

## OPAG-EPAC

### WMO/IUGG Assessment of Aerosol Pollution Effects on Precipitation

*(submitted by L.A. Barrie)*

#### Purpose of Document and Major Decision(s) Requested

To inform CAS MG of the completion of the assessment, to report conclusions and to invite CAS MG feedback.

### Summary of Activity

#### Scope

Review the published peer-reviewed scientific literature summarizing current understanding and identifying gaps.

#### Milestones

- May 2003 WMO Congress recommended the establishment of a group to address aerosols effects including biomass burning on precipitation.
- July 2003 IUGG Congress after careful consideration of WMO recommendation recommended an international programme of study and assessment of rain related effects of aerosols on precipitation
- June 2004 the Executive Council of WMO confirms the establishment of an International Aerosol Precipitation Scientific Assessment Group by President of CAS led by Prof. P. Hobbs and an independent review group led by Dr George Isaac, President of the IUGG/IAMAS/ International Commission on Clouds and Precipitation (1996-2004).
- July 2004 1st meeting at the International Symposium on Physics and Chemistry of Clouds, Bologna Italy
- July 2005 Prof Z. Levin replaced Prof. P. Hobbs as chair. Prof. W. Cotton co-chair
- Nov 2005 WMO/IUGG sponsored workshop hosted by Meteorological Service of Canada
- June – Sept 06 Peer review conducted by Dr. G. Isaac
- Nov 2006 WMO/IUGG sponsored workshop hosted by MeteoFrance
- February 2007 Completion of the Assessment
- May 2007 Document distributed and report given by president of CAS to Congress XV (Cg-XV para. 3.3.1.7) with the following outcome:

*“Congress expressed satisfaction with the response of CAS to the request of Cg-XIV (Abridged Final Report with Resolutions of the Fourteenth World Meteorological Congress (WMO-No. 960) general summary, paragraph 3.3.5.4) and with the establishment of an ad-hoc group to address the effects of aerosol pollution, including biomass burning, on precipitation. It noted that CAS had designated AREP to lead a joint WMO effort with the International Union of Geodesy and Geophysics (IUGG) that established the WMO/IUGG International Aerosol Precipitation Science Assessment Group and organized a peer-reviewed report entitled “Aerosol Pollution Impact on Precipitation: A Scientific Review”. It accepted the President’s recommendation supported by the IUGG representative that WMO and IUGG proceed to publish the report as a joint publication and consider for EC-LX possible actions resulting from the recommendations. Congress expressed its thanks to IUGG, co-editors Professors Z. Levin and W. Cotton and leader of the peer-review Dr G. Isaac as well as to the many contributors and reviewers.”*

- July 2007 IUGG Welcomes report and drafts the resolution in Appendix I:
- November 2007 Prof Zev Levin President of ICCP of IAMAS/IUGG visited WMO on sabbatical to complete the book.
- September 2008 WMO and IUGG, Book published was published by Springer Verlag.

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“Aerosol Pollution Impact on Precipitation: A Scientific Review”

Zev Levin, Tel Aviv University, Israel; William R. Cotton, Colorado State University, Ft. Collins, USA (Eds.)

Abstract

*Life on Earth is critically dependent upon the continuous cycling of water between oceans, continents and the atmosphere. Precipitation (including rain, snow, and hail) is the primary mechanism for transporting water from the atmosphere back to the Earth’s surface. It is also the key physical process that links aspects of climate, weather, and the global hydrological cycle. Changes in precipitation regimes and the frequency of extreme weather events, such as floods, droughts, severe ice/snow storms, monsoon fluctuations and hurricanes are of great potential importance to life on the planet. One of the factors that could contribute to precipitation modification is aerosol pollution from various sources such as urban air pollution and biomass burning. Natural and anthropogenic changes in atmospheric aerosols might have important implications for precipitation by influencing the hydrological cycle, which in turn could feed back to climate changes. From an Earth Science perspective, a key question is how changes expected in climate will translate into changes in the hydrological cycle, and what trends may be expected in the future. We require a much better understanding and hence predictive capability of the moisture and energy storages and exchanges among the Earth’s atmosphere, oceans, continents and biological systems. This book is a review of our knowledge of the relationship between aerosols and precipitation reaching the Earth’s surface and it includes a list of recommendations that could help to advance our knowledge in this area.*

Appendix: Resolution July 2007 by the International Union of Geodesy and Geophysics(IUGG)

**Resolution July 2007 by the International Union of Geodesy and Geophysics(IUGG)  
Intensified Study of Aerosol Pollution Effects on Precipitation**

**Welcomes and Commends**

*the comprehensive and peer reviewed report "Aerosol Pollution Impact on Precipitation, A Scientific Review" that provides an in-depth study of the relationship between aerosol pollution and precipitation that was called for by the IUGG XXII General Assembly in Sapporo and the WMO Congress CgXIV in Geneva, and prepared by the International Aerosol-Precipitation Scientific Assessment Group (IAPSAG), which was composed of leading scientists from around the world,*

*and*

**Considering**

- *aerosol pollution resulting from biomass and fossil-fuel burning, and wild fires can significantly alter the formation and distribution of precipitation,*
- *the changes in precipitation that can occur, depending on the characteristics of aerosol pollution and the geographic and meteorological situations, and*
- *the possible significant societal and economic impacts of changes and re-distribution in precipitation, and*

**Noting**

- *the recommendations listed in the "Review" call for actions by international bodies, individual governments and the scientific community at large,*

**Urges:**

- *the WMO to join with IUGG and form an Aerosol-Precipitation Project Group charged with converting the recommendations of the Review into an international action plan,*
- *the WMO to join with IUGG in approaching the Food and Agricultural Organization (FAO) and other international organizations and ask them to join the IUGG/WMO efforts and participate in the planning,*
- *IAMAS, IAHS and other IUGG Associations, as appropriate, to continue their efforts to improve understanding, with the goal of forming a basis for moderation of adverse effects, and*
- *the scientific community to study the direct impacts of aerosol pollution on precipitation and global and regional precipitation climate, with all its social and economic implications so that governments can consider appropriate actions,*

**Decides**

- *to appoint a special officer to lead the IUGG efforts in the context of the Aerosol-Precipitation Project Group and to liaise with the WMO (Dr John Turner, British Antarctic Survey, High Cross, Madingley Road, Cambridge, CB3 0ET,UK,Email: J.Turner@bas.ac.uk ,Tel +44 (1223) 221485, Fax +44 (1223)221279)*