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A Review work on Atmospheric Nanoparticles and Cosmic Ray activity are the cause of Climate Change and Biological Disorder of Public Health

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Abstract
For cosmic radiation emerging from cosmic rays, the high energy particles is originating outside the solar system.The flux of incoming Cosmic Rays at the upper atmosphere is dependent on the Solar Activity. The influence of Solar Variability on Earth's climate requires a solar variability, solar –terrestrial interactions and mechanisms determining the response of the Earth's climate system, including solar irradiance variations on both decadal and centennial time scales and their relation to galactic cosmic rays. Cosmic Rays are also responsible for the continuous production of a number of unstable isotopes in Earth's atmosphere. It can be used for validating magnetospheric field models during very severe storms.Measurements of the energy and arrival directions of the ultra-high-energy primary cosmic rays by the techniques of density sampling and fast timing of extensive air showers. Nanoparticles *have large surface area to volume ratios and react rapidly in the* atmosphere, *commonly growing into particles large enough to interact with* radiation *and to have serious consequences for visibility and local, regional, and global climate. They also have potentially significant health effects. Gamma ray deriving from local supernovae could have affected cancer and mutation rates, and might be linked to decisive alterations in the Earth's climate. Nucleation mode particles accounts for the greatest number of atmosphericparticles and are found in high number concentrations near their sources.* Atmospheric Nanoparticles *are of growing interest to many investigators for two - nanoparticles in technology and in the atmosphere Nanosized particles are a subgroup of atmospheric particles. Though humans have been exposed to Nanosized particles through- out their evolutionary stages, the respective exposure has dramatically increased over the last century due to contribution from various anthropogenic sources. The Airbourne particles are one of the most important pollutants of present times and their presence in the atmosphere has harmful effects both on human health and environment.*

Keywords: *Cosmic Radiation, Solar Variability, Global Climate,Airbourne particles*

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I. Impact on Climate change with the increasing of Galactic Cosmic Rays:

The action of space factors on the Earth's climate is realized mostly through cosmic rays and space dust influenced on formation of clouds controlled the total energy input from the Sun into the Earth's atmosphere. The propagation and modulation of Galactic Cosmic Ray in the Heliosphere are determined by their interactions with magnetic fields frozen in solar wind and in coronal mass ejections with accompanied interplanetary shock waves(1), (2)The effects of space factors on the climate can be divided into two types: one is related to changes on time scales ranging from 10^8a to 11–22a, producing effects which could be greater than that produced from anthropogenic factors, and another is sudden type, coming from supernova explosions and asteroid impacts. It is necessary to investigate all of the possible sudden factors, to develop methods of forecasting and also for protecting the biosphere, and the Earth's civilization from big changes in climate and environment.Cosmic Rays and Cosmic Dust through their influence on cloudiness are important factors in understanding climate.Cosmic Ray Ionization maintains the atmosphere as very dilute electrically conducting plasma, allowing a continuous electrical current to pass from the ionosphere to Earth's surface. The most Energetic Cosmic Rays are dangerous because they are Ionizing Radiation.(4)-(8), (15)-(18)The Magnetic Flux of Cosmic Ray at the upper atmosphere is dependent on the Solar Wind. On entering the heliosphere, charged cosmic rays are deflected by the inhomogeneous magnetic fields of the solar wind. The dominant effect on the motion of cosmic rays in the solar wind is the interplanetary magnetic fieldusing random functions. Sunspots are on the Sun'sphotosphere that appear as spots darker than the surrounding areas are marked by intense magnetic activity and play host to solar flares and hot gassy ejections from the sun's corona. They are regions of reduced surface temperature caused by concentrations of magnetic flux that inhibit convection.The total solar irradiance reaching the Earth's atmosphere is the main driving agent for the variation in the Earth's climate. The effect of cosmic rays on climate could be in three ways: (a) through changes in the concentration of cloud condensation nuclei, (b) thunderstorm electrification and (c) ice formation in cyclones. (9)-(14)The concentration of cloud condensation nuclei depends on the light ions produced during cosmic ray ionization, based on a laboratory experiment in which a gas mixture equivalent to chemical composition of the lower atmosphere was subjected to UV light and cosmic rays, reported that the released electrons promoted fast and efficient formation of ultrafine aerosol particles which may grow to become cloud condensation nuclei. The flux of incoming Cosmic Rays at the upper atmosphere is dependent on the Solar Wind, the Earth's magnetic field, and the energy of the cosmic rays. For cosmic radiation high energy particles originating outside a solar system. Cosmic rays are also responsible for the continuous production of a number of unstable isotopes in Earth's atmosphere. Cosmic rays can be used for validating magnetospheric field models during very severe storms. Cosmic rays are high-energy radiation, mainly originating outside the Solar System. Solar energetic particles and high-energy particles emitted by the sun. Measurements of the energy and arrival directions of the ultra-high-energy primary cosmic rays by the techniques of density sampling and fast timing of extensive air showers. When cosmic rays enter the Earth's atmosphere they collide with atoms and molecules, mainly oxygen and nitrogen.

II. Impact on Climate change with the increasing of Atmospheric Nanoparticles:

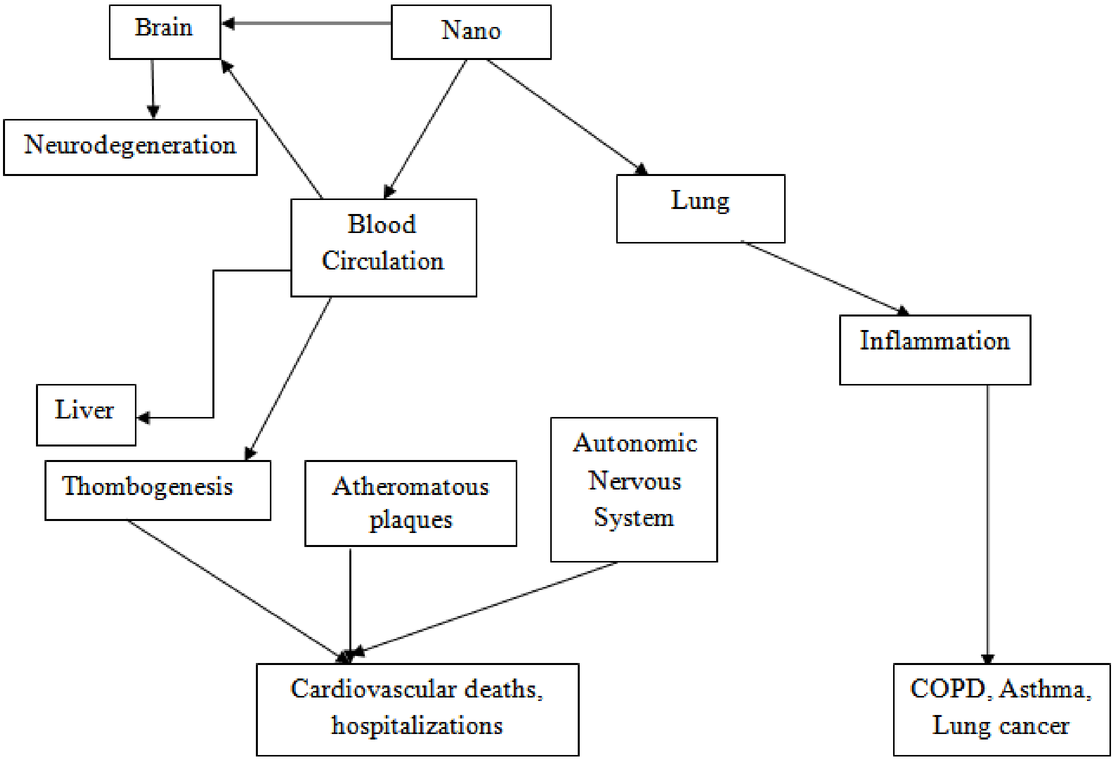
Depending on their compositions and sizes of the atmospheric nanoparticles influence global climate through both warming andcooling effects. Nanoparticles readily coagulate with largerparticles, increasing their sizes and changing their properties,at which point they seriously affect optical propertiesand thus climate. The influence of aerosol particles on climate recognizing thatthe major players are particles that have grown from the nanoparticle range. However, since the nanoparticles are the major precursors to larger particles that interact with radiantenergy, nanoparticle influence on climate can be huge.The Aerosol particles themselves scatter andabsorb sunlight, as well as light reflected from the ground.When they scatter light, some part of the energy returnsto space, resulting in net cooling of Earth. The reverseoccurs when they absorb light, resulting in a warmingeffect like that produced by greenhouse gases. Throughtheir interaction with sunlight, aerosol particles contributedirectly to the planetary energy balance. This type of interactionis called the direct effect.If the particles are hydrophilic, and if growth is sufficientlyrapid to avoid loss by coagulation, they can also act as CCNand change the sizes, numbers, and lifetimes of cloud droplets,increasing the scattering of sunlight and resulting in a netcooling effect.(19), (20) The influence of particles on clouds is calledthe indirect effect and is one of the largest uncertainties inglobal climate models. Thus the aerosol hygroscopicityis an important issue for global climate modeling.The contributions of aerosol particles and gases to the global climate are measured by radiative forcing, which is"the rate of energy change per unit area of the globe asmeasured at the top of the atmosphere".Since aerosol particles counteractthe warming effects of greenhouse gases, knowledge of the types and abundances of aerosol particles is criticalfor understanding changes in the global climate.Sulfate aerosol particles are extremely abundant, and theyproduce a net cooling effect of -0.4 Wm-2. If soot particles (largest contributor to warming among aerosol particles) are coated withsulfate or organic compounds which is common in the ambient atmosphere,their radiative forcing increases to about 0.6 Wm-2. In such cases, their radiativeforcing is the second largest contributor to global warming.Climate system, atmospheric chemistry and even life on the Earth are dependent on Solar Radiation. (21)-(25) Approximately 30% of the incoming solar energy is reflectedback to space. The remaining 70% is absorbed by the surface–atmosphere system of the Earth.This energy heats the planet and the atmosphere. As the surface and the atmosphere becomewarm, they release the energy in form of infrared radiation. This process continues until theincoming solar energy and the outgoing heat radiation are in balance. This radiation energybalance provides a powerful constraint for the global average temperature of the planet. Atmospheric greenhouse gases and particles affect the climate by altering the incoming solar and outgoing thermalradiations. In other words changing the atmospheric abundance or properties of these gasesand particles can lead to a warming or cooling of the climate system. The influence of a factor that cause change of climate system are typically evaluated in terms of its radiativeforcing, which is an estimate of how the energy balance of the Earth-atmosphere system isinfluenced when the factor in question is altered. Atmospheric nanosized particles are the main precursors of larger particles. (26), (30)They promotetheir growth and modify the optical properties thus affecting the radiative propertiesof the atmosphere. It was generally believed that particles reflect sunlight back tospace before it reaches the surface, and thus contribute to a cooling of the surface. During time as the concentrations of particlesincreased their cooling effect has masked some ofthe greenhouse warming. This It was found that atmospheric particles may also enhance scattering and absorptionof solar radiation thus causing direct warm-up. Especially, carbonaceous particles are considered as one of the major contributors to global warming, if they are coated with sulphate or organic compoundstheir radiative forcing can increase up to about +0.6 W m-2. Indirectly nanoparticles can also cause a negative radiative forcing through changes in cloudformations and properties. They can act as cloud condensation nuclei and modifysize and number concentrations of cloud droplets. (27)-(29) In clean air, clouds are composed of a relativelysmall number of large droplets. As a consequence, the clouds are somewhat dark andtranslucent. In polluted air with high concentrations of particles watercan easily condense on the particles, creating a large number of small droplets. These cloudsare dense, very reflective, and bright white. Due to the decrease of the size of water dropletsthese clouds are less efficient at releasing precipitation. They cause large reductions in aamount of solar radiation reaching Earth's surface, a corresponding increase in atmosphericsolar heating, changes in atmospheric thermal structure, surface cooling, disruption of regionalcirculation systems such as the monsoons, suppression of rainfall, and less efficient removalof pollutants. In general the indirect effects of particles are onlypartially understood. The interactions between aerosol particles and clouds are complex and most instruments cannot measure aerosols within the clouds. Climatologists consider the role of clouds to be the largest single uncertainty inclimate prediction.The close relation between climate and air quality also reflects on the impacts of climate changeon air pollution levels. The particle pollution levels are strongly influenced by shiftsin the weather. While closely related, climate changeand air pollution have mostly been treated as separate problems. At the international level,various efforts have helped to reduce air pollution levels. The largest reductions have beenachieved for emissions of sulphur dioxide which decreased in Europe by 82% between 1990and 2010. The implementation of EU regulation limits setting levels of sulphurdioxide in urban areas and various political actions to control urban atmospheric emissionshave contributed to these reductions. In addition, significant reductions were also obtained for emissions of air pollutants thatare primarily responsible for formation of harmful ground-level ozone: non-methane volatileorganic compounds and nitrogen oxides. However,based on the future climate scenarios the IPCC still projected declining air quality in cities into the future as a result of climatechange. The climate change could havevarious negative impacts on national air quality levels that included both increases and decreasesin particle pollution. Thus in order to protect human health and environment,joined efforts to control air pollution and mitigate climate change have to be done infuture: air pollution abatement measures may help protect the regional and global climatewhilst taking certain climate change measures may yield additional benefits through improvedlocal and regional air quality.

Impact on biological disorder of public health with the increasing of the Galactic Cosmic Rays:

The galactic cosmic rays impact on biological disorder of public heath. It is the cause of health risks. Itoccurs cancer. It damages the central nervous system. It occurs the cataract problem. It is the risk of acute radiation sickness and also have hereditary effects.Health threating from different sides is the effect of galactic cosmic rays.The HP threats from cosmic rays is a danger posed by galactic cosmic rays and solar energetic particles to astronauts on interplanetary missions or any missions that venture through the Van-Anen Belts or outside a Earth's magnetosphere.It signifanclty risk for cancer.Increased life time risk of fatal cancer because of occupational exposure to ionizing radiation is 1 in 4200 for 6m Sv/ year effective dose.The potential acute and chronic health effects of space radiation as with other ionizing radiation exposures, involve both direct damage to DNA, indirect effects due toi generation of reactive oxygen species and changes to a biochemistry of cells and tissues which can alter gene transcription and a tissue microenvironment along with producing DNA mutations. Acute effects result from high radiation doses and these are most likely to occur after solar particle events. Likely chronic effects of space radiation exposure include both stochastic events such as radiation Carcinogenesis . The health threat depends on a flux, energy spectrum and nuclear composition of a radiation.(32)-(35)

Impact on biological disorder of public health with the increasing ofthe Atmospheric Nanoparticles:

Toxicity of nanoparticles is of increasing interest because of the rapid development and growth of nanotechnology. When nanoparticles are absorbed or ingested, their behavior differs from that of larger particles. They pose a particularly large health risk because they are likely to be more reactive and toxic than larger particles. Nanoparticles may be taken into the body through the skin, lung, and gastrointestinal tract. When inhaled, theydeposit on all regions of the respiratory tract by diffusion,with particles smaller than 20 nm having the highest depositionefficiency.(31) After nanoparticles deposit in the alveolarregion, only ~20% of them are removed, whereas 80% ofparticles larger than 500 nm are removed. In contrast to larger particles, nanoparticlestravel into the circulatory and lymphatic systems. Theirtoxicity depends on their surface areas and compositions,and surface atoms and molecules work as catalysts forchemical reactions. The smallest particles have the largest specific surface areas, making nanoparticles especially reactive.Thus, they potentially cause adverse effects such asoxidation stress, pulmonary inflammation, and cardiovascularevents like heart attacks and cardiac-rhythm disturbance. Due to intensive research, there is an emerging evidence that exposure to nanoparticles mayadversely affect human health.(36)-(38)The nanoparticles enter human bodythrough the skin, lung and gastrointestinal tract. When they are inhaled, theirbehavior differs from coarse particles. Their small size allows them to be breathed deeply intothe lungs where they are able to penetrate alveolar epithelium and enter the pulmonary interstitiumand vascular space to be absorbed directly into the blood stream.They may also translocate within the body to the central nerve system, the brain, intothe systemic circulation and to organs like the liver. (39)- (42)They aremore reactive and toxic due to the larger surface areas, leading to detrimental health effectssuch as oxidation stress, pulmonary inflammation and cardiovascular events.Though the toxicological studies have provided evidence of the toxicity of nanoparticles, epidemiologicalevidence of the health effects is limited.Unlike for coarse and fine particles there are relativelyfew epidemiological studies on the health effects of atmospheric nanoparticles. The first conducted studies on atmospheric nanoparticles have been panel studies, which generally showedassociations between short-term exposure to nanosized particles and occurrence of acute respiratorysymptoms and lung function. Some of these studies have suggested that nanoparticles might be even morestrongly associated with adverse respiratory outcomes than fine particles whereas other studies found similar associations in health outcomes ofnano and fine particles.(43)-(48)



Although lungs are the primary target of nanoparictiles, the cardiovascular detrimental consequencesdue exposure to nanoparticles have been also observed in some epidemiologicalstudies study investigated the health effects of nanoparticles in three European cities, wheredaily number concentrations levels of nanoparticles in air were similar. (49)-(50)

III. Conclusion:

Atmospheric Nanoparticles are of growing interest to many investigators for two - nano particles in technology and in the atmosphere Nanosized particles are a subgroup of atmospheric particles. Though humans have been exposed to Nanosized particles through- out their evolutionary stages, the respective exposure has dramatically increased over the last century due to contribution from various anthropogenic sources. The Airbourne particles are one of the most important pollutants of present times and their presence in the atmosphere has harmful effects both on human health and environment.Cosmic Ray Ionization maintains the atmosphere as very dilute electrically conducting plasma, allowing a continuous electrical current to pass from the ionosphere to Earth's surface.The influence of a factor that cause change of climate system are typically evaluated in terms of its radiativeforcing, which is an estimate of how the energy balance of the Earth-atmosphere system isinfluenced when the factor in question is altered. Atmospheric nanosized particles are the main precursors of larger particles.The potential acute and chronic health effects of space radiation as with other ionizing radiation exposures, involve both direct damage to DNA, indirect effects due toi generation of reactive oxygen species and changes to a biochemistry of cells and tissues which can alter gene transcription and a tissue microenvironment along with producing DNA mutations.

References:

[1]. Cosmic rays and space weather: effects on global climate change, L. I. Dorman , Received: 01 Feb 2011 – Revised: 12 Sep 2011 – Accepted: 09 Oct 2011 – Published: 04 Jan 2012

[2]. "Solar Forcing of Climate". Climate Change 2001: Working Group I: The Scientific Basis. Archived from the original on 15 March 2005. Retrieved 10 March 2005.

[3]. Hapgood, Mike. "Space Weather: Its impact on Earth and implications for business". Lloyd's 360 Risk Insight. Lloyd's of London. Retrieved 24 June 2013.

[4]. Jorgensen, T. S., and A. W. Hansen (2000), Comments on "Variation of cosmic ray flux and global cloud coverages" by H. Svensmark and E. Friis-Christensen, J. Atmos. Sol. Terr. Phys., 62(1), 73–77.

[5]. Laken, B., and J. Calogovic (2013), Composite analysis with Monte Carlo method: An example with cosmic rays and clouds, J. Space Weather Space Clim., 3, A29, doi:10.1051/swsc/2013051, in press.

[6]. Meehl, G. A., J. M. Arblaster, K. Matthes, F. Sassi, and H. van Loon (2009), Amplifying the pacific climate system response to a small 11-year solar cycle forcing, Science, 325(5944), 1114–1118, doi:10.1126/Science.1172872.

[7]. Pudovkin, M., and S. Veretenenko (1995), Cloudiness decreases associated with Forbush-decreases of galactic cosmic rays, J. Atmos. Terr. Phys., 57(11), 1349–1355.

[8]. Sloan, T., and A. W. Wolfendale (2008), Testing the proposed causal link between cosmic rays and cloud cover. Environ. Res. Lett., 3(2), 024001.

[9]. Solar activity, cosmic rays, and Earth's temperature: A millennium-scale comparisonI. G. Usoskin M. Schüssler S. K. Solanki K. Mursula

[10]. "Space Weather: A Research Perspective | The National Academies Press". www.nap.edu. National Academy of Science. 1997. Retrieved 2015-07-24.

[11]. Bazilevskaya, G. A., et al. (2008), Cosmic ray induced ion production in the atmosphere, Space Sci. Rev., 137(1- 4), 149–173.

[12]. "The Detection of Cosmic Rays". Milagro Gamma-Ray Observatory. Los Alamos National Laboratory. 3 April 2002. Archived from the original on 5 March 2013. Retrieved 22 February 2013.

[13]. Morison, Ian (2008). Introduction to Astronomy and Cosmology. John Wiley & Sons. p. 198. ISBN 978-0-470-03333-3.

[14]. Science: Evidence Shows That Cosmic Rays Come From Exploding Stars 13 February 2013 Ginger Pinholster

[15]. Cosmic ray acceleration via magnetic reconnection of magnetic islands/flux-ropesAnil Raghav, Zubair Shaikh(Submitted on 30 Oct 2016 (v1), last revised 17 Nov 2016 (this version, v2))

[16]. Cosmic rays and space weather: effects on global climate change,L. I. Dorman , Received: 01 Feb 2011 – Revised: 12 Sep 2011 – Accepted: 09 Oct 2011 – Published: 04 Jan 2012

[17]. Arruda, L., Barao, F., & Pereira, R. 2008, ArXiv:0801.3243 ˜ Asakimori, K., Burnett, T. H., Cherry, M. L., et al. 1998, ApJ, 502, 278 Asaoka, Y., Shikaze, Y., Abe, K., et al. 2002, Physical Review Letters, 88, 051101 Auger, P., Ehrenfest, P., Maze, R., Daudin, J., & Freon, R. A. 1939, Reviews of ´ Modern Physics, 11, 288 Ave, M., Boyle, P. J., Gahbauer, F., et al. 2008, ApJ, 678, 262

[18]. "Detecting cosmic rays from a galaxy far, far away". Science Daily. 21 September 2017. Retrieved 26 December 2017

[19]. Cosmic Rays, Clouds, and Climate K. S. Carslaw1, R. G. Harrison2, J. Kirkby3,Science 29 Nov 2002

[20]. Cosmic Rays and the Sunspot Cycle: A Large Cosmic-Ray Decrease accompanying the Solar Maximum of 1957,J. R. WINCKLER & L. PETERSONNature volume181, pages1317–1319 (10 May 1958) |

[21]. Weart, Spencer (2006). Weart, Spencer, ed. "The Discovery of Global Warming—Changing Sun, Changing Climate?". American Institute of Physics. Retrieved 2007-04-14.

[22]. "Space Weather: A Research Perspective | The National Academies Press". www.nap.edu. National Academy of Science. 1997. Retrieved 2015-07-24. Space weather describes the conditions in space that affect Earth and its technological systems. Our space weather is a consequence of the behavior of the Sun, the nature of Earth's magnetic field, and our location in the solar system

[23]. Bazilevskaya, G. A., et al. (2008), Cosmic ray induced ion production in the atmosphere, Space Sci. Rev., 137(1-4), 149–173.

[24]. Bond, G., B. Kromer, J. Beer, R. Muscheler, M. N. Evans, W. Showers, S. Hoffmann, R. Lotti-Bond, I. Hajdas, and G. Bonani (2001), Persistent solar influence on North Atlantic climate during the Holocene, Science, 294(5549), 2130–2136.

[25]. Calogovic, J., C. Albert, F. Arnold, J. Beer, L. Desorgher, and E. O. Flueckiger (2010), Sudden cosmic ray decreases: No change of global cloud cover, Geophys. Res. Lett., 37, L03802, doi:10.1029/2009gl041327.

[26]. Chatfield, C. (1996), The Analysis of Time Series: An Introduction, 5th ed., pp. 21–25, Chapman and Hall, London.

[27]. Damon, P. E., and P. Laut (2004), Pattern of strange errors plagues solar activity and terrestrial climate data, Eos Trans. AGU, 85(39), 370–374, doi:10.1029/2004eo390005.

[28]. Davies, R. (2013), Comparison of longwave and shortwave cloud effects on equilibrium surface temperature using a radiative-convective model and 12 years of MISR observations, in Radiation Processes in the Atmosphere and Ocean (IRS2012), AIP Conf. Proc., vol. 1531, pp. 720–723, AIP Publishing LLC, Berlin.

[29]. Haigh, J. D. (1996), The impact of solar variability on climate, Science, 272(5264), 981–984.

[30]. Hansen, J., R. Ruedy, M. Sato, and K. Lo (2010), Global surface temperature change, Rev. Geophys., 48, RG4004, doi:10.1029/2010RG000345.

[31]. Jorgensen, T. S., and A. W. Hansen (2000), Comments on " Variation of cosmic ray flux and global cloud coverage—A missing link in solar-climate relationships" by H. Svensmark and E. Friis-Christensen, J. Atmos. Sol. Terr. Phys., 62(1), 73–77.

[32]. Kirkby, J. (2007), Cosmic rays and climate, Surv. Geophys., 28(5-6), 333–375, doi:10.1007/S10712-008-9030-6.

[33]. Kristjánsson, J. E., J. Kristiansen, and E. Kaas (2004), Solar activity, cosmic rays, clouds and climate—An update, Adv. Space Res., 34(2), 407–415, doi:10.1016/j.asr.2003.02.040.

[34]. Kristjansson, J. E., C. W. Stjern, F. Stordal, A. M. Fjæraa, G. Myhre, and K. Jónasson (2008), Cosmic rays, cloud condensation nuclei and clouds—A reassessment using MODIS data, Atmos. Chem. Phys., 8(24), 7373–7387.

[35]. Laken, B., E. Palle, J. Calogovic, and E. Dunne (2012), A cosmic ray–climate link and cloud observations, J. Space Weather Space Clim., 2, A18.

[36]. Marsh, N., and H. Svensmark (2000), Cosmic rays, clouds, and climate, Space Sci. Rev., 94(1-2), 215–230.

[37]. Meehl, G. A., J. M. Arblaster, K. Matthes, F. Sassi, and H. van Loon (2009), Amplifying the pacific climate system response to a small 11-year solar cycle forcing, Science, 325(5944), 1114–1118, doi:10.1126/Science.1172872.

[38]. Neff, U., S. J. Burns, A. Mangini, M. Mudelsee, D. Fleitmann, and A. Matter (2001), Strong coherence between solar variability and the monsoon in Oman between 9 and 6 kyr ago, Nature, 411(6835), 290–293

[39]. Pallé, E., and C. J. Butler (2000), The influence of cosmic rays on terrestrial cloud and global warming, Astron. Geophys., 41, 4.18–4.22.

[40]. Pudovkin, M., and S. Veretenenko (1995), Cloudiness decreases associated with Forbush-decreases of galactic cosmic rays, J. Atmos. Terr. Phys., 57(11), 1349–1355.

[41]. Rao, U. R. (2011), Contribution of changing galactic cosmic ray flux to global warming, Curr. Sci., 100(2), 223–225.
[42]. Sloan, T., and A. W. Wolfendale (2008), Testing the proposed causal link between cosmic rays and cloud cover. Environ. Res. Lett., 3(2), 024001.
[43]. Sun, B. M., and R. S. Bradley (2002), Solar influences on cosmic rays and cloud formation: A reassessment, J. Geophys. Res., 107(D14), 4211, doi:10.1029/2001jd000560.
[44]. Svensmark, H. (2007), Cosmoclimatology: A new theory emerges, Astron. Geophys., 48(1), 18–24.
[45]. Svensmark, H., and E. Friis-Christensen (1997), Variation of cosmic ray flux and global cloud coverage—A missing link in solar-climate relationships, J. Atmos. Sol. Terr. Phys., 59(11), 1225–1232.
[46]. Svensmark, J., M. Enghoff, and H. Svensmark (2012), Effects of cosmic ray decreases on cloud microphysics, Atmos. Chem. Phys. Discuss., 12, 3595–3617, doi:10.5194/acpd-12-3595-2012.
[47]. Tinsley, B. (2008), The global atmospheric electric circuit and its effects on cloud microphysics, Rep. Prog. Phys., 71(6), 066801.
[48]. Todd, M. C., and D. R. Kniveton (2001), Changes in cloud cover associated with Forbush decreases of galactic cosmic rays, J. Geophys. Res., 106(D23), 32,031–32,041.
[49]. Todd, M. C., and D. R. Kniveton (2004), Short-term variability in satellite-derived cloud cover and galactic cosmic rays: An update, J. Atmos. Sol. Terr. Phys., 66(13), 1205–1211.
[50]. Solar activity, cosmic rays, and Earth's temperature: A millennium-scale comparisonI. G. Usoskin M. Schüssler S. K. Solanki K. Mursula

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