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GLC IN DRUG ANALYSIS

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The purpose of the gas chromatograph is to separate mixtures into individual components that can be detected and measured one at a time. A plot of the detector output is called a chromatogram, which charts the detector's response as a function of time, showing the separate components. The separation occurs based on differences in affinities for the two phases. As shown in the figure, the sample is introduced into the GC column by way of a heated injector, which volatilizes all three components and introduces them into the gas flowing over the stationary phase. He sample is introduced into the GC column by way of a heated injector, which volatilizes all three components and introduces them into the gas flowing over the stationary phase. In this example, the compound represented by the arrowhead has the least affinity for the stationary phase. As a result, it moves ahead of the other two components and will reach the detector first. The compound symbolized by the diamond has the greatest affinity for the stationary phase and spends the most time associated with it. As a result, this compound will be the last to reach the detector. Separation has been achieved based on the different affinities of the three types of molecules found in the sample. In reality, complex mixtures cannot always be completely separated, with some compounds emerging from the column simultaneously. In most forensic applications of GC, a sample is prepared by dissolving it in a solvent, and the solution is injected into the instrument using a syringe. For example, to analyze a white powder suspected of being cocaine, a small portion is weighed out and dissolved in a solvent such as methylene chloride, methanol, or chloroform. A tiny portion of the sample is then drawn up into a syringe and injected into the heated injector port of the instrument. A tiny portion of the sample is then drawn up into a syringe and injected into the heated injector port of the instrument. The mobile phase gas (called the carrier gas) also enters the injector port, picking up the volatilized sample and introducing it into the column where the separation process occurs. If the sample contains cocaine, it will emerge from the column at a given time (known as the retention time) that can be compared to the retention time of a known standard sample of cocaine. The retention time in conjunction with information obtained from the detector is used to positively identify the compound as cocaine if indeed it is present. Another method of sample introduction for GC is called pyrolysis, in which a solid sample such as a fiber or paint chip is heated in a special sample holder to extreme temperatures, causing the sample to decompose into gaseous components that can then be introduced into the GC. Pyrolysis is used when the sample is not readily soluble in common GC solvents. A number of different detectors are available for use in gas chromatography. In forensic applications, the most commonly used are mass spectrometry (often abbreviated as MSD for mass selective detector), flame ionization (FID), and nitrogen-phosphorus (NPD). The MSD is the most common of the three, principally because it can provide definitive identification of compounds (in almost all cases) along with quantitative information.

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NOVELTIES OF LIQUID CHROMATOGRAPHY-MASS SPECTROMETRY IN VOLUME TERRY WOVEN FABRICS

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A Novelty of Mass spectrometry is an exceedingly sensitive and specific analytical technique in Volume Terry Woven Fabrics that can precisely determine the identities and quantities of compounds within Terry Woven Fabrics. Chromatography-Mass Spectrometry in Terry Woven Fabrics industry, which mass spectrometry it is a convenient, versatile method for characterization and identification of process, and also for characterization of fibers and contaminants of the fabrics. Additive Manufacturing in Terry Woven Fabrics is the processes used to synthesize a volume object under computer control with successive material layers. Volume Terry Woven Fabrics witnessing a huge potential market with new business modules, Volume Terry Woven Fabrics created a platform for researchers, bio finishing Industries & who all are the part of knowledge on current trends, innovations and methodology in Volume Terry Woven Fabrics. It came up with a theme “Innovations in textiles”. For generating structural information from species generated by soft ionization techniques, have been highlighted. Some important aspects of both qualitative and quantitative data analysis have been described and the power of using mass profiles to enhance selectivity and sensitivity has been demonstrated.

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SPECIATION OF METAL IONS BY HIGH PERFORMANCE LIQUID CHROMATOGRAPHIC TECHNIQUE

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Speciation of metals is of increasing interest and importance because bioavailability, environmental mobility, toxicity and potential risk of metals in general is strongly dependent on the chemical species of metals. With the capability of partitioning the complex species of different metal ions, high performance liquid chromatography (HPLC) is a model concert for this task. We have done the speciation of chromium ion as well as phenyltin species with the help of pre-concentration technique (Fabric phase sorptive extraction method) via high performance liquid chromatography. A preconcentration technique is indispensable due to the presence of various metal ions in environmental water at trace levels. Fabric phase sorptive extraction (FPSE), a relatively new but promising sample preparation technique, was applied to preconcentrate complex from water samples. Efficient extraction of the metal complex from aqueous samples has been accomplished by applying FPSE using a cellulose fabric substrate coated with sol-gel C18 hybrid nano-composite sorbent. The new FPSE-HPLC-UV method can be used for the routine screening of metal ions in various water samples with high sensitivity, precision and reliability.

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BIOASSAY-DIRECTED ISOLATION OF HYPOTENSIVE ALKALOIDS FROM *HOLARRHENA PUBESCENS*

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Holarrhena pubescens belongs to the family Apocynacea, commonly known as "kurchi" is highly reputed in traditional medicine as a remedy for amoebic dysentery and other intestinal ailment. Bioassay-directed fractionation by chromatographic methods the ethanolic extract of *Holarrhena pubescens* resulted in the isolation of steroidal alkaloids i.e. Holamide and Pubscinine. Holamide showed a three proton doublet at 1.45 (J=6.56 Hz) and two AB doubles at 3.17 and 3.00 each for on proton (J=12.06 Hz) in the 1H NMR spectrum suggested that it belongs to conanine series of alkaloid (A class of compound with the steroid nucleus and a five members heterocyclic ring with nitrogen). In contrast Pubscinine showed one methyl at 1.28 while the doublet is missing a three proton singlet was observed at 2.28 due to a vinylic methyl indicated a double bond in the 18,20 – epimino ring of the conanine series of alkaloids. In anaesthetized rats, the Holamide and Pubscinine caused a fall in blood pressure in a dose-dependent manner. Pretreatment of animals Atropine completely abolished the hypotensive response of Acetycholine; whereas hypotensive effect of Holamide and Pubscinine were not modified by Atropine. Similarly Acetylcholine produced contractile effect in guinea-pig ileum, which was antagonized by atropine, however both (Holamide and Pubscinine) failed to produced any stimulant response on guinea-pig ileum. These data indicate that the steroidal alkaloids i.e. Holamide and Pubscinine from *Holarrhena pubescens* mediated hypotensive response through a mechanism different to that of Acetycholine.

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ONLINE SAMPLE PREPARATION METHOD FOR COMPLEX SAMPLE ANALYSIS

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Sample pretreatment techniques have been regarded as the most important role of the whole analytical process. The online sample pretreatment mode is a promising way with the advantages of the automation, improvement of sensitivity and reduction of manual error. In this work, sample preparation media, including metal-organic frameworks, microporous organic polymers, graphene and molecularly imprinted polymers, were developed coupling to HPLC for online analysis of complicated samples. A NH2-MIL-53(Al)-polymer monolithic column was prepared and applied to in-tube SPME for online analysis of estrogens in urine. The enrichment factors were 180-304. A micro-solid-phase extraction (μ-SPE) column based on hydrazone linked covalent organic polymer was developed for online analysis of sudan dyes in chilli powder and sausage. The enrichment factors were 305-757. Acylhydrazone bond gel μ-SPE monolithic column was developed and applied to online enrichment and analysis of trace sulfonamides in weever and shrimp. The extraction capacity were 270-401 pmol. A monolithic column based on covalent cross-linked polymer gels for online extraction and analysis of trace aflatoxins in food sample was developed. The enrichment factors were 36-51. Acrylamide-modified graphene was applied to online μ-SPE for trace heterocyclic amines analysis in foods. The enrichment factors were 78-166. A molecularly imprinted monolithic column was developed for the online analysis of trace antimicrobials. The enrichment factors were 46-211. These online sample preparation methods were successfully applied to complex sample analysis.

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QBD DRIVEN STABILITY INDICATING RP-HPLC ASSAY METHOD FOR FLIBANSERIN: DEVELOPMENT, VALIDATION AND CHARACTERIZATION OF MAJOR DEGRADANTS BY LC/QTOF-MS/MS

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The inherent chemical stability of Flibanserin (FLB) was investigated by using Plackett Burman design for screening of independent variables. Box-Behnken design was used for optimization of high performance liquid chromatography (HPLC) stability indicating assay method. Forced degradation of FLB was carried out under hydrolysis (acidic, basic, and neutral), photolysis, oxidation and thermal stress conditions. The major oxidative degradation product was isolated by preparative HPLC. The degradation product was identified as 2-HBenz-imidazol-2-one,1, 3-dihydro-1-[2-[4-[3(trifluoro methyl) phenyl]-1-N-oxide-piperazinyl] ethyl] following characterization by UV, IR, HRMS and NMR techniques. The parent ion mass of the oxidative degradants was observed mass 407.1710 and major fragments (389.1582, 375.1422, 255.1100, 243.1103, 228.0866, 216.1127, and 200.0680) in LC-QTOF-MS when analysed in positive ionization mode. Oxidation and hydrolysis were found to be the primary degradation pathways for this molecule. The chromatographic separation was achieved on Cromasil C18 column (4.6mm×250mm, 5µm) using a mobile phase consisting of a mixture of ammonium acetate (pH 5.5) and acetonitrile in linear gradient elution mode. The method was found to be linear in the concentration range of LOQ (0.5 to 70 µg/mL). The method was validated as per ICH guideline Q2 (R1). Degradation of FLB followed first-order kinetics under all experimental conditions. A V-shaped pH-rate profile kinetics over the pH range 2–10 was observed with maximum stability at pH 6.8. In conclusion, a reverse phase high performance liquid chromatographic method has been developed and validated for quantitation of FLB in presence of their degradation products. The major degradation product has been identified and fully characterized that has not been reported till date. This is the first time to report a stability indicating assay method for FLB.

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ABUSE DRUGS BY GAS CHROMATOGRAPHY MASS SPECTRUM

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Background: Drugs of abuse are any drug or substance which if taken by any route (oral-snuffing-injection) will lead to mood change, psychological disturbance and can affect brain functions and level of perception. The aim of this work is to evaluate the usefulness of using urine immunoassay kits for detection of some drugs of abuse, and study the correlation between the results obtained by EMIT and GC / MS techniques.

Materials & Methods: Drug toxicology tests are most commonly performed on urine, since most drugs and their breakdown products are excreted in the urine at higher concentration. A total number of 449 inhabitant urine samples were collected from patients admitted to emergency hospital, Mansoura University. 449 urine samples were analyzed by EMIT and GC / MS for benzodiazepine, barbiturate, opiate and cannabinoid. Results revealed that urine immunoassay kit is useful for rapid preliminary screening of abuse drug. GC / MS results confirm that 245 samples (54.56 %) are positive of the total number of samples. These positive samples by GC / MS were as follows; benzodiazepines; 159 ((clonazepam, oxazepam, temazepam), barbiturates; 58 (thiobarbiturate, butabarbital, seconal) and opiates; 28 (methadone metabolite)).

Conclusions & Recommendations: GC / MS analysis must be done for accurate identification and confirmation of EMIT results. In addition, it is recommended as the most suitable technique for obtaining optimum analytical results.

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FABRIC PHASE SORPTIVE EXTRACTION FOR THE DETERMINATION OF LOCAL ANESTHETICS FROM BIOLOGICAL SAMPLES

Ripneel Kaur
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A novel, simple and sensitive high-performance liquid chromatography with ultraviolet detection (HPLC-UV) method has been developed and validated for simultaneous quantification of three local anesthetics namely lidocaine, prilocaine and dibucaine in blood serum and urine. New sorptive technique has been used for preconcentration of anesthetics in the various samples of blood serum and urine followed by the HPLC-UV detection. Various factors which can influence the performance of fiber phase extraction like extraction time, back extraction time, eluting solvent and volume of extracting solvent etc were optimized. The chromatographic separation was achieved using a simple mobile phase consisting of acetonitrile: water (70:30 v/v) at an isocratic flow of 0.5mL/min using HPLC (Dionex softron GmbH, Germany) setup consisted of a P 680 quaternary solvent delivery pump, a column o C18 column (100 × 4.6 mm, i.d., 5 µm) and UV detector. The separation was performed on wavelength of 230nm. The calibration curves of target analytes were prepared in the concentration range 5–500 ng/mL with good coefficient of determination values (R2 >0.992).. The limits of detection range from 0.050 to 0.160µg/mL.

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THE ROLE OF PROGRAMMED CELL DEATH 'APOPTOSIS' IN THE DEVELOPMENT OF INNER SULCUS IN THE COCHLEA

Tarfa M Peter
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Hearing loss is one of the most common chronic diseases that affect both young and old but it is most prevalent in old people. This condition is generally irreversible in humans and can be due to the loss of hair cells, which are unable to regenerate. However, recent evidence of some regenerative ability reported in a number of non-mammal vertebrates have given us hope that, in the future a solution may be discovered. Although several advances have been recorded in this field in recent times and ere are still challenges ahead. This study tried to investigate he formation of the inner sulcus located in the cochlea, as it is thought that, the processes involved during the development of this important region are most likely due to apoptosis or another type of programmed cell death, although this has not yet been confirmed. Mouse expressing an EGFP (green fluorescent protein) reporter at the Tecta locus was used. Specimens were stained with phalloidin as a general cell stain of f-actin and this was combined with (Terminal deoxynucleotidyl transferase dUTP Nick End) TUNEL staining in order to observe whether dying cells are the result of programmed cell death. Very little TUNEL staining was observed in the developing sulcal region, although some were seen in the associated mesenchymal cells in the cochlea. In some of the sections, Blebbing as well as extrusion of some cells that are thought to be undergoing programmed cell death were evident during the formation of the sulcus. The formation of the sulcus occurs earlier in the basal region of the cochlea than in the apical part following the regression of the greater epithelial ridge (GER) cells. Counting of nuclei in the sulcal region during the formation suggest that cells are being lost. It is not easy to establish whether these cells that are being removed could be due to apoptosis or another type of programmed cell death.

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NOVEL APPROACH TO PREPARE HIGH QUALITY PHOTONIC CRYSTALS FOR SEPARATION USAGE

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Photonic crystals (PCs) have ordered structure with optical band gap at the visible range or crystal lattice at the size of several hundreds of nano meters. PCs assembled from particles can offer pass-through nano-pores which, in theory, readily produce ultra-high performance of separation. Unfortunately, in practice their real applications were limited to the separation of a few compositions because they are hard to prepare unless highly mono-disperse nanopartciles are used that take time to prepare and cost high. In fact, mono-disperse particles do not necessarily uniformly order inside the assembled PCs but often separate into various domains. The domain borders can destroy the separation efficiency and easily cause clasps of PC-packed columns. Herein we present a novel approach to assemble PCs from polydisperse particles which are easily synthesized in a normal laboratory at a very low cost. The obtained PCs were measured to have sharp band gaps. They can be shaken in disarray but soon recover their ordered structure after settling for about decade seconds. Such a type of PCs can thus be made into various shapes so that they can be used to write iridescent letters, to paint colorful pictures, and of cause to fill capillary columns. The PC-filled capillary columns have been shown to yield fast (in seconds) and high separation efficiency in electro-chromatographic studies.

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THE KEY ROLE AND ADVANTAGES OF GNSS PRECISE RELATIVE POSITIONING IN SPACECRAFT FORMATION FLYING MISSIONS DESIGN, ANALYSIS AND OPERATIONS

Michelangelo Ambrosini
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The paper focuses on a specific space application of the satellite-based navigation Global Navigation Satellite System (GNSS), namely its use for the precise relative positioning and navigation of formation flying satellites. The paper describes GNSS advanced data processing methods using software tools for the precise relative positioning of formation flying satellites and its use, key role and advantages in their missions design and operations. Precise relative navigation is an essential aspect of spacecraft formation flying missions, both from an operational and a scientific point of view. One of the fundamental issues of spacecraft formation flying is the determination of the relative state (position and velocity) between the satellite vehicles within the formation. Knowledge of these relative states in (near) real-time is important for operational aspects. In addition some of the scientific applications, such as high resolution interferometry, require accurate post-facto knowledge of these states instead. Therefore a suitable sensor system needs to be selected for each mission. As commonly known precise relative positioning between GNSS receivers in geodetic networks is exercised on a routine basis. Furthermore GNSS receivers are already frequently used on-board satellites to perform all kinds of navigational tasks, are suitable for real-time applications and provide measurements with a 3-dimensional nature. Therefore they are often considered as the primary instrument for relative navigation in future satellite formation flying missions. The paper describes the most recent GNSS Data Processing Techniques and Algorithms used for the estimation of the initial carrier phase ambiguities with the highest level of accuracy possible for the determination nearly in real-time of the relative baseline between two GNSS Receivers installed on-board two Low Earth Orbit (LEO) satellites in formation flying.

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OMIT-SAT: AN OPEN MESH INFRASTRUCTURE FOR TELEMETRY IN DISASTERS

Romeo Kienzler
IBM, Switzerland

Natural disasters usually lead to a backdown of telecommunications. OMIT-APRS is a proven technology for resilient messaging in a mesh network. Network partitions are mitigated by I-Gates, internet connected nodes in the mesh and HF-Gates, nodes interconnected using shortwave radio. With OMIT-SAT we are proposing a CUBESAT on a LEO operating on worldwide freely available ISM frequencies able to store and forward messages all over the planet. The first mission will carry an SDR (e.g. HackRF) with the capability to receive firmware updates from the ground station to test a variety of frequencies and modulations. This project is part of the IBM Call4Code challenge and also available as open source project open to anyone to contribute to.

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GRAVITY MODIFICATION TODAY, FOR SATELLITE NAVIGATION

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The exploration of space time and gravity emerged from two discoveries that were derived from very detailed analyses of the empirical data. These discoveries are, (i) the massless formula for gravitational acceleration g=τc2 and (ii) that the gravitational constant G is not a constant but a variable Gi dependent upon the isotopic mass of element i. Therefore, the need for a gravitational theory that encompasses, cosmology, near field gravity measurement inconsistencies, and gravity modification. This paper presents one approach, that spacetime is the carrier of velocity and acceleration. Macro forces are observed when a Non Inertia (Ni) field is present and governed by g=τc2, the universal (gravitational, electromagnetic and mechanical) descriptor of macro forces. A Non Inertia (Ni) Field is the spatial gradient of real or latent velocities. It was verified that these velocities are real in mechanical structures, and latent in gravitational and electromagnetic fields. Thus g=τc2 is the mathematical formula for acceleration for macro forces. This lends itself to the development of gravity modification engines. Solomon showed that four criteria need to be present when designing force field engines (i) the spatial gradient of velocities, (ii) asymmetrical non-cancelling fields, (iii) vectoring, or the ability to change field direction and (iv) modulation, the ability to alter the field strength. This paper provides detailed guidance on how to design and construct gravity modification engines, one of which has been verified by independent researchers.

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FROM ISS TO THE DEEP SPACE GATEWAY AND BEYOND: KEY TRENDS IN HUMAN SPACEFLIGHT SOLUTIONS

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The January 2018 GER (Global Exploration Roadmap) introduces the concept of the Deep Space Gateway (DSG) as the next step beyond LEO in the Human Space Exploration. Planned for buildup in the first half of 2020s, the DSG is conceived around two key elements, a Power Propulsion Element and a Habitat Module, complemented by an Airlock, a Robotic Arm, possible Refueling Element and logistic carriers. It will be used as a platform in cislunar environment to host the crew of Orion during its regular visits of about one month once per year, and as an outpost for missions to/from Moon. Starting in the second half of the next decade, it might act as well as an orbital base for final outfitting of the next generation Habitats (Deep Space Transport, DST) which will support longer human journeys into deep space and towards Mars. Leveraging on the large know-how acquired in the development of the several pressurized modules built for the ISS, Thales Alenia Space is actively working in designing the new generation of deep space Habitats, accounting for a proper balance between heritage and innovation, to ensure fulfilment of relevant technical and programmatic, e.g. schedule, requirements. This paper will analyze which key differences in objectives and scenario of the cislunar DSG Habitat impact its design with respect to the solutions adopted for ISS Modules: launch and assembly approach, environment, interior design for enhanced ergonomics, software architecture. The evolution of the Habitat for the second phase of the deep space exploration (the so-called Deep Space Transport) will also be drawn, to an even more 'human-centered' design, with improved habitat autonomy, for mission sustainability and reliability. The DSG will also be the first potential 'test bench' for demonstration of key technologies for deep space exploration in a representative environment.

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GREYBODY FACTORS AND QUASINORMAL MODES OF BLACK HOLES: EXACT ANALYTICAL EXPRESSIONS

Grigorios Panotopoulos
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Greybody factors are frequency dependent quantities that measure the deviation from the perfect black body spectrum of Hawking radiation, and they provide us with valuable information about the near horizon structure of black holes. In addition, when black holes are perturbed the geometry of spacetime undergoes dumbed oscillations. Quasinormal modes, with a non-vanishing imaginary part, provide us with the frequencies and the dumbing times of these oscillations, and since they do not depend on the initial conditions, they carry unique information about the few black holes parameters.I will discuss both greybody factors and quasinormal modes under scalar perturbations of the BTZ black hole as well as of the Eistein-Born- Infeld dilaton black hole, which is inspired from Superstring Theory, and I will present exact analytical expressions for both quantities in both models.

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MONITORING THE EARTH'S ENERGY BUDGET AND CLIMATE FROM THE SURFACE OF THE MOON

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Pulkovo observatory of the RAS, Russia

We have developing very important special space project "Lunar optical observatory" (LOO) (http://www.gaoran.ru/russian/project/lunar_observatory. pdf) on monitoring of the Earth's energy budget and climate. LOO is necessary for the long-term investigation of the deviation an average annual energy budget of the planet from the equilibrium state and of physical reasons of the climate changes. LOO is a system of two completely identical special optical telescopes-robots with diameter of the primary mirror ~300 mm with visor (SOTR-300V) operating successively in the automatic mode on a single program of Earth observation as a single telescope. Telescopes SOTR-300V installs along narrow latitude of the equatorial zone of the visible surface of the Moon on two opposite edges relative to its visible center at points at a distance 9.1°±0.1° respectively from the eastern and western edges. Comprehensive measurements variations of reflected and scattered by the Earth of the total solar irradiation (TSI) in all directions in the wavelength range $\Delta\lambda$ = 0.2 – 4 μm, the thermal radiation of the Earth in the wavelength ranges $\Delta\lambda$ = 4 – 50 μm and the atmospheric transparency windows $\Delta\lambda$ = 8 – 13 μm, as well as of the remote sensing of the Earth from surface of the Moon (RSM) in 10 narrow predetermined ranges of the spectrum ($\Delta\lambda$ = 0.3 – 3 μm) are carried out consecutively by two SOTR-300V in during more 94% lunar day continuously only at night in places of their installation. The system two telescopes SOTR-300V provides the most reliable high-precision data of global climate parameters, as well as monitoring of the surface state, clouds, vegetation, cryosphere, concentration aerosols and ozone around the globe with a spatial resolution of 6.5 km. SOTR-300V will used a microbolometric CCD for a comprehensive measurement of the reflected and scattered by the Earth of the TSI in all directions in the wavelength range $\Delta\lambda$ = 0.2 - 4 μm and the thermal radiation of the Earth in the wavelength ranges $\Delta\lambda$ = 4 - 50 μm and $\Delta\lambda$ = 8 – 13 μm. The average annual values of the Bond albedo and the Earth's own thermal radiation determined by the Lunar Optical Observatory, and on their basis the deviations of the average annual energy budget of the planet from the equilibrium state will be practically an order of magnitude more accurate than those determined by any orbital spacecraft. LOO for the first time during a significantly superior 11-year cycle of the Sun will provide the most important missing precision global climate data that cannot be obtained by any other cosmic methods of their direct measurements.

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AERODYNAMIC DATABASE GENERATION AND MANAGEMENT OF REENTRY SPACE VEHICLE

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For reentry vehicles with the wide range of flight envelope, a large number of coefficients are required to fulfill the aerodynamic multi-dimensional tables. To reduce the number of high-fidelity analyses without considerable accuracy loss, a proper combination of sampling, interpolation, and data fusion methods are required. The proposed framework includes a multi-dimensional nonlinear interpolation (Kriging), a data fusion (co-Kriging) and a sampling method (Latin Hypercube Sampling) in an integrated structure coupled with aerodynamic solvers. The main idea is applying Kriging interpolation method on cheap data points to estimate the aerodynamic coefficients' trends over the entire space of variables, and refining the trends with accurate sample points and data fusion. Latin hypercube sampling method is used for optimal distribution of cheap samples and initial accurate sample points. After a few high-fidelity analyses, co-Kriging data fusion method is applied for the improving aerodynamic database fidelity via augmentation of trends with the accurate data. The process iterates using new accurate sample points (located on maximum mean squared error) until the mean squared error criteria is met. Cheap data are produced by a variety of low-fidelity solvers e.g. potential and Euler solvers and high-fidelity data are calculated by full Navier-Stokes solvers (CFD). For each regime of the flight envelope, i.e. subsonic, transonic, supersonic and hypersonic and each type of reentry configurations, e.g. Apollo-type, grid studies are done separately and the optimum grid and solver settings are implemented into the framework to facilitate the automatic aerodynamic database generation and management. All parts of the presented framework are validated independently in compare to some reference test cases. To show the capabilities of the developed framework, Orion reentry capsule with complete flight envelope is assumed as a sample. Orion aerodynamic database is generated efficiently and the obtained results are in good agreement in comparison with experimental data.

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THE CLIMATE VARIATIONS ARE CONTROLLED BY THE SOLAR IRRADIANCE

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The Earth's climate is a highly complex and non-linear all observed in the last quarter of the 20th century, system affected by numerous factors, dynamics and loops of simultaneous climate changes on planets of the Solar system. feedback effects. The climate system depends at an The gradual weakening of the Gulf Stream power will result in extremely complex set of long-term (≥ 20 years) physical even stronger cooling in the zone of its action. All changes in processes in the ocean-land-atmosphere system, which, in the Earth's climate from the Little to the Big Ice Ages are due to turn, is influenced by diverse, mainly quasi-bi-centennial cyclic change in the TSI, taking into account not only direct but variation of the total solar irradiance (TSI). If we take into also more important subsequent secondary feedback effects. account only by direct impact of quasi-bicentennial variations. TSI order ~0.4%, the resulting increments in the planetary temperature are small (~0.3 K); however, they are extremely important as a triggering mechanism of subsequent multiple feedback effects, which cause a significant change in the magnitude of the Earth's Bond albedo, the content of greenhouse gases in the atmosphere, and the transmission of the atmospheric transparency window. The climatic influence of these effects depends on the duration of the variation of TSI and may affect the climate up to three times as strong as directly TSI variations do. The direct effect of the quasi-bicentennial variations of the TSI accounts for about 25-30% of the observed change in the planetary temperature, and the remaining of the temperature change are determined practically by multiple influences secondary feedback effects. Quasi-bicentennial cyclic variations of TSI along with very important successive multiple influences of the feedback effects are the main fundamental cause of corresponding alternations of climate variation from warming to the Little Ice Age and by the main factor that controls the climate system. The impact of an increase in the area of the cloud cover, presumably caused by the growth of the cosmic rays flux, on climate is practically absent. The long-term (≥ 20 years) equilibrium state of the Earth's average annual energy balance between the TSI coming into the outer layers of the atmosphere and the total energy radiation going out from the Earth into space from the entire atmosphere determines the practical stability of the climate. However, since ~1990, the Sun has been in the declining phase of the quasi-bi-centennial variation in TSI. The observed practically proportional decrease in the average annual TSI portion absorbed by the Earth since ~1990 has not been compensated by a decrease in the average annual energy radiated into space due to the thermal inertia of the oceans. Since ~1990, the Earth radiates more energy back to space than it absorbs. As a result, the Earth has, and will continue to have, a negative average annual energy balance and a long-term adverse thermal condition. Such gradual loss in the total amount of the solar energy accumulated by the oceans during the twentieth century has resulted in the beginning of a quasi-century epoch of a new Little Ice Age after the maximum phase of solar cycle 24. In fact, the warming ended in the 2016. The start of the solar Grand minimum is anticipated in the solar cycle 27±1 in 2043±11 and the beginning of the phase of deep cooling in the new Little Ice Age in 2060±11. The solar irradiance defines of the climate both of the Earth and other planets since long-term changes in the Sun's energy output can account for almost.

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COSMOLOGICAL MODELS WITH BVDP

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The observed value of the deceleration parameter (DP) is always interesting in cosmology: The study of cosmological models with time dependent DP attracts cosmologists more after the discovery of accelerating expansion of the universe confirmed by Perlmutter & Riess et.al. [1-2] An idea of variable deceleration parameter is much important to measure the expansion rate of the universe. In this reference several authors have proposed many laws for DP including my peer research group [3]. In this study cosmological models with BVDP will be discussed. [1] Perlmutter, S., et al.: Discovery of a supernova explosion at half the age of the universe. Nature 391, 51 (1998). [2] Riess, A. G., et al.: Observational evidence from Supernova for an accelerating universe and cosmological constant. Astrophys. J. 116 1009 (1998). [3]: Mishra, R. K., et al. Cosmological models in alternate theory of gravity with bilinear deceleration parameter. Astrophys. Space Sci. 361, 259 (2016).

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FAST CORONAL HOLE SOLAR STREAMS TRIGGERED THE CENTRAL ITALY STRONG EARTHQUAKE 2016-2017

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Central Italy was hit by several strong earthquakes in 2016-2017. 24 August, 26&30 Oct 2016 and 18 January 2017. All of those earthquakes were triggered by fast coronal holes streams with velocities 500-700 km/s. Those solar wind streams imitated auroras and magnetic storms. We suggest that telluric electric currents are induced within the earth and cause the plates to move, collide or sub duct triggering earthquakes particularly in points of weakness. The very weak solar cycle number 24 was rich in coronal holes. Such coronal holes with open magnetic lines of force allow fast solar wind streams to escape the sun; hence very strong earthquakes were common worldwide. The south magnetic pole has moved recently from Canada to Siberia thus scientists are expecting the sun to rise from the west in the near future. They claim that strong earthquakes can make such a reversal day nearer.