EDITORIAL

The Anthropogenic Global Warming (AGW) concept, which claims that during the last 40-50 years man-made CO_2 emissions played a central role in progressive warming of the Earth's climate, is the rationale of the Kyoto Protocol, adopted in 2005 by 191 countries. However, at the renewal of this protocol in late 2012, only a minority of its former supporters committed themselves to continued reduction of anthropogenic CO_2 emissions. By early 2013, Canada, Japan, New Zealand and Russia had withdrawn from the Kyoto Protocol while the USA had never ratified it.

The Kyoto Protocol is based on the assessment reports of the UN Intergovernmental Panel on Climate Change (IPCC), which is responsible for the scientific rational that justifies reduction of the anthropogenic emission of so-called 'greenhouse gases'. While the IPCC does not conduct research on its own, it compiles and evaluates scientific literature on climate change and climate-forcing mechanisms. Of its three Working Groups, only WG1 addresses the science of climatology.

In 2012, when the first phase of the Kyoto Protocol ended, only the European Union, Australia, Iceland, Norway, Switzerland and Croatia endorsed its extension to 2020. With this limited number of supporters, the Kyoto Protocol ceased to be internationally binding. Despite increasing concerns about implications arising from Kyoto Protocol stipulations for energy and development policies, the IPCC continues, with strong support of the European Union, to propagate prevention of putative catastrophic Anthropogenic Global Warming (AGW).

The IPCC and the World Meteorological Organization (WMO), which claim to possess quasi-exclusive authority and the support of the best scientists in the field of climate science, concluded, based on computer simulations, that only anthropogenic emissions can be invoked to explain the global warming observed since the middle of the 20th century (see IPCC AR4, 2007, fig. 9.5). Despite obvious uncertainties, the IPCC devoted its efforts mainly to advocating the AGW postulate instead of demonstrating that increased atmospheric CO_2 concentration is indeed responsible for the observed warming, and assessing possible alternate explanations for the observed climate change.

Due to this lack of balance in climate research, scientists not affiliated with the IPCC network, and who are therefore not funded by national governments and international organizations such as the EU, have for years seriously challenged the AGW hypothesis and IPCC predictions. Scientists criticizing the AGW hypothesis, also referred to as AGW antagonists, climate sceptics or simply deniers have repeatedly sought a direct dialogue with the IPCC network. Yet, AGW protagonists persistently resisted a free exchange of views with antagonists. Moreover, lead authors of IPCC draft assessment reports largely disregarded invited comments submitted by AGW antagonists.

Given the socioeconomically harmful consequences arising from implementing the climate-engineering policies of the Kyoto Protocol, it is vital to critically assess the validity of scientific arguments backing the AGW postulate. This is the objective of this Special Issue of Energy & Environment that addresses a selection of key controversial processes inherent to the concept of anthropogenic climate change.

The coincidence of rising atmospheric CO_2 concentrations and increasing average surface temperatures can, however, no longer be considered as conclusive evidence for the AGW concept, as postulated by the IPCC in its Summaries for Policy Makers. This postulate, which is fundamental to the AGW concept, is based on the fact that CO_2 absorbs and emits infrared (IR) radiation. This leads to theoretical descriptions of radiation transfer processes in atmospheric columns that are based on the well-known Planck and Lambert-Beer physical laws. The question arises, however, whether these 'laws', considered in their restricted sense only, also apply in the complex global climate system as assumed at first sight.

Invoking the properties of so called thermal reservoirs in the climate system, *R. Clark* discusses how energy transfer processes in the atmosphere can be identified, thus challenging the prominence of the greenhouse gas effect, as suggested by basic physical properties. Moreover, it is obvious that climate variability studies at geological time scales provide important insight in so far as particular phenomena may be physically related or coincide fortuitously. This leads to the crucial question of 'what is cause and what is effect' and, if so, 'to what extent in a complex system'. This is illustrated by the paper of *H.N.A. Priem* that reviews the continuous change in average global temperatures and atmospheric CO_2 concentrations through geological times.

The emphasis of the IPCC on the fact that atmospheric CO_2 concentrations continuously increased during the last century while surface temperatures rose cyclically, tempts to seek correlations with other signals of climate variability, although this is fundamentally questionable due to the complexity of natural climate variability. For instance, *M. Khandekar* shows that the frequency of extreme weather events has not increased during the last few decades, despite numerous contrary press reports and forecasts by the IPCC. Furthermore *N-A. Mörner,* reviewing the AGW postulate of an ongoing rapid rise in sea level, finds that the alarmist scenario of impending flooding of low lying coastal areas is not compatible with factual data.

The 'projections' of future climate development, often wrongly referred to as 'predictions', are based on so-called General Circulation Models (GCM). In two short notes *S.F. Singer* addresses the validity of these models, stressing their chaotic character and how this can be overcome, and that observational evidence contradicts the occurrance of tropical Hot Spots. In the same vein, *F. Engelbeen* evaluates the way aerosol effects are accounted for in GCM and concludes that reality is simply disregarded. In their concluding paper *A. Rörsch & P.A. Ziegler* further elaborate on misunderstandings inherent to the AGW concept that arise from the neglect of new insights gained from Complexity Theory.

The danger of man-made global warming has been widely challenged by independent scientists since warming during the last 100 years is limited to about 0.8^0C. In this context, the use of a global average temperature increase as an important signal must be challenged. In a short note *D.H. Douglass & J.R. Christy* address the disparity between observed surface and troposphere warming rates.
A.Rosema et al report on METEOSAT thermal infrared band observations of the Earth surface temperature change during 1982-2006, which indicate a slight global surface temperature decrease. Some spots show, however, a temperature increase, that can be explained in terms of major human interventions with the water balance at the Earth's surface.

Since the dominant climate-forcing effect of human CO_2 emissions, as postulated by the IPCC, is seriously questioned and probably plays only a subordinate role, the well-documented variations in solar activity probably underlay the documanted fluctuations in global surface temperatures during geological, historic and recent times. In this context, *van Geel & Ziegler* present evidence that the effect of variations in solar activity has been seriously underestimated by the IPCC. Furthermore, *N. Scafetta* shows that climate changes are mainly regulated by solar, astronomical and lunar harmonics at multiple scales. Moreover, he shows that climate models supporting the AGW concept fail to reproduce two major aspects of climate fluctuations, namely that (1) the claim of the GCM that variations in solar activity contribute little to climate change, akin to the hockey stick model, is not consistent with modern temperature reconstructions reflecting large millennial oscillations in solar activity, (2) the GCM fail to correctly reproduce all natural climatic oscillations at decadal and multidecadal scales. *I.R.G. Wilson* presents evidence for lunar tidal control on the ENSO oscillation and soli-lunar tidal control on the Pacific Decadal Oscillation.

In their concluding paper *A. Rörsch & P.A. Ziegler* address further shortcomings of the AGW concept. Furthermore, they point out that solar activity, varying in response to planetary forcing, and related feedback mechanisms probably dominates climate fluctuations, with anthropogenic CO_2 emissions playing a subordinate, though discernible role.

All papers of this compendium were reviewed by at least two referees and whenever possible by AGW supporters and critics. In case of a negative review report, comments by additional referees were sought. In several cases this led to an extensive exchange of views between authors and referees and corresponding manuscript revisions, which were subject to a second round of peer review prior to acceptance for publication.
We gratefully acknowledge the participation of fifty reviewers who invested their time

to critically assess papers forming this special issue.

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WHY SCIENTISTS ARE SCEPTICAL ABOUT THE AGW CONCEPT

by

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WHY SCIENTISTS ARE 'SCEPTICAL' ABOUT THE AGW CONCEPT

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ABSTRACT
The strong climate-forcing effect of rising atmospheric CO_2 concentrations advocated by the IPCC, is at odds with climate developments during geological, historical and recent times. Although atmospheric CO_2 concentrations continuously increased during industrial times, temperatures did not increase continuously to the present level but stagnated or even declined slightly during 1880 to 1900, 1945 to1977 and again since 1998. Total solar irradiation rose from a low in 1890 to a first peak in 1950 that was followed by a sharp decline ending in 1977, giving way to a period of rapidly increasing radiation peaking in 2002 when solar activity started to decrease, possibly declining to a new Little-Ice-Age type low. The Greenhouse Effect of increasing atmospheric CO_2 concentrations, claimed and widely propagated by IPCC, is particularly vexing as it is widely over-estimated without adequate scientific justification. Large observed climate variations documented for geological and historical times, as well as the lack of insight into the behaviour of complex systems, seriously question the Anthropogenic Global Warming (AGW) concept propagated by the IPCC. The climate variability during industrial times was essentially governed by changes in solar activity with increasing atmospheric CO_2 content playing a subordinate role. The climate controlling effect attributed by the IPCC to increasing atmospheric CO_2 concentrations is rejected since supporting models are not compatible with observations. Lastly, the authors consider from a historical and philosophical science point of view why current mainstream climate change research and IPCC assessments may have been on an erring way for several decades.

1. PROOF OF THE PUDDING

The interpretations of observational data presented by particular investigators can always be queried. As part of the scientific tradition, such critical comments are usually presented in the 'discussion and conclusion' section of scientific papers and can be even followed by a re-interpretation of the pertinent data. This allows for an open discussion of controversial issues in the literature. During the last decades a hot public debate developed between Anthropogenic Global Warming (AGW) protagonists and antagonists on the subject of climate-driving mechanisms. In this debate, both sides were not always prepared to respect each other's views. [1]

The main controversies between protagonists and antagonists are addressed in the following four sections. Common to this dispute on the causes of Global Warming is the general neglect of insight provided by not directly related disciplines.

Before going into details, a fundamental problem of climate research must be addressed, namely the tendency to accept certain observations as evidence that can stand the test of time. This concerns specifically the reproducibility of data by independent investigators. In most natural sciences it is understood that the significance of a single paper, despite thorough peer-review, decreases if other investigators do not confirm its findings. For instance, climate research greatly profited during the last few decades from the development of new technological developments, such as satellite observation. However, due to their cost and the organizational structure required, satellites are generally administrated by national agencies, such as NASA. Although there is no reason to doubt the scientific integrity of these agencies, it is vexing when original interpretations of observational data are revised at a later stage, claiming earlier errors. This leaves questions inherent to research on global-scale climate variability open, particularly by independent scientists. This problem has not been fully recognized by authors of assessment studies and the IPCC-AGW network but also by AGW antagonists, who all too often focus on a single observation.

2. GEOLOGICAL AND PALEO-BIOLOGIC RECORD [2]

Geological and paleo-biologic records provide an overview of climate changes during more than one billion years. Particularly relevant to current climate research are phenomena related to changes in atmospheric CO_2 concentration and variations in solar irradiance during geological times - and even more so during the last million years. However, mechanisms of climate changes during historic times may not be the same as those of industrial times, for which the principle " l'histoire se répète" may not apply. In this respect, an important difference between geological and industrial times is the ever-increasing human impact on the environment. It is, however, suspected that for political reasons the effect of humanity on climate has been seriously exaggerated.

Although on a geological time scale, important insight has been gained on mechanisms governing climate variability, it is realized that the correlation between phenomena can be causal but also coincidental. In this respect, the key questions in such complex systems as the climate are 'what is cause and what is effect' and 'what is oscillatory and what is transient' (see section 3).

Unfortunately, current climatologic reasoning preferentially invokes particular causes to explain observed effects. What is missing is the element of 'comparative' science that looks to other disciplines for a solution to common problems in an effort to reach a mutually acceptable solutions.

Moreover, the power of scientific explanations is based on their resistance to criticism. Climate science cannot offer unique explanations because physical processes controlling the climate are still incompletely known. Indeed, expectations based on the current state of climate physics are notoriously poorly constrained. Therefore, the theory of climate physics cannot be disproven at small and medium scales, and its explanations are not uniquely causal.

Inherent to natural sciences is the search for so-called ‘grand unifying theories’, such as the Darwinian theory of biological evolution that invokes the interaction of random variation and natural selection. The search for meaning has expanded, for instance, to physics and more generally to development of the Complexity Theory, which in itself had a strongly unifying effect on all sciences.[3] However, most climate researchers isolate themselves from this general trend of the natural sciences, preferring to adhere to their abbreviated cause-and-effect concept. In this respect, the neglect of insight provided by geological and paleo-biological records is but one example of this tendency.

3. INSIGHT FROM COMPLEXITY THEORY DEVELOPMENT [4]

Pragmatic application of the Complexity Theory to the understanding of climate change may resolve the ongoing dispute between AGW protagonists and antagonists. The origin of the Complexity Theory, formerly referred to also as catastrophe or chaos theory, dates back to the 19th century. It addresses dynamic processes that occur far away from thermodynamic equilibrium, which can only be described by non-linear partial non-soluble differential equations. The nature of such processes can now be simulated due to great improvement of computer simulation since the 1950s and development of information technology. It must be realized, however, that such simulations do not provide actual, real-world solutions but represent virtual reality of “what if” experiments under closely defined conditions. The trajectory of an ensemble of simulations represents a physical possibility, although individually none of them corresponds beyond doubt to a particular physical reality.

Due to its complexity, the study of climate change is a good example of a discipline in which computer simulations have so far brought only limited progress. This was already realized and followed up by mainstream climatologists in the 1950s [5] (see also section 5).

Climatology could greatly contribute to the advancement of Complexity Theory and its efforts to develop unifying natural science concepts. This concerns particularly systems understood as never reaching an equilibrium state, such as the global-scale climate. Therefore, it is expected that climate research, due to its multi-disciplinary nature (physics, astronomy, chemistry, biology, geology, geophysics, mathematics), may contribute substantially to the understanding of processes controlled by a combination of partial differential equations.

Application of the Complexity Theory may yield insight into the dynamic processes of continuous energy flux systems, which operate far from thermodynamic equilibrium with maximized entropy production. The physical processes of climate variability are typical examples of such processes. The Second Law of Thermodynamics stipulates that in such non-linear processes forces can lead to quite unexpected results.

4. GLOBAL AVERAGING OF PHENOMENA AND DATA

According to the Complexity Theory, it is obvious that, provided two or more climate forcing functions are co-linear during a specific period of time (e.g. increase of solar and GHG forcing during the 20th century), a temperature increase of a few tenth of a degree Celsius during a century can be differently interpreted. For instance, it is necessary to carefully investigate whether a warming trend of one century forms part of a millennial cycle. Moreover, from a theoretical and mathematical point of view it is obvious that in oscillatory processes the 'average' of a particular period does not equate to the theoretical equilibrium state, defined by a 'fixed point' that is never reached. The application of statistics in current climate variability research has indeed been subject to criticism by statistics specialists. [6,7]

Discussions on trends are generally restricted to the assumed linear relationship between variables rather than on the fact that a variety of sinusoidal oscillations can be observed at time scales ranging between decades and 100.000s of years. [8]

5. USE OF SIMULATION MODELS

In many natural sciences computer modelling of processes has become an important instrument to foster the understanding of the effect of processes. It is, however, generally understood that models provide only an imaginary world. If model projections do not correspond with observed facts, there must be something fundamentally wrong either with the input to, or the algorithm of the model. It is all too clear to AGW challengers, as well as to AGW supporters that climate predictions for the last 10 years do indeed not accord with observations.

6. MAIN OBJECTIONS TO THE AGW CONCEPT

The concept of the strong climate-forcing effect inherent to increasing atmospheric CO_2 concentrations, as advocated by the IPCC, is however at odds with climate developments during geological, historical and recent times (Priem; van Geel & Ziegler, this volume). During Phanerozoic times (543 Ma to present) four major, internally highly cyclical, glacial periods occurred, each lasting tens of million years. These ice ages coincided with the drift of the Solar System through the four arms of the Milky Way Galaxy and a marked increase in the galactic cosmic rays flux at the transition from greenhouse to icehouse conditions [9] (Svensmark, 2007). Related fluctuations in sea-surface temperature of several ^{0}C were, however, not associated with changes in atmospheric CO_2 concentrations.[10,11] The Late Cretaceous-Cenozoic cyclic temperature decline, heralding the Neogene ice age, was associated with a steady decrease of the atmospheric CO_2 concentrations (Priem, this volume). Ice core data demonstrate that increasing atmospheric temperatures preceded the increase in atmospheric CO_2 concentrations by 800 to 1200 years, demonstrating that warming of the lower troposphere is not driven by increasing atmospheric CO_2 concentrations, as claimed by Mudelsee and Sigman et al.[12,13]. Obviously, warming of the oceanic surface layers controls their CO_2 degassing, as seen for example at the end of the Little Ice Age (LIA) when atmospheric CO_2 concentrations began to increase from about 0.0028% around 1750 to the present level of 0.00396%, accelerating in the 1950s due to increasing anthropogenic CO_2 emissions. However, since 1750 temperatures did not increase continuously but cyclically declined somewhat or remained stable during 1880 to 1900, 1945 to 1977 and again since 1998, despite steadily rising atmospheric CO_2 concentrations. This is obviously not compatible with the CO_2-driven AGW concept advocated by the IPCC. Similarly, *H.N.A. Priem* (this volume) points out that during Phanerozoic times a causal relationship between changes in atmospheric CO_2 concentration and average global temperature cannot be established and therefore raises further doubt about the claims of the IPCC. While atmospheric CO_2 concentrations and also average global temperatures were higher during much of the Phanerozoic than today, the "thermostat effect" of the combined hydrosphere and atmosphere always kept temperature variations within a range of approximately 10^oC.

The physics of climate forcing by a gradual 100 ppm increase in the atmospheric CO_2 concentration since 1750 was assessed by R. Clark (this volume) and found to account for a warming of about $1.5Wm^{-2}$. This warming phase was accompanied by a cyclic TSI increase of about 2.5 Wm^{-2} (Scafetta, this volume). Significantly, the observed periodic interruptions of the general post-LIA temperature increase coincide with the negative phases of the Pacific Decadal Oscillation (PDO) that is characterized by a 60-years cycle (Wilson, this volume). This cycle reflects the interaction of planetary tidal forces with the Sun, affecting the intensity of its activity as well as its motion, the Earth's rotation rate and, via Solar and Lunar tidal forces, also the ocean current system (Scafetta, this volume). The intensity of solar radiation increased cyclically since the end of the LIA, reached a first peak in 1944, declined during 1945-1977 and culminated during cycles 21, 22 and 23 in 1981, 1990 and 2000. Whereas solar cycle 23 culminated in early 2000 at a sunspot number of 120, the current solar cycle 24 is predicted to culminate in autumn 2013 at a sunspot number of only 66 [13] (NASA, 2013). Indeed, solar cycle 24 appears to mark the onset of a low solar activity period that may reach a minimum in the 2040s at a sunspot number of about 30 [14] (Abdussamatov, 2012; Scaffetta, this volume), probably entailing a commensurate temperature decline despite continuously rising atmospheric CO_2 concentrations.

In the first two papers of this volume R. Clark emphasizes the need to reinvestigate the physical basis of the greenhouse effect, thought to result from increasing atmospheric CO_2 concentrations. The coincidence of rising atmospheric CO_2 concentrations and increasing average global surface temperatures can, however, no longer be considered as conclusive evidence for the cause-effect relationship of anthropogenic CO_2 emissions, as postulated by IPCC. One reason is the lack of correlation, for instance, at the timescale of the PDO.

The physical basis for an enhanced greenhouse effect is indeed the ability of CO_2 to absorb and re-emit infrared (IR) radiation. This leads to theoretical descriptions of radiation transfer processes in atmospheric columns that are based on the well-known Planck and Lambert-Beer physical laws. The question arises, however, whether these 'laws', considered in their restricted sense only, apply also in the complex global climate system, as might indeed be expected at first sight. Clark (this volume), invoking the properties of so-called thermal reservoirs in the climate system, discusses how in the atmosphere energy transfer processes can be identified, thus challenging the prominence of the greenhouse gas effect, as advocated by basic physical properties.

Rosema et al. (this volume) report on METEOSAT thermal infrared band observations of the Earth surface temperature change during 1982-2006, which indicate a slight global surface temperature decrease. Some spots show, however, a temperature increase, that can be explained in terms of major human intervention with the water balance at the Earth's surface. The most striking example of this is the drainage of marshes near Basra in SE Iraq during 1993-1995. The related theoretical temperature increase closely corresponds with the observed one. These METEOSAT observations contradict earlier satellite microwave observations that point to a temperature increase of the troposphere. This may encourage research on processes of energy exchange between the Earth's surface and the atmosphere.

The increase in atmospheric CO_2 concentrations from 280 ppm in 1750 to 390 ppm in 2010 was associated with a decrease of the $^{13}C/^{12}C$ ratio ($\delta^{13}C$) from -6.3 to -8.20. Although these changes are generally attributed to increasing anthropogenic emissions, it must be kept in mind that the greatest source and sink of CO_2 are the shallow layers of the Southern Oceans and the Arctic Sea, respectively (Schmitt et al., 2012) [15]. Long-term changes in $\delta^{13}C$ are identical in both hemispheres while $\delta^{13}C$ increases seasonally northward in the Northern Hemisphere due to plant growth [16,17] (Quirk, 2009; Piper, 2012). The depleted fraction of atmospheric CO_2 consists not only of an anthropogenic and a natural biogenic component but also a probably dominant component that is related to atmosphere/water exchange fractionation.

Although the relative contribution of these processes to the observed short- and long-term $\delta^{13}C$ changes is difficult to assess, natural processes appear to play a more important role than anthropogenic emissions. While the oceans absorb large parts of the anthropogenic CO_2 emission, they emit at steady temperatures only a small CO_2 fraction into the atmosphere. Depending on authors, the airborne fraction of anthropogenic CO_2 is currently in the range of 4% (Segalstad, 1996, 2010) [18,19] and 7% (Haynie, 2011). [20]

Moreover, for the last 40-50 years there is no evidence for an accelerating sea level rise as predicted by AGW protagonists (Mörner, this volume), nor is there any tangible evidence for increasing extreme weather events (Khandekar, this volume). In the same vein, F. Engelbeen criticizes the way aerosols have been incorporated in GCMs and points out that GCM results do not match reality.

In view of the above, the CO_2-driven AGW concept, the justification of the IPCC, is not compatible with the findings presented in this volume.

7. CONCLUSION

It is anticipated that in time countries supporting the Anthropogenic Global Warming theory, the credo and justification of the IPCC, will eventually recognize that the 'greenhouse gas' theory on which it is based is probably too simplistic. This theory has guided the research of thousands of scientists for decades into a direction that is strongly suspected to be erroneous. This persisting conservative attitude hampered progress in understanding climate variability.

In science, there are several examples of new concepts having to wait for tens of years before being accepted. Similarly, erroneous concepts have dominated for considerable times before they were recognized as such and finally discarded.

For instance, the meteorologist Alfred Wegener presented in 1912 for the first time the fundamental Continental Drift concept. At that time, this novel concept was, however, considered as highly speculative. Therefore, it had to wait for general acceptance until the 1950s when new data and methods, such as paleomagnetism, provided strong support for Wegener's concept that lies at the base of the modern Plate Tectonics paradigm.

By contrast, the way Sir E.S. Thompson deciphered the Maya script in the early 20th century was strongly criticized by the Russian Y.V. Konoscov who advanced an alternate interpretation. This led to a long and bitter controversy that ended only with the death of Thompson in 1975. Thereafter, the views held by Konoscov were accepted, and within 10 years, 90 per cent of the Maya hieroglyphs were deciphered in their presently still accepted form. [21]

Common to these two examples is a persistently conservative attitude of much of the established scientific community, which stolidly adhered to an earlier formulated concept that was followed for years by leading scientists. The current climate debate resembles the two examples mentioned above. Nevertheless, many scientific issues addressed by the IPCC-WG1 assessment reports deserve close attention at the current level of understanding. These issues demand, however, further multidisciplinary discussion and assessment in a more open scientific environment than the IPCC. For the sake of continuing the ongoing climate dialogue at high scientific standards, the IPCC will have to cease acting as a worldwide pressure group advancing its controversial AGW concept.

A major and general critique voiced in several papers of this volume address the use of simulation models as scientific proof and for forecasting. In this context it is noted that the importance of the complex oscillatory characteristics of climate variability is not given sufficient attention. Authors, scientists and engineers with professional experience in modeling complex systems in a range of disciplines, expressed doubts about the current trust in climate modeling. This concerns particularly the development of assessment reports, which tend to end up in Summaries for Policy Makers.

Provided climate variability research can separate itself from the AGW concept and its 'greenhouse gas' climate-forcing hypothesis, attention can be centered on regulatory mechanisms contributing to the stabilization of the Earth's climate within the observed temperature range. This will permit climate research to contribute substantially to the understanding of regulatory principles in complex systems, such as the Earth's climate. If climate research continues to advocate its CO_2-forced global warming concept, it will remain in 'splendid' isolation from the other natural sciences branches.

The notion of CO_2-based climate forcing has to be seen in the light of political developments. The availability and maintenance of a reliable energy supply is a main concern of the Earth's ruling species, *Homo sapiens*, that strives at the wellbeing of its next generations. In view of the gradual depletion of hydrocarbon reserves contained in conventional, natural accumulations, attention is increasingly focused on unconventional oil and gas resources and on economizing production and the use of still available reserves until an alternate economic energy supply can take over. Moreover, there will be an increasing need for recycling other natural products. Based on the second law of thermodynamics, such conversions demand an increasing use of energy. Apart from nuclear energy, potential important energy resources that may eventually replace hydrocarbons and coal are still in evaluation regarding their efficiency, technologic feasibility and economy. Therefore, humanity will have to rely in foreseeable times, particularly for locomotion purposes, on still amply available coal, gas and oil shale resources. Fossil energy resources, which formed during hundreds of million years, are now rapidly consumed, thus contributing to the atmospheric CO_2 content. In this respect, climate alarmists ought to keep in mind that the safest and most economic place to store fossil fuel derived CO_2 is after all the atmosphere. Moreover, it should be kept in mind that the current atmospheric CO_2 content of 0.00395% is, compared to geological times, extremely low and not optimal for plant growth.

Although the scientific integrity of most climate researchers is not queried, scientific publications are often influenced by views held by the IPCC network. Maybe not so much the authors of these papers ought to be challenged, but rather those responsible for the IPCC assessment reports.

We are looking forward to the final IPCC WG1 AR5 report that probably will be published in late 2013. Several contributors to this Energy and Environment volume have followed the discussions on the First and Second Order draft of this forthcoming AR5 report and thus are familiar with current developments. As editors of this special issue, we have strived at restricting reactions of contributors to this volume to factual comments on the draft AR5 report and the general performance of the IPCC. Views presented in this special issue of Energy and Environment by independent scientists and engineers from different disciplines and countries on climate controlling mechanisms and the merits of the Anthropogenic Global Warming concept are herewith opened to free discussion.

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