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EARTH SCIENCE AND CLIMATE CHANGE

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The importance of shifting to noospheric medicine in the epoch of cosmoplanetary changes**Alexander Zakharov and Natalia Kulikova**

Noospheric Health Center, Russia

The human being is a part of the cosmoplanetary macrosystem. At the same time he is gifted with a powerful talent: Consciousness and intellect that helps him to perform creative as well as destructive activities with his psycho-emotional energy towards objects of the environment and his own physical and mental health. Normally when coherent low-frequency impulses are generated ($H > 50\%$) in brain hemispheres, resonant cavitation energies appear in the interfaced body segment that form blood soliton in the myocard, that nutrifies all cells of this segment. Under excessive exposure of external environmental factors together with psycho-emotional experience, inadequately strong by amplitude ($H \leq 50\%$), right and left brain hemi-spheres generate incoherent energies that induce excessive cavitation in the corresponding body segment, lowering content of hydrogen protons and superoxide ions. Misbalance in the work of brain hemispheres can be eliminated through the use of autotrophic helioprotecting water, created in ISRICA. This water is a supplier of hydrogen protons. However, the effect of this correction is not long-lasting, as the water eliminates only geoheliophysical imprints of the first year of life. In the epoch of cosmoplanetary changes the vicious circle of pathologic body processes can be broken only with proactive approach of the individual to the health recovery through correction of cavitation processes that are produced by inadequate state of the brain. In our experience this happens through active psychophysical work of the individual, particularly, with the help of holodynamics and acupressure methods. Consequently, in the epoch of cosmoplanetary changes it is most important to perceive the shift from modern medicine of consumer society to noospheric medicine, when the individual activates independently and supports self-healing mechanisms following doctor's recommendation, performs a role of a coach on individual selection and launch of health-conserving and health-developing mechanisms.

Biography

Zakharov Alexander has completed his MD in Saratov State Medical University, Medical Residency in Moscow State University of Medicine and Dentistry with a degree in Orthodontology in 2009 and PhD in 2012. He is currently the General Director of Noospheric Health Center, Moscow. He is an author and a mastermind of a new approach in stomatology; noospheric stomatology. He has written more than 60 scientific works. He is also a co-author of 2 patents and one text-book for medical students. His basic research interests are physiology, cosmic anthro-ecology, preventive medicine and biofeedback.

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Evaluation of greenhouse gas emission and treatment cost of municipal solid waste by using system dynamics modeling**Kanchan Popli and Seungdo Kim**
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The inappropriate way of treating the solid waste leads to the increase in the emission of greenhouse gases and hike in the cost of treatment of solid waste. South Korea is facing the problem of treating the municipal solid waste in a cost effective way and decided the target to reduce the GHG emissions by 23% from waste sector by 2030 from business-as-usual (BAU) level. Hence this study aims to develop a model with the help of system dynamics to find an optimum methodology for disposal of municipal solid waste by using the emission unit and cost unit of treatment for the different methods of disposal, namely, landfill, recycling and incineration. In total seven scenarios made to find the best method for the disposal of municipal solid waste. The model is simulated for thirty years with initial year of 1990. Among all, SCENARIO 5 has been chosen as the best method where the percentage of waste going to recycling is higher than the percentage of waste going to the landfill for its treatment which has ended up in reducing the GHG emission and the cost of treatment. The need for the government policy has also been determined by using the parameter like new waste generation per capita. If the waste generation per capita is reduced, the total cost of treating the waste can be reduced with the reduction in the GHG emission from waste successfully.

Biography

Kanchan Popli has her expertise in system dynamics modelling in climate change research under the environmental studies. She has completed her engineering degree in Biotechnology from Kurukshetra University, India with awards in various competitions like sports, painting, science exhibitions etc. She has learned about the 'Product Management' during her summer training in Jade University of Applied Sciences, Wilhelmshaven, Germany. At present, she is pursuing her Master's degree at the Department of Environmental Science and Biotechnology, Hallym University, South Korea, on the project "Research & Development Center for reduction of Non-CO₂ Greenhouse gases (2016001690005)" funded by Korea, Ministry of Environment (MOE) as "Global Top Environment Research & Development Program".

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Assessment of the bioclimate of Northwest region at various scenarios of climate change**Marina Trubina**

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Statement of the Problem: The scenarios of climate change created by the Coupled Model Intercomparison Project Phase 5 (CMIP5) during 2011-2060 evidence average annual temperature in some regions of Russia will increase by 1.6-7.0°C. The main risks for human health are connected with change of frequency and intensity of heat waves, spread of the southern infectious diseases in northern latitudes, emergence of earlier uncharacteristic natural and focal diseases and zoonosis.

Purpose: The purpose of work is the assessment of bioclimatic capacity of the Russian Northwest region at scenarios of climate change of RCP2.6, RCP4.5 and RCP8.5 during 2011-2060. Development of effective measures for easing adaptations to climate change, demands medico-geographical approaches, creation of new biometeorological models and introduction of system of medical weather forecasts. Research includes biometeorological monitoring (creation of a multiparametrical database, calculation of the main biometeorological indexes), modeling of change of biometeorology conditions on the basis of results of the CMIP5 model during 2011-2060, assessment interseasonal acclimatization by using the mathematical model created by V.A. Matiukhin (Russia, Novosibirsk).

Results: The result of research will be applied to creation of medico-geographical electronic cards and recommendations about mitigation of adaptation of the population to climate change.

Findings: This study is a step towards the use of information technology in biometeorology, development bioclimatic assessment techniques, determining the vector of interdisciplinary research and demands new methods and technologies for data processing.

Biography

Marina Trubina has completed her Diploma of the Meteorologist from Russian State Hydrometeorological University (RSHU) in Russia. She has completed her PhD in Geography at RSHU. She was the Director of Computer Center, Researcher and Assistant Professor from RSHU and has published more than 200 papers in scientific journals. Currently she is the Chairman of the Commission of Medical Geography of the Russian Geographical Society (RGS), renowned Expert in the field of applied climatology, biometeorology, human ecology and space weather. Her basic research interests are biometeorology, space weather, heliometeopathic, medical weather forecasts, human ecology and balneology.

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Prediction of flood risk under the impact of climate change on the thermal power plant using one dimensional hydraulic modelNguyen Thanh Tuu¹, Seungdo Kim¹ and Van Pham Dang Tri²¹Hallym University, South Korea²Can Tho University, Vietnam

This research provides a mathematical approach for estimating the flood risks due to the effects of climate change by developing a one dimensional (1D) hydraulic model for mountainous river reaches located closely to the Yeongwol thermal power plant. Input data for the model, including topographical data and river flow measured every 10 minutes from July 1st to September 30th, 2013 by Han River Flood Control Office (HRFCO), were imported to a 1D hydraulic model. Output results were the simulated water levels, water discharges and average flow velocities at each cross-section. The simulated water levels in different years (including 2011, 2012 and 2014) were used to calibrate and validate the applied model. Climate change scenarios were estimated by referencing the climate change adaptation strategies of the Korean government and historical information about the extreme flood event in 2006. The downstream boundary was determined as the friction slope which is 0.001 and the roughness coefficient of the main channels is 0.036. This model demonstrates the significance of riverbed widening strategy through the six flooding scenarios to reduce inundation depth and flow velocity which impact on the power plant. In addition, the impact of upstream Namhan River flow is more significant than Dong River.

Biography

Nguyen Thanh Tuu has his expertise in hydraulic modeling and system dynamics modeling for the environmental management and climate change research. During his working time at the Research Institute for Climate Change, Can Tho University, he has opportunities to do the projects with modeling the impact of climate change on water resources and rice production. He has his high grade Master degree on Natural resources and Environmental Management at Can Tho University, Vietnam. Currently, he is doing Ph. D. at the Department of Environmental Science and Biotechnology, Hallym University, South Korea, on the project "Research & Development Center for reduction of Non-CO₂ Greenhouse gases (2016001690005)" funded by Korea Ministry of Environment as "Global Top Environment Research & Development Program".

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The human cardiovascular system as an acceptor of changes in helio-geophysical impacts

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In the scientific and medical community continues to shape the understanding that human health depends on environmental parameters: Atmospheric pressure, geomagnetic conditions, the effects of solar flares and solar radiation (solar wind). Cardiovascular system is most sensitive to these factors. The mortality from cardiovascular diseases ranks first in the total mortality and the study of the influence of helio-geophysical factors on this system is very relevant. Among the methods to assess such effects was highlighted a few: (1) The speed of the pulse wave and endothelial function with hypoxic test were made on the device Tonocard (Moscow), (2) Cardiointervalography with calculation of the tension of the sympathetic and parasympathetic systems, expressed in indexes Baevsky and (3) Original author's interpretation of cardiointervalogram as a sequence of notes, reflecting the musical frequency score, a special music of the heart, recorded on diagnostic and treatment complex Veda-pulse (Biokvant, Novosibirsk, Russia). In music of the heart, the ratio of consonant and dissonant notes in dependence from Sun's status and using of protective means was analyzed. In a series of tests on volunteers was analyzed the influence of drinking water processed image and glasses with embedded hologram, having helioprotectors properties on the performance of the cardiovascular and the autonomic nervous systems, as well as the dependence of light-water holographic effects of helio-physical factors. Thus, in tests with the holographic processed water effect on endothelial function was particularly pronounced and significant. It can be concluded that heliophysical factors have a significant impact on the work of the most important regulatory cardiovascular and autonomic nervous systems. The speed of the pulse wave endothelial function and cardio-intervalography are sensitive indicators of helio-biofunctional conjugation. Promising but as yet little-studied is the integral method of frequency-resonance estimates of spectral-wave characteristics of the Sun and the human heart, the method of analysis of so-called music of the heart, when changing light-fotogalerijas test actions and we tested and confirmed as effective, the method of using of people of protective drinking water on periods of solar and geomagnetic disturbances.

Biography

Olga Oseeva is a Physician and Cardiologist, completed her graduation from Medical School in 1989. She has worked in various programs of International Scientific Research Institute of Cosmic Anthropoecology since 1991 and currently she works as a Doctor in Academician E.N. Meshalkin Novosibirsk State Research Institute of Circulation Pathology. Her basic research interests are heliobiology, cosmic anthropoecology, helioclimatopathology, preventive medicine and cardiology.

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Light and water holographic protective manipulations in geocological human safety system during heliophysical changes

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The main goal of the research is to study possible techniques of slowing down the process of aging and reducing the dependency of the human body on various malicious heliophysical factors with the help of modern holographic technologies. In July 2014 in Bulgaria, in collaboration with G. Veselinova from Varna, we conducted a test for the “Stop Time” technological restorative complex project designed to slow down the aging process in humans with no medication involved. In the course of 7 days, the 36 volunteers were asked to test helio-geroprotective effectiveness of holographic drinking water, balneotherapy in holographically processed water and helioprotective sunglasses and milk. It was discovered that 70-80% of the volunteers have shown clear signs of anti-aging tendencies, for example, on helio-dependence of neuro-physiological reactions speed-MT SVMR. From May to June 2015 at the Apsara Wellness Center (Novosibirsk, Russia) took place a trial research of two new holograms of a reflective type, produced in partnership with Holoart company. The holograms contained helioprotective information structured in a new way. The 12 volunteers wore holographic helioprotective sunglasses for 5 minutes, first with hologram N1 (control), then N2. To evaluate the changes in physiological parameters during the interaction between holographic information and eye retinas, as well as cerebral cortex and subcortex we used the VedaPulse pulse diagnostics complex. The effectiveness of water and light holographic impact on the basic functional systems of human body was proven during physiological testing. It manifested itself in clear anti-aging functional tendencies: A decrease in pulse wave velocity and a speedup of neurophysiological processes. The unique non-medication healing complex “StopTime” proved its effectiveness and readiness to be implemented in various places across the world. Human body functional systems possess an ability to react to cosmophysical events before they take place. This is very importantly for best human adaptation to helio-climatic changes.

Biography

Kuznetsova Taisia has completed her PhD in Chronic Neurogenic Hyperventilation. She has participated in ISRICA's various research projects: Pakal Votan 2005, Solar Eclipse 2008, Holographic Eclipse 2009, OARION 2015 and in a number of helioprotective water trials in Kozyrev's Space, etc.

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Agricultural development from advanced remote sensing and GIS

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Remote detecting is worried with the accumulation of information by a detecting gadget not in-contact with the question being detected and the assessment of the gathered information, which is then named data and is exhibited in guide frame or as insights. Obviously, the idea of RS covers a colossal field: A field inside science and innovation which envelops a tremendous applications area, i.e., in the feeling of contributions of connected science, applications in the preparing field and in the feeling of the courses in which RS yields can be connected. While it is agriculturists that make progress toward beneficial, effective and supportable creation from inexhaustible assets (trims specifically additionally animals, timber and scrounge), it is progressively the leaders and organizers who need to deliver and react to issues of over-or potentially under-generation, imports, fares and portions, preservation and assurance, nourishment security, endowment designation and organization. Unequivocal inside this order is government creation levels, specifically trim evaluation including zones under generation, yields, expectations/conjectures, changing area utilize and arrived possession, changing administration and specialized data sources, cultivating frameworks and genuine products planted and gathered. GIS for agriculture balancing the sources of info and yields on a ranch is crucial to its prosperity and productivity. The capacity of GIS to investigate and picture agrarian conditions and work processes have ended up being extremely helpful to those included in the cultivating business. From portable GIS in the field to the logical examination of creation information at the homestead director's office, GIS is assuming an expanding part in agribusiness generation all through the world by helping ranchers increment creation, decrease costs and deal with their territory more effectively. While normal contributions to cultivating cannot be controlled, they can be better comprehended and made do with GIS applications, for example, trim yield gauges, soil correction investigations and disintegration distinguishing proof and remediation. Early detection, diagnosis and control of plant diseases, nutrient deficiency diagnostics and stress detection, yield prediction and crop growth monitoring and economic benefits.

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Monitoring chlorophyll-A and sea surface silicate concentrations using MODIS dataYuanzhi Zhang¹ and Zhaojun Huang²¹Nanjing University of Information Science and Technology, China²Chinese University of Hong Kong, Hong Kong

Continually supplied with nutrients, phytoplankton maintained high productivity under ideal illumination and temperature conditions. *In situ* data in the south part of Cheju Island in the East China Sea (ECS), which has experienced spring blooms since the 2000s were acquired during a research cruise in the spring of 2007. Compared with *in situ* measurements the MODIS chlorophyll-A (chl-A) products show a high stability in the area. Removing a few error stations data, the correlation between nutrients and chl-A concentration in the study area is examined. The result shows that there is a high positive correlation between silicate and chl-A concentration using regression analysis. MODIS chl-A products and the sea surface temperature (SST) are used to determine the surface silicate distribution. The silicate concentration retrieved from MODIS data show a good agreement with *in situ* measurements with $R^2=0.1803$, root mean square error (RMSE)=0.326 $\mu\text{mol/L}$ (8.23%) and mean absolute error (MAE)=0.925 $\mu\text{mol/L}$ (23.38%). These results support previous studies in the same area. MODIS chl-A products and the sea surface temperature (SST) are used to determine the surface silicate distribution. The silicate concentration retrieved from MODIS data show a good agreement with *in situ* measurements with $R^2=0.803$, root mean square error (RMSE)=0.326 $\mu\text{mol/L}$ (8.23%) and mean absolute error (MAE)=0.925 $\mu\text{mol/L}$ (23.38%).

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Sea level changes as documented in nature instead of horror scenarios**Nils-Axel Morner**
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In geology we have a long-term tradition to base our statements and conclusions on observational facts in nature itself and physical laws documented in actual processes in our terrestrial system. This is especially important when it comes to predictions and mitigation of different hazards (seismic, volcanic, climatic, coastal, etc.). In recent decades, climate modeling-ignoring observational facts, basic scientific knowledge accumulated over time and even physical laws, have drastically changed this modus operandi providing a number of horror scenarios for the near future. One of those model scenarios is a rapidly rising sea level threatening to flood low-lying coasts and islands around the world. Already by 2100, sea level is claimed to rise by about 0.5 m up to a couple of meters, which indeed would be disastrous, had it been not correct. By analyzing available geological facts with respect to observed and measured changes in sea level and the boundary conditions of changes of different sea level parameters, a quite different picture emerge. This is evident from the following 5 points: (1) +1.14 mm/year, the mean of 184 tide gauge records scattered all over the globe selected by for their global sea level analyses. This value is too high, however, because many sites used represent subsiding delta sites, (2) $+1.0 \pm 0.1$ mm/year, the eustatic component the North Sea, Kattegatt and Baltic region, (3) $+0.55 \pm 0.10$ mm/year, the revised satellite altimetry values, (4) $+0.25 \pm 0.19$ mm/year, the mean of 170 tide gauge stations having a length of more than 60 years and (5) ± 0.0 mm/year, the value obtained from many global test sites; the Maldives, Bangladesh, Goa in the Indian Ocean, Tuvalu, Vanuatu, Kiribati, Majuro in the Pacific, Surinam-Guyana in NE South America, Venice in the Mediterranean. In conclusion, this implies variations between 0.0 and 1.0 mm/year or $+0.5 \pm 0.5$ mm/year. Global sea level is not at all in a rapidly rising mode, only changing by about 0.5 ± 0.5 mm/year. By year 2100 sea level is likely only to change by $+5 \text{ cm} \pm 15 \text{ cm}$, which poses no problems.

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Passive treatment technologies for the treatment of AMD from abandoned coal mines, Emalaheni, South Africa: Column experimentsMpule Gloria Dube¹, Novhe O¹, Ramasenya K¹ and Van Zweel N²¹Council for Geoscience, South Africa²North-West University, South Africa

Acid mine drainage (AMD) production from abandoned and ownerless coal mines is a huge environmental problem worldwide. Characteristics of AMD includes low pH (<4), high sulfate (SO₄) concentrations, high acidity levels and potentially hazardous metals such as Al, Fe and Mn. Passive treatment technologies for AMD remediation can function in remote areas with low costs of operation, monitoring and maintenance and therefore are practical for setting up on abandoned mine sites. Even though such systems have been used to treat acid mine water efficiently, limitations such as coating and clogging as a result of Al³⁺ and Fe³⁺ oxyhydroxide precipitates have been reported. For solving the clogging problems associated with most of the passive treatments, dispersed alkaline substrate (DAS) was introduced in Spain by Rotting, et al., 2008. A DAS is a system composed of coarse matrix (e.g., wood shavings: Provide and maintain high permeability) mixed with a fine grained alkaline material (e.g., limestone: Provides a bulk reactive surface area, where it will dissolve and react with AMD before it is coated). The main aim of the study was to investigate the effectiveness of the DAS system in treating AMD from an abandoned coal mine and compare it with the traditional reducing and alkalinity producing system (RAPS). The column experiments remediated acid water successfully for 21 weeks after which the DAS system clogged while RAPS was continuing to treat AMD successfully. For assessment of the treatment systems water parameters such as pH, EC, Redox, Total Dissolved Solids (TDS), concentrations of metals and metalloids were analyzed weekly. Both treatment systems were able to raise the pH from an average of 3 to 8. Contaminants such as Fe, Al, and Zn were completely removed. Mn concentrations were reduced but were still above the standards. Minimal SO₄ reduction was also noted in both the systems.

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Characterization of settleable dust, surface dust and trapped dust samples from the old and abandoned asbestos mine dumps in the Limpopo Province, South Africa**Maphuti Georgina Kwata and Shadung J Moja**
University of South Africa, South Africa

Asbestos mining was banned in South Africa because of the health effects that are linked to the inhalation of asbestos dust/fibers. Asbestos mine dumps in Limpopo Province are partially rehabilitated and surface asbestos dust/fibers could easily be lifted and transported by wind and settle in sensitive areas. Despite the cessation of asbestos mining in 2002, there is still a concern about possible environmental exposure to asbestos fibers. The presence of old and abandoned asbestos mine dumps continue to be a concern to government and local communities. Since old and abandoned asbestos mine dumps are partially rehabilitated, it is now the government's responsibility to fund the rehabilitation of the dumps. The aim of this research is to monitor, measure and characterize settleable dust, surface dust and trapped dust samples collected around local communities in the vicinity of old and abandoned asbestos mine dumps. The local standard method for collection and analysis of settleable dust (the South Africa National Dust Control Regulations 827 of 2013) was used in this research. Surface dust samples were collected using a dust pan, brush, zipper plastic and sieve sample. Trapped dust samples were collected by using a sticky tape and stored in containers. Samples were collected from January 2016 to July 2016 in Limpopo Province at five sampling sites named Site A, Site B, Site C, Site D and Site E. Samples were prepared for analyses with X-Ray Diffraction (XRD), Scanning Electron Microscopy-Energy Dispersive Spectrometry (SEM-EDS) and X-Ray fluorescence (XRF) techniques. The settleable dust rates are below the residential limit of 600 mg/m²/day. The XRF result confirms the presence of silicates of oxides minerals. SEM results confirm the presence of amphibole, fiber glass with a strong long spiral shape and particles size of 685 µm, 150 µm and with different shape granular and sponge like shape with particle size of 430 µm for chlorite, mix spectra of organic fiber and quartz, organic fiber, smectite, talc and mica. The XRD results confirm presence of 11% of amphibole and specifically 7% of serpentine within Limpopo Province is a concern due to its contribution to human health problems.

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Characterizing pollutant plume dispersion in urban atmospheric surface layer

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In highly urbanized cities, narrow streets are flanked by closely packed, high-rise buildings, forming arrays of street canyons. The dynamics below the urban canopy layer are different from those in the atmospheric surface layer (ASL) aloft. Moreover, the building-induced drag modifies the wind and pollutant dispersion. Advanced understanding of the pollutant dispersion over urban areas is utmost important for public health and the formulation of pollution control strategy. Gaussian plume model is the conventional method for pollutant dispersion prediction. Its accuracy mainly depends on the functionality of the empirical dispersion coefficients (σ_y in lateral and σ_z in vertical directions). ASL turbulence is complicated by land feature such as natural terrain or building morphology. It in turn influences the dispersion coefficient (especially σ_z), which, however, is often overlooked in the practice of pollutant dispersion modeling. Friction factor f , as a measure of surface roughness in engineering flows, has been adopted to parameterize street-level ventilation using both large-eddy simulation (LES) and wind tunnel experiments. As an extended effort of our on-going research studies, we report in this paper our attempt to parameterize the vertical dispersion coefficient σ_z in the conventional Gaussian plume model in terms of friction factor and other flow variables. Analytical solution shows that the vertical dispersion coefficient σ_z in the Gaussian plume model is proportional to the friction length scale $L_f (=x/2 \times \delta^{1/2} \times f^{1/4}$, where x is the distance after the pollutant source and δ the ASL thickness). Wind tunnel measurements are used to verify the newly proposed equation in which σ_z and L_f show a close correlation coefficient $R^2=0.933$. The analytical solution and wind tunnel measurements collectively demonstrate the importance of dynamics and surface roughness on the plume dispersion over urban areas.

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Methane emission estimates in South Asia: Challenge of the atmospheric methane and agriculture in South Asia projectSachiko Hayashida¹, Naveen Chandra¹, Prabir K. Patra², Yukio Terao³, Shigeto Sudo⁴, Kazuyuki Inubushi⁵, Masayoshi Mano⁵ and Akinori Yamamoto⁶¹Nara Women's University, Japan²Japan Agency for Marine-Earth Science and Technology, Japan³National Institute for Environmental Studies, Japan⁴National Institute for Agro-Environmental Sciences, Japan⁵Chiba University, Japan⁶Tokyo Gakugei University, Japan

Methane (CH₄) is the second most significant anthropogenic greenhouse gas. In Asia, methane emissions are mostly attributable to ruminant animals and rice fields. However, accurately quantifying emissions from these sources still remains a challenge. In order to improve methane emission estimates, a project called "Atmospheric Methane and Agriculture in South Asia (AMASA)" was initiated. The project is sponsored by the Japanese Ministry of the Environment. The project goals are to improve local methane emission estimates in South Asia using remote sensing data from the Greenhouse Gases Observing Satellite (GOSAT) and *in situ* measurements from ground-based stations and to develop an emission mitigation proposal. Based on local experimental works on those measurements, we will arrange some mitigation scenarios; these will be inputted into an atmospheric transport model in order to examine their feasibility and the predicted methane pathways and concentrations. Very high concentrations of methane were detected over Asia in the satellite data; these seem to be caused by high methane emissions in this region. However, determining local emission is not straight forward because of complex atmospheric transport mechanisms. For instance, during the monsoon season, upwelling winds can lift methane from the foothills of the Himalayan Mountains up to the mid- and upper-troposphere. High columnar concentrations are indeed observed in GOSAT data. Presently, field measurements of atmospheric methane and cultivation experiments are being conducted by the Tamil Nadu Rice Research Institute in South India. Preliminary results demonstrated that methane emissions from rice cultivation can be reduced by half when applying proper cultivation management strategies. Following these new findings, similar mitigation approaches are being proposed in South Asia.

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