaîne Protérozoïque de Transition: Les Migmatites de Yaoundé au Cameroun," *Compte Rendu Académie des Sciences de Paris*, Vol. 299, No. 17, 1984, pp. 1197-1199.
- [19] C. Castaing, J. L. Feybesse, D. Thieblemont, C. Triboulet and P. Chevremont, " Paleogeographical Reconstructions of the Pan-African/Brasiliano Orogen: Closure of an Oceanic Domain or Intracontinental Convergence between Major Blocks," *Precambrian Research*, Vol. 69, 1995, pp. 327-344. doi:10.1016/0301-9268(94)90095-7
- [20] C. Nzolang, H. Kagami, J. P. Nzenti and F. Holz, " Geochemistry and Preliminary Sr-Nd Isotopic Data on the Neoproterozoic Granitoids from the Bantoum Area, West Cameroon: Evidence for a Derivation from a Paleoproterozoic to Archean Crust," *Polar Geoscience*, Vol. 16, 2003, pp. 196-226.
- [21] M. L. Djouka-Fonkwe, B. Schulz, J. P. Tchouankoué and C. Nzolang, " Geochemistry of the Bafoussam Pan-African I and S-type Granitoids in Western Cameroon," *Journal of African Earth Sciences*, Vol. 50, No. 2-4, 2008, pp. 148-167. HUdoi:10.1016/j.jafrearsci.2007.09.015U
- [22] A. Nzina Nchare, J. P. Nzenti, E. L. Tanko Njiosseu, S. Ganno and T. Ngnotué, " Synkinematic Ferro-Potassic Magmatism from the Mekwene-Njimafofire Fouban Massif, along the Fouban-Banyo Shear Zone in Central Domain of Cameroon Pan-African Fold Belt," *Journal of Geology and Mining Research*, Vol. 2, No. 6, 2010, pp. 142-158.

- [23] C. Chebeu, C. D. Ngo Nlend, J. P. Nzenti and S. Ganno, " Neoproterozoic High-K Calc-Alkaline Granitoids from Bapa-Batié, North Equatorial Fold Belt, Central Cameroon: Petrogenesis and Geodynamic Significance," *The Open Geology Journal*, Vol. 5, 2011, pp. 1-20. doi:10.2174/1874262901105010001
- [24] A. A. Ganwa, W. Frisch, W. Siebel, G. E. Ekodeck, C. K. Shang and V. Ngako, " Archean Inheritances in the Pyroxene-Amphibole-Bearing Gneiss of the Méiganga Area (Central North Cameroon): Geochemical and Pb/Pb Age Imprints," *Comptes Rendus Geosciences*, Vol. 340, No. 4, 2008, pp. 211-222. doi:10.1016/j.crte.2007.12.009
- [25] A. A. Ganwa, W. Siebel, C. K. Shang, N. Seguem and G. E. Ekodeck, " New Constraints from Pb-Evaporation Zircon Ages of the Méiganga Amphibole-Biotite Gneiss, Central Cameroon, on Proterozoic Crustal Evolution," *International Journal of Geosciences*, Vol. 2, 2011, pp. 138-147.
- [26] S. F. Toteu, A. Michard, J. M. Bertrand and G. Rocci, " U/Pb of Precambrian Rocks from Northern Cameroon, Orogenic Evolution and Chronology of the Pan-African Belt of Central Africa," *Precambrian Research*, Vol. 37, No. 1, 1987, pp. 71-87. doi:10.1016/0301-9268(87)90040-4
- [27] D. Tchaptchet Tchato, B. Schulz and J. P. Nzenti, " Electron Microprobe (EMP) Monazite Dating and P-T Data of the Neoproterozoic Metamorphic and Mylonitic Events in the Kekem Area, Cameroon North Equatorial Fold Belt," *Neues Jahrbuch für Paleontologie*, Vol. 186, No. 1, 2009, pp. 95-109.
- [28] D. T. Tchato, J. P. Nzenti, E. L. Tanko Njiosseu, T. Ngnotué and S. Ganno, " Neoproterozoic Metamorphic Events in the Kekem Area (Central Domain of the Cameroon North Equatorial Fold Belt):