



DEPARTMENT OF PHYSICS,
COLLEGE OF SCIENCE & TECHNOLOGY,
COVENANT UNIVERSITY, OTA, NIGERIA



Presents

International Conference on Science
and Sustainable Development

ICSSD 2017

Theme

**THE ROLE OF SCIENCE
IN NOVEL RESEARCH AND
ADVANCES IN TECHNOLOGY**

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Covenant University, Canaan Land, Ota, Nigeria





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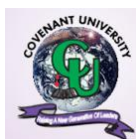
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SUMMARY



Prof. Babatunde Rabi

National Space Research and Development Agency, Abuja

Scientific Research: a Critical Input to Sustainable Development

Science is presented as a key to sustainable development. Science is a critical input to sustainable national and human development. This paper examined developments that has been catalyzed by application of scientific research in developed nations and highlighted some developments that are visible around us courtesy of applications of results from scientific research performed elsewhere. No nation can advance beyond the level of its scientific advancement. Technology is application of scientific output. Contributions of various aspects of science and technology to human developments were reviewed. The paper further emphasized the roles of science and technology in alleviating poverty; curbing economic leakages; fast-tracking economic recovery; fighting corruption; fighting against disease; population growth and urbanization; the digital/information divide; coping with climate change; confronting the water crisis; defending the soil; preserving forests, fisheries and biodiversity; building a new ethic of global stewardship; and such like. The need for scientific community to redirect her research agenda to solve multiple national challenges is re-echoed and a fresh call is made for the policy makers to patronize output from the laboratories of scientists towards sustainable development. A robust scientific research requires a robust financial support. Effective appropriation of fund for scientific research is inevitable for our science to be impactful toward sustainable development.



Prof. Adenike Boyo

Lagos State University, Lagos

Renewable Energy for Sustainable Development: the Role of Renewable Energy in Sustainable Development

A great attention is drawn to the world use of clean sources of energy and sustainable development in the world. The cleanest source of energy is the Sun, which has been sustaining life on Earth. The sustainability development of a nation depends on the policies, socioeconomic and structure of the nation. Harnessing Renewable energy sources will contribute to the economic, social and environmental energy sustainability of rural villages and urban cities. They improve energy demand for the population; reduce emissions of local and global Pollutants and create local socioeconomic development opportunities for the nation.

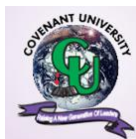


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New novel technology of future refrigeration and air-cooling systems using abundantly available dry ice

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Abstract – Based on the new novel technology thoroughly investigated by De and Oduniyi, it is possible that in near future the industrial emissions that pollute the environments and cause health problems would be completely captured in frozen solid forms of the emission products. One of these is the frozen carbon dioxide which is known as dry ice, which would be available then in hundreds of millions of tons in any country. Cost analysis show that the power and cement industries would significantly benefit by selling the dry ice captured using the technology, just at \$0.07 per kg. The present paper discusses this aspect together with a new technology of using the dry ice thus available abundantly for future refrigeration and air-cooling systems that can run only on a small solar power. The new refrigeration and air-cooling systems would specially be very useful in places where electricity is very scarce and is expected to be more economic and environment friendly than the current air-conditioning and refrigeration systems.

New novel technology of fighting wildfire in future using abundantly available dry ice

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Abstract – Wild fire causes havoc and serious destruction of forest resources and wild life. It also causes occasionally serious damages to human lives and properties. Current technology of fighting wild fire employs fire retardant chemicals which pollute environment seriously and damages both wild and aquatic lives. Based on the new novel technology thoroughly investigated by De and Oduniyi, it is possible that in near future the industrial emissions that pollute the environments and cause health problems would be completely captured in frozen solid forms of emissions products. One of these is the frozen carbon dioxide which is known as dry ice, which would be available then in hundreds of millions of tons in any country. Cost analysis show that the power and cement industries would significantly benefit by selling the dry ice captured using the technology, just at \$0.07 per kg. The present paper discusses the new technology of applying dry ice that would thus be abundantly available in fighting wildfire. The paper discusses how the new technology would be by far superior to current technology that employs fire retardant chemicals in terms of environmental protection and the cost effectiveness over the current technology.

World's Highest Energy Efficient Cooker

Dilip Kumar De^{1a}, Olawole Olugbenga Festus^a, Olawole Olukunle^a, Amechi Onome Otuto^a, Oladele James Samuel^b

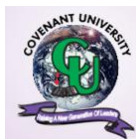
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Abstract – We report in this paper first the environmental pollution and health hazards arising out of cooking and the need to find means to cook food with minimum energy in order to minimize environmental pollution and protect health. We then report our researches on three versions of world's most energy efficient cookers using a pressure



cooker pot. In versions I & II the pressure cooker pot containing a microprocessor controlled heater is kept inside a well-insulated box. In version I, the heater delivers heat just 10% higher than the sensible heat required to cook the food (1 kg raw food plus required amount of water and ingredients). The sensible energy for cooking 1 kg of raw food is based on our previous works. In the version II, the heater delivers heat until the mean temperature of the food inside the pressure cooker reaches 115 °C (as measured by four sensors inside the food) and it switches off and on as the temperature rises to 115 °C and falls to 112 °C respectively. In the third version the pressure cooker pot containing the food is heated on a stove until the first whistle is heard and then it is kept inside a well-insulated box. In all the cases the food (rice, beans, meat, potato) is cooked when kept inside the insulated box for 30 minutes maximum. We also report the design and construction of an energy efficient wood stove and how it can be used to cook food with highest energy efficiency. We report the data collection on energy usage and analysis of the data (energy, time and quality of cooked food) including the comparison with published data on energy requirement for cooking.

New Novel technology of generating electrical power from the sun using thermionic energy converter

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Abstract – Thermionic energy converter (TEC) is an emerging technology that is being researched upon worldwide. In Covenant University we have carried out in-depth theoretical research on conversion of solar energy to electrical energy using TEC with graphene as emitter(cathode) and carbon nanotube material as collector(anode). In our studies, solar energy is concentrated on to the emitter by means of a parabolic concentrator. We discuss electrical power output for various solar insolation, diameter of parabolic concentrator, anode temperature, work functions of cathode and anode, emissivity and absorption coefficient of parabolic mirror and cathode. We discuss possible ways to minimize the space charge. In our simulation work we have used Richardson-Dushman equation modified by De and Olawole. We discuss the future potential application of the invention.

Modeling of Diurnal Pattern of Air Temperature in a Tropical Environment: Ile-Ife and Ibadan, Nigeria

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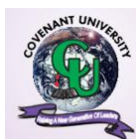
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Abstract – Existing diurnal air temperature models simulate night time air temperature over Nigeria with high biases. An improved parameterization is presented for modeling the diurnal pattern of air temperature (T_a) which is applicable in the calculation of turbulent heat fluxes in Global climate models, based on Nigeria Micrometeorological Experimental site (NIMEX) surface layer observations. Five diurnal T_a models for estimating hourly T_a from daily maximum, daily minimum, and daily mean air temperature were validated using root-mean-square error (RMSE), Mean Error Bias (MBE) and scatter graphs. The original Fourier series model showed better performance for unstable air temperature parameterizations while the stable T_a was strongly overestimated with a large error. The model was improved with the inclusion of the atmospheric cooling rate that accounts for the temperature inversion that occurs during the nocturnal boundary layer condition. The MBE and RMSE estimated by the modified Fourier series model reduced by 4.45 °C and 3.12°C during the transitional period from dry to wet stable atmospheric conditions. The modified Fourier series model gave good estimation of the diurnal weather patterns of T_a when compared with other existing models for a tropical environment.

Keywords: Air temperature, Surface Energy balance, Fourier series analysis, Mean Bias error



Modeling of the relative humidity, air temperature and solar radiation over Ota, Nigeria

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Abstract – Many agricultural, biological, environmental and physical processes require one or a combination of the following meteorological parameters: temperature, relative humidity and solar radiation. The study analysed the trend, as well as modeled the respective temperature, relative humidity and solar radiation over Ota, Nigeria. Four months (September - December 2012) minute-data were obtained from experiment carried out at the Department of Physics Covenant University Ota, Nigeria. The data were analyzed for the determination of trends in temperature, relative humidity and solar radiation. Fournier, Gaussian, Sum of Sine Functions and Exponential models were fitted using MATLAB with the accuracy of the models determined from root mean square error (RMSE), the coefficient of determination (R^2) and standard square error (SSE). The models that indicate the best fit between observed and estimated values for Ota is Fourier model while the worst model is Exponential model. The results can also produce input for weather pattern information planning and making decision for sustainable development in Ota, Nigeria.

Keywords: Temperature, relative humidity, solar radiation and root mean square error

The Significance of Quality Scientific Research Publications in the Sustenance of National Development

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Abstract – Scientific research publication is an essential part of academic progress and a general form of sustaining the technological development of a country. New advances in human knowledge are communicated to the outside world through scientific publications. It is essential that the knowledge communicated is accurate, valid, practicable, and useful. Therefore, every faculty/academic institution aims at becoming a leading runner of qualitative research and collaborative activities to develop her immediate environment and the world at large. One of the major ways of achieving this feat is by subscribing to credible journal outlets. Consequently, this work highlights and discusses some outstanding demands of publishing, and essential principles to follow, starting from manuscript writing to publishing. Some of these include making the most of one's time, finding relevant information, sharpening one's writing skills, developing funding savvy, and accelerating one's publishing career. Practical examples were also presented.

Keywords: Scientific publication; academic progress; technological development; writing skills;

Environmental pollutions, health hazards and global warming due to Industrial pollutions

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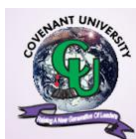
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Abstract – This paper discusses with statistics the various types of emissions that take place from coal and natural gas fired power plants and cement plants. It discusses the various health and environmental effects that are associated with these emissions. It discusses the growing level of CO₂ in atmosphere and the future global warming



potential as a consequence of the rising CO₂ concentration. The effect of global warming on environment and life on earth in future is discussed.

Assessing soil quality for sustainable precision farming using integrated geophysical methods

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Abstract – Sustainable farming will only be achieved by maintenance and improvement of soil quality. Agriculture as a vital tool for any buoyant economy seeking to attain food security must be enhanced with various methods to boost crop production and improve soil quality. A type of farming whereby large field are properly managed with the aid of information technology is known as precision farming. This method of farm management has been used extensively in advanced nations of the world such as USA, Germany and China. The results of exploiting land-use systems without consideration of the consequences on soil quality have been environmental degradation. Geophysical methods, which have been increasingly applied within a variety of agro-ecosystems, are some of the methods adopted to assess soil quality with a view of enhancing crop yield in precision agriculture. Resistivity, electromagnetic induction and ground penetrating radar have been the most prominent geophysical methods used in precision farming. However, in the last few decades, technological advancement has produced new geophysical tools or enhanced existing techniques so that near-surface geophysical investigation can be robust, cost-effective and non - invasive/ minimally invasive. These methods have proved to be very effective in detecting and mapping soil physical, chemical and biological properties relevant for sustainable agriculture. This work reviews some of the non-invasive and/or minimally invasive geophysical methods used for precision agriculture.

Keywords: Soil quality, precision farming, non-invasive geophysical methods

Coronal Mass Ejections Effects on the Time Derivatives of Geomagnetic Field H, Z and Electromagnetic Induction at the African Sector

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Abstract – This study describes the coronal mass ejection effects on the time derivatives of horizontal (H) and vertical (Z) components of the geomagnetic field and the rate of induction $\Delta Z/\Delta H$ at African sector (AAE, MBO, HBK, HER and TAM). We examined the largest geomagnetic disturbance of solar cycle 24 occurred on both 17 March and 22 June 2015 with Dst minima of -223 and -195 nT respectively. The results of the study demonstrated large dH/dt and dZ/dt which is more prevalent during daytime than the nighttime on 17 March 2015 while nighttime enhancement of dH/dt and dZ/dt observed on 22 June 2015. An application of wavelet analysis is done with the $\Delta Z/\Delta H$ data of AAE, MBO, HBK, HER and TAM, in order to analyze the $\Delta Z/\Delta H$ variability observed in African longitudes. The induction variability analysis, the main frequency components in the time series are studied by the global wavelet spectrum, exhibiting the $\Delta Z/\Delta H$ variation at AAE, MBO, HBK, HER and TAM.

Keywords: Coronal mass ejection, geomagnetic storm, geomagnetic field and wavelet spectrum.



Determination of the Effect of some Soil Parameters in Precision Agriculture using Electrical Resistivity and Physiochemical methods: case study of Covenant University Farm, Ota, Southwestern Nigeria

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Abstract – This project is to determine the role of some soil parameters such as soil resistivity, nutrients and Total Dissolved Solids (TDS) in agriculture using Electrical Resistivity and physiochemical methods in Covenant University School Farm. Three 2D profiles with a length of 32m each were carried out using the Wenner array. A total of 4 data levels were obtained for each profile. The inverse resistivity models obtained shows relatively high resistivity in most areas of each profile having a range of 84Ωm to 263Ωm, 62.46Ωm to 764.98Ωm and 0.60Ωm to 797Ωm for profiles 1, 2 and 3 respectively. The resistivity results indicates the presence of clay, sandy clay and clayey sand soil type for profile 1, clayey sand, clayey gravel and sandy clay for profile 2 and surface soil, clay, sandy clay and clayey sand for profile 3. The physiochemical analysis carried out indicated low level of Total Dissolved Solids and some soil nutrients in the area. Total Dissolved Solids (TDS) and soil conductivity levels in the area are within the WHO standard which is conducive for plants. Nevertheless, the area may not favour high crop production as its nutrient content is very low and would require the application of fertilizer to improve crop production. Using the results obtained from this study, it was concluded that the crops whose growth could be supported by the soil status in the study area are bean, corn and wheat.

Construction of a Voice Recognition Security System

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Abstract – Biometric technology is fast gaining popularity as means of security measures to reduce situations of fraud and theft due to its use of physical characteristics and traits for the identification of individuals. Voice recognition and identification technology focuses on training the system to recognize an individual's unique voice characteristics. It is like making an artificial human ear to be able to recognize and distinguish one person (ID holder) from another (intruder). This project seeks to deploy voice recognition for domestic use in homes, offices and wherever access control might be needed. A door setup was designed as case study using a stepper motor, a PIC18F4620 microcontroller, stepper motor controllers, LM3940 and LM7805 voltage regulators, a voice recognition module and other components. The entire system runs on a 12V power supply. It is designed such that upon proper verification, the access is granted and the door opens.

Keywords: Voice recognition, Security, Microcontroller, Identification technology.

Construction of Water Level Controller

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Abstract – In developing countries, residents struggle to monitor the water level of the tanks effectively and keep the pump running properly. In order to remediate the situation, there is need for an Automatic Water Pump Controller (AWPC) system to monitor the water levels and controls the pump so as to prevent breakdown and maximize water storage without overflowing the overhead tank and wasting water. Automatic water level controller for overhead tank was designed to monitor the level of water in a tank using Arduino microcontroller (ATMEGA328P). Several circuits were put together to ensure proper working of this circuit which includes the supply unit, the micro-processor unit, the sensor unit, the display unit and the pump drives unit. The sensor unit (an ultrasonic sensor) is responsible for detecting the water level and transferring the information of water level to the microprocessor for processing which eventually energizes or de-energizes the relay system depending on the



information sent to the controller. Hence the pumping machine at low water level It displays unit is use to physically show the current position of water in the tank, using the light emitting diode (LED) and when it is at the lowest level; a pump is activated automatically to refill the tank. When the tank is filled to its maximum capacity, the pump is automatically de-energized.

Keywords: Water, automatic pump controller, tanks, display

Design and Implementation of a Solar Laptop Charger

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Abstract – In today’s environmentally conscious climate there is more and more interest being taken in alternative forms of power supply. The project focuses on charging a laptop from sun, to be used by students, which is powered by energy generated from the sun through solar panels. The objective is to design a cheap, versatile and efficient solar laptop charger which allows mobility and environmental friendliness which reduces the limitation of using only ‘AC’ power supply.

This project involves designing a small scale laptop charging system which is powered via a solar panel through a dc to dc converter and that is capable of charging multiple laptop batteries simultaneously. This project work is therefore recommended that the prospect of generating power from the solar energy is reliable and should be duly considered as a major way to alternate the power source of a laptop charger.

Keywords: Solar panel, laptop, charger, power supply

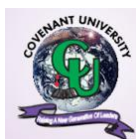
Construction of Frequency Modulation Bugger Circuit

F.T. Oyeniran, M.R. Usikalu, I.O. Babarimisa, W.A. Ayara and L.N. Obafemi

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Abstract – An FM transmitter is an electronic device which, with the aid of an antenna, produces radio waves. The transmitter itself generates a radio frequency alternating current, which is applied to the antenna. When excited by this alternating current, the antenna radiates radio waves. Frequency modulation (FM) transmitter generates the radio waves by varying the radio signal’s frequency slightly. FM transmitter is basically a VHF Colpitts oscillator capable of transmitting sound or music to any standard FM receiver. FM transmitter also has a capacitor microphone which picks up very weak sound signals. This FM transmitter was designed using transistors and other components such resistors, inductors and capacitors. In this project the transmitter frequency is $100\text{MHz} \pm 5\%$. The transmitting distance is 5 metres. It is powered with a 9-volt D.C battery and using a suitable F.M receiver tuned to the transmitting frequency of this project. F.M Transmitter can be used as cordless microphones, mobile phone and for public address purposes.

Keywords: Frequency modulation, radio wave, transmitter, interference



Current state-of-the-art- technologies to capture industrial emissions, their limitations and the need for better technology

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Abstract – This paper discusses the various state-of-the-art- technologies that have been so far invented in order to capture industrial CO₂ and various toxic emissions, their methods of capturing, the cost and materials implications and their limitations. It also gives statistics where such technologies are already implemented and refusal of many countries to adopt the costly technologies for climate mitigation. It then discusses the need for development of a new novel state-of-the-art-technology that can completely capture the emissions without need of any reagents or cryogen and transform them into useful products. The paper gives a hint of such novel technology that has been thoroughly investigated theoretically and the great future potential of such technology.

Development of an Automatic Solar Powered Water Level Controller

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Abstract – The need for water requirement for daily use is on the increase. Most cities and towns do not have a viable water treatment plant capable of meeting the demand for water by its citizens. Therefore, to mitigate the challenge of water shortage, both individuals and corporate entities now resort to sinking boreholes to meet their everyday water requirement. These boreholes in turn need water pumping machine whose efficiency is optimized with the availability of constant power supply. Undoubtedly, this effort is constantly being disrupted by erratic or non availability of power supply to pump and maintain the level of water in the over head tank. This project implements the possibilities of automatically maintaining usable water level in the overhead tank without wastages. The design implements the use of either a DC or AC water pumping machine powered by solar coupled with a battery power bank to provide power during possible cloud cover.

Keywords: Water, power bank, pumping machine, tanks, solar

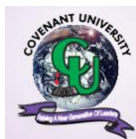
Biodegradation of Crude Petroleum by Bacterial Strains Isolated from Oil-Contaminated Soils in Ota, Ogun State

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Abstract – Pollution from petroleum products is of public health concern because of its attendant health and environmental impacts. Biodegradation of Bonny light crude petroleum and other selected hydrocarbons by bacteria isolated from soils of three different mechanic workshops in Ota, Ogun State, were studied. Bacteria were isolated using standard microbiological techniques from enrichment of the soil samples in minimal salt medium supplemented with 1% (v/v) crude petroleum as the only source of carbon and energy. The petroleum utilizing bacteria belonging to the genera *Bacillus* sp. SB4, *Pseudomonas* sp. SC8, *Serratia* sp. SC11, and *Acinetobacter* sp. (SC12) were screened and subjected for oil degradation using turbidity and total viable count, reduction in pH and residual oil concentration as indices. Gas Chromatographic (GC) analysis was used to analyse the component and percentage of the petroleum utilized. Plasmid curing and profiling were performed to determine whether the ability to utilize carbon is plasmid or chromosomally encoded. Results revealed that four bacteria strains were able to



utilize petroleum as energy source. The GC fingerprints showed that both the aliphatic and aromatic components of crude petroleum were reduced to varying degree with the exception of nonadecaneC19. Strain SC11 could not reduce anthracene, chrysene, benzo(a)pyrene and pyrene components. Strain SB4 depleted 24% - 57% aliphatics and 20% - 42% aromatics and strain SC8 depleted 38% - 67% aliphatics and 30% - 79% aromatics while strain SC11 depleted 12% - 46% aliphatics and 13% - 29% aromatics. All organisms harboured plasmid which suggests that petroleum degradation capabilities could be plasmid encoded. This indicates that the petroleum utilizing bacteria could be used for remediation of the petroleum polluted environment.

Keywords: Biodegradation, Bioremediation, Aliphatics, Aromatics, Gas Chromatography.

A Sustainable Mhealth Framework for Improving Health care Delivery in Developing Nations (Nigeria as a case study)

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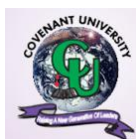
Abstract – Health systems in developing nation especially low and low-middle income countries is characterised with quite number of challenges which ranges from inefficient health information system, poor health delivery system, mortality and morbidity rate of disease and ailments, inadequate health manpower etc. The growth of ICT especially in developing nations has been on the increase bringing about a lot of invention amongst which mobile technology is one. Mobile technology as a significant ICT tool has the ability of penetrating into both the urban and rural areas and bringing about disruptive changes and development. The impact of technology has being seen in health system to bring across innovative inventions like telemedicine, telehealth, ehealth ,mhealth and has provided solutions to diverse health challenges. This paper presents the use of mhealth framework in providing promising solution. This paper focuses on using resources and technology that is supported based on availability, ease to access, affordability in a country to provide a sustainable framework for delivery of healthcare services and information.

Non-Destructive Evaluation of Antenna Sub-Reflector Quadrapod Support Legs for Radio Astronomy in Ghana

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Abstract – Ghana, as an SKA Africa partner country, has welcomed and collaborated with the Square Kilometer Array (SKA-SA) and the Hartebeesthoek Radio Astronomy Observatory (HartRAO) group of South Africa to assess the radio astronomy potential of the redundant satellite communication antennas at Kuntunse in Ghana. The suitability of the 32 metre cassegrain antenna and the Kuntunse control station for radio astronomy were assessed by the group. As part of the antenna conversion exercise, major rehabilitation work, which included the replacement of the corroded sub-reflector quadrapod support legs, was carried out. The new support legs, after fabrication from mild steel, were inspected for quality and reliability using radiography. Each support leg was 15 metres long and 0.4 metre thick. Circumferential, longitudinal and T- joints of the four legs, totaling 172 components, were inspected. After preliminary liquid penetrant tests of the joints, the welding passes were laid and capped for radiography. The welds were exposed to Ir-192 of 15 Ci activity for 4 minutes using contact technique at a source to film distance of 0.4 metre. Only 12 films, representing 7% of total welds radiographed, were rejected for repairs as a result of observed cracks and irregularities after processing and interpretation. The results show that the various components of the newly constructed sub-reflector quadrapod support legs are of high quality and therefore meet international standard.



The NASA CCMC Model: a Tool for Ionospheric and Magnetospheric Simulation Activity

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Abstract – The Community Coordinated Modeling Center (CCMC) being hosted in the Space Weather Research Laboratory of NASA-GSFC in US was launched with the aim of (i) facilitating research and development, (ii) addressing space weather needs, and (iii) supporting research to operations transition. In this work, a general overview of the CCMC activities was presented. Observational result was also compared with simulation activities using the Block Adaptive Tree Solar-wind with Roe-type Upwind Scheme with Rice Convection Model (SWMF/BATS-R-US+RCM) for geomagnetic induced currents (GICs) during a disturbed magnetic activity with special emphasis on the equatorial ionosphere. Part of our result is that the simulated magnetosphere responds earlier to fluctuating flow speed but the effect due to the fluctuating proton density lasted longer. GIC was presented as an all latitude phenomenon.

Keywords: Space weather, Geomagnetic induced current, Geomagnetic storm, equatorial latitude

The Demands of Quality Research Publications: your Role

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Abstract – Scientific publication is an essential part of academic progress. New advances in human knowledge are communicated to the outside world through publications. It is essential that the knowledge communicated is accurate, valid, practicable, and useful. Therefore, every faculty/academic institution aims at becoming a leading runner of qualitative research and collaborative activities. One of the major ways of achieving this feat is by subscribing to credible journal outlets. Consequently, this work highlights and discusses some outstanding demands of publishing, and essential principles to follow, starting from manuscript writing to publishing. Some of these include making the most of one's time, finding relevant information, sharpening one's writing skills, developing funding savvy, and accelerating one's publishing career. Practical examples were also presented.

Keywords: Scientific publication, Academic progress, Manuscript; Writing skills

How far do Refinery Emissions Go? A case study of the Tema Oil Refinery

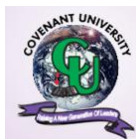
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Abstract – Refineries are known to contribute significantly to atmospheric emissions which may possess long-range transport capabilities. To determine the extent of dispersion of the refinery emissions in Ghana, the Tema Oil Refinery was used as a case study. The dispersion of particulate matter (2.5) PM_{2.5} was modelled over a 60 km² space with the refinery nearly at the centre. Within this space, thirty-eight (38) receptor locations representing residential and health facilities, schools and industries were identified and daily average concentrations of the



pollutants at these location calculated using the CALPUFF-WRF modelling system. Simulation results of ground level daily average PM concentrations indicated that the impact of the refinery emissions was felt at receptor locations within a radius of about 10 km around the refinery. Furthermore, receptors located on the north and north-eastern parts of the refinery showed relatively higher PM concentrations than other receptors in the study domain as a result of the predominant south-westerly winds in the study area. Conversely, south-western receptors were the least impacted by refinery emissions. The predicted daily average concentrations exceeded WHO regulatory limits at critical receptors.

Keywords: Refinery, Particulate matter, Receptors, CALPUFF-WRF modelling system

Delineation of Subsurface Hydrogeology Structure of Covenant University Ota and Environs using Magnetic and Resistivity Techniques

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Abstract – High resolution aeromagnetic data over Covenant Ota and environs was analyzed and this was used to investigate the heterogeneous nature of the subsurface of the area. The aeromagnetic technique was primarily used to delineate igneous rocks buried in the subsurface and to locate lineaments/faults within the area; this is because both parameters investigated are important for understanding the subsurface hydrogeology. The igneous rocks buried were identified from their high-amplitude and high-frequency of responses of magnetic properties of the subsurface. The source parameter imaging and tilt derivative were used respectively to estimate source depths and locate faults within the study area. The result revealed that there are clusters of faults in the eastern part of the study area compared to the western part and as a result, this presence of faults may likely control the occurrence of groundwater in the study area. However, further geophysical studies using resistivity technique was carried out in the area that is clustered with faults. It was observed that three (3) kinds of aquifer exist in the study area namely shallow aquifer with depth that ranged between 30 – 68 m, semi-deep at depths that ranged from 70.8 to 95.0 m and deep aquifer at depths that ranged from 96.0 to 108 m. This suggests that the groundwater potential in Covenant University may be controlled by this presence of faults.

Keywords: Aeromagnetic technique, resistivity technique, subsurface, groundwater

Estimation of Hydraulic Parameters from Dar-zarrouk Parameters for Aquiferous Zone Characterization in Iyesi Axis Ota, Ogun State Nigeria

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Abstract – The cost of estimating hydraulic parameters from slug test, pumping test, soil sample analysis etc is expensive. However, these parameters such as transverse resistance and longitudinal conductance can be estimated from geophysical parameters which are cost effective, non-invasive and inexpensive. In this present study, twenty (20) geoelectric sounding were carried out in Iyesi- Jackross axis with the use of ABEM 1000 series terrameter using schlumberger array and AB/2 ranges from 240 to 420m. The result revealed that there are six lithological layers in the study area namely; topsoil, lateritic clay, clayey sand, kaolitic clay, clayey sand (low yield aquifer) and sand (Main aquifer). The aquifer's depth ranges from 45.1 to 114.7 m with resistivity values ranges from 19.5 to 850.8 Ωm . Furthermore, transverse resistance and longitudinal conductance were estimated from geophysical parameters and it was observed that longitudinal conductance is low which ranges from 0.0127 to 0.0941 Ω^{-1} . Consequently, the aquiferous unit is characterized with high transmissivity and hydraulic conductivity. Transverse resistance ranges from 12246.00 to 124878.61 Ωm^2 and increase in transverse resistance that was observed generally indicating high transmissivity and high yield of the aquiferous units. It is therefore signifies that the study area is characterized with good groundwater potential. Further study can be carried out to estimate the boundary of aquifer thickness and the possible intrusion of Basement complex using magnetic technique.



Keywords: Geophysical parameters, Hydraulic parameters, Aquiferous zone

Dewatering of Tailing Storage Facility (TSF) at Mensin Gold Mines-Bibiani, Ghana

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Abstract – The aim of this project was to determine the quality and volume of water to be pumped out of the Tailing Storage Facility (TSF) at Mensin Gold Mines Bibiani. The overall pumping process, and the time required to undergo the dewatering process were determined. The process also determined the possible impacts of dewatering on the surrounding towns, assessed the physical and chemical parameters of water samples from the decant pond, levees; an embankment built to prevent the overflow of a river and the receiving media. The parameters were compared with the WHO standard and EPA guideline values. Ammonium, nitrate, cyanide and the other trace metals concentrations were below the WHO standard and EPA guideline values. The turbidity values measured were above the WHO and EPA guideline values. Considering the largest volume of water, a flow rate of 500 m³/hr was obtained with January and December chosen as months for the dewatering as they recorded the least amount of rainfall. The Flygt 5000 series model H5150 was used. A multi-layer filtration system was recommended to solve the high turbidity before the pumping from the TSF to the surrounding streams and rivers.

