

IAMAS EXECUTIVE COMMITTEE
7 and 11 July 2013, Congress Center, Davos, Switzerland



Drafted agenda as communicated in advance by Email:

EC-1: Sunday, 7 July 2013, 14:00-18:00, room 'Schiahorn'

- 00) Welcome [5', Coustenis / Volkert]
- 01) Adoption of agenda [5', Coustenis]
- 02) Brief review of IAMAS-EC@IUGG-2011 in Melbourne [10', Volkert]
- 03) Overview of IAMAS activities since IUGG-2011 [20', Coust., Volk., Lin]
- 04) IAMAS finances 2011-2013 [15', Volkert / Berbery]
- 05) Brief reports on commission activities (à max. 5', 2 slides)
[<50', Comm. Presidents]
- 06) Information from National Representatives [30', National Corresp.]

16:30

- 07) Review decision process for IAGA-IAMAS-IAPSO assembly in 2017
[5', Coustenis]
- 08) Compact presentations of bids for joint IAGA-IAMAS-IAPSO assembly in 2017 +
questions [10'+5' per bid]
- 09) Early Career Scientist Medal (review 2013, outlook 2017) [10', Turner / Penner]
- 10) Status and discussion of ICCP/IAMAS *Resolution on Geo-Engineering*
[15', Flossmann]
- 11) Setup Nomination Committee for EC-member election 2015
[5', Coustenis / Volkert]
- 12) Future development of IAMAS and role of Members-at-Large [all]
- 13) Drafting of *Resolution of Thanks* to LOC of DACA-13 [5', Coustenis / Penner]
- 14) Collection of items for EC-2 [10', Coustenis /Volkert]
- 15) Any other business (part 1)

EC-2: Thursday, 11 July 2013, 12:00-13:00, room 'Dischma'

- 16) Adoption of residual agenda from item 14 [5', Coustenis / Volkert]
- 17) Approval on venue of IAGA-IAMAS-IAPSO assembly in 2017
[15', Coustenis / Volkert]
- 18) Adoption of Resolution on Geo-Engineering [15', Coustenis]
- 19) Adoption of Resolution on IAMAS' contribution to Future Earth [5', Coustenis]
- 20) Adoption of Resolution of Thanks to LOC of DACA-13 [5', Volkert/Penner]
- 21) IAMAS Early Career Scientist Medal outlook to 2015 [10', Penner]
- 22) Formation of IAMAS Nominating Committee [15', Wu]
- 23) Preparation for IUGG2015 in Prague [5', Volkert]
- 24) Identification of non-finished items, possibly decision on 3rd session@DACA-13
[Volkert]
- 25) Any other business (part 2)

FIRST MEETING OF THE IAMAS EXECUTIVE COMMITTEE

7 JULY 2009, ROOM SCHIAHORN, Congress Center, Davos, 14:00 - 18:30

Present

Athena COUSTENIS	IAMAS President; from 16:00 (due to delayed flight)
Terje BERNTSEN	Norwegian National Correspondent (NC)
John BURROWS	ICACGP president; from 15:00
Huw C. DAVIES	IAMAS past President (1999-2003)
James DRUMMOND	Canadian NC
Andrea FLOSSMANN	ICCP President and French NC
Markus FURGER	Swiss NC
Teo GEORGIADIS	Italian NC
Tomas HALENKA	Czech NC
Zen KAWASAKI	ICAE president
Tom LACHLAN-COPE	ICPM President
Jianping LI	ICCL secretary and Chinese NC
Sanjay LIMAYE	ICPAE President
Zheng (<i>Jenny</i>) LIN	administrative assistant to IAMAS bureau
Mike MacCRACKEN	IAMAS past President (2003-2007)
Hisashi NAKAMURA	Japanese NC
Joyce PENNER	IAMAS vice-President, USA; from 15:00
Peter PILEWSKIE	IRC Secretary
Colin PRICE	Member at large and Israeli NC
Mathias ROTACH	Austrian NC
Werner SCHMUTZ	IRC President
Richard SWINBANK	ICDM President
Guoxiong WU	IAMAS immediate past President
Hans VOLKERT	IAMAS Secretary General
Shigeo YODEN	ICMA past president

Invited

Alik ISMAIL-ZADEH IUGG sec.-gen.

Snapshot of EC-1 on 7 July 2013; around the table from the left:

Athena Coustenis, Zen Kawasaki, Zheng Lin (standing), Huw C. Davies, Markus Rotach, Markus Furger, Terje Brentsen, James Drummond, Tomas Halenka, Tom Lachlan-Cope, Sanjay Limaye, Hishasi Nakamura, Colin Price, John Burrows, Andrea Flossmann, Werner Schmutz, Peter Pilewski, Jianping Li, Guoxiong Wu, Michael MacCracken, Richard Swinbank, Shigeo Yoden, Alik Ismail-Zadeh, Joyce Penner

photo: Hans Volkert



MINUTES

- 0 Short self-introduction of everyone
- 1 Adoption of agenda
- 2 Hans VOLKERT briefly reviewed IAMAS EC meetings during IUGG2011 in Melbourne. No specific question was raised.
- 3 Overview of IAMAS activities since IUGG-2011. John BURROWS suggested that IAMAS should pay attention to the new ICSU initiatives, in particular “Future Earth” and insisted that the current successful projects within IGBP should continue and be enhanced.
- 4 Hans VOLKERT’s report showed that IAMAS accounts are in a good financial situation and the resources can last long. Hans VOLKERT further explained, in response to John BURROWS’ inquiry, the two resources of IAMAS income: head tax \$30 from the local organizing committee of each IAMAS scientific assembly and annual income allocation from IUGG. Hans VOLKERT observed that the income from IUGG has been declining over the years. Alik ISMAIL-ZADEH explained that there had been problems with some ‘developed’ countries that were hesitant to pay their dues in time and with their full factor.
Hans VOLKERT thanked IUGG for supporting IAMAS workshops and DACA-13.
- 5 9 commissions reported their activities and IO3C submitted a written report before the meeting. Some of the highlights are as follows:
 - a) ICACGP had several workshops in South Africa, South Asia, Europe and North America. In 2014 ICACGP will hold its quadrennial conference in Brazil and would need strong support from IAMAS and IUGG.
 - b) 14th ICAE(International Conference on Atmospheric Electricity) was held at Rio de Janeiro, Brazil in 2011. The 15th ICAE will be held at Norman, Oklahoma, USA in 2014, following the suggestion of IAMAS bureau made in the last IAMAS EC meeting in 2011. Henceforth ICAE will be held in the even years to avoid overlap with IAMAS/IUGG assemblies. The ICAE newsletter continued to be issued twice a year on WEB, prepared by ICAE Secretary Daohong WANG.
 - c) ICCL held the “ICCL Expert Assessment Workshop on Decadal Climate Variability and Cross-Scale Interactions” in Beijing in 2013 and recruited new members. A paper summarizing the workshop will be submitted to BAMS.
 - d) In addition to holding conferences and workshops in Germany, Poland and Switzerland, ICCP also organized a special issue and a monograph dedicated to the above-mentioned events. ICNNA held a conference in USA in 2013. ICCP created a facebook page. ICCP issued a statement on geo-engineering, which was posted on the ICCP website and on facebook.
 - e) ICDM held a workshop on "Dynamics and Predictability of High Impact Weather and Extreme Climate Events" in Kunming during August 2012.

ICDM plans to publish a book as a volume in the IUGG special publication series published by Cambridge University Press based primarily on material presented in Kunming workshop. It is also proposed to organise a further workshop, tentatively in March 2015, with a focus on high-latitude dynamics, in collaboration with ICPM, and perhaps also jointly with the new WMO Polar Prediction Project.

- f) ICMA has a tradition of joining IAMAS and IAGA assemblies, alternatively every four years. Some ICMA scientists will attend both DACA-13 and IAGA-2013 this year, the emphasis being on IAGA-2013. ICMA held workshops in Argentina, Japan and USA in 2012. ICMA has also prepared a brief historic review of its activities. Alik ISMAIL-ZADEH suggested establishing an inter-association commission with IAGA.
 - g) IO₃C issued a press release on the state of the ozone layer for the Ozone Day (16 September). The 2012 Quadrennial Ozone Symposium (QOS) was held in August, 2012 in Canada and was supported with 5000 Euros by IAMAS. A new SPARC/IO3C/WMO-IGACO-O3/UV initiative (under the acronym of SI2N) was started in January 2011 on the understanding of past changes in the vertical distribution of ozone. IO3C also prepared a statement about geo-engineering.
 - h) ICPAE has a completely new bureau. The budget has caused some grief but ICPAE managed to organize a very successful workshop on Atmospheric Model Parameterization in the Polar Regions in Boulder Colorado in 2012 thanks to a grant from IAMAS/IUGG. ICPAE also sponsors a special issue of *Plan. Space Sci.* every year. A new web site is in place.
 - i) ICPM was involved in two symposia: "Clouds, Aerosols and Precipitation at High Latitudes" and "High Latitude Climate Change and Links with the Cryosphere". The latter one saw good collaboration with IACS. ICPM also plans workshops during the next two years with ICDM and ICCP (on clouds, aerosols, sea ice and precipitation). Revitalization of the ICPM website is planned for the last quarter of 2013, along with an improved ICPM mailing list and finally getting an ICPM logo.
 - j) IRC elected a new office in 2012 which took office by January 2013. IRC working groups have been active and IRC as a whole organizes symposium (IRS) every 4 years. IRS2012 was held in Germany and the proceedings are freely available via the IRC website. Next year IRC will decide where IRS will be held in 2016.
- 6 Italian and Chinese national representatives reported about their activities. Teo GEORGIADIS presented a collection of reports on IAMAS-related activities in Italy during 2012/13. Hans VOLKERT and Athena COUSTENIS expressed their thanks and agreed that the final version can be linked to the IAMAS website. Jianping LI reported the progress of IAMAS related activities in China, in particular, the journal *Advances in Atmospheric Sciences* sponsored by CNC-IAMAS which published two special issues during 2012/13. One special issues contains the 8th national report of CNC-IAMAS to IUGG. The journal's impact factor is increasing.

Athena COUSTENIS congratulated the editorial team for this good progress.

- 7 Athena COUSTENIS and Hans VOLKERT briefly recalled the decision process for holding a joint IAGA-IAMAS-IAPSO assembly in 2017.

- 8 The detailed bid from South Africa for the joint IAGA-IAMAS-IAPSO assembly in 2017 in Cape Town was in only one received after the joint call for bids issued by all three associations. (Israel's NC Zev LEVIN had refrained from submitting a bid after expressing initial interest of his country). Concerning personal security in Cape Town, some EC members (Hisashi NAKAMURA, Mike MacCRACKEN, John BURROWS and Terje BERNTSEN) who had been there reported their experience of a security level as in previous venues.

Huw DAVIES underscored the importance of the science quality of the meeting's program for a successful assembly; he expressed his hope that the local meteorological societies/institutes/weather service will cooperate to ensure the science quality of the assembly.

Several EC members also expressed the concern that the registration fee should stay in the range of previous assemblies (order of 500 Euro/week). Tom LACHLAN-COPE was concerned if the voting was no, there would be no other country that will take it.

Athena COUSTENIS asked Jenny LIN to send the South African bid book electronically to everyone for discussion at the 2nd EC meeting.

- 9 Joyce PENNER recalled the selection process of IAMAS Early Career Scientist Medal. 4 nominations were received and after extended discussion by Email James SCREEN was selected the first recipient of the IAMAS Early Career Scientist by a award committee presided by John TURNER. Alik ISMAIL-ZADEH suggested the award being given in conjunction with WMO or other organizations to make the award more prominent. Huw DAVIES pointed out that WMO has a young scientist award and a prestigious award for senior scientists, so IAMAS should be careful to avoid repetition.

[Note: James SCREEN attended the DACA-13 Opening ceremony on Monday 8 July and received the ECSM and a certificate from the IAMAS president. He presented parts of his research in a solicited poster on Tuesday 9 July. Altogether, both selection and presentation of this new award are considered as highly succesful]

- 10 Andrea FLOSSMANN presented the ICCP resolution on geo-engineering (Appendix 1), in response to the to-be-released IPCC report, in which there's a whole chapter on geo-engineering. ICCP realizes that Radiation Management does not prevent other deleterious impacts of GHGs such as ocean acidification; furthermore, lifetimes of GHGs are much longer than the species of gases and particles that have been proposed as potential geo-engineering agents. ICCP asked to receive backing from other commissions and advertise a possibly IAMAS-wide consensus. IO₃C (Appendix 2) statement was also passed around and the EC found it very much science based.

Mike MacCRACKEN would like to see some re-phrasing in ICCP resolution. Andrea FLOSSMAN argued that the presented text is an ICCP resolution, which was already published on ICCP web-site; therefore, she did not want to change it. Guoxiong WU pointed out that every commission has freedom to issue its own resolution or work with other commission to issue a joint resolution. Finally, it was decided that IAMAS will issue a separate resolution. Athena COUSTENIS suggested establishing a small working group chaired by Mike MacCRACKEN, with Andrea FLOSSMAN, Jhoon KIM, Sanjay LIMAYE, Sophie GODIN-BEEKMANN, and Joyce PENNER as group members to work on the IAMAS resolution on this matter.

- 11 EC is to set up a nominating committee chaired by the immediate past president Guoxiong WU. Guoxiong WU was asked to send a letter to all EC members and National Representatives asking for volunteers for the members of the committee. The slate of candidates will be discussed at the second EC meeting.
- 12 Duties and roles of Members-at-Large were briefly discussed and no additional concrete tasks were assigned.
- 13 Joyce PENNER was asked to draft a resolution of thanks to the LOC of DACA-13.
- 14 Athena COUSTENIS collected items to be discussed at the EC-2 including
 - staffing the nominating committee for the elections in 2015,
 - endorse IAMAS resolutions on geo-engineering,
 - approve the South African bid for IAMAS-IAPSO-IAGA 2017.
- 15 Alik ISMAIL-ZADEH suggested IAMAS discussing how it can contribute to ICSU's new initiative Future Earth. Huw DAVIES suggested issuing a resolution which also mentions previous experiences. It was decided that Huw DAVIES and Jianping LI will prepare a draft.

Summary of actions

No.	Action	Action by
8	Distribute South African bid for discussion at the EC-2	Jenny LIN
10	Establish a working group on drafting an IAMAS resolution on climate change and geo-engineering	Mike MacCRACKEN and the working group
11	Set up nominating committee for EC-member election 2015	Guoxiong WU
13	Draft Resolution of Thanks to LOC	Joyce PENNER
15	Draft Resolution of IAMAS' contribution to Future Earth	Huw DAVIES and Jianping LI

Second MEETING OF THE IAMAS EXECUTIVE COMMITTEE

11 JULY 2009, room DISCHMA, Congress Center, Davos, 12:00-13:30

Present

Athena COUSTENIS	IAMAS President
Laszlo BOZO	Hungarian National Correspondent (NC)
John BURROWS	ICACGP President
Robert CAHALAN	IRC past President
James DRUMMOND	Canadian NC
Luca EGLI	assistant to IRC president
Andrea FLOSSMANN	ICCP president and French NC
Markus FURGER	Swiss NC
Richard GROTJAHN	ICDM secretary
Tomas HALENKA	Czech NC
Zen KAWASAKI	ICAE President
Janusz KRZYSCIN	Polish NC
Matthew LAZZARA	ICPM secretary
Sanjay LIMAYE	ICPAE President
Zheng (<i>Jenny</i>) LIN	administrative assistant to IAMAS bureau
Mike MacCRACKEN	IAMAS past President (2003-2007)
Igor MOKHOV	Russian NC
Hisashi NAKAMURA	Japanese NC
Joyce PENNER	IAMAS vice-President, USA
Irina PETROPAVLOUSKIKH	IO ₃ C representative
Colin PRICE	Member-at-Large and Israeli NC
Mathias ROTACH	Austrian NC
Werner SCHMUTZ	IRC President
Richard SWINBANK	ICDM President
Mark WEBER	IO ₃ C representative
Guoxiong WU	IAMAS immediate past President
Hans VOLKERT	IAMAS sec-gen.
Shigeo YODEN	ICMA past President

Invited

Alik ISMAIL-ZADEH	IUGG sec.-gen.
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Snapshot of EC-2 on 11 July 2013; around the table from the left:

John Burrows, Werner Schmutz, Mark Weber, Irina Petropavlouskikh, Markus Rotach, Hisashi Nakamura, Luca Egli, Matthew Lazarra, Tomas Halenka, Igor Mokhov, Richard Grotjahn, Zen Kawasaki, Richard Swinbank, Andrea Flossmann, Athena Coustenis, Alik Ismail-Zadeh, Janusz Krzyscin, Robert Cahalan, Markus Furger, Michael MacCracken, Guoxiong Wu, Shigeo Yoden, Colin Price, Joyce Penner

photo: Hans Volkert



MINUTES

- 16 Adoption of the rest of the agenda. IO₃C representatives were introduced and welcomed.
- 17 EC unanimously approved the recommendation made by the Sec.-Gen. to hold the next IAMAS assembly jointly with IAGA and IAPSO in Cape Town South Africa during the period Mo. 28 Aug. to Sa. 2 Sep. 2017 as proposed by the bid made by the South African National Committee (SANC) of IUGG. It was noted that the bid book provided by the Cape Town Convention Center and the presentation submitted by Isabelle ANSORGE contained different targets for the registration fee. The EC strongly urged the SANC to target the lower regular price in the order of 500 EUR (rather than around 700 as in the bid book). Hans VOLKERT will inform South African National Committee, IAPSO and IAGA about the approval and concerns raised.
[Note: At the IAHS-IAPSO-IASPEI assembly in Gothenburg, Hans VOLKERT personally informed the IAPSO EC on 22 July and discussed at length with Isabelle ANSORGE. IAPSO expressed similar concerns about the importance of a reasonable registration fee. It was agreed to cooperate closely between associations and SANC following the tradition since MOCA-09.]
- 18 The working group on the geo-engineering resolution presented a draft of the resolution. In addition to comments on semantics and phrasing, there was a discussion that IAMAS could go one step further to include other effect of the geo-engineering on the environment of Earth and other planets, i.e. biological effects. However, there was a strong opinion to include only references that are related to IAMAS activities, such as effects of radiation engineering on changes in radiation and clouds. The statement included the reference to the consequences that could affect stratospheric ozone recovery. The EC felt that a *statement* is more appropriate than a *resolution*. It was suggested adding a short abstract and to put contact-person information at the end of the statement. The text will be still edited further to make it more media-friendly. Hans VOLKERT will eventually put it on the IAMAS website (Appendix 3).
- 19 The draft resolution on IAMAS' contribution to Future Earth was discussed. John BURROWS urged to include a clear message for the continuation and strengthening of current essential observational projects within IGBP. The EC decided to add the message in the last paragraph of the draft. Mike MacCRACKEN and John BURROWS will further edit the draft (Appendix 4).
- 20 Joyce PENNER read the Resolution of Thanks to LOC of DACA-13 and it was approved (Appendix 5) [and read by her together with IACS sec.-gen. Andrew MACKINTOSH to the participants of the DACA-13 dinner on the same evening].
- 21 The procedure of IAMAS Early Career Scientist Medal (ECSM) selection process was discussed. It was agreed that the award recipient should be present at the

IAMAS assembly. Thus, 1 July 2014 was fixed as the deadline for the submission of nominations by the IAMAS Commissions. By 1 October the decision is to be made, i.e., prior to the IUGG-2015 abstract submission deadline. All the commissions and Members at Large should keep in mind a suitable nomination. Alik ISMAIL-ZADEH reminded the EC that in their 2015 assembly IUGG will also present an Early Career Scientist Award; IAMAS should be also prepared to nominate a young scientist for this as well.

22 Guoxiong WU reported formation on the composition of the IAMAS Nominating Committee:

- Guoxiong WU, chair [Past President, IAMAS (2007-2011)]
- Athena COUSTENIS, ex officio [President, IAMAS (2011-2015)]
- Joanna HAIGH, UK National Representative
- Pablo LAGOS, Peru National Representative
- Neil HOLBROOK, ICCL President (Australia)
- Hugo BERBERY, MaL, Argentina/USA

The Committee was found to be balanced in terms of gender (2 women, 4 men) and continents and was, therefore, approved.

23 Preparation for IUGG2015 was discussed. Hans VOLKERT expects to receive proposals for symposia/sessions by 15 December and commissions were urged to coordinate among themselves and produce over-arching symposia (trains) that contain several topical sessions (wagons). A more complete program should be available by June 2014.

24 It was found that a 3rd session of the Executive Committee was not necessary.

25 Other business: Report of IUGG liaison to WMO (Appendix 6) will be circulated after the meeting.

Summary of actions

No.	Action	Action by
17	Inform South African National Committee, IAPSO and IAGA of the approval, and express the concern of registration fee	Hans VOLKERT (done meanwhile)
18	Further edit the statement on geo-engineering w based on the suggestion of EC and include abstract and contact person information. Post the statement on the IAMAS website	Mike MacCRACKEN and the working group Hans VOLKERT
19	Further edit the resolution on IAMAS' contribution to Future Earth, include a request to continue and enhance current IGBP projects Pass on to IUGG and ICSU	Mike MacCRACKEN and John BURROW

20	Read “thank-you” resolution at the conference dinner	Joyce PENNER (was done together with Andrew MACKINTOSH, IACS Sec.-Gen)
21	Call for nomination for IAMAS ECSM (deadline: 1 July 2014)	Hans VOLKERT and Jenny LIN
22	Set up timeline of nomination for EC-member election 2015	Guoxiong WU
23	Call for symposium proposal (deadline: 15 December 2013)	Hans VOLKERT and Jenny LIN

Minutes drafted until 24 July 2013 by Jenny LIN;
amended on 30 July 2013 by Hans VOLKERT;
circulated to the participants and finally approved on 19 August 2013.

Appendix 1:

INTERNATIONAL COMMISSION ON CLOUDS AND PRECIPITATION (ICCP) STATEMENT ON RADIATION MANAGEMENT CLIMATE ENGINEERING

Global average temperatures are rising due to human emissions of greenhouse gases (GHGs). This is helping to drive widespread melting of snow and sea ice and will result in significant changes in precipitation patterns that will be detrimental to humanity and to Earth's biodiversity.

Different strategies have been proposed to reduce climate change risks. Emissions reductions are a possible long-term solution, but it has been difficult to make progress in achieving such reductions. Adaptation is a second possible course of action, but is likely to be one that sees large reductions in biodiversity and would not be a suitable strategy in the event of catastrophic climate change such as rapid melting and disintegration of the Greenland or West Antarctic ice sheets. A third possible course of action, and the most radical, involves *climate engineering* (or *geoengineering*). This is the deliberate manipulation of the Earth's physical, chemical or biological processes to counteract deleterious effects of climate change.

This ICCP policy statement focuses upon a subset of climate engineering strategies called *Radiation Management* (RM) that attempt to reduce the amount of solar or infrared radiation reaching the Earth's surface. Proposed RM techniques include: 1) those designed to reflect more sunlight back to space, examples of which include space-based mirrors, introducing sulfate aerosols into the stratosphere and increasing the droplet concentration in marine low clouds; 2) reducing thin cirrus optical depth and cloud cover that prevents longwave radiation escaping to space.

Given the current state of understanding, RM could only be considered as a strategy of last resort should catastrophic climate change become unavoidable in the future. ICCP recognizes that current scientific research on RM techniques is in its infancy and that the current level of scientific knowledge about the feasibility of RM techniques is an inadequate basis for shaping policy decisions. Little is known about the potential risks of deliberate attempts to change the Earth's radiation budget. For example, it is becoming widely accepted that anthropogenic GHGs, ozone and absorbing aerosols may all be playing important roles in changing the latitude of storm tracks and the intertropical convergence zone. Further regional to global-scale adjustments caused by climate engineering would induce regional precipitation changes that would not necessarily cancel those caused by GHGs and therefore may not uniformly benefit all nations, peoples and ecosystems. This has major sociopolitical and ethical implications that have to be considered.

In addition to the potential risks of climate engineering applications, there are also major concerns that the development of RM strategies might be seen as an equivalent to emissions reduction strategies. Radiation management cannot substitute for GHG emissions reduction strategies for the following reasons: 1) the areal patterns of radiative forcing associated with GHGs is fundamentally different from those expected from RM, 2) RM management does not prevent other deleterious impacts of GHGs such as ocean acidification, and 3) the lifetimes of GHGs are much longer than the species of gases and particles that have been proposed as potential geoengineering agents.

The International Commission on Clouds and Precipitation recommends:

- That further research is pursued to better understand the fundamental science and possible efficacy of radiation management climate engineering schemes.
- That climate engineering research be conducted in an open and independent manner that engages public participation, and is used to properly assess the potential risks involved.
- That research activities must include studies of the human impacts, ethics, legal and political impacts of climate engineering

Given the poor state of the current knowledge on clouds, aerosols, precipitation and their interactions, the ICCP does not support the implementation of climate engineering and does not expect that climate engineering can solve the global warming problem. Climate engineering cannot substitute for aggressive emissions reduction. However, ICCP supports conducting research to improve our basic understanding of the processes needed to explore the possibility that climate engineering might contribute to a broad risk management strategy to temporarily reduce some of the dangerous effects of climate change.

Appendix 2:



International Association of Meteorology and Atmospheric Sciences (IAMAS)

International Ozone Commission (IO₃C)

President

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March 15th, 2013

Statement on Geo-engineering (solar radiation management by the injection of aerosols into the stratosphere) for the reduction of climate change

Rising concerns about increased greenhouse gases have led to suggestions that various geo-engineering concepts be investigated as possible temporary “solutions” for moderating climate change¹. In particular, solar radiation management (SRM) by the injection of aerosols into the stratosphere has been proposed as a technique to increase the reflectivity of the Earth’s atmosphere, and thereby reduce the amount of solar energy passing through the atmosphere to the Earth’s surface. This reduction of incoming solar energy could counteract the increase in surface temperatures caused by increasing abundances of greenhouse gases.

Early research has suggested that the deliberate injection of aerosols into the stratosphere would directly alter not only climate (as intended), but also stratospheric ozone levels and the climate in the lower stratosphere (unintended consequences). Ozone changes are of particular concern because ozone screens the Earth’s surface from harmful solar ultraviolet radiation. The discovery of the Antarctic ozone hole in 1985 and subsequent scientific research demonstrated that the ozone layer has been endangered by massive emission of chlorine and bromine compounds into the atmosphere (the so-called ozone depleting substances – ODS, e. g., chlorofluorocarbons and halons) by human activities. This research revealed the important role of heterogeneous chemistry occurring on stratospheric aerosol and polar stratospheric clouds for ozone depletion in Polar Regions and at global scale (heterogeneous chemistry also occurs on surfaces of volcanic aerosols). The 1987 Montreal Protocol regulated the production and consumption of ODS, and the ozone layer should recover during this century.

The effects of aerosols in the stratosphere are broadly understood because of many years of research on the evolution of injections of volcanic plumes into the stratosphere. The Mt. Pinatubo eruption, in particular, which occurred in 1991 in a

¹ Crutzen, P. J., Albedo enhancement by stratospheric sulfur injections: A contribution to resolve a policy dilemma?, *Climatic Change*, 77, 211-219, doi: 10.1007/s10584-006-9101-y, 2006

period of high ODS levels in the stratosphere, injected a sulfur dioxide cloud into the stratosphere that spread across the planet and led to reduced levels of ozone.

The Mt. Pinatubo eruption demonstrated the efficacy with which future deliberate injections of stratospheric aerosols could cool the Earth's surface. However, in spite of numerous studies of this massive injection, our ability to fully simulate the eruption remains relatively crude and a number of open questions about the eruption's impact in the stratosphere are still unanswered. For example, it is clear that while stratospheric chemistry was significantly altered in both hemispheres, only the Northern Hemisphere exhibited large stratospheric ozone losses. Current models of the stratosphere have been unable to simulate this basic difference in ozone losses. Hence, most current models are also not adequate to simulate the full effects of deliberately injected aerosols.

Closing this gap in modeling the effects of stratospheric aerosols from natural or anthropogenic sources will require a focused effort within the atmospheric modeling community. The Geo-engineering Model Intercomparison Project (GeoMIP) is a first effort to assess model simulations of geoengineering concepts such as direct aerosol injection. Continued observations of vertically highly resolved stratospheric composition and dynamics in the upper troposphere and lower stratosphere will be required to support a focused modeling effort by providing essential modeling constraints.

The understanding of aerosol and ozone changes gained from the Mt. Pinatubo eruption was a direct result of careful observations by ground stations, aircraft, balloons, satellites, and modeling studies conducted both before and after the eruption. Observations prior to an eruption provide a baseline for evaluating the ozone and climate perturbations caused by the volcanic aerosols. Large volcanic eruptions reaching the stratosphere are episodic on a multi-decadal timescale. Hence, maintaining global observational resources for ozone, aerosol and related atmospheric parameters is essential if we are to achieve a comprehensive understanding of the effects of aerosol injection into the stratosphere.

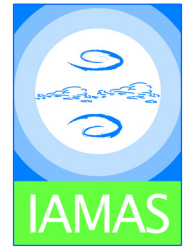
Based on the expertise of its members, the IO₃C recommends that research institutions around the world continue to support observational and modeling research related to stratospheric aerosol science in order to fill the known gaps in our current understanding and modeling skills and to respond fully to interest from the policy community in how stratospheric ozone may respond in an atmosphere changed by unexpected volcanic emissions or deliberate anthropogenic sulfur emissions.

Thanks to the Montreal Protocol, the levels of ODS are now declining in our atmosphere and it is expected that ozone levels will rebound back towards their natural levels in the coming few decades. However, the ozone layer is meanwhile very vulnerable, and deliberate injections of aerosols into the Earth's atmosphere have the potential to cause significant ozone reductions.

INTERNATIONAL ASSOCIATION OF METEOROLOGY AND ATMOSPHERIC SCIENCES

STATEMENT ON RADIATION MANAGEMENT CLIMATE ENGINEERING

Approved at the Executive Committee Meeting on July 11, 2013



Greenhouse gas (GHG) emissions are increasing, leading to multi-decadal increases in global average temperature. This is contributing to driving widespread melting of snow and sea ice as well as intense drying episodes and more extreme precipitation events. These and other impacts will be detrimental to humanity and to Earth's biodiversity with its provision of ecosystem services.

To avoid very detrimental impacts to nations around the world, aggressive actions must be taken to reduce CO₂ and other greenhouse gas emissions. This must be done to maintain the climate in a state suitable for ensuring sufficient agricultural production, ecological services for society and sustainable development, as called for in the UN Framework Convention on Climate Change. Sharply cutting emissions of CO₂ and other greenhouse gases is required to reduce long-term future warming, and can be achieved by increasing energy efficiency, reducing deforestation, switching to renewable energy sources, and other measures. Cutting emissions of shorter lived species such as methane, absorbing aerosols and compounds that lead to tropospheric ozone formation will not only slow global warming, but also improve air quality, human health, and energy efficiency. Adaptation to future changes in climate must also be pursued, but cannot, without emissions reductions, prevent serious impacts such as the coastal inundation that would come from rapid melting of polar ice sheets.

A suggested supplementary approach could be *climate engineering* (or *geoengineering*), which is defined as the deliberate manipulation of the Earth's physical, chemical or biological processes to counteract deleterious effects of climate change. Evidence from our planet as well as other planets shows that radiation and greenhouse gas concentrations are major factors in determining the climate. *Radiation Management* (RM) represents a subset of climate engineering approaches that attempts to counter-balance the warming effect of greenhouse gases by reducing the amount of solar or infrared radiation warming the Earth. Proposed RM techniques include those designed to: 1) reflect more sunlight back to space, for example by injecting sulfate aerosols into the stratosphere or increasing the reflectivity of low clouds over the ocean; and 2) reduce the optical depth and extent of thin cirrus clouds that prevent longwave radiation escaping to space.

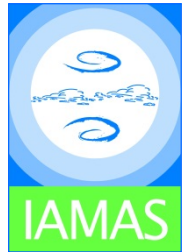
Given our current state of understanding of clouds, aerosols, precipitation and other processes and their interactions within the climate system, the relative risks and benefits of RM cannot be determined with enough confidence to make this a viable option for shaping policy decisions. For example, stratospheric approaches may well endanger the ozone layer. In addition, RM could induce changes in the latitude of storm tracks, weather patterns and regional precipitation that would not necessarily cancel those caused by increased GHGs emissions. Both greenhouse gas induced warming and climate engineering have major socio-political, legal, economic, and ethical implications that have to be considered.

In addition to the potential risks of climate engineering applications, there are also major concerns that the development of RM strategies might be seen as an alternative to emissions reduction strategies. For several reasons, RM cannot substitute for GHG emissions reduction strategies: 1) other deleterious impacts of GHGs such as ocean acidification are not prevented, 2) the induced spatial and temporal precipitation modifications may worsen conditions in some areas, 3) once started, RM would likely need to be continued for many decades to centuries to sustain its offsetting effects, and (4) the maximum amount of greenhouse gas warming that can be offset is limited.

The International Association of Meteorology and Atmospheric Science recommends:

- That further research be pursued to better understand the fundamental science and possible efficacy of radiation management approaches;
- That climate engineering research be conducted in an open and independent manner that encourages public engagement;
- That the potential risks involved in climate engineering be assessed relative to those associated with global warming without climate engineering; and
- That research activities include studies of the human impacts, ethics, and the legal, economic, and political implications of climate engineering.

In summary, climate engineering cannot be considered a viable alternative or substitute for aggressive emissions reductions. IAMAS supports conducting research to improve the basic understanding and to explore the possibility that climate engineering may eventually be part of a broad risk management strategy aimed at temporarily reducing some of the dangerous impacts of climate change until emissions reductions are sufficient.



Resolution in Recognition of the Establishment of “Future Earth” by ICSU

[Approved in concept 11 July 2013; Davos, Switzerland]

The IAMAS Executive Committee

Recognizing:

- the major sustainability and environmental challenges currently confronting the scientific community and the nations of the world;
- the centrality and significance of atmospheric processes to the determination of the weather, air and water quality, the frequency and intensity of floods and droughts, and both short-term climate variability and long-term climate change;
- that a well-founded understanding of the Earth system is built on a base of on-going and high quality surface, in situ, ship, aircraft, and space-based observations, intensive studies of processes and interactions, a hierarchy of models capable of representing the wide breadth of space and time scales, and the analysis of a strong scientific community; and

Valuing:

- the observations being gathered by nationally and internationally supported satellite, surface, and in situ-based systems and networks;
- the important insights and understanding emerging from the major research projects and their coordination efforts organized particularly by the International Geosphere-Biosphere Programme (IGBP) and the World Climate Research Programme (WCRP) since their inception;
- the advanced modeling and research programs being supported in many nations, including particularly the essential computational, analytic, and data storage resources provided to ensure the success of these efforts; and
- the promotion of international cooperation in science by the nations of the world in order to most rapidly advance scientific understanding;

Welcomes:

- the establishment of “Future Earth” by the International Council for Science (ICSU) in cooperation with the Science and Technology Alliance for Global Sustainability; and

Urges:

- the atmospheric sciences community and its various components to engage fully with the new activity; and
- the leadership of the Future Earth to sustain, draw upon and build the community’s expertise for addressing the many important societal, environmental and other challenges facing the world community; and

Recommends:

- the continuation, evolution and expansion of the research encompassed in the IGBP and other relevant projects, including the facilitation, direction and orientation of field campaigns, and the provision and preservation of long-term data sets that yield the evidence base for determining key atmospheric and surface parameters required by policymakers;
- the initiation, development, and sustenance of cooperative partnerships between IUGG and its Associations and Future Earth for the purpose of ensuring and strengthening the programs of research, analysis, and observations needed to advance scientific understanding of the Earth system and meet the many, diverse needs of Future Earth; and
- the devotion of special attention to education, training, and mentoring in areas that will build and expand the intellectual capacity of the natural and social sciences, especially focused on providing development, participation, and recognition of those who can provide expertise for bringing advances in understanding across disciplinary areas.

Appendix 5:

Resolution of Thanks

The International Association of Meteorology and Atmospheric Sciences,

Gratefully records its appreciation for the organization, arrangements, and hospitality at the DACA-13 conference. On behalf of all participants, the Association expresses its warm thanks to the National Organizing Committee Chaired by Heini Wernli, the Local Organizing Committee, Chaired by Werner Schmutz, the Program Committee, Chaired by Michael Lehning and Project Manager, Anja Schilling Hoyle and her staff, for their efforts to make the joint IAMAS and IACS Assembly a scientific success in the beautiful city of Davos.

INTERNATIONAL ASSOCIATION OF METEOROLOGY AND ATMOSPHERIC SCIENCES (IAMAS)

within the International Union of Geodesy and Geophysics (IUGG)



Secretary-General

25 July 2013

comprising the

Short report of atmosphere (IAMAS) liaison to WMO on behalf of IUGG for 2011-2013

International
Commission on
Atmospheric
Chemistry and
Global Pollution

Temporal sequences of formal activities:

July 2011	Hans Volkert (HV) named as IUGG-liaison to WMO for atmospheric matters by IUGG council;	International Commission on Atmospheric Electricity
Oct. 2011	HV visits WMO secretariat in Geneva; meets IUGG-liaison for hydrological matters, Arthur Askew (AA); agrees with WMO-director for atmospheric research and environment, Deon Terblanche, to provide IAMAS/IUGG input for future plans of the WMO Commission for Atmospheric Sciences (CAS), especially with regard to future conferences of the World Weather Research Programme (WWRP); cf. IAMAS newsletter 12 of Dec. 2011 under www.IAMAS.org/NewsLetters ;	International Commission on Climate
Feb. 2012	HV accepted invitation by WMO to join the CAS Management Group (MG) as Expert Advisor in his capacity as Secretary-General of IAMAS;	International Commission on Clouds and Precipitation <i>Committee on Nucleation & Atmospheric Aerosols</i>
June 2012	2-day participation at WMO Executive Council meeting together with the other two IUGG liaisons to WMO, AA and Arnau Folch; cf. IUGG e-journal of July 2011;	
Sep. 2012	7 th meeting of CAS-MG via teleconference; initial planning World Weather Open Science Conference scheduled for Aug. 2014 in Montréal, Canada (WWOSC-2014);	International Commission on Dynamical Meteorology
May 2013	8 th meeting of CAS-MG in Geneva, after WMO Executive Council meeting; similarities in structure of WMO and IAMAS highlighted, the former being the 'club' of national (hydro-)meteorological services and the latter a network of personalities mostly drawn from academic institutions; cf. minutes under www.wmo.int/pages/prog/arep/cas/documents/Report-CASMG8-final.pdf	International Commission on the Middle Atmosphere International Ozone Commission

Brief personal evaluation:

The link with WMO strengthened since 2011 and is about to resume its former state of exchanges, also on an informal basis. Emphasis lies on ties to WWRP, where the liaison to WCRP is provided by IUGG past president Tom Beer.

International
Commission on
Planetary
Atmospheres and
their Evolution

International
Commission on
Polar
Meteorology

International
Radiation
Commission

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