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Groundwater Protection using Numerical Simulations Applied to the Carbonate Aquifer Resource in the Augusta's Industrial Area (Sicily, Italy)

PDF (Size: 2620KB) PP. 283-294 DOI: 10.4236/jwarp.2011.35036

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ABSTRACT

Simulation of flow in fractured aquifers is a complex issue. The problem of mathematical modeling of highly heterogeneous porous media, typical of natural systems, couples with the needs making proper simplifying assumptions and approximations. In this kind of groundwater systems, studying contamination spreading and analyzing risk are challenging tasks. The main difficulty stems from determining both the travel times and the maximum distances covered by pollutants. In this context, the risk of contamination in the deep carbonate aquifer of the Augusta coastal area is presented. We used a geostatistical approach and numerical codes (MODFLOW-2000, MT3DMS) to reconstruct the complex geological framework of the study area where several contamination scenarios of hypothetical point source in a risk assessment framework were simulated. Results on the contaminant spreading are discussed and the effect of the geological structures characterizing the zone under study, namely horst and graben, are described.

KEYWORDS

Carbonate Rocks, Groundwater Flow, Monte Carlo Simulation, Numerical Modeling, Geostatistics

Cite this paper

A. Carloni, E. Guastaldi, V. Ferrara and C. Gallo, "Groundwater Protection using Numerical Simulations Applied to the Carbonate Aquifer Resource in the Augusta's Industrial Area (Sicily, Italy)," *Journal of Water Resource and Protection*, Vol. 3 No. 5, 2011, pp. 283-294. doi: 10.4236/jwarp.2011.35036.

References

- [1] M. Grasso and F. Lentini and S. Carbone, " Carta Geo- logica Del Settore Nord - Orientale Ibleo," In: Memorie della Società Geologica Italiana, Lineamenti geologici del Plateau Ibleo (Sicilia S.E.): presentazione delle carte geologiche della Sicilia sud - orientale, XXXVIII, fasc. unico.
- [2] H. M. Pedley, " Sedimentology and Palaeoenvironment of the Southeast Sicilian Tertiary Platform Carbonates," *Sedimentary Geology*, Vol. 28, No. 4, 1981, pp. 273-291. doi:10.1016/0037-0738(81)90050-6
- [3] S. Carbone and F. Lentini, " Rapporti Tra Vulcanesimo Miocenico e Tettonica Nel Settore Orientale Dei Monti Iblei (Sicilia Sud-Orientale)," *Rend. Soc. Geol. It.*, Vol. 4, 1985, pp. 245-248.
- [4] M. Grasso and F. Lentini, " Sedimentary and Tectonic Evolution of the Eastern Hyblean Plateau (South-Eastern Sicily) during Late Cretaceous to Quaternary Time," *Palaeogeography, Palaeoclimatology, Palaeoecology*, Vol. 39, No. 3-4, 1982, pp. 261-280. doi:10.1016/0031-0182(82)90025-6
- [5] S. Carbone, M. Grasso and F. Lentini, " Considerazioni Sull' Evoluzione Geodinamica Della Sicilia Sud-Orientale dal Cretaceo al Quaternario," *Mem. Soc. Geol. It.*, Vol. 24, 1982, pp. 367-386.
- [6] V. Ferrara and A. Pennisi, " Salt Water Intrusion and Its Influence on Groundwater Use in the Siracusa Area (Sou- th-Eastern Sicily)," *Proceedings of 13th Salt-Water Intrusion Meeting, Cagliari*, 1994, pp. 227-234.

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- [7] S. Carbone, " I Depositi Pleistocenici Del Settore Nord- -Orientale Ibleo Tra Agnone e Melilli (Sicilia SE): Rela- zione Tra Facies e Lineamenti Strutturali," Boll. Soc. Geol. It., Vol. 104, 1985, pp. 405-420.
- [8] G. Matheron, " The Theory of Regionalized Variables and Its Applications," Ecole Nationale Supérieure des Mines de Paris, Fontainebleu, 1971.
- [9] J. P. Chiles and P. Delfiner, " Geostatistics: Modeling Spatial Uncertainty," Wiley, New York, 1999.
- [10] J. Bear, " Hydraulics of Groundwater," McGraw-Hill, Boston, 1979.
- [11] L. Kiraly, " Modelling Karst Aquifers by the Combined Discrete Channel and Continuum Approach," Bulletin du Centre d' Hydrogeologie, Vol. 16, 1998, pp. 77-98.
- [12] R. Y. Rubinstein and D. P. Kroese, " Simulation and the Monte Carlo Method," 2nd Edition, John Wiley & Sons, New York, 2007. doi:10.1002/9780470230381
- [13] A. W. Harbaugh, et al., " MODFLOW-2000, the U.S.G.S Modular Ground-Water Model - User Guide to Modularization Concepts and the Ground-Water Flow Process," Open File Report 00-92, USGS, Denver, 2001.