



PUBLICATIONS 2012

1. Al-Amri, A. M.; Harris, D.; Fnais, M.S.; Rodgers, M. (2012): A regional Seismic Array of three-component stations in Saudi Arabia. *Seismological Research Letters*, 83(1), 49-58.

Abstract:

2. Zobin, V. M.; Al-Amri, A. and Fnais, M. (2012): Seismicity associated with active, new-born, and re-awakening basaltic volcanoes: case review and the possible scenarios for the Harrat volcanic provinces, Saudi Arabia. *Arab J. Geosci*, 6:529-541

Abstract:

3. Al-Amri A. M., Fnais M. S., Kamal Abdel-Rahman, Mogren S. and Al-Dabbagh M. (2012): Geochronological dating and stratigraphic sequences of Harrat Lunayyir, NW Saudi Arabia. *International Journal of Physical Sciences* Vol. 7(20), pp. 2791-2805, 23 May, 2012.

Abstract

Harrat Lunayyir is a basaltic volcanic field in NW Saudi Arabia. Lava flows are basaltic to basanitic in composition, and the Holocene flows are alkali olivine basalts. The volcanic field contains about 50 cones that were constructed on Precambrian crystalline rocks along an N-S axis. The dominantly basaltic lavas of Harrat Lunayyir have been divided based on their erosion characteristics into two major units – an older Tertiary unit (Jarad basalt) and a younger Quaternary unit (Maqrah basalt). The Quaternary Maqrah basalt has been subdivided into five stratigraphic subunits, Qm1 and Qm2 forming the Lower Maqrah basalt and Qm3, Qm4, and Qm5 forms the Upper Maqrah basalt. In 2009, a 3-km-long rupture in Harrat Lunayyir and lengthened to 8 km. Satellite radar images suggested that the most likely cause of this fault was magma intruding vertically along a 10-km-long fracture. The regional stress field deduced from the orientation of the observed dike indicates NE - SW tension, which is also indicated by focal mechanism solutions with normal faulting with two major structural trends of NE-SW and NW-SE. These trends are consistent with the orientation of the opening of the Red Sea and with regional tectonics of Arabian-African rifting. Moreover, these results show that the Red Sea ridge stress field extends at least 200 km from the rift axis into the Arabian plate. Prior to this study, estimates of the ages of the samples ranged from Tertiary to Quaternary. This work places the ages of all samples firmly in the Quaternary period. $^{40}\text{Ar}/^{39}\text{Ar}$ age determinations have been produced for six samples. Most of these are fine-grained enough that whole-rock fragments were chosen for irradiation. The precision of the ages calculated in this study are limited by the small amounts of radiogenic argon compared to the larger amounts of non-radiogenic, or background argon typical in basaltic whole rocks of this age. The discrepancies in ages and stratigraphic position are due to the small amounts in accumulated argon over the relatively very short period of time. In general, this study shows that volcanic activity at Harrat

Lunayyir started about 500,000 years ago. There must have been a substantial time between the lowest unit (which has previously been assigned a tertiary age) and youngest so that an unconformity has been developed. The latest activity could have taken place at about 5000 years ago.

4. Al-Bassam, A. M., Khalil, A. R., 2012, "DurovPwin: a New Version to Plot the Expanded Durov Diagram for Hydro-chemical Data Analysis", *Computers & Geosciences*, 42, p.1-6.

Abstract

Graphical representation of groundwater major dissolved constituents (major cations and major anions) helps in understanding its hydro-chemical evolution, grouping and areal distribution. Several graphical representation techniques were published in the literature. The most widely used of these is the expanded Durov diagram. The expanded Durov diagram is used to show the hydro-chemical processes occurring within different hydrogeological systems. Calculating Durov coordinates and plotting the diagram is a tedious and time consuming process especially when large number of multiple samples data sets is used. A "DurovPlot" program was written under DOS operating system to do the calculations, plotting and to help users of Durov Diagram to do their work fast, easy and accurate. Since the DOS operating system became obsolete which represents a great limitation, a new version called DurovPwin is designed in this study mainly to overcome any drawback of the previously expanded DurovPlot. The "DurovPwin" is a user friendly program with many new features such as it works under windows and uses the Dot Net framework features of compatibility and Graphical User Interface (GUI) facilities. A second new feature is adding the plot of pH and the plot of (TDS) on an arithmetic log scale. The third facility is the ability to initiate X-Y plots of any two parameters in a separate sheet. A fourth new feature is the ability to create preliminary report grouping the wells into subgroups of the nine fields of the expanded Durov diagram. Last feature is the ability to select the electrical balance tolerance and create subgroups of wells then manipulate the hydrochemistry data for each.

5. Al-Arifi, N. S., Al-Humidan, S. M., and Al-Bassam, A. M. (2012). Time independent seismic hazard analysis of the afar depression. *Scientific Research and Essays*, 7(14), 1494-1500.

Abstract

A Bayesian approach is applied to conduct a seismic hazard analysis in Afar Triple junction, resulting in a spatial distribution of the probability of exceedance in 100 years for earthquakes of MSK intensities VI and VII. The highest values of the exceedance probability for intensity VII are relatively scattered, showing spatial distribution that conforms with the RRR (rift-rift-rift) relative translational and rotational motions of the three bounding (Main Ethiopian Rift-Southern Red Sea Rift-Gulf of Aden Rift). The spatial distribution of the probability of exceedance for intensity VI is similar, but in scope. Iso-curves of the probability of exceedance for intensity VI seem to strike in a NW and NE direction while the intensity VII distribution is characterized by NW, NE and E-W directions. The map of spatial distributions of the probability of exceedance indicates specific areas of high seismic hazard in the future in the study area.

6. Al-Saleh A. M., & Kassem, O. M. K., 2012: Microstructural, Strain Analysis and $^{40}\text{Ar}/^{39}\text{Ar}$ Evidence for the Origin of the Mizil Gneiss Dome, Eastern Arabian Shield, Saudi Arabia. *Journal of African Earth Science*, 70 (24-35).

Abstract

The Mizil antiform is a gneiss-cored culmination situated near the northern end of the Ar Rayn island arc terrane, which is the easternmost exposed tectonic unit of the Arabian Shield. This domal structure has a mantle of metamorphosed volcanosedimentary rocks belonging to the Al-Amar Group, and an igneous interior made up of foliated granodiorite-tonalite with adakitic affinity. The gneissic core has a SHRIMP U–Pb zircon age of 689 ± 10 Ma making it the oldest rock unit in the Ar Rayn terrane. An adakite diapir, formed by the melting of the subducted crust of a young marginal basin, and rising through the volcanosedimentary succession of the Ar Rayn island arc is thought to have caused the observed doming. Relatively uniform strain throughout the dome combined with strong vertical shortening and the roughly radial pattern of stretching lineation is consistent with diapirism; the absence of strain localization rules out detachment faulting as a causative mechanism. Amphibolites from the metamorphic envelope have an $40\text{Ar}/39\text{Ar}$ age of 615 ± 2 Ma; the age gap between core and cover is thought to reflect the resetting of metamorphic ages during the final suturing event, a phenomenon that is often observed throughout the eastern shield. Aeromagnetic anomalies beneath the Phanerozoic sedimentary cover indicate the presence of a collage of accreted terranes east of the Ar Rayn terrane that were probably amalgamated onto the Arabian margin during the latest stages of the closure of the Mozambique ocean; culminant orogeny is believed to have taken place between 620 and 600 Ma as these terrane collided with a major continental mass to the east referred to here as the eastern Arabian block (EAB). The Mizil gneiss dome is therefore considered to have formed in a convergent contractional setting rather than being the outcome of extensional post-orogenic collapse.

7. A. Batayneh, A. Laboun, S.Qaisy, H. Ghrefat, T. Zumlot, H. Zaman, E. Elawadi, S. Mogren, K. Al-Qudah (2012): Assessing groundwater quality of the shallow alluvial aquifer system in the Midyan Basin, northwestern Saudi Arabia. AGJSR 30 (1): 7-13.

Abstract

The Midyan Basin is characterized by arid climate with rare surface water flow. Groundwater is the main water resources in this region. In order to evaluate their suitability for drinking, domestic and irrigation purposes, chemical characteristics of groundwater in the Midyan Basin (northwestern Saudi Arabia) have been investigated and evaluated. A total of 72 water samples were collected from different wells and analyzed for hydrogen ion concentration, total dissolved solids, electrical conductivity, total hardness, Ca^{2+} , Na^{+} , Mg^{2+} , K^{+} , Cl^{-} , HCO_3^{-} , NO_3^{-} and SO_4^{2-} . To understand quality of groundwater and their suitability, chemical indices like sodium percentage, sodium adsorption ratio and salinity values have been calculated using analytical techniques. From traditional Piper diagram for water classification, the water quality is placed at $\text{Na}^{+}\text{-Ca}^{2+}\text{-SO}_4^{2-}\text{-Cl}^{-}$ type. According to the results of electrical conductivity and sodium adsorption ratio, 37% of the studied samples are regarded as highly saline, while 63% of them are classified as very highly saline. As per the Arab Gulf and international standards, such waters are not suitable for irrigation under normal condition and further action is required to remediate such problem by salinity control. Sodium content in 24% of the studied samples is regarded as high that can't be used for irrigation purposes for any soils. Thus high level of salinity, sodium adsorption ratio and sodium percentage in most water samples have made them unsuitable

8. Fat-Helbary, R. E.; Kamal Abdelrahman; Fnais, M. S. and Abdel-Moneim, E.: Seismic hazard and site response assessment on the proposed site of Aswan cement plant, Egypt. International Journal of Earth Sciences and

Abstract:

Aswan-Kalabsha area is characterized by moderate earthquake activity where an earthquake with magnitude 5.6 m_b has occurred at 60 km southwest of Aswan High Dam along Kalabsha Fault on 14th of November 1981. Paleoseismological trenches indicate that the rate of slip displacement reaches about 2 mm/year along Kalabsha fault. New cement plant has been proposed recently along Kalabsha fault zone which represents the most active fault in southern Egypt. Accordingly, the assessment of seismic hazard potentiality at the proposed site is of critical importance. It has been assessed throughout the application of the probabilistic, deterministic and stochastic approaches. The earthquake activities around the site have been collected and precisely reviewed with the local and international earthquake bulletins and then the affected seismic source zones have been modeled. The maximum expected values of peak ground acceleration reach 215 cm/sec^2 with 90% probability of not being exceeded in exposure times of 50 years at the selected site based on the probabilistic approach while reach 175 cm/s^2 and 200 cm/sec^2 depending upon the deterministic and stochastic approaches respectively. Furthermore, the response spectrum of the simulated earthquake has been constructed at the site. These results are highly recommended and must be taken into consideration before construction of the new cement plant at the selected site.

9. Kamal Aldelrahman, Abdel-Aziz Khairy; El-hady, Sh.; Mohammed, A. A., Abdel-Moneim, E.(2012): Fundamental Site frequency estimation at new Domiat city, Egypt. Arab J Geosci (2012) 5:653–661

Abstract

The horizontal to vertical (H/V) spectral ratio technique has applied to detect the fundamental frequency at the sites of ambient noise recordings for New Domiat city. Noise measurements are acquired at ninety of sites for one hour of continuous recording with a sampling rate of 100 Hz. Then, these data are processed following to SESAME-project scheme. The presence of deep sedimentary basin in the Nile Delta suggests that the site response should be important. Consequently, the obtained fundamental frequency having lower values (0.2 to 0.6 Hz). However, low frequency ground motions attenuate more gradually with distance and can excite vibrations in large engineered structures, such as tall buildings and long bridges. There is hazardous threat even from the distant earthquakes originated from Mediterranean convergence zone for the structures in the city. It is recommended that, the results of this study must be taken into consideration from civil engineering point of view before construction of civil engineering structures at this part.

10. Awni Batayneh, Eslam Elawadi, Saad Mogren, Elkhedr Ibrahim and Saleh Qaisy (2012): Groundwater quality of the shallow alluvial aquifer of Wadi Jazan (Southwest Saudi Arabia) and its suitability for domestic and irrigation purpose. Scientific Research and Essays Vol. 7(3), pp. 352-364.

Abstract

The groundwater quality of wadi Jazan (southwest Saudi Arabia) experienced

degradation due to rapid urbanization and industrialization. On the basis of the groundwater chemistry, an evaluation of groundwater for domestic and irrigation uses is established. Thirty one groundwater samples were collected in February 2011 from wadi Jazan, southwest Saudi Arabia to study the chemical parameters such as hydrogen ion concentration, total dissolved solids, electrical conductivity, total hardness, calcium, magnesium, sodium, potassium, bicarbonate, sulfate and chloride. To classify water quality for irrigation, parameters such as sodium adsorption ratio and sodium percentage were calculated. Concentrations of major cations and anions of groundwater samples are exceeding the allowable concentration compared to their levels in potable water. The total dissolved solids are 5220 mg/l or below which indicates the presence of saline water. The saline water condition is also verified by low to high electrical conductivity (552 to 8030 tS/cm) and lowers than 7.92 hydrogen ion concentration values. The low to medium sodium adsorption ratio (0.99 to 10.62) coupled with low to high electrical conductivity gives the water medium, high to very high salinity hazard and low to medium sodium hazard. Thus, most of the study groundwater samples are generally unsuitable for domestic and irrigation purpose.

11. Awni Batayneh, Babes Ghrefat, Haider Zaman, Saad Mogren, Taisser Zumlot, Eslam Elawadi, Abdulaziz Laboun and Saleh Qaisy (2012): Assessment of the Physicochemical Parameters and Heavy Metals Toxicity: Application to Groundwater Quality in Unconsolidated Shallow Aquifer System. Research Journal of Environmental Toxicology 6 (5): 169-183.

Abstract

12. Awni Batayneh, Habes Ghrefat (2012): Lineament Characterization and Their Tectonic Significance Using Gravity Data and Field Studies in the Al-Jufr Area, Southeastern Jordan Plateau, Journal of Earth Science, Vol. 23, No. 6, p. 873–880

Abstract

: Lineaments in the southeastern Jordan plateau are mapped using gravity data and field studies in order to understand the tectonic origin of these lineaments, especially in relation to the Dead Sea transform (DST) and the Red Sea opening. Four sets trending E-W, NW-SE, NE-SW, and N-S are identified in gravity data. Field studies generally reveal similar orientations. Field and gravity studies indicate that most of the lineaments are extensional features that correspond to normal faults. Most of these were subsequently reactivated into strike-slip shear fractures. The NW-SE and N-S lineaments represent dilatational fractures. The N-S trending lineaments are the oldest. The E-W lineaments form conjugate shear fractures and are younger than the N-S lineaments. These conjugate shear fractures are also older than other set of conjugate shear fractures oriented NE-SW. The evolution of all these fractures is attributed to the DST and the Red Sea spreading. Kinematic and dynamic analysis of the two, older and younger, pairs of conjugate strike-slip fractures revealed, respectively, broadly NW-SE and N-S oriented transpressional stress (σ_1) with corresponding transtensional stress (σ_3) oriented NE-SW and E-W.

13. Abdelbaset S. El-Sorogy. Mohamed A. Mohamed. Hamdy E. Nour (2012): Heavy metals contamination of the Quaternary coral reefs, Red Sea coast, Egypt. Environ Earth Sci., 67:777–785.

Abstract

In order to assess pollutants and impact of environmental changes along the Egyptian Red Sea coast, seven recent and Pleistocene coral species have been analyzed for Zn, Pb, Mn, Fe, Cr, Co, Ni, and Cu. Results show that the concentration of trace elements in recent coral skeletons is higher than those of Pleistocene counterpart except for Mn and Ni. In comparison with recent worldwide reefs, the present values are less than those of Central America coast (iron), Gulf of Aqaba, Jordan (lead, copper), Gulf of Mannar, India (chromium, zinc, manganese), Costa Rica, Panama (chromium, nickel), North-west coast of Venezuela and Saudi Arabia (copper). The present values are higher than those of Gulf of Aqaba, Jordan (iron, zinc, manganese), Gulf of Mannar, India (lead, cobalt, nickel), North-west coast of Venezuela (lead, zinc, chromium, manganese), Australia (copper, nickel, zinc, manganese). The highest values were recorded in *Stylophorapistillata* (iron, lead and copper), *Acroporacytherea* (cobalt), *Pocilloporaverrucosa* (zinc) and the lowest concentrations were recorded in *Goniastreapectinata* (iron, chromium, copper and nickel), *Favitespentagona* (lead, zinc and manganese), and *Poriteslutea* (cobalt). The differences in metals content among the studied species are attributed to differences in microstructure and microarchitecture.

14. Ahmad M. Al-Saleh (2012): The Kirsh gneiss dome: An extensional metamorphic core complex from the SE Arabian Shield. *Arab J Geosci* (2012) 5:335–344

Abstract

A number of gneiss-cored domes and antiforms are exposed along the regional strike-slip Najd fault system in the Arabian Shield and the eastern desert of Egypt. The mode of origin is still controversial although plausible comparisons with modern metamorphic-core complexes were made in some well-studied areas. The Kirsh dome is located within the major Ar Rika shear zone and consists of a core of orthogneiss /migmatite and an envelope of paragneisses with locally-abundant kyanite-bearing quartzites. The dome is surrounded by the low-grade metasediments of the Murdama Group, and is bound from the south by a low-angle dip-slip fault. Beyond the southern strand of the Ar Rika fault is the Kibdi Basin which hosts unmetamorphosed sediments belonging to the Jibalah Group; this group occupies scattered pull-apart basins closely associated with releasing bends along the Najd fault system. Little dating has been done on the gneiss domes of the Arabian Shield; however, recent dates from similar structures in the eastern desert and Sinai range from 580 to 620 Ma. A similar, albeit younger $^{40}\text{Ar}/^{39}\text{Ar}$ age of 557 ± 15 Ma was obtained from a biotite paragneiss south of Jabal Kirsh; this age difference probably represent the time interval it took the Kirsh rocks to cool below the biotite closure temperature and would place a lower age limit for the dome. The Kirsh dome occupies an extensional zone between left-stepping faults; movement within this zone might have caused enough decompression to trigger fluid-absent melting in the middle crust especially as the rocks cross the biotite dehydration solidus. Diapiric ascent aided by strike slip dilatancy pumping led to the emplacement of the Kirsh rocks in their present position within the Murdama Group metasediments.

15. Faisal K Zaidi, A. M. Bassam, M. T. Hussein and Osama M.K. Kassem (2012): Hydrological characterization of Mahd Ad Dahab Gold Mine, Saudi Arabia. *International Journal of Physical Sciences* Vol. 7(22), pp. 2935-2943.

Abstract

The present study focuses on the gold mining in Mahd Ad Dahab region of Saudi Arabia. The study aims at the integrated use of existing meteorological information with the drainage basin morphometry of the mine catchment for determining the

preferential flow path for the mine contaminants. The study reveals that the actual mining area lies at the headwaters of two watersheds: Watershed A and Watershed B. The streams in Watershed A drain in a North East-South West direction, whereas the streams of watershed B trend in a South East–North West direction. The peak runoff estimates show that in case of a heavy rainfall event, more surface discharge will be generated in Watershed A mainly due to its large surface area thus, leading to potential contamination in the south of the mining area. The runoff estimates for a maximum rainfall event of 104 mm/day is equal to 21.527 m³/s for Watershed A and 8.310 m³/s for Watershed B. Studies related to the investigation of the water pollution from mining activities should be concentrated towards the south of the mine.

16. Elawadi, E., Mogren, S., Ibrahim, E., Batayneh, A., and Al-Bassam, A. (2012). Utilizing potential field data to support delineation of groundwater aquifers in the southern Red Sea coast, Saudi Arabia. *Journal of Geophysics and Engineering*, 9(3), 327.

Abstract

In this paper potential field data are interpreted to map the undulation of the basement surface, which represents the bottom of the water bearing zones, and to delineate the tectonic framework that controls the groundwater flow and accumulation in the southern Red Sea coastal area of Saudi Arabia. The interpretation reveals that the dominant structural trend is a NW (Red Sea) trend that resulted in a series of faulted tilted blocks. These tilted blocks are dissected by another cross-cut NE trend which shapes and forms a series of fault-bounded small basins. These basins and the bounded structural trends control and shape the flow direction of the groundwater in the study area, i.e. they act as groundwater conduits. Furthermore, the present results indicate that volcanic intrusions are present as subsurface flows, which hinder the groundwater exploration and drilling activities in most of the area; in some localities these volcanic flows crop out at the surface and cover the groundwater bearing formations. Furthermore, the gravity and magnetic data interpretation indicates the possible existence of a large structural basin occupying the southeastern side of the study area. This basin is bounded with NW and NE trending faults and is expected to be a good host for groundwater aquifers; thus it is a promising site for hydrogeological investigation.

17. F.K. Zaidi, Osama M. K. Kassem (2012). Use of Electrical Resistivity Tomography in delineating zones of groundwater potential in arid regions: A case study from Diriyah Region of Saudi Arabia. *Arabian Journal of Geosciences*, Vol. 5, No. 2, pp. 327 – 334.

Abstract

A detailed geophysical investigation in the form of electrical resistivity tomography (ERT) was carried out using the SYSCAL Pro Unit at two locations with a dipole–dipole configuration in one of the private farms in Diriyah area of Riyadh, Saudi Arabia with the purpose of delineating the approximate depth of the water-bearing formations. The survey helped in delineating a superficial moist zone at the first site which was mainly due to the seepage from surface water pipes used for irrigating the date palms. At the second site, a potential water-bearing zone was detected starting from a depth of 23 to 46 m. However, an already existing bore well in close vicinity of the site of the second survey showed a water table depth of 85 m, indicating the presence of a layered aquifer. Finally, it was concluded that a shallow bore well drilled up to a depth of 50–60 meters would be able to tap the water resources of shallow water-bearing horizon discovered at the second site during the survey; however, the yield of the bore well might not be sustainable over a longer period of

time. The survey at the first site did not show any promising groundwater potential up to the investigated depth which was around 70 m. The study confirms the usage of ERT surveys for exploring sources of freshwater supplies in arid regions.

18. Mohamed Metwaly, Eslam Elawadi, Sayed S. R. Moustafa, F. Al Fouzan, S. Al Mogren and N. Al Arifi (2012): Groundwater exploration using geoelectrical resistivity technique at Al-Quwy'yia area central Saudi Arabia International Journal of the Physical Sciences Vol. 7(2), pp. 317 – 326

Abstract

Geoelectrical resistivity surveys were carried out in Al Quwy'yia area, located at the central part of Saudi Arabia, to map the aquifer and estimate the groundwater potentiality. The acquired vertical electrical sounding (VES) data sets have been collected along three longitudinal profiles trending East- West, perpendicular to the basement/sedimentary contact. The data sets have been analysed using 1D to obtain the initial figure out of the resistivity layers along the areas. Then, the data were inversion resistivity section using 2D inversion scheme. Information from two boreholes were incorporated during the processing to enhance the results and constrain the resistivity models with geological layers. The results revealed mainly two geoelectric layers represent mainly the basement and sedimentary rocks. The basement rocks dip generally east ward, where the sedimentary section increases in this direction. The depth to the basement is about 50 m in the western part of the area and cannot be reached from the acquired data in the eastern part. The contact bounding between the basement complex and sedimentary rocks can be determined. The static water table is coincident with the limestone rock of Khuff formation as indicated from the comparison between the individual resistivity models and the two wells located at the study area. The thickness of the aquifer is increasing in the north eastern direction where the possibility of the groundwater potentiality is increasing

19. Ghrefat, HA ; Howari, FM (2012): Rate of deposition and quality of sedimentation dust in Al Ain and Ras Al Khaimah, United Arab Emirates, ARABIAN JOURNAL OF GEOSCIENCES , 6 (4), 1033-1039

Abstract

This study presents data on the mineralogy and the metal content of dust deposited in Al Ain and Ras Al Khaimah, United Arab Emirates. The mineralogical compositions of the dust were determined using X-ray diffraction, and the results revealed that quartz is the dominant mineral, whereas calcite, dolomite, plagioclase, and serpentine were minor minerals. Two sampling sites were chosen from both Al Ain and Ras Al Khaimah. The concentrations of Fe, Zn, Cu, Cr, Pb, Cd, Ni, and Co in the sedimentation dusts samples of these sites were determined using inductively coupled plasma. The levels of most of heavy metal were generally below those determined in the other cities in the Middle East. The air enrichment factors for all the samples were analyzed, and the results indicated that Cd, Zn, Co, and Ni were highly enriched relative to their crustal ratios (to Fe) and correspond to substantial contribution of anthropogenic source of these metals. These metals mainly originate from the traffic emissions and industrial activities with contribution from natural sources. The average rates of deposition in Al Ain and Ras Al Khaimah were 193 and 972 mg m⁻² day⁻¹, respectively. These rates were higher than those of other regions.

20. Habes A. Ghrefat & Awni Batayneh & Haider Zaman & Taisser Zumlot & Eslam Elawadi & Yousef Nazzal (2012): Major ion chemistry and weathering processes in the Midyan Basin, northwestern Saudi Arabia, Environ Monit Assess, DOI

Abstract

Chemical characteristics of 72 groundwater samples collected from Midyan Basin have been studied to evaluate major ion chemistry together with the geochemical and weathering processes controlling the water composition. Water chemistry of the study area is mainly dominated by Na, Ca, SO₄, and Cl. The molar ratios of (Ca + Mg)/total cations, (Na + K)/total cations, (Ca + Mg)/(Na + K), (Ca + Mg)/(HCO₃ + SO₄), (Ca + Mg)/HCO₃, and Na/Cl reveal that water chemistry of the Midyan Basin is controlled by evaporite dissolution (gypsum and/or anhydrite, and halite), silicate weathering, and minor contribution of carbonate weathering. The studied groundwater samples are largely undersaturated with respect to dolomite, gypsum, and anhydrite. These waters are capable of dissolving more of these minerals under suitable physicochemical conditions.

21. Taisser Zumlot , Awni Batayneh , Yousef Nazal, Habes Ghrefat , Saad Mogren, Haider Zaman, Eslam Elawadi, Abdalaziz Laboun, Saleh Qaisy (2012): Using multivariate statistical analyses to evaluate groundwater contamination in the northwestern part of Saudi Arabia. *Environ Earth Sci*, DOI 10.1007/s12665-013-2392-1.

Abstract

Chemical characteristics of groundwater in the Midyan Basin (northwestern Saudi Arabia) were investigated and evaluated. A total of 72 water samples were collected from existing shallow wells and analyzed for different elements. Two multivariate statistical methods, hierarchical cluster analysis (HCA) and principal components analysis (PCA), were applied to a subgroup of the data set in terms of their usefulness for groundwater classification, and to identify the processes controlling groundwater geochemistry. The subgroup consisted of 46 water samples out of 72 samples and 24 variables included major elements (Ca²⁺, Na⁺, Mg²⁺, K⁺, Cl⁻, HCO₃⁻, NO₃⁻, SO₄²⁻), minor and trace element (SiO₂, Al, As, B, Ba, Cd, Cr, F, Fe, Mo, P, Pb, Sb, Sn, Ti, and V). For water samples, four geochemically distinct clusters (i.e., C1, C2, C3 and C4) have been observed by hierarchical cluster analysis. Cr, F and Pb are the dominant ions in cluster C2. Al, As, Cd, Mo, Sb and Ti are the dominant ions in cluster C3, while B, Ca, Cl, HCO₃, K, Mg, Na, SO₄ and V are identified as dominant ions in the cluster C4. In the PCA, a total of five components are extracted from the data set, which explained 73.37 % of the total data variability. Among them the first component reveals strong associations between As, B, Cd, Cr, F, Mo, Pb, Sb and Ti. The second component reveals the associations between Ca, Cl, HCO₃, Mg, Na, SO₄ and V

22. Mohamed Metwaly & Mohamed Ahmed Khalil & El-Said Al-Sayed & Abeer El-Kenawy (2012): Tracing subsurface oil pollution leakage using 2D electrical resistivity tomography, *Arab J. Geoscience*, DOI 10.1007/s12517-012-0600-z.

Abstract

This study provides an evaluation of the subsurface oil contaminant flow in an oil production field at the Wadi Feiran fan, along the Gulf of Suez, Egypt. The 2D electrical resistivity tomography technique has been applied along four profiles surrounding the spill location of oil dump site. Theoretical soil resistivity response versus fluid resistivity for different cation exchange capacity values has been studied. Then, a physical model for the current situation of flowing the oil over the groundwater (sea invaded water) of saturated fluvial sediments has been introduced. It was supposed that the crude oil has higher resistivity values and turned to be conductive far away from the oil spill source under the effect of microbial

biodegradation. Such conditions of contaminated distribution and its resistivity values have been considered during the inversion and interpretation of the acquired data sets. The processed 2D resistivity profiles reveal that oil plumes are accumulated in the seawater invasion direction, whereas it has low signatures along the profiles parallel to the shore line.

23. Ghrefat, HA ; Yusuf, N ; Jamarh, A ; Nazzal, J (2012): Fractionation and risk assessment of heavy metals in soil samples collected along Zerqa River, Jordan ENVIRONMENTAL EARTH SCIENCES vOL: 66 (1), 199-208.

Abstract

: The objectives of the current study were to determine the chemical partitioning of Pb, Ni, Zn, Co, Cr, Mn, Fe and Cd using sequential extraction procedure and to assess the environmental risk associated with these metals in the farming soils along Zerqa River. Metal concentrations were measured by atomic absorption spectrophotometer. The study area demonstrated a wide range for pH, organic matter, carbonate contents, and cation exchange capacity, and is polluted with Pb, Cd, Mn, and Cu. The extensive use of fertilizers and pesticides in the agricultural activities, and discharge of treated and untreated wastewater are the major sources of pollution in the study area. Principal component analysis coupled with Pearson's correlation analysis between the heavy metals revealed strong and positive correlation between these metals in the study area. According to the Risk Assessment Code (RAC), major portions of Cd and Mn are contained in exchangeable and carbonates fractions and therefore can easily enter the food chain. These metals pose a high to very high risk to the environment. Cu, Ni, Pb, and Zn pose medium risk, while Cr poses a low environment risk.

24. Lashin, A., (2012): A preliminary study on the potential of the geothermal resources around the Gulf of Suez, Egypt. Arabian Journal of Geosciences, DOI 10.1007/s12517-012-0543-4.

Abstract

The Gulf of Suez is characterized by the presence of many hot springs and deep thermal wells scattered around its coastal areas. So it is considered one of the promised geothermal areas in Egypt. In this study, the main emphasis is to investigate the geothermal potential around the Gulf of Suez using the available logging and geothermometer datasets. The temperature profiles and well logging data of some hot springs and deep wells around or within the coastal area of the Gulf of Suez are used in this study. The temperature profiles are analyzed and some important thermophysical properties are estimated (geothermal gradient, thermal conductivity, heat flow, and specific heat capacity). Such analysis revealed that a medium to high geothermal gradient (22.0–30°C/Km) is given for the Gulf of Suez as a whole, with some spots of much higher gradient in the order of 35.0–44°C/Km (Ras Fanar and Hammam Faraun areas). The compiled thermal plots show that the thick evaporates and rock salt lithology, which is a major constituent in this area, attain the highest thermal conductivity (>3.10 W/m/K) and heat flow (>90 mW/m²) and the lowest specific heat capacity (<0.30 J/kg/K). The available gamma ray and the natural gamma ray spectroscopy logs are used to conduct a radioactive-based heat generation study using the characteristic radioactive nature of some elements like; ²³⁸U, ²³⁵U, ²³²Th, and of the isotope of ⁴⁰K. A good linearity is observed between the heat production (A in microwatt per cubic meter) and the gamma ray (API) along a wide range of datasets (0–150 API) in all wells. The heat production factor increases in the carbonate lithology (up to 3.20 μW/m³) and is proportional to the shale volume. A geothermometer-based study is used to estimate the subsurface formation temperature and heat flow from the geochemical analysis of some water

samples collected from the studied hot springs. The estimated thermal parameters are in harmony with the regional thermal regime concluded from logging data. A thermal basin growth study, in relation to the clay diagenesis is conducted concerning the thermal effects that take place with depth giving rise to another clay mineral (illite). Furthermore, a number of 2D thermal–burial history diagrams are constructed for the compiled sections of some of the studied areas to show the vertical distribution of the estimated petrothermal properties. A reserve evaluation study is carried out to estimate the economic geothermal capacity of these hot springs to be used as alternative clean source for possible energy production (electricity) and other low-temperature purposes.

25. Lashin, A., and Serag Al Din, S., (2012): Reservoir parameters determination using artificial neural networks: Ras Fanar field, Gulf of Suez, Egypt. *Arabian Journal of Geosciences*, DOI 10.1007/s12517-012-0541-6.

Abstract

Ras Fanar field is one of the largest oil-bearing carbonate reservoirs in the Gulf of Suez. The field produces from the Middle Miocene Nullipore carbonate reservoir, which consists mainly of algal-rich dolomite and dolomitic limestone rocks, and range in thickness between 400 and 980 ft. All porosity types within the Nullipore rocks have been modified by diagenetic processes such as dolomitization, leaching, and cementation; hence, the difficulty arise in the accurate determination of certain petrophysical parameters, such as porosity and permeability, using logging data only. In this study, artificial neural networks (ANN) are used to estimate and predict the most important petrophysical parameters of Nullipore reservoir based on well logging data and available core plug analyses. The different petrophysical parameters are first calculated from conventional logging and measured core analyses. It is found that pore spaces are uniform all over the reservoirs (17–23%), while hydrocarbon content constitutes more than 55% and represented mainly by oil with little saturations of secondary gasses. A regular regression analysis is carried out over the calculated and measured parameters, especially porosity and permeability. Fair to good correlation ($R < 65\%$) is recognized between both types of datasets. A predictive ANN module is applied using a simple forward backpropagation technique using the information gathered from the conventional and measured analyses. The predicted petrophysical parameters are found to be much more accurate if compared with the parameters calculated from conventional logging analyses. The statistics of the predicted parameters relative to the measured data, show lower sum error ($< 0.17\%$) and higher correlation coefficient ($R > 80\%$) indicating that good matching and correlation is achieved between the measured and predicted parameters. This well learned artificial neural network can be further applied as a predictive module in other wells in Ras Fanar field where core data are unavailable

26. Nassir S. Al-Arifi, Aref Lashin and Saad Al-Humidan and (2012): Migration of local earthquakes in the Gulf of Aqaba, Saudi Arabia. *Earth Sci. Res. SJ*. Vol. 16, No. 1 (June, 2012): 35 - 40.

Abstract

The Gulf of Aqabah has been considered one of the most seismically-active regions in the Middle East during the last 15 years; a catalogue of 1,415 earthquakes (duration magnitude $M_d \geq 2.8$) during 1985- 1995, compiled by Al-Arifi (1996) and Al-Shaabi (1998), mainly based on data from King Saud University. Seismic Studies Center (SSC), Saudi Arabia, for $28^\circ - 30^\circ\text{N}$ and $30^\circ - 36^\circ\text{E}$, has been used for studying local aftershock migration. Aftershocks migrated northwards about 60 km for the 1993 sequence and about 70 km for the 1995 sequence and also to shallow focal

depths (15 km focal depth for 1993 main-shock). Depths reduced as time elapsed until reaching 2 km for the last strong aftershock ($M_d=5.2$) which occurred during the late stage of the sequence. The 1993 main-shock caused a redistribution of stresses to the parallel faults' segment where the largest 1993 aftershock occurred triggering these faults' segment to become an area of stress nucleation and generated the 1995 main-shock.

27. Lashin, A. and Mogren, S., (2012): Total organic carbon enrichment and source rock evaluation of the Lower Miocene rocks based on well logs: October Oil Field, Gulf of Suez-Egypt. *International Journal of Geosciences*. Vol. 3, 683-695.

Abstract

October oil field is one of the largest hydrocarbon-bearing fields which produces oil from the sand section of the Lower Miocene Asl Formation. Two marl (Asl Marl) and shale (Hawara Formation) sections of possible source enrichment are detected above and below this oil sand section, respectively. This study aims to identify the content of the total organic carbon based on the density log and a combination technique of the resistivity and porosity logs ($\Delta \log R$ Technique). The available geochemical analyses are used to calibrate the constants of the TOC and the level of maturity (LOM) used in the ($\Delta \log R$ Technique). The geochemical-based LOM is found as 9.0 and the calibrated constants of the Asl Marl and Hawara Formation are found as 11.68, 3.88 and 8.77, 2.80, respectively. Fair to good TOC% content values (0.88 to 1.85) were recorded for Asl Marl section in the majority of the studied wells, while less than 0.5% is recorded for the Hawara Formation. The lateral distribution maps show that most of the TOC% enrichments are concentrated at central and eastern parts of the study area, providing a good source for the hydrocarbons encountered in the underlying Asl Sand section.

28. Lashin, A., and Al Arifi, N., (2012): The geothermal potential of Jizan area, Southwestern parts of Saudi Arabia. *International Journal of the Physical Sciences* Vol. 7(4), pp. 664 - 675.

Abstract

The geothermal resources of Saudi Arabia are mainly located in the southwestern parts associated with a series of volcanic rocks and ridges. Jizan area is considered as one of the most promising geothermal targets which are characterized by the presence of a number of structural related hot springs with a surface temperature range of 46 to 79°C. This work mainly aims to throw light on the possible potentiality of these resources at Jizan area, through analyzing the available satellite images and interpreting the geothermometer data. A number of Landsat and Spot satellite images, which cover the study area, are analyzed. The drainage pattern, digital elevation model and the prevailing structural elements are all interpreted. Three main thermal anomalies are recognized (Al Ardah, Al Khouba and Bani Malik), and more closely located to the east, away from the coastal plain in areas of high and complicated topographic nature, and originating from hard crystalline rocks. The general slope decreases notably westward from 45° in the high hill areas to 1° near the sea coast. The prevailing drainage patterns are mainly dendritic, running seaward and associated with up to four seaward-oriented coastal basins. A geo-thermometer based study (Silica, Na, K and Mg) was performed by analyzing the different water samples collected from the different studied hot springs and adjacent water wells to determine the subsurface formation temperature, heat flow and water type. Much higher thermal regimes are recognized in the localities occupied by the hot springs as compared with other surrounding areas. Maximum values up to 152°C and 210 mW/M² are recorded for the subsurface temperature and heat flow respectively. The studied hot springs are promised and needs to be

further investigated and accessed by additional geophysical methodologies.

29. Nassir S. Al-Arifi, Saad Al-Humidan and Aref Lashin (2012): Duration magnitude calibration of Kuwait national seismic network. Scientific Research and Essays Vol. 7(4), pp: 453-459.

Abstract

One type of magnitude formula is preliminarily developed from Kuwait National Seismic Network (KNSN) data which is intended for application by the network in its seismic monitoring activities. This is the duration magnitude scale of measurement which is empirically determined and expressed as: $MD = 2.66 \log(\Delta) + 0.036\Delta - 1.97 + Ci$. The magnitude formula is the result from applying multiple regression techniques to the data which have the seismic signal duration, Δ , that are obtained from 6 stations of the network. To ensure applicability of the magnitude equation for the network, stations corrections were determined which is indicated the Ci for the station. The station corrections are evaluated from the average of the difference values between the proposed magnitude formulas to respective magnitude equations was obtained from each seismic station.

30. Nassir S. Al-Arifi, Saad Al-Humidan and Aref Lashin (2012): Spatial distribution of maximal earthquake effects in the Red Sea region. International Journal of the Physical Sciences Vol. 7(16), pp: 2486 – 2492.

Abstract

Two maps of estimated maximum intensity distribution have been prepared for the Red Sea region by applying appropriate intensity attenuation and conversion equations, without considering the probability of exceedance. The maps are represented in two parametric elements, which are: the maximal earthquake effects and the period of observation. The significance of these maps is due to their contributory aspect of providing supplemental earthquake information pertaining to simple, but necessary seismic hazard representation of the Red Sea area. Basically, the maps are illustrative of the areas that are likely and susceptible to experience the possibility of hazardous earthquake effects as shown and indicated. The importance of this study is to give some high light on the maximal earthquake effects in the Red Sea which is one of the most important plate boundaries with frequent occurrence of moderate earthquakes. It is one of the most important passages of world trade with some important commercial ports on each flank.

31. Lashin, A. and Shata, A. (2012) An analysis of wind power potential in Port Said, Egypt. Renewable and Sustainable Energy Reviews Vol.16, pp: 6660–6667.

Abstract

Measurement station with mast of 19 m has been established in a built-up area, near the seashore to study the structure of a coastal location “Port Said” on Suez Canal-Mediterranean Sea intercept in Egypt. From our analysis of the wind data , an important characteristic is revealed in that the wind speed Spring months are more than that in Winter period. This characteristic is opposite to the prevailing wind speed parameters in most European countries. This paper also gives a detailed analysis of measured frequency distributions and monthly wind speed variation with air temperature that can exploited in the best way for fast wind machines. A numerical model was introduced to calculate the monthly and annual average wind energy flux and found to be quite moderate (in excess of 92 kW/m² per year at 50 m hub height) for this area.

It appears from our research that the expected energy from the wind in Port Said region which is nearly like as island- lies in the medium range. This potential can be

converted to electrical energy specially in the Spring months. However, an immediate application seems to be limited to electricity generation using medium size wind farms and water pumping.

32. Lashin, A. and Mogren, S., (2012): Analysis of well log and pressure data of the gas-bearing sand reservoirs of Kafr El-Sheikh formation: Case study from the off-shore Nile Delta-Egypt. *International Journal of the Physical Sciences* Vol. 7(35), pp. 5353-5366.

Abstract

The off-shore Nile Delta is one of the most promising areas for gas exploration and production in Egypt and the Middle East. The present study deals with evaluation of the gas-bearing sand anomalies at the off-shore Nile Delta of Egypt using the available well logging and the pressure datasets. The early to middle Pliocene sediments (Kafr El Sheikh Formation) of eleven wells scattered in the Darfeel and Port Fouad Concessions are analyzed and studied for determining the different petrophysical parameters necessary for reservoir evaluation. This study reveals the presence of three gas-bearing sand zones (anomalies-1, -2 and -3), with good hydrocarbon potential, encountered at different depth levels at the Early Pliocene sediments of Kafr El Sheikh Formation. The detailed petrophysical analysis of these zones shows that anomalies-1 and 2 attain good reservoir parameters, while anomaly-3 is not penetrated in majority of wells in the study area. However, anomaly-2 exhibits unique characteristics; in terms of the good porosity (27 to 33%), low shale volume ($V_{sh} < 10\%$) and high gas potentiality (42 to 93%), which it attains. The constructed petrophysical property maps of gas anomalies-1 and -2, reveal an observed diminish of gas saturation towards the eastern flank of the study area. The potential accumulations with the best reservoir cut-off parameters are recognized in the central and western parts of Darfeel Concession. The analysis of pressure data is concerned mainly with locating the different fluid contacts and determining the pressure gradients of the gas-bearing zones. Very close pressure regimes are detected for most of the investigated gas anomalies throughout the study area. Pressure gradient ranges of 0.331 to 0.345 psi/ft and 0.314 to 0.444 psi/ft are indicated for anomalies-1 and 2, respectively.

33. Saad Mogren and Mohamed Shehata (2012): Groundwater vulnerability and risk mapping of the Quaternary aquifer system in the Northeastern part of the Nile Delta, Egypt. *International Research Journal of Geology and Mining (IRJGM)* (2276-6618) Vol. 2(7) pp. 161-173

Abstract

As the most valuable natural resources, protection and management of groundwater is vital for human evolution, socio-economic development and ecological diversity. This paper presents the groundwater vulnerability mapping of the Quaternary aquifer system in the northeastern part of Nile Delta using Weighted Multi-Criteria Decision Support System model (WMCDDSS). This model has been implemented using Geographic Information System to delineate groundwater zones and to suggest a protection and improvement plan for major groundwater wells in the area. Six thematic layers were digitally integrated after assigning different weights (W_f) and rates (R_f) to them. These GIS layers have been created to adopt the most indicative criteria for investigating the groundwater degradation trends from sea level rise and seawater intrusion. The chosen layers are: total dissolved solids (TDS), r_{Cl}/r_{HCO_3} ratio, sodium adsorption ratio (SAR), groundwater type, hydraulic conductivity (K) and well discharge (Q). Weights have been assigned to all these layers according to their relative importance for groundwater vulnerability, whereas their corresponding normalized weights were obtained from their effectiveness factors. The groundwater

vulnerability map indicates four classes ranging from very low to high. According to this map, the promising localities for groundwater usage are located in areas where very low to low vulnerability has been observed. These localities are distributed over 4080 Km² area, covering 53.68% of the total study area. The areas having moderate to high groundwater vulnerability are more than 3520 Km², indicating a deterioration of groundwater quality in 46.32% of the study area, which need special treatment and cropping pattern before use.

34. Mukhopadhyay, B., Mogren, S., Mukhopadhyay, M. and Dasgupta, S., 2012. Incipient status of dyke intrusion in top crust – Evidences from the Al-Ays 2009 earthquake swarm, Harrat Lunayyr, SW Saudi Arabia. **GEOMATICS, NATURAL HAZARDS & RISK** (Taylor & Francis, London), published online 23 April 2012, iFirst article, pp. 1-19, <http://www.tandfonline.com/loi/tgnh20>

Abstract

The 2009 earthquake-swarm in the Al-Ays volcanic zone in Harrat-Lunayyir in NW Saudi-Arabia is unique because of its intense character and focal-depth distribution at two depth bands (5–10 and 15–20 km) in upper crust without volcanic eruption. We investigate an anatomy of the dyke-intrusion model that supports the mechanism for the swarm itself with seismo-tectonics, pore pressure diffusion process and inference model. Inferred dyke-intrusion initially started at depth had a five-day peak period (15–20 May 2009) since inception of event recordings, following which the activity diminished. The process of pore pressure perturbation and resultant ‘‘r–t plot’’ with modelled diffusivity ($D \approx 0.01$) relates the diffusion of pore pressure to seismic sequence in a fractured poro-elastic fluid saturated medium. The spatio-temporal b-values show high b-values (41.3) along the zone of dyke intrusion (length 10 km and height 5 km) at *20km depth. The main-shock and other prominent earthquakes originated on a moderate b-value zone (*1.0). Temporal b-value analysis indicates an exceptionally low b-value (*0.4) during the main-shock occurrence. The Al-Ays lava-field is inferred to underlie a seismic volume trending NW-SE bounded on both sides by two NW-SE trending fault systems, dipping 40–508 opposite to each other within a proposed nascent rift setting.

35. Dasgupta, SW., Mukhopadhyay, B. and Mukhopadhyay, M., 2012. Earthquake forerunner as probable precursor – An example from north Burma subduction zone. **J. GEOL. SOC. INDIA** (Springer), 80: 393-402.

Abstract:

The Burmese Arc seismic activity is not uniform for its ~ 1100 km length; only the Northern Burmese Arc (NBA) is intensely active. Six large earthquakes in the magnitude range 6.1 – 7.4 have originated from the NBA Benioff zone between 1954 -2011, within an area of 200 x 300 km² where the Indian plate subducts eastward to depths beyond 200 km below the Burma plate. An analysis on seismogenesis of this interplate region suggests that while the subducting lithosphere is characterized by profuse seismicity, seismicity in the overriding plate is rather few. Large earthquakes occurring in the overriding plate are associated with the backarc Shan-Sagaing Fault (SSF) further east. The forecasting performance of the Benioff zone earthquakes in NBA as forerunner is analysed here by: (i) spatial earthquake clustering, (ii) seismic cycles and their temporal quiescence and (iii) the characteristic temporal b-value changes. Three such clusters (C1- C3) are identified from NBA Benioff Zones I & II that are capable of generating earthquakes in the magnitude ranges of 7.38 to 7.93. Seismic cycles evidenced for the Zone I displayed distinct quiescence (Q1, Q2 and Q3) prior to the 6th August 1988 (M 6.6) earthquake. Similar cycles were used to forecast an earthquake (Dasgupta et al. 2010) to come from the Zone I (cluster C1); which, actually struck on 4 February

2011 (M 6.3). The preparatory activity for an event has already been set in the Zone II and we speculate its occurrence as a large event (M > 6.0) possibly within the year 2012, somewhere close to cluster C3. Temporal analysis of b-value indicates a rise before an ensuing large earthquake.

36. Kassem, O. M. K., Abd El Rahim S. H. & El Nashar E. R., 2012: Strain analysis and Microstructural evolution characteristic of Neoproterozoic rocks associations of Wadi El Falek, Centre Eastern Desert, Egypt. *Geotectonics*, Vol. 46, No. 5, 379-388.

Abstract

The estimation of finite strain in rocks is fundamental to a meaningful understanding of deformational processes and products on all scales from microscopic fabric development to regional structural analyses. The R_f/ϕ and Fry methods on feldspar porphyroclasts and mafic grains from 5 granite, 1 metavolcanic, 3 metasedimentary and 1 granodiorite samples were used in Wadi El Falek region. Finite-strain data shows that a high to moderate range of deformation of the granitic to metavolcano-sedimentary samples and axial ratios in the XZ section range from 1.60 to 4.10 for the R_f/ϕ method and from 2.80 to 4.90 for the Fry method. Furthermore, the short axes are subvertical associated with a subhorizontal foliation. We conclude that finite strain in the deformed granite rocks is of the same order of magnitude as that from metavolcano-sedimentary rocks. Furthermore, contacts formed during intrusion of plutons with some faults in the Wadi El Falek area under brittle to semi-ductile deformation conditions. In this case, finite strain accumulated during superimposed deformation on the already assembled nappe structure. It indicates that the nappe contacts formed during the accumulation of finite strain.

37. Kassem, O. M. K. 2012: Kinematic Vorticity Technique for Porphyroclasts in the Metamorphic Rocks: An Example from the Northern thrust in Wadi Mubarak belt, Eastern Desert, Egypt. *Arabian Journal of Geosciences*, Vol. 5, No. 1, 159–167.

Abstract

New structural, metamorphic, finite strain and kinematic vorticity data for mylonitic granitic rocks from northern thrust in Wadi Mubarak reveal a history of deformation reflecting different tectonic regimes. The vorticity analysis of porphyroclasts was determined in high temperature mylonites. The kinematic vorticity number for the mylonitic granitic samples in the northern thrust in Wadi Mubarak range from 0.66 to 0.90, and together with the strain data suggest deviations from simple shear. It is concluded that nappe stacking occurred early during the underthrusting event probably by brittle imbrication and that ductile strain was superimposed on the nappe structure during thrusting. The accumulation of ductile strain during thrusting was not by simple shear and involved a component of vertical shortening, which caused the subhorizontal foliation in the northern thrust in Wadi Mubarak and adjacent units.

38. Gabtni, H, Jallouli C, Mickus K, Dhaoui M., Turki M.M., Jaffal M., Keating P. (2012). Basement structure of southern Tunisia as determined from the analysis of gravity data: implications for petroleum exploration. *Petroleum Geoscience*. 18:143–152.

Abstract

Gravity data were analysed in the Ghadames Basin and surrounding regions in southern Tunisia in order to determine the basement structure of the region and its

relationship to petroleum exploration in relatively unexplored basins. The analysis included the construction of regional Bouguer gravity anomaly and horizontal gravity gradient maps. These maps indicate that the Ghadames Basin is not a simple sag basin but consists of a series of sub-basins and uplifts. The northern boundary of the basin which we call the Telemzan–Ghadames transition zone is marked by a NE-trending high amplitude gravity gradient anomaly which decreases in amplitude toward the east and breaks into a series of orth–south- and east–west-trending anomalies implying a more structurally complex region. When the known petroleum fields are overlain on to the gravity gradient anomaly maps, the fields mostly occur along or next to linear alignments of horizontal gravity gradient maxima. We interpret the correlation of the petroleum fields and horizontal gravity gradient maxima to indicate that the basement was involved in forming the petroleum traps. This study illustrates that a regional gravity analysis can be useful in determining where additional exploration can be applied in relatively unexplored basins.

39. Gabtni, H, Al-YahYaoui S, Jallouli C, Hasni W., Mickus K. (2012). Gravity and seismic reflection imaging of a deep aquifer in an arid region: Case history from the Jeffara basin, southeastern Tunisia. *Journal of African Earth Sciences* . 66(67):85-97.

Abstract

A detailed mapping of the lateral and the vertical extension of the Upper Cretaceous units which contains aquifer bearing lithologies and may be part of the Complexe Terminal aquifer in the Jeffara basin of southeastern Tunisia using land and satellite Bouguer gravity anomaly data, eight seismic reflection profiles and two deep wells was performed. Borehole data indicated that the Upper Cretaceous unit is thickest within the Jeffara basin and thins considerably in the Dahar High. Bouguer gravity data in general confirms this result but lacks the resolution to accurately determine the thickness of the Upper Cretaceous units. Eight seismic reflection profiles constrained by borehole data indicated that the Upper Cretaceous aquifer may be present at depths greater than 500 m and is up to 400 m thick. The seismic reflection analysis showed that the Upper Cretaceous units contain two distinct zones. Within the northeastern portions of the Jeffara basin, the Upper Cretaceous units are influenced by horsts, grabens and tilted blocks where the Upper Cretaceous units are deeper and thicker units occur within the grabens. A second zone exists toward the basin's southwestern section where the Upper Cretaceous units are shallower and gradually thin against the Dahar High. Structural contour maps of the top and the base of the Upper Cretaceous aquifer constructed from the seismic reflection profiles reveal the presence of fractured depressions in the northeastern part of the Jeffara basin that are favourable to the hydrogeological exploitation.

40. Sayed S. R. Moustafa, Elkhedr H. Ibrahim, Eslam Elawadi, Mohamed Metwaly and Naser Al Agami (2012): Seismic refraction and resistivity imaging for assessment of groundwater seepage under a Dam site, Southwest of Saudi Arabia. *International Journal of the Physical Sciences* Vol. 7(48), pp. 6230-6239.

Abstract

Seismic refraction and resistivity imaging methods were used to investigate a Dam site in Southwest Saudi Arabia to delineate the source and pathway of groundwater seepage in the site. The selected methods have the possibility to give an image of the subsurface and map lateral and vertical variations in the subsurface geology of the site. For this purpose, 48-channels seismograph with geophone spacing of 5 m, near-offset distance of 10 m and a total far-offset distance which varies between 230 and 280 m was used. Three seismic lines were conducted and the acquired data were inverted to velocity sections

using tomographic inversion. Velocity sections show that the subsurface is classified into four distinct seismic layers; starting with the topmost unconsolidated alluvium that is underlain by a second layer of saturated and/or compacted alluvium sediments. The third layer is associated with fractured basement, while the fourth layer is correlated to the hard massive bedrock with a relatively high velocity. These results indicate that the site is affected by faulting that resulted in two depressions which extends in the form of buried structural channels filled with porous alluvium and fractured greenstone. These depressions are considered zones of permeability and represent a favourable pathway for groundwater flow. These results and the zones of seepage are confirmed and verified using resistivity imaging, where a low resistivity zone of thickness up to 22 m is observed. This low resistivity zone is interpreted as a layer of alluvial sediment saturated with groundwater, which may indicate possible seepage flow.

41. Mohamed El Alfy (2012): Hydrochemical Modeling and Assessment of Groundwater Contamination in Northwest Sinai, Egypt. *Water Environ. Res.*, 84 (2012). doi:10.2175/WER-D-12-00157.1

Abstract:

This study aims to investigate groundwater geochemical characteristics, and to assess the effects of groundwater contamination in northwest Sinai, Egypt. A geographic information system, geochemical modeling, and statistical analyses tools were used. Twenty-five groundwater samples from a Quaternary aquifer were sampled. These water samples were analyzed for major, minor, and trace elements. The results of this study contribute to a better understanding of the hydrochemical characteristic as well as the anthropogenic processes of groundwater pollution. On the basis of these analyses, the geochemical parameters and the anomalous concentration of different elements enable the characterization of salinity sources of the brackish waters and the suspected sources of polluted water. Pollution sources are represented by waste disposal and agricultural activities as well as the probable upward leakage of highly saline water from the deeper aquifers and the saltwater intrusion. Pollution risk is high when the depth of the water table is shallow (0.3 to 15.0 m) and the aquifer has high hydraulic conductivity and poor matrix buffering capacity.

42. Mohamed El Alfy 2012): Integrated Geostatistics and GIS techniques for assessing groundwater contamination in Al-Arish area, Sinai, Egypt. *Arab J Geosci* (2012) 5:197-215

Abstract:

Sustainable development in El Arish area of North Sinai, Egypt, is retarded by serious environmental problems, where the land-use and land cover of the region is changing over present time. The impact of human activities in the study area is accompanied by the destruction and over-exploitation of the environment. This study applies multivariate statistics (factor and cluster analyses) and GIS techniques to identify both anthropogenic and natural processes affecting the groundwater quality in the Quaternary sands aquifer. The aim of this study was to investigate the impacts on groundwater resources, the potential pollution sources, and to identify the main anthropogenic inputs of both nutrients and trace metal. Since the depth to the water table is shallow especially in the northern part (<4 m), and the aquifer was exposed on the ground surface, it has poor buffering capacity and the pollution risk is very high. Groundwater chemistry in this coastal region has complex contaminant sources, where intensive farming activities and untreated wastes put stress on groundwater quality. Several areal distribution maps were constructed for

correlating water quality with possible contributing factors such as location, land-use, and aquifer depth. These maps identified both anthropogenic and natural processes affecting groundwater quality of the studied aquifer. Cluster analysis was used to classify water chemistry and determine the hydrochemical groups, Q-mode dendrogram is interpreted and there are three main clusters. Factor analyses identify the potential contamination sources affecting groundwater hydrochemistry such as: nitrate, sulfate, phosphate and potassium fertilizers, pesticides, sewage pond wastes, and salinization due to circulation of dissolved salts in the irrigation water itself.

43. Youssef, M. Taha, S. (2012). Biostratigraphy and Paleocology of Paleocene/Eocene (P/E) interval of some geological sections in central Egypt. *Arabian Journal of Geosciences*. Arab J Geosci DOI 10.1007/s12517-012-0692-5.

Abstract

The Paleocene/Eocene boundary intervals were studied in three outcrops along the Nile Valley: Gabal Taramsa, Gabal Qreiya, and Gabal Nag El Quda in Qena and Esna regions. The planktonic and benthic foraminifera have been examined. The qualitative study of planktonic foraminifera distinguishes eight planktonic biozones from (P4 and P5) Paleocene age to (E1, E2, E3, E4, E5, and E6) Early Eocene age. The analysis of quantitative distribution patterns of benthic foraminifera allows the reconstruction of the paleoenvironmental settings in the studied area. The disappearance or scarce appearance of deeper-water benthic foraminifera (*Angulogavelinella avnimelechi* and *Gavelinella rubiginosus*) and increasing dominance of shallow-marine taxa (*Buliminides*, *Loxostomoides applinae*) indicate deposition in shallow water environments. The benthic foraminiferal assemblages which dominated by *Loxostomoides applinae*, *Buliminids*, and *Lenticulina* indicate Dysoxic conditions and maximum food levels. The species of mid-way type fauna dominate the assemblages of the studied area; the species of Velasco-type fauna are very rare.

44. Zaidi, F. K., Kassem, O. M., Hussein, M. T., and Al-Bassam, A. M. (2012). Application of ERT Survey for Addressing the Issues of Urban Rain Storm Water Logging in the Qassim Province of Saudi Arabia. *International Journal of Geosciences*, 3(4), 726-736.

Abstract

The Qassim province is one of the most arid regions of Saudi Arabia, however heavy rainfall events have led to water logging problems in the populated centers like Buraidah mainly as a consequence of construction in low lying areas and valleys. Urban rain storm water logging problem were reported at 4 localities in the Buraidah Municipal area after heavy rainfall in November 2008 and March 2009. The logged water from these sites were directed to 4 manmade lakes however the stagnant water in these lakes posed a serious environmental threat mainly in the form of water borne dis-ease. Keeping this problem in mind, a detailed geophysical investigation in the form of Electrical Resistivity Tomogra-phy was carried out using the SYSCAL Pro Unit at these 4 locations with a dipole-dipole configuration. The survey was helpful in delineating the wet zones from the dry ones and based on the interpretations the optimum depth and sites of 4 injections bore-wells were determined at each locality. These injection bore-well would serve the dual propose of get-ting rid of the stagnant water in these lakes and also recharging the underlying aquifers.