Climate and Climate Research

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The Norwegian organization Klimarealistene (Climate Realists) was founded in 2009 to provide the society with more balanced scientific information about climate change and the relevance of related technologies and political decisions. In 2015 Klimarealistene's Scientific Council was established to form a broader and more systematic basis for scientific discussion.

The members expertise covers the most important aspects of climate science including physics, astrophysics, geology, chemistry, biology, and mathematics as well as experiences within climatology, technology, economy and media. Together with international open data sources, this forms a sound basis for understanding the climate, its drivers, derived effects, and related political measures. The Council operates autonomously, and the members form their own scientific opinions and presentations for various purposes.

Now, Klimarealistene takes one more step by launching a new scientific journal which, hopefully, may contribute to the scientific debate and further clarification. The science is far from settled as explained in the following by some general considerations and examples including the Nordic and Arctic regions with the highest temperature anomalies. Science needs free speech not restricted by censorship of any kind.

Climate

Nature and most people prefer warmer to colder climate as shown by the distribution of people, plants and fauna at various latitudes and altitudes. Nearly ten times as many people live in the USA compared to the much larger, but colder area in Canada. Reliable forecasts of future climate variations in the various climate zones would be beneficial, particularly for everybody involved in activities related to nature and the derived businesses. Global predictions are of less importance.

Scientifically, the climate is formed and must be understood and modelled within the various climate zones, and then be aggregated on a global level if that would be of interest. Unfortunately, the large climate computer models focus on the global aspect. The important downscaling to regions is far from settled.

Reliable forecasts for the different climate zones would require detailed understanding of the influencing factors which generate a temperature span from –80°C to +60°C formed by the Sun, moon (tide), latitude and altitude positions, oceans, winds as well as derived effects, and even by cosmic influence from outside our solar system.

The variations of the Sun's internal sunspot cycle every 9-14 years are shown in Figure 1. They also have more long-range modulations with minima giving colder periods (dark red) like 1600-1750 (Maunder), around 1800 (Dalton), around 1900 and forecasted for 2030-50 in between the warmer periods (yellow). Our present warm period is part of the 'Grand Solar Maximum' between 1923 and 2004, the strongest in 8000 years according to the presence of isotopes generated by solar activity effects. They influence important characteristics like total solar insolation, spectral distribution, magnetic field strength, solar storms and Forbush effects.

In their selection of publications, IPCC favour results from modelling (PMOD) of the sun's activity instead of the best satellite measurements (ACRIM) and modern sunspot counting (Belgium). Thereby, the Sun's contribution to a major part of the present warming period is excluded. That is scientifically doubtful, and it is unacceptable to claim that science is settled. The normal practice of IPCC to settle crucial scientific questions by modelling instead of observations is continued.

A Submitted 2021-06-04. Accepted 2021-07-21. Reviewed by G. Hasnes. https://doi.org/10.53234/scc202106/20

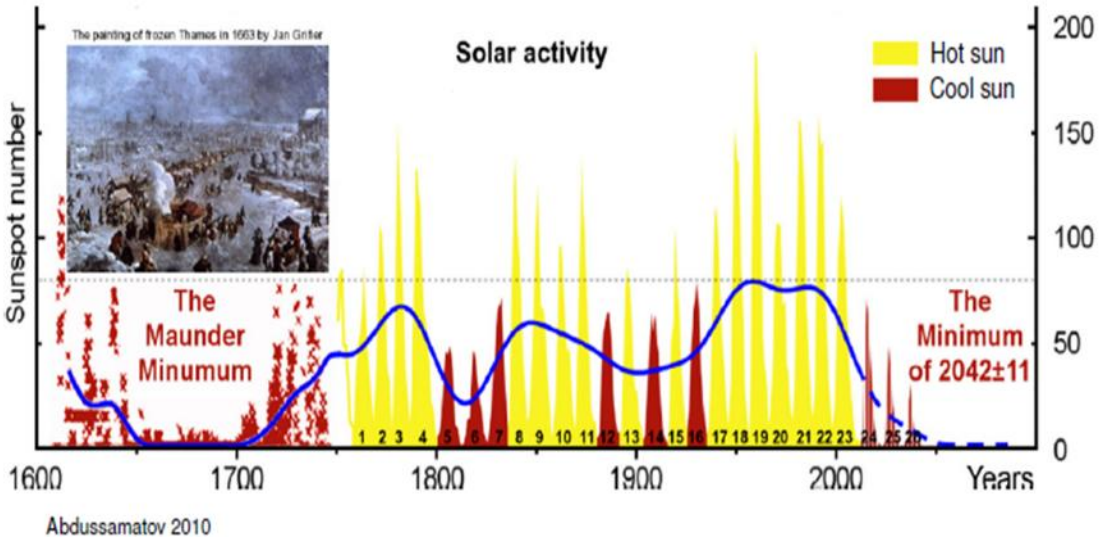

Figure 1. Counted sunspot numbers between the years 1600 and 2010 and forecasts. Warmer periods are painted yellow and colder dark red. The 'Grand Solar Maximum 1923-2004 appears outstanding. Occurrence of historic events correlates very well with the strength of the solar cycles. From Abdussamatov 2010.

Particularly, the Sun heats the equatorial zone generating pole-ward transport of surplus energy influenced by numerous factors including the formation of clouds. The systems are never fully balanced and may generally be considered as oscillating around quasi-equilibrium states. Everything varies over time and influences the weather and the climate to various degrees on different time scales. Colder and warmer periods of the Earth during the Holocene seem to correlate largely with variations of the planetary parameters of the solar system, the various internal cycles of the Sun and the derived effects. Chaotic processes also occur.

Greenhouse gases contribute with secondary effects making larger areas of the Earth warmer and habitable. The increase of the atmospheric infrared active gases contributes even less per molecule as they approach optical saturation as water vapour and CO_2.

The sun-ocean interaction may be a key element. About 90 % of the Sun's radiation is absorbed within a depth of ten metres, but the rest penetrates down to about 180 m, particularly in the blue part of the spectrum. Infrared radiation is almost totally absorbed within the surface skin activating hydrogen bonds in the surface layer. Heat transfer through the atmosphere is primarily by evaporation and convection the first kilometre, then radiation gradually increases and dominates at higher altitudes. The energy effect from the doubling of CO_2 (IPCC use sensitivity of ca 3.5 W/m²) is only a few percent of the heat transfer. The lower sea variation boundary is influenced by heat release through formation of sea-ice at -1.9 °C, the other one at about 30-32 °C through cooling by evaporation, which then starts to increase significantly according to the Clausius-Clapeyron equation.

It is almost unbelievable that these numerous variations, according to recent IPCC claims, have little or no influence on the climate and its variations in the affected zones. They are, according to IPCC-theory, anticipated to be balanced out, not influencing the global average figures, or are explained by volcano activity. Some effects may cancel out, and heavy volcano eruptions may influence the stratosphere for a few years. However, the natural processes are the more relevant, obviously for modelling the various climate zones. They may be difficult to track and quantify. Also, a given amount of energy makes much larger impact of the air temperatures than for ocean temperatures. There is an asymmetry in energy uptake and release from ocean and ice compared to the atmosphere, and major differences in transport speed by winds and ocean currents, which may be hard to settle, not least to calculate by the global computer models.

Over most of the world, systematic variations on various time scales are well known: The Sun's and the moon's cycles including ocean tidal effects and influence on the Earth's rotation, the Intertropical Convergence Zone (ITCZ), the Quasi Biannual Oscillation (QBO), the Pacific Decadal Oscillation (PDO), the Atlantic Multidecadal Oscillation (AMO, AMOC), the North-Atlantic Oscillation (NAO) as part of the Arctic Oscillation (AO), the Indian Ocean Dipole (IOD) and the Southern Annular Modulation (SAM), all influencing enormous regions, but changing at various time scales. Weather phenomena, like the El Niño Southern Oscillation (ENSO), may also show long term, systematic modulation.

One evident example is the systematic variations of wind patterns, JET-streams and others, and the Atlantic and Bering currents into the Arctic Ocean which generate well known changes in the ice cover with subsequent changes of the albedo and the heat exchange between the atmosphere and open sea. Today's changes are well within the many historical variations of the ice-edge over the last hundreds of years. The global effects from the Arctic are well recognised as observed by the warmer decades around the years 1870, 1940 and 2000 with intermediate colder periods. Meaningful correlation with atmospheric amounts of CO_2 is lacking.

Numerous scientific studies and even the media reported a large temperature increase in the atmosphere and in the Arctic Ocean in the 1920-40s with glaciers retreating several kilometres and plants and fauna thriving. "Almost ice free to the North Pole" Russian sources stated in the autumn 1945, which was referred in a major Norwegian newspaper by only seven lines in a small column. Later, the Arctic sea-ice recovered with a new maximum around 1980 followed by a new multidecadal reduction. In the 1930s, the warming was considered as climate improvement as part of the recovery after the Little Ice Age.

Variations in Antarctica are smaller due to circumpolar ocean currents and winds, the latter including the frequent, continental katabatic mode.

Such observed cycles cannot be refuted by adjusting temperatures, statistical methods and non-validated empirical computer models. Nature is too complicated. The large computer models have challenges of numerical kind, the physics and mathematics of turbulent fluid transport, they are global without proper zonal downscaling and have still too large a grid structure (100x100 km) to represent adequately many phenomena, particularly clouds, which also are poorly understood, even according to the IPCC reports. The parametrisations are numerous and essential in tuning the models, but it is not necessarily influencing the calculations in the way nature acts and will act in the future. The effect from the doubling of CO_2 is smaller than the uncertainty of the calculations.

Historical variations

Over the last 500 million years no systematic temperature variations have been found, giving evidence to any dominating, prevailing temperature influence from atmospheric CO_2 even with amounts 15 times the present level. On the contrary, several studies report low or no correlation. The average global temperature has been found to vary between 13-22 °C, the upper limit with living conditions supporting large animals for about 200 million years. Today, the average global temperature is 14.5 °C, about 7 °C lower, which is in the lower quartile.

For the last 2.5 million years, the Globe has experienced a geological ice age period, Pleistocene, with glacial periods of ca 100 000 years normally being interrupted by warmer, interglacial periods of up to 15 000 years. We are approaching the end of the Holocene period in about 1500-2500 years according to average periodicity, although there are studies reporting that the regularity occasionally has been disrupted.

A new Ice Age would cause an enormous climate crisis. Maybe even a new Little Ice Age with its natural decline of food production would be disastrous in some of the climate zones. A forecasted reduction of the Sun's activity in the coming decades may produce a cold Dalton or even, but less likely, a Maunder type of minimum in the coming decades according to recent solar research.

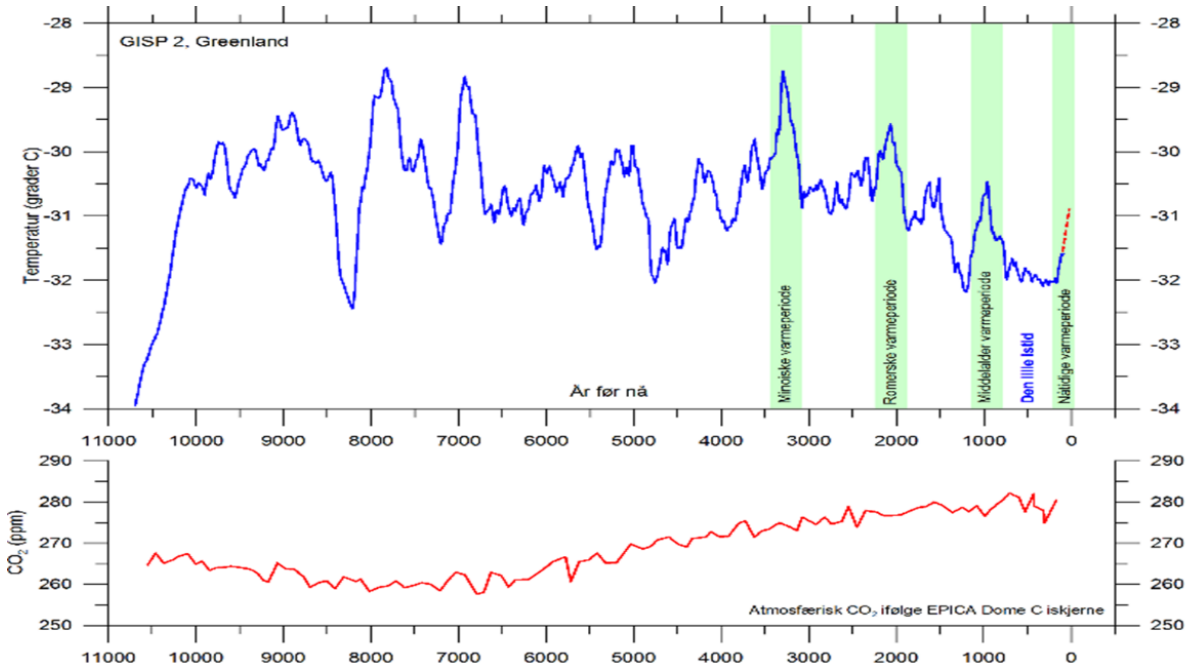

Figure 2. GISP 2 results from ice core drillings at Greenland summit. Green coloured regions are the known warming periods. Minoan, Roman, Middle Age and present, spaced with about 1000 years. CO_2 data are from Law Dome, Antarctica. From Ole Humlum, climate4you.

At the Holocene maximum 8000 years ago, the water in the Atlantic Current outside the Lofoten Islands in Norway reached a temperature of ca. 4 °C warmer than today with a summer insolation of ca. 35 W/m² above existing level. Norway was ice free with large pine forests up to present altitudes of 1400 m in the middle part. Other types of vegetation requiring considerably higher temperatures than today, have also been reported.

Ice cores from the Greenland summit show the Minoan, Roman and Medieval warming epochs spaced in time by a quasi-millennial cycle. The next cycle coincides with the present warming including the 'Grand Solar Maximum' from 1923 to 2004, the most active period of the Sun for the last 8000 years. Other planets and their moons, with different atmospheric compositions, have also warmed. There is ample evidence for largely correlating the Sun's activity and the Earth's major cold and warm periods of the last thousands of years. The warming periods were also beneficial for the societies.

From Greenland temperatures since 1840, the warm period of the 1930s is comparable with today's level and with rapid and substantial ice reduction as for other parts of the Arctic. Anthropogenic CO_2 started to increase noticeably after 1950 while the Greenland temperatures dropped further, and the glaciers started to grow. Not until 1990 were the processes reversed. Greenland's variations seem to differ by ca. 30 years from global averages.

The warming from about 1850 can easily be explained by recovery from the Little Ice Age. When CO_2 started to increase discernibly from 1950, the global temperature had already started to cool for the next 30 years. The World Meteorological Organization (WMO) forecasted in the 1960s even a possible coming ice age which was taken seriously by governments until the recent warming period started around 1975. The climate legend Hubert Lamb stated that it must be something else than CO_2 which dominates the climate variations as there is little correlation with CO_2, also in recent centuries. The 15 years temperature 'hiatus' reported by IPCC in 2013, may be part of these variations.

IPCC and its reports

United Nation's IPCC has tried to establish a reputation as the world's scientific climate change authority. The iconic conclusion from 2001 has been that more than 50 % of the climate change is anthropogenic. Even that contribution is heavily challenged scientifically with respect to the radiation effects as well as the anthropogenic CO_2 share of the atmosphere. The extreme statement that CO_2 is almost totally dominating climate is new in AR 6 without any scientific justification.

The IPCC climate reports give an impression of a split view. Partly, it presents many important results extracted from the scientific literature with proper handling of data and adequate discussions. This category is found deeper inside the reports and even put in appendixes, like John Christy's critical analysis of the computer models and temperatures (AR 5).

The other part is the one-sided selection, according to their mandate, of publications to support the anthropogenic global warming hypothesis and the rather exaggerated effects from that warming without adequate discussions, partly lacking the basic scientific criteria as presented by Carl Popper and promoted by Richard Feynman: Theories ought to be formulated so that they may stand the test of falsification, and theories not explained by observations and experiments should be rejected.

Turning from the major scientific part of the reports towards the summaries and the final 'Summary for Policymakers' (SPM), which is dominating the public debate, a distillation of information and views, under substantial politicised influence, have occurred in order to establish support for anthropogenic climate influence. More than one hundred computer models without observational backing are their main basis. The SPM deviates partly from the original scientific chapters. In some respects, it lacks scientific integrity as important holistic views are omitted. Consequently, the reader is left with false impressions. The selection of biased start and end points in time series are evident examples. The subsequent public debate is further apart from SPM and even past the limit of pseudoscience.

This is not a surprise. The evaluation in 2010 of the IPCC organization after the 'Climategate' event concluded with serious shortcomings in the IPCCs scientific processes, a lack of expressing scientific uncertainties in the reports and its dissemination, a mixing of roles and a mixing of science and politics. The various emails that appeared reflect viewpoints among key, scientific IPCC-reviewers, close to dialogs among strong IPCC critics, without any mentioning in the final IPCC-reports.

Politicised climate science

Climate science has become highly politicised. IPCC, researchers, politicians, non-governmental organizations and the mass media have for decades presented versions of a one-sided approach. Those conclusions are based on exaggerated CO_2 effects from computer models as compared to observations and experimental data, neglecting even the major influences from settled natural variations caused by the Sun, the moon, winds and oceans as well as from derived effects.

Many studies contain controversial elements like data, statistics and other methods, lack of representative start and end points in presentations of many time series, selection of non-representative temperatures and adjustments of surface temperatures, lack of recognising adequate satellite temperature measurements, wrong presentations and even manipulations of historical data and, finally, lack of focus on settled natural, regional, zonal and continental variations. In addition, many exaggerated extreme effects and forecasts have been presented, although many has later been disclaimed in the 2007, 2012 and 2013 IPCC-reports.

One example is the statement that the increase in atmospheric CO_2, beyond doubt, is anthropogenic. However, their Bern model show significantly slower response for disappearance of CO_2 from the atmosphere than measured for the radioactive ^{14}C-isotope. Other studies refer to the 50:1 ratio of CO_2 in the seas and in the atmosphere and the major CO_2-circulations giving a far less human

contribution, only about 5 %. Again, non-validated models are taken for granted within the IPCC-system and expressed as settled science.

The phrase "settled science" has been used even by the world's leading politicians. However, the last published article showed that only 0.64 % of nearly 12 000 scientific abstracts, supported the standard IPCC conclusion that more than 50 % of the warming is anthropogenic, a remarkably low figure.

Over the years, a fixed CO_2 sensitivity is frequently used as basis for calculations of various atmospheric CO_2 scenarios. Roger Pielke's literature search found more than 17 000 articles based on the IPCC's CMIP6 model version which is well known to be unrealistically exaggerated. An even more exaggerated high emission scenario, RCP8.5, on top of that makes modelling to a playground for creating alarms. In contrast, top rated scientists in their field, questioning the value of the CO_2-sensitivity, get their contributions refused since their results do not support the IPCC-hypothesis.

Small radiation effects from increased CO_2

The main scientific question in the climate debate is the quantification of the greenhouse gas effects of the various atmospheric gases including their mutual influence and possible feedback forcing. John Tyndall measured in 1959 the absorption effects of the main atmospheric molecules and found that water vapour is the dominating greenhouse gas making England habitable. The effects from CO_2, methane, ozone and nitrous oxide were not negligible, but were small. Since then, the physical laws, theories and relevant molecular spectra have been presented, not least, in the books (1935-50) by the Nobel Laureate (1970) Gerhard Hertzberg, frequently known as the spectroscopic bible.

From the 1960s and onwards, the US Air Force has been compiling the most recent high resolution infrared spectra of atmospheric gases (HITRAN, MODTRAN), which, together with thermo-dynamic data of the atmosphere, are well suited for calculations of atmospheric effects for various purposes surpassing the early calculations by Svante Arrhenius in 1896 and 1906.

There is no doubt that practically all gaseous molecules, liquids and solid materials absorb and emit infrared radiation. The temperature influence depends on the emission from the surface, how the absorbed energy is transformed and dissipated and the state of molecular emission from the atmosphere. While there is a focus on the absorption part, the emission is equally important as the net effect is the energy difference of the two mechanisms. It implies that a detailed understanding of the emission surface and atmosphere around the globe, particularly temperature and pressure profiles, is important. Neither of them is well expressed in detail by the large, global climate models.

Using HITRAN, the energies linked to absorption and emission of outgoing radiation throughout the atmosphere can be calculated quite accurately for known amounts of individual and mixed gases and the atmospheric conditions. A comparison with the frequency distribution of the Earth's surface emission according to Planck's law, corrected for variations of the emissivity coefficient, gives the net energy. This may give a quite correct picture of the radiation effects at clear sky for a particular location when atmospheric parameters are known.

Such calculations are more accurate for local effects than larger, global computer models. They give more precise answers to critical questions of impact from individual molecules, significance of overlapping bands, possible reinforcement by water vapour or not and effects from atmospheric variations like pressure shift and pressure broadening at various altitudes. Calculations may be performed for representative areas and be combined to give a global picture. Those results show far less CO_2 sensitivity and water vapour feedback than the large global models. Accordingly, the derived climate effects of various kinds must be correspondingly smaller.

John Tyndall and Knut Aangstrøm (1900) were right. The effect from increased CO_2 is small and is approaching optical saturation at the present amounts (Beer-Lamberts law). With the logarithmic

absorption pattern, the less abundant greenhouse molecules have stronger impact per molecule, but the minimal atmospheric amounts, now and in the future, give altogether a small impact. Water vapour is the dominant greenhouse gas, but the strengthened forcing by increased amounts is small due to saturation effects in most regions. The alarming 'tipping point' is far from reality.

Also, satellites and radiosondes measure reduced specific humidity in the altitudes where the large computer models calculate the highest impact. The missing 'hot spot' in the upper troposphere, considered as a lack of crucial evidence even by IPCC scientific advisors, is still not observed. A negative forcing from less water vapour in the critical emission zones is therefore most likely.

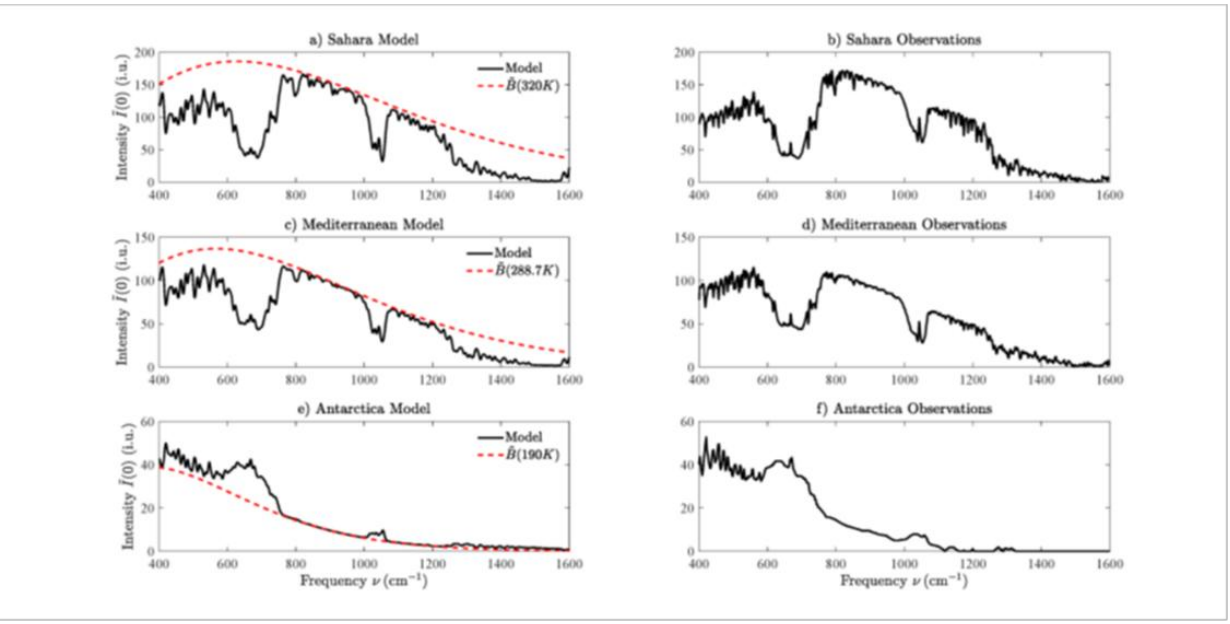

Figure 3. Modelled (left) and observed (right, from Nimbus satellite 1970) retention of radiative energy by CO_2 at typical regions like Sahara (upper), Mediterranean (middle) Antarctica (lower). The red, dotted lines are emissions from earth according to Planck distribution at the given temperatures. The area between the two lines represents the detained energy. From W. Weijngaarden and W. Happer 2020.

Calculating the radiation effects at various places on earth give some variations (Figure 3). For inverted atmospheric temperature profiles, CO_2 will give cooling, even more for increased amounts of CO_2. The stratosphere and polar areas during winter, particularly the very cold Antarctica, will reduce the global effect observed from the high temperature desert regions having the strongest ground emission and accordingly absorbed energy. An eventual melting of Antarctica glaciers will not be caused by increased CO_2 as calculated by the global computer models, which are far from as representative for important climate regions as claimed.

The calculations are based on clear sky conditions. Clouds interfere strongly as the radiation from the ground is absorbed. Their emission is controlled by the clouds' surfaces with normally lower temperatures than the ground. The impact from cloud cover change and altered albedo is larger than the calculated effect generated from increased CO_2. IPCC admits that clouds are poorly understood. The effect is calculated by parametrization and is strongly involved in the tuning of the models with no guarantee of being part of a future realistic approach.

There are ample observations that the average temperature increase is particularly influenced by warmer minimum values in colder periods like nights and winters. Greenhouse gases are among the possible explanations. That is far from causing a climate crisis, 'tipping point' and 'burning Globe'.

Beneficial effects from increased CO_2

Numerous alarms of increased frequencies and severity of natural disasters caused by higher temperatures have been reported by IPCC. However, this is not reflected in official statistics which show stable, reduced tendencies or similar patterns over the recent decades and centuries. In its 2012 and 2013 reports IPCC disclaimed previous alarming statements (concerning tropical cyclones, floods, droughts, major storms in the North-Atlantic, Gulf Stream will not stop etc.), not so in AR 6. No major hurricanes landing in the USA from 2005 to 2017 is another indication. The sea level rise follows the pattern from tide gauge measurements since 1810 as a natural recovery from the Litte Ice Age. It will take years to alter these conclusions as the number of extreme events is small.

Furthermore, the small temperature effect and significant CO_2 contribution to plant growth have made the Earth greener by approximately 15 % since satellite recordings started in 1979, also in critical areas like south of Sahara. This is consistent with up to 1200 ppm of CO_2 being added in greenhouses to stimulate photosynthesis and growth in particularly C3 plants, but also the less abundant C4 plants. Record crops are frequently reported over the later warmer years. A warmer world will make huge land areas towards the north and at higher altitudes better suited for farming and forestry, a favourable scenario when the world's population is on its way to ten billion people.

Even the corrected results from Richard Tol, working with environmental and climate strategies, justify his previous statement that the world would be a better place to live for richer and poorer within a temperature rise of 2 °C. Increased atmospheric level of greenhouse gases is no threat to that limit. They will contribute, regardless of the CO_2 increase, most likely significantly less than the low limit of the Paris agreement of 1.5 °C in year 2100, and the human part of that is even smaller. A CO_2 sensitivity of about 0.5 °C has been suggested in several studies. Today, about half of that level has been reached.

There is no climate crisis. Such a conclusion is not stated in the scientific related part of IPCC reports prior to AR 6. Natural variations are the more likely explanation for recent climate change. Increased warming from higher atmospheric CO_2 levels and less abundant greenhouse gases is small and will remain so in the future. Increased CO_2 will, most likely, contribute to a more favourable development in most climate zones.

The various political measures to reduce atmospheric CO_2 would be very costly and make fairly large impact on the society - but not much on climate. An eventual crisis linked to the forecasted cooling from a weaker Sun, the tide influencing moon, the earth's rotation and variations in wind and ocean patterns in the coming decades is probably more likely as the World's population increases.

Climate science is not settled. The new journal will, hopefully, contribute to clarify further aspects of our wonderful and interesting Globe, its climate and its variety.