Recycle Strategies to Deal with Metal Nanomaterials by Using Aquatic Plants Through Phytoremediation Technique

Jyoti Mehta, Moharana Choudhury, Arghya Chakravorty, Rehab A. Rayan, Neeta Laxman Lala, and Andrews Grace Nirmala

Abstract An expanding need for nanotechnology in different enterprises may cause a vast situation scattering of nanoparticles in the coming years. The most widely recognized recuperation technique utilized so far includes using magnets to isolate iron-containing nanoparticles from complex blends, including wastewater. A few strategies have additionally been produced for the extraction, partition, and re-utilization of costly gold nanoparticles from various fluids. Pollution of multiple contaminants similar to metal nanoparticles (MNPs), Cu, Ni, Zn, Cd Ag, Pb, etc. exists well known to cause toxicity on the aquatic ecosystem. Macrophytes *like Trapa spp., Lemna spp., Eichhornia spp., Vallisneria spp., and Pistia spp.,* etc., will be used to remove the MNPs from the contaminated water in an eco-friendly and cost-effective way. Phytoremediation has been effectively actualized in various

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Chapter 13
Factors Associated with COVID-19 and Predictive Modelling of Spread Across Five Urban Metropolises in the World

Arvind Chandra Pandey, Bikash Ranjan Parida, Shubham Bhattacharjee, Tannu Priya Wasim, Munizzah Salim, and Rahul Kashyap

13.1 Introduction

Severe acute respiratory coronavirus 2 (SARS-COV-2) was identified in Wuhan, China, in late December 2019 and caused an outbreak of the pandemic from the beginning of the year 2020 [1]. The novel coronavirus COVID-19 spread rapidly to 188 countries in the early months of 2020, and WHO declared Public Health Emergency of International Concern (PHEIC) on the 30th of January 2020 [2]. As of 5 October 2020, more than 35 million cases and 1.03 million deaths have been reported across the world [3]. The most affected countries concerning the number of COVID-19 cases were the USA, Brazil, Russia, India, the United Kingdom, Spain, Italy, France, and Germany [2]. To control the spread of novel coronavirus, the government has undertaken rigorous containment measures mostly in early and late March 2020, and such actions were partial to total lockdowns of economic activities and citizen mobility. The break of economic activities has led to a decline in the burning of fossil fuels and fumes from sclerotic traffic across the world. These measures have led to the reduction of atmospheric pollution and at the same time improvement of air quality index across the world [4–6]. The lockdown measures have led to a decline in the spread of infections over majorly affected countries but not to end the epidemic. The whole world is eager to know its end. Thereby, the influence of weather variability, built-up city patterns, and population density is of major interest on the spread of novel coronavirus across cities.

The outbreak has caused a healthcare crisis globally. The government in many countries has adopted various steps to reduce the transmission and to relieve the pressure on the healthcare system. According to researches on China and South

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Optimal Use of Land and Water Resources of a River Basin: Case Study

Prabeer Kumar Parhi

Abstract Due to quick rise in population and rapid urbanization more water needs to be diverted for domestic and industrial use thus decreasing the allocation of water for irrigation in the near future. Therefore it is the need of the hour to optimally allocate available land and water resources for irrigated agriculture in a river basin so that maximum benefits from the available resources are received. In view of the above in a given agro-climate region, an optimal cropping pattern can be developed such that the return from the available land resources is maximized with minimum consumption of available water for irrigation. Hence the present study aims at maximizing net return from the cultivable crops in a command area by satisfying land availability, Irrigation water requirement, surface, ground as well as total water availability and minimum and maximum crop area constraints considering the projected population by the year 2051 AD. For the purpose of analysis, the Brahmani Basin in Odisha State has been considered as a case study. For the purpose of optimization Linear Programming (LP) model has been used. The Software package Language for Interactive Discrete Optimizer (LINDO) has been used for solving the LP model. For estimating crop water requirement, the guidelines of Food and Agricultural Organisation (FAO) have been considered. The optimal cropping pattern so developed utilizes 3186.95 MCM water and generates a net profit of Rs 183489.2 lakhs against the existing cropping pattern which uses 4033.21 MCM of water and generates a net profit of Rs 114930 lakhs.

Keywords Cropping pattern · Optimization technique · Linear programming · Brahmani Basin

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Incomplete fusion dynamics in ^{19}F + ^{154}Sm system at energies ≈ 4-6 MeV/nucleon

Amritraj Mahato; D. Singh; Pankaj K. Giri; Nitin Sharma; Sneha B. Linda; Harish Kumar; Suhail A. Tali; M. Afzal Ansari; R. Kumar; S. Muralithar; R. P. Singh

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To study the dependence of incomplete fusion on entrance channel parameters, the excitation functions of evaporation residues populated through complete and/or incomplete fusion in ^{19}F + ^{154}Sm system were measured at projectile energy range ≈ 4–6 MeV/nucleon The measured excitation functions were compared with theoretical model PACE-4 predictions. Analysis of measured data suggests the production of xn/pxn-channels via complete fusion, as these were satisfactorily reproduced by PACE-4 cross-sections, while, a significant enhancement in the cross-sections of α-emitting channels was found, which was attributed due to the incomplete fusion process. A systematic study suggests that the incomplete fusion contribution increases with the entrance channel mass asymmetry and coulomb factor. Further, a study on the breakup threshold suggests that the incomplete fusion contribution increases with decrease in the α-Q value of the projectile.

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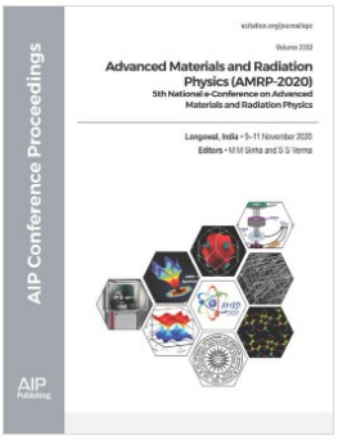

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Break-up fusion in the ^{16}O + ^{146}Nd system by measurements of excitation function of evaporation residues

Nitin Sharma; D. Singh ✉; Amritraj Mahato; Pankaj K. Giri; Sneha B. Linda; Harish Kumar; Suhail A. Tali; M. Afzal Ansari; R. Kumar; S. Muralithar; R. P. Singh

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Measurements of excitation function (EF) for the evaporation residues populated via complete and incomplete fusion in interaction of projectile ^{16}O with target ^{146}Nd have been done. Stack foil activation technique has been employed for these measurements. The measured excitation functions of the four ERs ^{158}Er (4n), ^{157}Er(5n), ^{155}Dy(α3n) and ^{153}Dy(α5n) has been compared with statistical model code PACE-4. The present measurements show that the experimental excitation functions for xn-emission channels follow the PACE-4 predictions to a great extent, whereas, α-emission channels don't agree well and exhibits considerable enhancement from theoretical predictions. The enhancements may be ascribed to the break-up of projectile ^{16}O resulting in incomplete fusion as PACE-4 considers only the complete fusion process. It has also been found that with increment in the projectile energy, probability of projectile break-up increases. Further, the comparison of present data

Quarkonium dissociation properties at finite chemical potential in relativistic heavy ion collisions

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Abstract. Using the quasi-particle Debye mass we have mapped the quarkonium properties at finite baryonic chemical potential which is obtained by approximated medium modified potential at $T = 0$ through the dielectric function. We study the dissociation temperature and baryonic chemical potential dependence of binding energy of heavy quarkonia states for full QCD case and estimated the ground state patterns of the J/ψ states.

1. Introduction

The study of quarkonium properties in relativistic heavy ion collisions is useful for varifying the existance of a Quark-Gluon Plasma (QGP) [1]. As we know that bound state of quarkonia via J/ψ or Υ mesons have larger life time comparatively to the medium produced in nucleus-nucleus collision. The potential models are used to calculate the binding energy using Schrodinger equation in which a potential is modified by the fourier transformation,which is medium dependent at finite temperature and baryonic chemical potential [2, 3]. In strongly interacting QGP [4],we can considers all possible hadronic particles even at $T > T_c$ and explain non-ideal behavior of QGP near T_c. It is assumed that once the charmonium dissociates the light quarks combining with the heavy quarks by hadronization,if the charmonium states are dissociates [5]. Therefore 60% of the observed J/ψ's particles comes from in a hadronic collisions and the remaining coming from the decays of χ_c and the ψ',excited charmonium states. Since each $c\bar{c}$ bound state dissociates at a different temperature with the point of reproducing the charmonium suppression pattern in the heavy ion collision [6, 7, 8, 9]. At finite temperature there are two speculative lines of studies to determine the quarkonium spectral functions which are potential models [10] and lattice QCD [11]. In this present work,we have studied quarkonia dissociation properties at finite chemical potential using quasiparticle debye mass [12]. For this we have studied both perturbative and non-perturbative term in cornell potential to get the heavy quark chemical potential through dielectric function at finite temperature and baryonic chemical potential. To describe these bound states of quarkonia we need exact potential obtained from lattice QCD,like the cornell potential at $T = 0$,has been derived from perturbative non-quantum chromodynamics from the zeroth order metching cofficient. Because of various difficulties arises in the affective field theories at the finite temperature extension, the lattice base potential becomes important. Till it is an open Question,which energy that is free energy or internal energy taken as potential which describe the bound state of quarkonia. We have studied quarkonium dissociation in the quark matter of high baryon density and minimum temperature by using quasiparticle Debye mass,for that purpose we have using the heavy quark chemical potential

CEOs Compensation and Firm Performance: Evidence from Bhutan

Publisher: IEEE

Cite This PDF

Kriti Bhaswar Singh ; Deepak Tulsiram Patil ; Rahul Khandelwal **All Authors**

Abstract:

This paper aims to explore the relationship between the remuneration of CEOs and the success of DHI companies owned and regulated in Bhutan. Financial data, obtained from secondary sources, for the period of 5 years from 2014 to 2018 using three performance indicators – Earnings after Tax, Return on Equity, and Tobin's q ratio were analyzed. CEOs' remuneration comprising salary and all other allowances, disclosed in the annual report were taken. Correlation and bivariate regression analysis were used to find the relationship between the compensation of CEOs and the success of firm performance. EAT and ROE show positive and Tobin's q ratio shows negative relationship between CEOs' remuneration. Further, CEOs' remuneration is observed to cause variability in EAT and ROE.

Unfolding the contribution of environmental and anthropogenic variables in forest fire over western Himalayan fire regime

Publisher: IEEE

Somnath Bar ; Bikash Ranjan Parida ; B. Uma Shankar **All Authors**

Abstract:

In last few decades, a surge of uncontrolled wild and forest fire has been observed over biomes, mostly from tropical and subtropical regions. The present study has disentangled the contribution of different environmental and anthropogenic factors in forest fire over the western Himalayan (Uttarakhand and Himachal Pradesh) fire regime, which is an active fire hotspot in India. Fire-CCI v5.1 data was used to labelled fire and non-fire pixel. The climatic (e.g. maximum and minimum temperature, precipitation, solar radiation, vapour pressure, wind speed, water vapour deficit, soil moisture and palmer drought index), physiographic (elevation, slope, aspect and roughness), anthropogenic (population density and human modification) and locational (latitude and longitude) variables were utilized to unfold their contribution in forest fire by the aid of Random Forest (RF) a machine learning technique. After parameterization, a 10-fold cross-validation RF model was built over the

Flood Frequency Analysis Using ERA5-Land Based Precipitation for Kosi-Mahasetu Station in North Bihar, India

Publisher: IEEE

Gaurav Tripathi ; Arvind Chandra Pandey ; Bikash Ranjan Parida **All Authors**

Abstract:
Floods are the biggest concerns in developing countries. Lower catchment areas of Kosi River basin inside North Bihar recurrently affected by floods due to heavy downpour. Flood frequency information is therefore vital but unavailability of historical data at public domain makes difficult to investigate flood events. This study has utilized ERA5-Land based rainfall data (1981-2020) over Kosi-Mahasetu CWC rain gauge in Supaul district for evaluating the rainfall frequency and development of different distribution curves. The mean annual rainfall at Kosi-Mahasetu station was 518.12 mm (SD =115.66, CV =0.12). The coefficient of skewness and Kurtosis was 0.184 and 0.607. The distribution functions such as Normal, Log 10 Normal and Gumble were applied over historical rainfall data to calculate rainfall intensity for 5, 10, 25, 50, and 100 years of return period. Based on Kolmogorov-Smirnov (K-S) test, it is observed that Log 10 normal distribution showed significant results. During 2007 flood event, the region received highest rainfall as ~779 mm during monsoon season with a return period of 41 years. Similarly, 1999, 2019, 1996, 2008, 1995, and 1993 flood events received ~748, ~730, ~717, ~677, ~673, ~624, ~616 mm rainfall with a return period of 20.5, 13.67, 10.25, 8.2, 6.83, 5.86, and 5.12 years, respectively. The study also exhibited that a total ~24% land area of North Bihar inundates recurrently. This study found helpful to predict and prepare for the extreme hydrological events by considering the return period of major flood events.

Design and analysis of the pressure sensor based on 2D photonic crystal consisting of micro-cavity

Publisher: IEEE

Nilaksha Ghosh ; Puja Sharma ; Sarang Medhekar ; Man Mohan Gupta **All Authors**

Abstract:

In this paper we design and analyze a photonic crystal (PhC) based pressure sensor. 2D hexagonal lattice having infinitely long circular silicon rods of refractive index 3.5 in air background has been considered here. There are two photonic crystal waveguides (PCWs) and a micro cavity in between in the design. The micro-cavity offers maximum coupling between two PCWs at resonant wavelength. The resonant wavelength suffers shift on application of pressure and hence, pressure can be sensed. We use Plane Wave Expansion (PWE) technique to analyze the band structure and 2D Finite Difference Time Domain (FDTD) technique to simulate light propagation in the considered design. Simulation results show that proposed sensor can operate in the pressure range of 0 GPa- 11 GPa with sensitivity of 7.53 nm/GPa.

Optical add-drop filter based on square ring resonator consisting of octagon shape core

Publisher: IEEE

Cite This

PDF

Puja Sharma ; Man Mohan Gupta ; Nilaksha Ghosh ; Sarang Medhekar **All Authors**

Abstract:

In this paper, an optical add-drop filter (ADF) based on a 2D square lattice photonic crystal (PC) is designed. Band diagram of considered ADF is analyzed with Plane Wave Expansion (PWE) technique and simulations on light propagation through it have been carried out using 2D Finite Difference Time Domain (FDTD) technique. The 2D square lattice PC consists of 35*29 infinitely long circular silicon rods of refractive index 3.45 in air background. The ADF design consists of two defect waveguides Bus and Drop which are coupled to each other through a square ring consisting of an octagon shape core. The proposed ADF is a compact structure of 286.19μm ^{2} . with resonance at wavelength 1549.2nm, a bandwidth of 2 nm, a high quality factor of 774.59, and a dropping efficiency of 90%. The effect of refractive index variation (of different parts of the design) on the performance of ADF is also investigated.

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A Study on the Vertical Pullout Capacity of Suction Caisson Foundation in Sandy and Clayey Soils

Suchit Kumar Patel and Baleshwar Singh

1 Introduction

Suction caisson foundation is an adequate alternative foundation for offshore structures including offshore wind turbine and offshore oil and gas platform. Its simple installation procedures and overall economy makes it a dependable foundation option compared to the conventional pile foundation especially in the higher water depth [1]. Suction caissons are concrete or steel cylindrical structure with larger diameter, open at bottom and closed at the top. Installation of suction caisson initially starts with self-weight penetration where caisson is permitted to enter the seabed under own weight. The self-weight penetration is followed by suction assisted penetration up to the required depth in seabed. In suction assisted penetration, suction pressure is generated inside the cylindrical chamber by pumping out the water from within the caisson chamber. This generates a differential pressure across sealed top, causing a downward hydrostatic force, which acts on the caisson top and pushes it to desired depth. The overall installation process takes a relatively short time and is not weather dependent. Larger diameter of suction caisson makes it to attain significant horizontal holding capacity. Suction caissons have been used for various offshore structures including single buoy moorings [2], tension leg platforms [3], jackets [4], deepwater subsea structures [5] and for anchoring some deep water submersible platforms [6].

Under severe environmental conditions, the acting tensile pullout load on suction caisson develops a passive suction pressure in pore water of soil beneath the caisson, providing the resistance against the pullout. Due to prolonged pullout loading, the

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Experimental Analysis of Ignition Delay in Dual Fuel Diesel Engine with Secondary Fuel

Chandra Bhushan Kumar, D. B. Lata, and Dhaneshwar Mahto

Abstract In the present research work, experiments were conducted on four cylinder water-cooled DI compression ignition diesel engine with diesel as base fuel, LPG and hydrogen gas as substitute fuel. For the experimental work, diesel engine was modified to run on base fuel diesel and secondary fuel gas. The experiments were conducted to measure the variation of pressure, ID period at varied conditions of load and different substitution of diesel with LPG and hydrogen fuel with and without EGR at rated speed. For the comparative study, the experimental result of ID was compared and contrasted with Hadenberge-Hase equation for the diesel engine and DFD diesel.

Keywords Dual fuel · Dual fuel compression ignition diesel engine · Alternative fuel · Ignition delay · Exhaust gas recirculation

Nomenclature

DFD	Dual fuel diesel
DF	Duel fuel
ID	Ignition delay
CNG	Compressed natural gas
NG	Natural gas
NGL	Natural gas liquid

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Spray forming technique for aluminium matrix materials: A review

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ABSTRACT

The spray forming technique is one of the emerging technologies that exhibit the near net shape forming capability of materials with improved mechanical and tribological properties, which enhance the performance of the material. This technique has the relatively high rate of deposition and solidification, which provides the fine size particles and their minimum segregation. Economically benefited, single step spray forming technique is a flexible and wide range of materials can be produced that are not feasible by any other techniques. This review paper provides the overview of spray forming technique to produce aluminium matrix materials. The major focus has been given to (a) microstructural features, (b) influence of process parameters, (c) porosity formation and its control and (d) evolution of mechanical and tribological properties. This review will be conclude the further recommendation for new research and direction to produce aluminium matrix materials for different applications.

Selection and peer-review under responsibility of the scientific committee of the International Conference on Materials, Processing & Characterization.

1. Introduction

Aluminium is a silvery-white metal produced from alumina. It is one of the lightest metals in the world, which is almost three times lighter than iron. Aluminium and its alloys are most economical, versatile and attractive metallic materials due to its unique combination of properties [1]. However, aluminium alone is inferior for a diversity of engineering applications, thus various alloying elements like copper (Cu), Zinc (Zn), silicon (Si), magnesium (Mg), manganese (Mn) have been introduced to enhance the mechanical as well as the other properties [2-5]. Aluminium with other elements exhibits the good mechanical properties, anti-corrosive & wear properties, high thermal and electrical properties [6-11].

Aluminium alloys are generally preferred as matrix materials in the composites, while the second phase is being used as reinforcement having the different morphology such as fibers, whiskers and particulates. Generally, oxides (ZrO_2, SiO_2, Al_2O_3), carbides (SiC, B_4C, TiC), nitrides (AlN, BN), boron, TiB_2, AlB_2, carbon (coconut ashes and graphite) are majorly used reinforcement in aluminium metal matrix composites (AMMCs) in the recent decades [12-15]. Many researchers have been employed diverse routes for manufacturing and processing of these composites [16-21].

Aluminium matrix composites/materials fabricated by conventional casting processes possess inferior mechanical properties due to the weak bonding between the reinforcement and matrix as well as dendritic structure. Such issues limit the applications of these materials in different industries. Number of fabrication techniques has been evolved to enhance the mechanical properties as well as other properties of the aluminium matrix materials, which has been done with a target to increase the overall performance for the engineering applications. Although, various researchers have been used various route to fabricate aluminium matrix materials such as stir casting [22], stir casting followed by die casting [23], powder metallurgy [24-26] etc. Conventional casting along with other casting process (stir casting, compo-casting) is slow solidification process, which extend the time of contact between reinforcement particles and matrix phase that generate potentially detrimental reaction products at the interface. On the other hand, spray forming is the fast solidification technique, which prevents the interfacial reactions [19]. Uniform distribution of secondary phase particles and fine microstructure of matrix in the aluminium matrix materials can be produced through the spray forming technique, which contributes to improve the good mechanical, physical and tribological properties [27]. Such spray formed aluminium

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Combustion Characteristics of Conventional Diesel Engine and Low Heat Rejection Diesel Engine with Biodiesel Blends

Sharad P. Jagtap, Anand N. Pawar, Subhash Lahane, and D. B. Lata

1 Introduction

There is overwhelming evidence that enhanced greenhouse effect from human activates is changing the global climate. To protect the environment, energy efficiency needs to be adopted and alternative to petroleum/fossil fuel for sustainable development is to be developed. Biodiesel is one of the options for motivating renewable and lower pollution making fuel for internal combustion engine. Hence, it is studied worldwide by long ago as a fuel for compression ignition engines. Biodiesel can substitute or blended with diesel fuel and can be used with some or no changes in CE operation. It is non-toxic, biodegradable and sulfur, aromatics is almost negligible [1]. Oil derived by crushing of oil seeds is not suitable as engine fuel. It has lower heating value, high viscosity, and low volatility. Transesterification is mostly used to reduce viscosity and improve other properties [2, 3]. The engine performance and combustion characteristics can be improved by applying thermal barrier coating (TBC) on engine cylinder head, piston crown, and both valves that causes low heat rejection passing through engine surfaces into jacket cooling water. A wide range of

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Incomplete fusion dynamics in ^{19}F + ^{154}Sm system at energies ≈ 4-6 MeV/nucleon

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To study the dependence of incomplete fusion on entrance channel parameters, the excitation functions of evaporation residues populated through complete and/or incomplete fusion in ^{19}F + ^{154}Sm system were measured at projectile energy range ≈ 4–6 MeV/nucleon The measured excitation functions were compared with theoretical model PACE-4 predictions. Analysis of measured data suggests the production of xn/pxn-channels via complete fusion, as these were satisfactorily reproduced by PACE-4 cross-sections, while, a significant enhancement in the cross-sections of α-emitting channels was found, which was attributed due to the incomplete fusion process. A systematic study suggests that the incomplete fusion contribution increases with the entrance channel mass asymmetry and coulomb factor. Further, a study on the breakup threshold suggests that the incomplete fusion contribution increases with decrease in the α-Q value of the projectile. These present results clearly show the effect of projectile structure on ICF dynamics along with other entrance channel parameters.

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Break-up fusion in the ^{16}O + ^{146}Nd system by measurements of excitation function of evaporation residues

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Measurements of excitation function (EF) for the evaporation residues populated via complete and incomplete fusion in interaction of projectile ^{16}O with target ^{146}Nd have been done. Stack foil activation technique has been employed for these measurements. The measured excitation functions of the four ERs ^{158}Er (4n), ^{157}Er(5n), ^{155}Dy(α3n) and ^{153}Dy(α5n) has been compared with statistical model code PACE-4. The present measurements show that the experimental excitation functions for xn-emission channels follow the PACE-4 predictions to a great extent, whereas, α-emission channels don't agree well and exhibits considerable enhancement from theoretical predictions. The enhancements may be ascribed to the break-up of projectile ^{16}O resulting in incomplete fusion as PACE-4 considers only the complete fusion process. It has also been found that with increment in the projectile energy, probability of projectile break-up increases. Further, the comparison of present data with earlier measurements supports that the incomplete fusion contribution increases with the entrance channel mass asymmetry of the system, but differently for different projectiles.

Quarkonium dissociation properties at finite chemical potential in relativistic heavy ion collisions

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Abstract. Using the quasi-particle Debye mass we have mapped the quarkonium properties at finite baryonic chemical potential which is obtained by approximated medium modified potential at $T = 0$ through the dielectric function. We study the dissociation temperature and baryonic chemical potential dependence of binding energy of heavy quarkonia states for full QCD case and estimated the ground state patterns of the J/ψ states.

1. Introduction

The study of quarkonium properties in relativistic heavy ion collisions is useful for varifying the existance of a Quark-Gluon Plasma (QGP) [1]. As we know that bound state of quarkonia via J/ψ or Υ mesons have larger life time comparatively to the medium produced in nucleus-nucleus collision. The potential models are used to calculate the binding energy using Schrodinger equation in which a potential is modified by the fourier transformation,which is medium dependent at finite temperature and baryonic chemical potential [2, 3]. In strongly interacting QGP [4],we can considers all possible hadronic particles even at $T > T_c$ and explain non-ideal behavior of QGP near T_c. It is assumed that once the charmonium dissociates the light quarks combining with the heavy quarks by hadronization,if the charmonium states are dissociates [5]. Therefore 60% of the observed J/ψ's particles comes from in a hadronic collisions and the remaining coming from the decays of χ_c and the ψ',excited charmonium states. Since each $c\bar{c}$ bound state dissociates at a different temperature with the point of reproducing the charmonium suppression pattern in the heavy ion collision [6, 7, 8, 9]. At finite temperature there are two speculative lines of studies to determine the quarkonium spectral functions which are potential models [10] and lattice QCD [11]. In this present work,we have studied quarkonia dissociation properties at finite chemical potential using quasiparticle debye mass [12]. For this we have studied both perturbative and non-perturbative term in cornell potential to get the heavy quark chemical potential through dielectric function at finite temperature and baryonic chemical potential. To describe these bound states of quarkonia we need exact potential obtained from lattice QCD,like the cornell potential at $T = 0$,has been derived from perturbative non-quantum chromodynamics from the zeroth order metching cofficient. Because of various difficulties arises in the affective field theories at the finite temperature extension, the lattice base potential becomes important. Till it is an open Question,which energy that is free energy or internal energy taken as potential which describe the bound state of quarkonia. We have studied quarkonium dissociation in the quark matter of high baryon density and minimum temperature by using quasiparticle Debye mass,for that purpose we have using the heavy quark chemical potential

CEOs Compensation and Firm Performance: Evidence from Bhutan

Publisher: IEEE

Cite This

PDF

Kriti Bhaswar Singh ; Deepak Tulsiram Patil ; Rahul Khandelwal **All Authors**

Abstract:
This paper aims to explore the relationship between the remuneration of CEOs and the success of DHI companies owned and regulated in Bhutan. Financial data, obtained from secondary sources, for the period of 5 years from 2014 to 2018 using three performance indicators – Earnings after Tax, Return on Equity, and Tobin's q ratio were analyzed. CEOs' remuneration comprising salary and all other allowances, disclosed in the annual report were taken. Correlation and bivariate regression analysis were used to find the relationship between the compensation of CEOs and the success of firm performance. EAT and ROE show positive and Tobin's q ratio shows negative relationship between CEOs' remuneration. Further, CEOs' remuneration is observed to cause variability in EAT and ROE.

Unfolding the contribution of environmental and anthropogenic variables in forest fire over western Himalayan fire regime

Publisher: IEEE

Somnath Bar ; Bikash Ranjan Parida ; B. Uma Shankar **All Authors**

Abstract:

In last few decades, a surge of uncontrolled wild and forest fire has been observed over biomes, mostly from tropical and subtropical regions. The present study has disentangled the contribution of different environmental and anthropogenic factors in forest fire over the western Himalayan (Uttarakhand and Himachal Pradesh) fire regime, which is an active fire hotspot in India. Fire-CCI v5.1 data was used to labelled fire and non-fire pixel. The climatic (e.g. maximum and minimum temperature, precipitation, solar radiation, vapour pressure, wind speed, water vapour deficit, soil moisture and palmer drought index), physiographic (elevation, slope, aspect and roughness), anthropogenic (population density and human modification) and locational (latitude and longitude) variables were utilized to unfold their contribution in forest fire by the aid of Random Forest (RF) a machine learning technique. After parameterization, a 10-fold cross-validation RF model was built over the whole dataset and the average overall accuracy, precision, recall, F-1 score and overall accuracy were estimated as 0.94 (±0.002), 0.86 (±0.003), 0.91 (±0.002) and 0.91 (±0.002), respectively. Furthermore, the whole dataset (2005-2018) was divided into two parts, training set (2005-2017) and testing (2018), to get a robust model. The testing accuracy (overall accuracy = 0.82, precision =0.79, recall = 0.95, F1 score = 0.86 and area under curve (AUC) = 0.95) suggested a reliable performance of RF model in forest fire classification (fire and non-fire). The contributions of the selected variables were retrieved from the feature importance of the RF model. The maximum temperature exhibited the highest importance, followed by elevation, minimum temperature and location variable (latitude and longitude). The population density and human modification (gHM) are moderately contributing to western Himalayan forest fire. Keywords: Forest fire; Western Himalaya; Random Forest

Published in: 2021 IEEE International India Geoscience and Remote Sensing Symposium (InGARSS)

Flood Frequency Analysis Using ERA5-Land Based Precipitation for Kosi-Mahasetu Station in North Bihar, India

Publisher: IEEE

Gaurav Tripathi ; Arvind Chandra Pandey ; Bikash Ranjan Parida **All Authors**

Abstract:
Floods are the biggest concerns in developing countries. Lower catchment areas of Kosi River basin inside North Bihar recurrently affected by floods due to heavy downpour. Flood frequency information is therefore vital but unavailability of historical data at public domain makes difficult to investigate flood events. This study has utilized ERA5-Land based rainfall data (1981-2020) over Kosi-Mahasetu CWC rain gauge in Supaul district for evaluating the rainfall frequency and development of different distribution curves. The mean annual rainfall at Kosi-Mahasetu station was 518.12 mm (SD =115.66, CV =0.12). The coefficient of skewness and Kurtosis was 0.184 and 0.607. The distribution functions such as Normal, Log 10 Normal and Gumble were applied over historical rainfall data to calculate rainfall intensity for 5, 10, 25, 50, and 100 years of return period. Based on Kolmogorov-Smirnov (K-S) test, it is observed that Log 10 normal distribution showed significant results. During 2007 flood event, the region received highest rainfall as ~779 mm during monsoon season with a return period of 41 years. Similarly, 1999, 2019, 1996, 2008, 1995, and 1993 flood events received ~748, ~730, ~717, ~677, ~673, ~624, ~616 mm rainfall with a return period of 20.5, 13.67, 10.25, 8.2, 6.83, 5.86, and 5.12 years, respectively. The study also exhibited that a total ~24% land area of North Bihar inundates recurrently. This study found helpful to predict and prepare for the extreme hydrological events by considering the return period of major flood events.

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Design and analysis of the pressure sensor based on 2D photonic crystal consisting of micro-cavity

Publisher: IEEE

Nilaksha Ghosh ; Puja Sharma ; Sarang Medhekar ; Man Mohan Gupta **All Authors**

Abstract:
In this paper we design and analyze a photonic crystal (PhC) based pressure sensor. 2D hexagonal lattice having infinitely long circular silicon rods of refractive index 3.5 in air background has been considered here. There are two photonic crystal waveguides (PCWs) and a micro cavity in between in the design. The micro-cavity offers maximum coupling between two PCWs at resonant wavelength. The resonant wavelength suffers shift on application of pressure and hence, pressure can be sensed. We use Plane Wave Expansion (PWE) technique to analyze the band structure and 2D Finite Difference Time Domain (FDTD) technique to simulate light propagation in the considered design. Simulation results show that proposed sensor can operate in the pressure range of 0 GPa- 11 GPa with sensitivity of 7.53 nm/GPa.

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Optical add-drop filter based on square ring resonator consisting of octagon shape core

Publisher: IEEE

Cite This PDF

Puja Sharma ; Man Mohan Gupta ; Nilaksha Ghosh ; Sarang Medhekar **All Authors**

Abstract:

In this paper, an optical add-drop filter (ADF) based on a 2D square lattice photonic crystal (PC) is designed. Band diagram of considered ADF is analyzed with Plane Wave Expansion (PWE) technique and simulations on light propagation through it have been carried out using 2D Finite Difference Time Domain (FDTD) technique. The 2D square lattice PC consists of 35*29 infinitely long circular silicon rods of refractive index 3.45 in air background. The ADF design consists of two defect waveguides Bus and Drop which are coupled to each other through a square ring consisting of an octagon shape core. The proposed ADF is a compact structure of 286.19μm ^{2} . with resonance at wavelength 1549.2nm, a bandwidth of 2 nm, a high quality factor of 774.59, and a dropping efficiency of 90%. The effect of refractive index variation (of different parts of the design) on the performance of ADF is also investigated.

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A Study on the Vertical Pullout Capacity of Suction Caisson Foundation in Sandy and Clayey Soils

Suchit Kumar Patel and Baleshwar Singh

1 Introduction

Suction caisson foundation is an adequate alternative foundation for offshore structures including offshore wind turbine and offshore oil and gas platform. Its simple installation procedures and overall economy makes it a dependable foundation option compared to the conventional pile foundation especially in the higher water depth [1]. Suction caissons are concrete or steel cylindrical structure with larger diameter, open at bottom and closed at the top. Installation of suction caisson initially starts with self-weight penetration where caisson is permitted to enter the seabed under own weight. The self-weight penetration is followed by suction assisted penetration up to the required depth in seabed. In suction assisted penetration, suction pressure is generated inside the cylindrical chamber by pumping out the water from within the caisson chamber. This generates a differential pressure across sealed top, causing a downward hydrostatic force, which acts on the caisson top and pushes it to desired depth. The overall installation process takes a relatively short time and is not weather dependent. Larger diameter of suction caisson makes it to attain significant horizontal holding capacity. Suction caissons have been used for various offshore structures including single buoy moorings [2], tension leg platforms [3], jackets [4], deepwater subsea structures [5] and for anchoring some deep water submersible platforms [6].

Under severe environmental conditions, the acting tensile pullout load on suction caisson develops a passive suction pressure in pore water of soil beneath the caisson, providing the resistance against the pullout. Due to prolonged pullout loading, the

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Experimental Analysis of Ignition Delay in Dual Fuel Diesel Engine with Secondary Fuel

Chandra Bhushan Kumar, D. B. Lata, and Dhaneshwar Mahto

Abstract In the present research work, experiments were conducted on four cylinder water-cooled DI compression ignition diesel engine with diesel as base fuel, LPG and hydrogen gas as substitute fuel. For the experimental work, diesel engine was modified to run on base fuel diesel and secondary fuel gas. The experiments were conducted to measure the variation of pressure, ID period at varied conditions of load and different substitution of diesel with LPG and hydrogen fuel with and without EGR at rated speed. For the comparative study, the experimental result of ID was compared and contrasted with Hadenberge-Hase equation for the diesel engine and DFD diesel.

Keywords Dual fuel · Dual fuel compression ignition diesel engine · Alternative fuel · Ignition delay · Exhaust gas recirculation

Nomenclature

DFD	Dual fuel diesel
DF	Duel fuel
ID	Ignition delay
CNG	Compressed natural gas
NG	Natural gas
NGL	Natural gas liquid

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Spray forming technique for aluminium matrix materials: A review

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ABSTRACT

The spray forming technique is one of the emerging technologies that exhibit the near net shape forming capability of materials with improved mechanical and tribological properties, which enhance the performance of the material. This technique has the relatively high rate of deposition and solidification, which provides the fine size particles and their minimum segregation. Economically benefited, single step spray forming technique is a flexible and wide range of materials can be produced that are not feasible by any other techniques. This review paper provides the overview of spray forming technique to produce aluminium matrix materials. The major focus has been given to (a) microstructural features, (b) influence of process parameters, (c) porosity formation and its control and (d) evolution of mechanical and tribological properties. This review will be conclude the further recommendation for new research and direction to produce aluminium matrix materials for different applications.

Selection and peer-review under responsibility of the scientific committee of the International Conference on Materials, Processing & Characterization.

1. Introduction

Aluminium is a silvery-white metal produced from alumina. It is one of the lightest metals in the world, which is almost three times lighter than iron. Aluminium and its alloys are most economical, versatile and attractive metallic materials due to its unique combination of properties [1]. However, aluminium alone is inferior for a diversity of engineering applications, thus various alloying elements like copper (Cu), Zinc (Zn), silicon (Si), magnesium (Mg), manganese (Mn) have been introduced to enhance the mechanical as well as the other properties [2-5]. Aluminium with other elements exhibits the good mechanical properties, anti-corrosive & wear properties, high thermal and electrical properties [6-11].

Aluminium alloys are generally preferred as matrix materials in the composites, while the second phase is being used as reinforcement having the different morphology such as fibers, whiskers and particulates. Generally, oxides (ZrO_2, SiO_2, Al_2O_3), carbides (SiC, B_4C, TiC), nitrides (AlN, BN), boron, TiB_2, AlB_2, carbon (coconut ashes and graphite) are majorly used reinforcement in aluminium metal matrix composites (AMMCs) in the recent decades [12-15]. Many researchers have been employed diverse routes for manufacturing and processing of these composites [16-21].

Aluminium matrix composites/materials fabricated by conventional casting processes possess inferior mechanical properties due to the weak bonding between the reinforcement and matrix as well as dendritic structure. Such issues limit the applications of these materials in different industries. Number of fabrication techniques has been evolved to enhance the mechanical properties as well as other properties of the aluminium matrix materials, which has been done with a target to increase the overall performance for the engineering applications. Although, various researchers have been used various route to fabricate aluminium matrix materials such as stir casting [22], stir casting followed by die casting [23], powder metallurgy [24-26] etc. Conventional casting along with other casting process (stir casting, compo-casting) is slow solidification process, which extend the time of contact between reinforcement particles and matrix phase that generate potentially detrimental reaction products at the interface. On the other hand, spray forming is the fast solidification technique, which prevents the interfacial reactions [19]. Uniform distribution of secondary phase particles and fine microstructure of matrix in the aluminium matrix materials can be produced through the spray forming technique, which contributes to improve the good mechanical, physical and tribological properties [27]. Such spray formed aluminium

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Combustion Characteristics of Conventional Diesel Engine and Low Heat Rejection Diesel Engine with Biodiesel Blends

Sharad P. Jagtap, Anand N. Pawar, Subhash Lahane, and D. B. Lata

1 Introduction

There is overwhelming evidence that enhanced greenhouse effect from human activates is changing the global climate. To protect the environment, energy efficiency needs to be adopted and alternative to petroleum/fossil fuel for sustainable development is to be developed. Biodiesel is one of the options for motivating renewable and lower pollution making fuel for internal combustion engine. Hence, it is studied worldwide by long ago as a fuel for compression ignition engines. Biodiesel can substitute or blended with diesel fuel and can be used with some or no changes in CE operation. It is non-toxic, biodegradable and sulfur, aromatics is almost negligible [1]. Oil derived by crushing of oil seeds is not suitable as engine fuel. It has lower heating value, high viscosity, and low volatility. Transesterification is mostly used to reduce viscosity and improve other properties [2, 3]. The engine performance and combustion characteristics can be improved by applying thermal barrier coating (TBC) on engine cylinder head, piston crown, and both valves that causes low heat rejection passing through engine surfaces into jacket cooling water. A wide range of

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Advances in Microbe-assisted Phytoremediation of Polluted Sites

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Advances in Remote Sensing for Forest Monitoring

Chapter 2

Geospatial Perspectives of Sustainable Forest Management to Enhance Ecosystem Services and Livelihood Security

Amit Kumar, Pawan Ekka, Subhashree Patra, Gajendra Kumar, Bodi S.P.C. Kishore, Rahul Kumar, Purabi Saikia

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Summary

Sustainable Forest Management (SFM) contributes to human well-being by meeting people's socioeconomic, ecological, cultural, and spiritual needs at local, national, and global levels. Integrated SFM enhances forests' carbon value, and maintains or improves other important local or global ecosystem services to support local livelihoods. Enhancing the carbon stock of forests has the potential to make a large contribution to carbon sequestration for climate change mitigation. Forests also aid in the preservation of groundwater aquifers that contribute significantly to overall agricultural productivity. The geospatial techniques provide a systematic, consistent picture of earth at regular intervals that help in detecting land cover changes and revealing biodiversity dimensions. With the availability of high-resolution satellite data, remote sensing has aided in the detection and recovery of forest disturbances. Adoption of a landscape-based approach to comprehensive land use planning, with a focus on forest ecosystem services and their long-term usage to support local livelihoods may contribute to SFM. Forest management should be guided by broad environmental and socioeconomic objectives that lead to ecosystem-based approaches (EbAs) to manage the entire ecological system in a holistic and integrated manner. The current chapter lays forth a comprehensive approach for supporting long-term forest management, with a focus on India.

Advances in Microbe-assisted Phytoremediation of Polluted Sites
2022, Pages 63-84

Chapter3 - Role of genetic engineering in microbe-assisted phytoremediation of polluted sites

Shahrukh Nawaj Alam [a], Zaira Khalid [a], Manisarani Patel [a], Priyanka Kumari [a], Anup Kumar [a], Bhaskar Singh [a], Abhishek Guldhe [a b]

https://doi.org/10.1016/B978-0-12-823443-3.00008-9 ↗

Abstract

Natural environment are being contaminated by various anthropogenic activities and developing industrialization. This demands appropriate technologies to remediate polluted sites. Because of the site-specificity most of the traditional remediation methods are not economical. Traditional phytoremediation is among the safest and most effective tools for remediation. However, it is time consuming and could be efficient for one contaminant but inefficient for another. Limitation of phytoremediating plants such as incomplete degradation and metabolism of some xenobiotics led to the concepts of modifying plants and microbes to enhance the conventional phytoremediation process. This chapter highlights microbe-assisted phytoremediation and developments of new plant-microbe association for enhancing remediation of harmful compounds, and discusses the role of transgenic microbes associated with plants which play role in the process of phytoremediation and decontamination of polluted ecosystems.

Advances in Microbe-assisted Phytoremediation of Polluted Sites

2022, Pages 27-62

Chapter2 - Microbial augmented phytoremediation with improved ecosystems services

Khushbu Kumari [a], Sam Cherian [b] *, Kuldeep Bauddh [a]

https://doi.org/10.1016/B978-0-12-823443-3.00017-X ↗

Abstract

A variety of appealing remediation techniques have been used to remove the contaminants. For this, significant management strategies have been applied to remediate the polluted soil using soil microbiological processes. This chapter aims to explore the advantages of microbial augmented phytoremediation for the enhancement of soil quality that ensure adequate supply of essential nutrients for surplus growth of agricultural crops with other improved ecosystem services. The microbial augmentation stimulates the nutrient storage, regulation of plant hormones and enhancement of the antioxidants. Application of microbes to the soil ecosystem improves nutrient bioavailability through nitrogen fixation and mobilizing essential elements to the plants while improving soil structure and decontamination efficiency. This chapter elaborates and explains abiotic and biotic stress-tolerant soil microbes and their mechanisms of action in order to improve environmental sustainability.

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Advances in Microbe-assisted Phytoremediation of Polluted Sites

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Chapter15 - Role of microorganism in phytoremediation of mine spoiled soils

Ankit Abhilash Swain †, Neha Dwivedi †, Kuldeep Bauddh, Manoj Kumar

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Abstract

Intensive mining activities across the globe produce huge amounts of mine waste which is polluting the soil, air, and water. Acid mine drainage is contaminating soil and water resources with toxic heavy metals (HMs) along with other potential contaminants. Through soil, HMs enter the food chain via plant roots uptake and deteriorate the entire ecosystem. Phytoremediation is an efficient, sustainable and environment-friendly technology in which plant is used for cleaning up the HMs and other toxic contaminants. With advancements in sequencing techniques, studies were conducted to assess the feasibility of microbial communities in assisting the phytoremediation of the contaminated sites. It is found that microorganisms accelerate the phytoremediation of the abandoned mine sites significantly. Microorganisms can precipitate toxic metals inside soils and can promote plant growth on polluted mined soils and tailings. In this chapter, mine spoiled soil and its management with special emphasis on the role of microorganisms in assisting phytoremediation of mine spoiled soil has been discussed. Some case studies where microorganisms facilitated the phytoremediation of contaminated soil are also reviewed.

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Advances in Microbe-assisted Phytoremediation of Polluted Sites

2022, Pages 207-230

Chapter 9 - Phytoremediation of heavy metal contaminated soil in association with arbuscular mycorrhizal fungi

Sonal Dixit [a], Preetanshika Tracy [b], Neha Vishnoi [b], Ankit Abhilash Swain [c], Kuldeep Bauddh [c], Manoj Kumar [c]

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Abstract

Various anthropological activities in developing countries have magnified the heavy metals (HMs) pollution in the soil and turned it to be a matter of serious concern for the environment. The accumulation of these noxious compounds in the surroundings has forewarned the advancement and health of living creatures through its mutagenic and carcinogenic nature. Arbuscular mycorrhizal fungi (AMF) associated with phytoremediation is an appealing approach for plant-based clean-up of the environment amongst the remediation approaches used for the restoration of polluted soil. Arbuscular mycorrhizal establishes symbiotic relationship with the plants which are significant in the renovation of tarnished ecosystems. AMF are not only utilized for facilitating vegetation establishment and sustenance in HMs polluted soil by defending but also boosted the process of bioremediation of soil by posturing telluric activity of microbes and refining soil composition. This phytotechnology is yet in its infancy and small-scale research has been conducted on matured polluted soils though its in-situ efficiency still remains unestablished. This chapter presents information about the impacts of HMs pollution on the ecosystem, the effectiveness of AMF symbiotic association and its part in the phytoremediation of HMs polluted soil.

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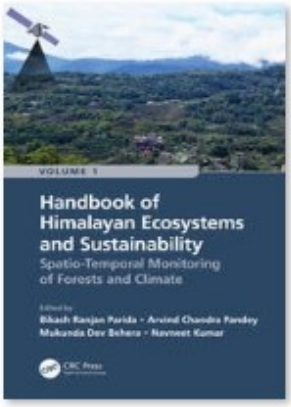

Chapter

Effect of Terrain Slope in Canopy Height Estimate Using LiDAR Data

By Tarun Joseph, Mukunda Dev Behera, P Tripathi, Bikash Ranjan Parida

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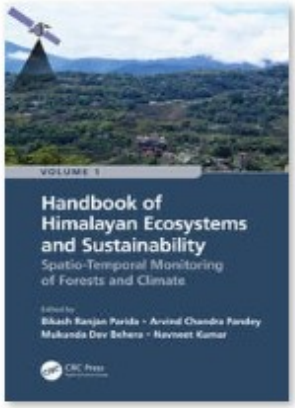
ABSTRACT

Canopy height is a crucial metric required to accurately quantify the aboveground plant biomass. The study explores the data derived using LiDAR technology from the GeoScience Laser Altimeter System (GLAS) aboard the Ice, Cloud, and Land Elevation satellite (ICESat) to derive canopy height estimates for Northwestern India using four different canopy height models. The interpretation of LiDAR waveforms for the purpose of estimating canopy heights is not straightforward, especially over sloping terrain where vegetation and ground are found at comparable heights. A terrain index derived from the ASTER digital elevation model (DEM) was employed to quantify the topographic relief effects that often plague the accuracy of canopy height estimates over steep terrain. The models that incorporated the terrain index were found to outperform their counterparts, especially over steep slopes, revealing that they were able to successfully account for the pulse-broadening effect. The study highlights the importance of identifying peaks corresponding to the ground location within the LiDAR waveform to yield better canopy height estimates, especially over gentle slopes.



Chapter

Himalayan Carbon Flux Demonstrates Higher Aseasonality GOSAT-Derived Spatio-Temporal Profile and Comparison through Wind and Water Vapour

By S Mandal, Pulakesh Das, Mukunda Dev Behera, Bikash Ranjan Parida

Book Handbook of Himalayan Ecosystems and Sustainability, Volume 1

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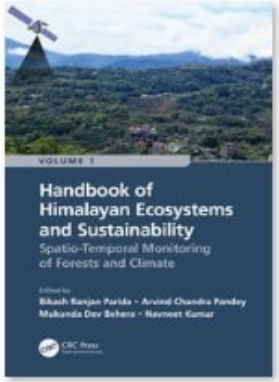
ABSTRACT

Spatio-temporal greenhouse gas (GHG) monitoring is essential to understand the seasonality in sources and sinks of GHGs distribution. This chapter analyses the CO_2 concentration over the Indian mainland during 2010-2012 using GOSAT data. The ground observed data from the Cape Rama station in the Western Ghats was used to rectify the GOSAT based observations by integrating the wind (u-wind, v-wind, resultant) and water vapour data. The second-order nonlinear and first-order multiple linear regression analyses were performed employing yearly and seasonal data. The regression equation was generated using 70% and validated with 30% of the observation data following the data splitting method. The mean CO_2 concentration of 2.09 gC/m^2/day and 3.16 gC/m^2/day was recorded over the Indian mainland in 2010 and 2012, respectively,



Chapter

Disentangle the Short-Term Forest Degradation over Most Fire-Affected Parts of Western Himalaya, India

By Somnath Bar, Bikash Ranjan Parida, Jadunandan Dash

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ABSTRACT

The tropical forest contributes around 5% to 15% of atmospheric carbon emissions, which are mostly anthropogenic. But there are large uncertainties in the quantification of these emissions from its sources. The remote-sensing data offers a practical opportunity to monitor and assess different forest disturbances. Western Himalayan forest is often affected by fire events, mostly during (pre-monsoon) dry and warm periods. In this study, we present a way to monitor the forest degradation condition using spectral mixture analysis (SMA) and surface reflectance of Landsat-8 data from 2014 to 2019. The Normalized Degradation Fraction Index (NDFI) has been performed by using spectral end member fractions of green vegetation (GV), non-photosynthetic vegetation (NPV), soil, and shade in the Google Earth Engine (GEE) cloud platform. The NDFI shows considerable spatial correspondences with clusters of fire spots during the pre-monsoon period. Around 3% to 9% of the forest burned area transformed to partially to highly degraded forest. The overall trend of degradation fraction (NDFI) over total forest cover shows a significant negative trend over a considerable area. Thus, Landsat-8-based SMA and NDFI demonstrate a potential way to identify forest

13 Monitoring Land Use/ Land Cover Change and High-altitude Vegetation Trends along with Their Climatic Controls across the Central and Eastern Himalayas

Bikash Ranjan Parida[1,*], *Shaily Sparsha*[1], *Somnath Bar*[1], *Arvind Chandra Pandey*[1], *and Navneet Kumar*[2]

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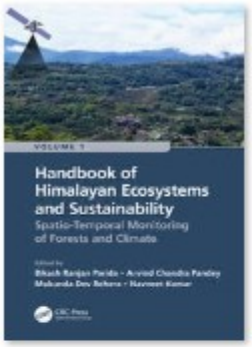

Chapter

Dynamics of Land Use/Land Cover over Indian Himalayan Region (IHR) Using Satellite Data from 1985 to 2015 Coupled with Local Perceptions

By Bikash Ranjan Parida, Preetam Kumar, Joyeeta Singh Chakraborty, Nandita Bag, Navneet Kumar

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ABSTRACT

The dynamics of land use/land cover (LULC) are governed by many complex interacting processes and mainly associated with natural and human factors. Monitoring LULC dynamics is necessary because such changes are the driving forces for assessing various ecosystems and environmental processes. This study has employed remote sensing-derived LULC datasets to quantify the spatio-temporal LULC dynamics in the Indian Himalayan region (IHR) from 1985 to 2015, and further, the analysis was coupled with local perceptions on LULC changes. The results showed that urban area increased significantly from 1985 to 2015 (28.6% in Sikkim to 305% in Uttrakhand). An increase in cropland was found from 1985 to 2005 over IHR (6.5% in Himachal Pradesh to 41.2% Arunachal Pradesh), whereas a decline in cropland was evident from 2005 to 2015 in both Western Himalaya (2% to 21.5%) and Eastern Himalaya (12.88% in Sikkim). A marginal loss in forest cover was seen (up to 4.9%) from 1985 to 2005 over IHR because of deforestation, urbanisation, and land degradation, which are attributed to human activity. The loss of forest cover was considerably higher (10.6% in Arunachal

14 Climate Forcing on Photosynthetic Variability across Various Relief Zones in the Himalaya

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CONTENTS

14.1 INTRODUCTION

Over the recent decades, the changing climate has been among the most crucial topics worldwide. The increased concentrations of greenhouse gases (GHGs), aerosol loads in the atmosphere, and changes in land use and land cover (LULC) patterns are leading to global warming trends (Solomon et al., 2007; Shukla et a., 2019). The most important factor for climatic studies in a region is its variability in temperature (Dimri and Chevuturi, 2014). One of the major indicators of climate change and variability is change in terrestrial vegetation.

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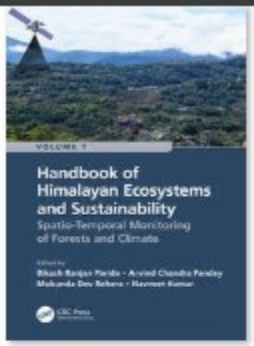

Chapter

Corroborating Satellite-Derived Forest Types Distribution and Diversity in the Subansiri Region of the Eastern Himalaya, India

By Mukunda Dev Behera, Bikash Ranjan Parida

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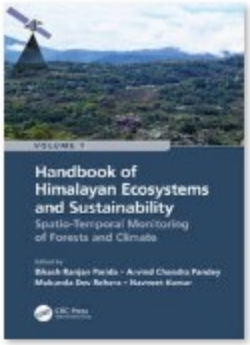
ABSTRACT

Satellite remote sensing-based forest vegetation maps provide information on forest cover and type distribution that can be corroborated to field-based diversity and structural characteristics. We used an existing forest vegetation type map and derided a vegetation greenness image using a normalized difference vegetation index (NDVI) in the Subansiri region of Eastern Himalaya. We analyzed the community structure and distribution of plants in four major forests (tropical semi-evergreen, sub-tropical evergreen, temperate broadleaved, and temperate/sub-alpine conifers. We reported that the sub-tropical evergreen forest accommodates the most individuals, species, and tree density, whereas the basal area had the most temperate broadleaved forest, indicating luxuriant growth. Rubiaceae and Euphorbiaceae were observed to be the most speciose, with families distributed in all broadleaved forests. The study demonstrates a definite pattern along the Subansiri Himalayan montane forests with sub-tropical evergreen forest with higher structure and diversity. Such information on the distribution and diversity of species corroborated with satellite-derived forest vegetation maps is of primary importance in planning biodiversity conservation measures.



Chapter

Estimating GPP over Croplands Using PlanetScope High-Resolution Satellite Data, Vegetation Index, and Photosynthetically Active Radiation on Majuli Islands in Assam

By Sandeep Kumar, Bikash Ranjan Parida, Mukunda Dev Behera, Nilendu Singh

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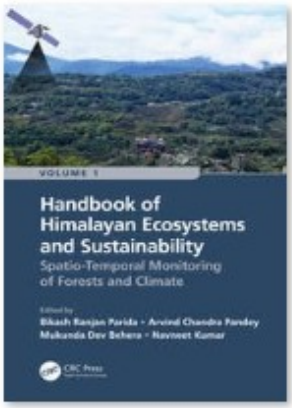
ABSTRACT

The terrestrial biosphere plays a significant role in governing the climate system through regulating carbon fluxes between the vegetation and the atmosphere. Gross primary production (GPP) plays a critical role in understanding the carbon cycle and the biogeochemical process of terrestrial ecosystems. Numerous remote sensing models have been proposed to estimate GPP, which can be categorized into statistical models, light use efficiency models, and process-based models that heavily rely on environmental parameters. This study has employed a vegetation indices (VIs)–based model (i.e., VI × VI × PAR) to estimate daily GPP over cropland on Majuli Island using high spatial resolution PlanetScope satellite data (3.125m) and photosynthetically active radiation (PAR). Almost 15 VI-based models were developed, wherein the NDVI × CI_{green} × PAR model was found to be better than others to deduce GPP accurately. The results showed that the daily GPP varied



Chapter

Monitoring Tea Plantations Dynamics Using Satellite Data between 2000 and 2020 in Dooars Regions of Himalaya

By Anshu Kumari, Bikash Ranjan Parida, Surajit Ghosh

Book Handbook of Himalayan Ecosystems and Sustainability, Volume 1

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ABSTRACT

Tea is an important beverage and an essential part of the economy and livelihood in many tea-growing countries. Identification and periodic monitoring of tea plantations are becoming vital as the tea industry is expanding rapidly along with changes in land use/land cover (LULC). This study utilised Landsat-5 TM and Sentinel-2A images for identifying and analysing the dynamics of tea plantations in the Dooars region of North Bengal over the period 2000 through 2020. The result shows that tea plantations have increased from 1,064km^2 (2000) to 1,286km^2 (2020), representing an increase in area of 21%. The maximum increase in tea plantations was found in Darjeeling and Kalimpong districts (+137km^2), followed by the Jalpaiguri and Alipurduar districts (+ 83km^2), mainly because of the expansion of the tea industry and population. The overall accuracy of classified LULC was nearly 89% with a kappa coefficient of 0.86. The health condition of tea plants was also assessed using leaf area index (LAI), and healthy tea mostly showed an LAI of more than 2. Assessment of LULC dynamics based on high resolution satellite data provides essential information

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Chapter 7

Real-Time Data Acquisition System for PV Module

Durgesh Kumar, Ila Ashok, Sweta Kumari, Dipanjali, Lawrence Kumar

Book Editor(s):A. Chitra, V. Indragandhi, W. Razia Sultana

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Summary

This paper presents a simplified data acquisition system for the photovoltaic (PV) module. The proposed work deals with the measurement of PV module electrical parameters under real-time outdoor conditions. The developed prototype is based on open-source software and hardware, which makes it cost-effective. It uses *Arduino Uno* and *Python* for data acquisition and post-processing under real-time working condition. The developed data acquisition system displays the current-voltage and power-voltage curve in real-time condition. It also computes module parameters such as short-circuit current, open-circuit, fill factor, and maximum power from the acquired data. An electronic load using N-Channel Power MOSFET hasbeen realized, which has been controlled by suitable gate-source voltage. The developed prototype is tested under uniform illumination and partial shading condition. The accuracy of the data obtained by the proposed prototype is validated by comparing experimental outcomes with digital storage oscilloscope data. This study will be helpful for the performance evaluation of PV module at real-time outdoor condition.

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