UNITED
NATIONS

EP

UNEP/OzL.Conv.10/6

Distr.: General
9 September 2014

Original: English

United Nations
Environment
Programme

Conference of the Parties to the
Vienna Convention for the Protection
of the Ozone Layer
Tenth meeting
Paris 17–21 November 2014
Item 5 (a) of the provisional agenda of the preparatory segment*

Vienna Convention issues: report of the ninth meeting of the Ozone Research Managers of the Parties to the Vienna Convention

Recommendations of the ninth meeting of the Ozone Research Managers of the Parties to the Vienna Convention

Note by the Secretariat

The ninth meeting of the Ozone Research Managers of the Parties to the Vienna Convention for the Protection of the Ozone Layer was held at the headquarters of the World Meteorological Organization in Geneva from 14 to 16 May 2014. The annex to the present note sets out the recommendations made by the Ozone Research Managers at that meeting. The recommendations are divided into six categories: overarching goals; research needs; systematic observations; data archiving and stewardship; capacity-building; and the General Trust Fund for Financing Activities on Research and Systematic Observations Relevant to the Vienna Convention. The last category of recommendations resulted from a discussion on the accomplishments and the future of the General Trust Fund. Those recommendations are particularly relevant for the discussions at the tenth meeting of the Conference of the Parties to the Vienna Convention on agenda item 5 (b) on the status of the General Trust Fund. The recommendations are reproduced in the annex without formal editing. The full report of the ninth meeting of the Ozone Research Managers will also be available to the Conference of the Parties at its tenth meeting as a background document.

* UNEP/OzL.Conv.10/1/Rev.1-UNEP/OzL.Pro.26/1/Rev.1.

Annex

Recommendations

A. Overarching goals

1. *Recognise that the issue of changes in climate and in the stratospheric ozone layer are intimately coupled*: The Montreal Protocol was instituted to protect the Earth's surface from the harmful UV radiation increases that could arise from the depletion of the ozone layer by ozone depleting substances. Over the decades, research has clearly shown that ozone layer depletion, and its projected recovery, and changes in climate are intricately linked. Therefore, it is essential to encompass changes in climate in efforts to protect the ozone layer.

2. *Existing observation capabilities for climate and ozone layer variables need to be maintained and enhanced*. Given the strong coupling between ozone layer depletion and changes in climate, the observations of climate and ozone layer variables should be carried out and analysed together whenever possible.

3. *Continue, enhance, and target the Vienna Convention Trust Fund for Research and Systematic Observation to better support the above goals*: In line with the above two goals, it is essential to continue and significantly enhance the Vienna Convention Trust Fund for Monitoring and Research to make it more effective in addressing some of the issues that arise from above. It is also essential to develop a strategic plan for the Fund and to request that the UNEP/Ozone Secretariat and WMO set up a small working group to assist them in setting priorities and ensuring implementation.

4. *Dedicate to build capacity to meet the above goals*: Given the above, it is very important to carry out capacity building activities in the Montreal Protocol Article 5 countries to expand the scientific expertise, with the added benefit of expanding the geographical areas for the measurements and data archival of the key variables related to the ozone layer and changing climate.

B. Research Needs

5. Extensive research over the past decade and more has highlighted the role that stratospheric ozone plays as a core component of the global climate system. Stratospheric ozone has responded to, and will continue to respond to, decreases in stratospheric temperatures resulting from accumulation of CO_2 in the stratosphere and to changes in ozone chemistry resulting from anthropogenic emissions of ozone depleting substances (ODSs). Further, the role of ODSs and their substitutes as greenhouse gases (GHGs) brings in yet another important facet to this issue.

6. The complex coupling of ozone, atmospheric chemistry and transport, and climate changes is still not fully understood. Further research is needed to better understand the underlying processes and to improve model predictions of the expected changes in both ozone and temperature distributions of the middle atmosphere. In support of WMO/UNEP Ozone Assessments, there is a need for coordinated simulations of future ozone changes using chemistry climate models (CCMs) constrained by common boundary conditions. These simulations should include ancillary simulations that include, e.g., fixed GHG concentrations or fixed ODS concentrations to permit an attribution of changes in ozone to these forcings.

7. Progress has been made on the recommendations made at the 8th Ozone Research Managers meeting, and it includes the following:

- Advances have been made in better quantifying the lifetimes of key ODSs and, importantly, their uncertainties.
- There have been ongoing efforts to further develop CCMs and to push towards the development of fully coupled Earth System Models (ESMs).
- Advances have been made in constructing long-term data records of stratospheric ozone and the trace gases that affect stratospheric ozone.
- Studies of the processes that maintain the stratospheric aerosol layer, which strongly influences ozone chemistry, have advanced.

- The value of including an interactive stratosphere in models of the global climate system has been more clearly elucidated.
- The role of HFCs as a climate-forcing agent has been better quantified and the means by which the climate protection benefits of the Montreal Protocol can be preserved has also been explored.

Key recommendations arising from the 9th ORM:

(i) Chemistry-climate interactions and monitoring the Montreal Protocol

8. It is now well established that the future evolution of the stratospheric ozone layer will depend not just on the decline of ODS concentrations, but also on how climate will affect stratospheric temperatures and circulation. Furthermore, the coupling between atmospheric composition and climate is two-way. Past changes in stratospheric ozone are known to have impacted surface climate; future ozone change is projected to affect the climate system.

9. It is incumbent on the scientific community to monitor the continued effects of the Montreal Protocol. There is a research need for detailed analyses of the wide range of data on ozone, ODS, and related gases so that we can comprehensively assess the impact of the Protocol. Further research, combining state of the art CCMs and reference quality, altitude-resolved data records is needed to explain past changes.

(1) Ozone in climate models: There is increasing appreciation that the inclusion of ozone in models of the atmosphere improves the quality of long-term projections of climate change, and also creates new opportunities, e.g., for seasonal predictions. Accordingly, research is required to better understand those surface climate processes affected by changes in the stratosphere, including effects on tropospheric circulation, precipitation, sea ice, ocean-atmosphere exchange, etc.

(2) The changing Brewer-Dobson Circulation: Research is needed to resolve the apparent inconsistency between model projections of an increasing strength in the Brewer Dobson Circulation (BDC) and observations of long-lived trace gases in the stratosphere, which, if anything, suggest a slowing of the BDC. Resolving this inconsistency may require new measurements, e.g., of SF_6 and CO_2 in the middle and upper stratosphere that can be used to infer changes in the strength of the BDC (see also the *Systematic Observations* section).

(3) Constructing Data Records: Improved, long-term data records of stratospheric ozone, other trace gases associated with ozone chemistry (e.g., HNO_3, ClO, BrO, H_2O, CH_4, N_2O) and other atmospheric state variables (e.g., temperature) need to be constructed to assess the physical consistency of trends in ozone and temperature, and to aid the interpretation of the causes of long-term changes in ozone. A temperature climate data record of the free troposphere and stratosphere is needed to interpret the interactions between changes in the thermal structure of the atmosphere (which will be forced by changes in greenhouse gas concentrations) and changes in ozone. Such a temperature data record will also support the construction of ozone data records since measurements in ozone mixing ratio often need to be converted to number density and measurements on pressure levels need to be converted to measurements on geopotential height, both of which require temperature time series. These temperature time series must be stable over multiple decades to avoid aliasing false temperature trends into false ozone trends. Inhomogeneities in current meteorological reanalyses suggest that this approach to generating temperature time series for the stratosphere is inadequate. Data records should be constructed according to the principles outlined by GCOS (Global Climate Observing System; GCOS-143).

(4) Trends in ozone: Research is required to better quantify trends in vertically resolved ozone data records in different regions of the atmosphere, and in particular over the polar regions where observed ozone trends have been largest. Trends in ozone and associated trace gases need to be analysed in detail to assess whether their observed evolution to date is consistent with our understanding of the process affecting trends and variability. Expectations for the length of measurement series required to confirm the effectiveness of the Montreal Protocol need to be investigated.

(ii) Processes influencing stratospheric evolution and links to climate

10. The stratosphere is a highly coupled chemistry-radiation-dynamics system. Thus, models need to incorporate the fundamental understanding of these processes. In some cases our knowledge base is incomplete. We require more and improved laboratory measurements of kinetic and spectroscopic parameters. Field measurements are required to improve understanding, ranging, for example, from the

surface emissions of very short-lived substances to the transport and transformation of species moving between the troposphere and stratosphere (and back again).

(1) *Non-ODS gases:* The role played by gases, other than the ODSs controlled under the Montreal Protocol, in ozone depletion chemistry (e.g., N_2O, CH_4, biogenic bromocarbons) needs to be further investigated. Emissions databases of CH_4 and N_2O need to be improved to permit more realistic modelling of the impact of their emissions on ozone. Changes in atmospheric concentrations of ODS replacements need to be reconciled with known emissions and atmospheric lifetimes of these gases. The effects of changes in tropospheric OH on the lifetimes of short-lived gases that, when transported to the stratosphere, provide a source of chemically active species to the stratosphere, need to be better quantified. Seasonally resolved tropospheric OH climatologies, validated against appropriate measurements (see *Systematic Observations* section), are required to reduce uncertainties in model simulations of the transport of short-lived compounds from the surface to the stratosphere. Knowledge of tropospheric OH concentrations is also required to understand lifetimes of other gases such as CH_4.

(2) *Laboratory measurements:* Laboratory measurements provide the foundation for our satellite retrievals, ground- observations, and model simulations. The quality/precision of O_2 and O_3 cross-sections needs to be improved. The O_2 cross-section has a major impact on the lifetime to species that are photolysed in the stratosphere. The selection and use of improved O_3 absorption cross-sections in ground-based remote sensing measurements of ozone need to be finalised. Furthermore, as new gases (e.g., HFCs) are proposed, it is necessary to conduct accurate laboratory studies of their fundamental loss processes (viz., reactions with OH, UV cross-sections, IR absorption spectra). Improvements in laboratory measurements of ozone absorption lines in the IR are also required for improving ground-based retrievals of other trace gases that are absorbed in the IR. It is also essential that these laboratory data are critically evaluated. Stewardship and curation of the laboratory data is important to have a trustworthy database for modelling, analyses, and understanding. Experts with deep knowledge of chemical kinetic, photochemical, and spectroscopic data need to be involved in the stewardship and curation process.

(3) *Stratospheric aerosols:* Stratospheric aerosols comprising the Junge Layer are important as both surfaces for heterogeneous chemical processes, but also for their radiative impact. Hence, understanding the processes that control the atmospheric distribution of aerosols is fundamental to modelling of the stratosphere. In particular, understanding how SO_2 and carbonyl sulphide (OCS) maintain the Junge layer and how particles evolve in the stratosphere are of key importance. Such research will also support the inclusion of appropriate processes in the models being used to assess aspects of proposed geoengineering actions through intentional enhancement of the stratospheric aerosol layer.

(4) *Stratosphere-troposphere exchange (STE):* Research is required to improve understanding of the processes controlling the two-way exchange of gases and aerosols between the troposphere and the stratosphere, e.g., the Asian Monsoon circulation that provides an efficient pathway for pollutants from close to the surface, through the tropical tropopause layer, and into the stratosphere. The fidelity of the simulation of STE processes in CCMs must be assured if we are to have confidence in projections of climate driven changes in STE through the 21st century. Targeted field campaigns are required, e.g., to understand tropical processes and the processes active in the upper troposphere and lower stratosphere (UT/LS) that modulate the chemical and dynamical two way coupling between the stratosphere and the troposphere.

(iii) UV Changes and other impacts of ODS changes

11. Recent simulations of ozone changes through the 21st century suggest that increases in surface UV in the tropics, and decreases at middle and high latitudes, could occur. For humans, this poses the risk of elevated skin cancer incidence in the tropics, but also slightly increases the risk of UV doses that are too low for the production of sufficient Vitamin D at middle and high latitudes. While research on the impacts of changes in UV radiation on various organisms has substantially advanced, various needs for research remain, including:

(1) Factors affecting UV: There is a need to disaggregate the factors affecting UV radiation at the surface so that the influence of factors other than ozone (e.g., cloud cover, aerosol abundance, albedo, and temperature) can be better assessed.

(2) UV change impacts: The effects of stratospheric ozone change, and the resulting changes in UV radiation, on human health, ecosystems, and materials, require further study. These studies should include quantitative analyses that allow an assessment of the magnitude of specific impacts in relation to

UV changes. Research should also account for interactions between the effects of changes in UV and those of climate change, particularly effects that may lead to feedbacks to climate change, for example, through altered carbon cycling or tropospheric chemistry.

(3) ODS substitutes: Support studies that investigate the environmental effects of ODS substitutes, and their degradation products, on human health and the environment.

C. Systematic Observations

12. As stated in Article 3 of the Vienna Convention, systematic observations are critical for monitoring and understanding long-term changes in the ozone layer, as well as changes in atmospheric composition and climate. In order to verify the expected ozone recovery and to understand interactions with changing climate, continuing observations of key trace gases and parameters characterizing the role of chemical and dynamical processes will be required for the next decades.

13. We are now moving from a period where increasing ozone depleting substances (ODS) were threatening the ozone layer, to a period where growing concentrations of other climate related gases, especially CO2, N2O, CH4 and H2O will impact the ozone layer more and more. These impacts are complex and are interacting. Not all are fully understood. Future emissions are especially uncertain.

14. Long-term monitoring of the ozone layer, therefore, has to continue. Monitoring needs to be expanded to important new species and parameters. Key measurement regions include the upper troposphere and lower stratosphere, regions of troposphere to stratosphere exchange in the tropics and monsoon circulations, as well as the polar caps and the upper stratosphere, In particular, measurements of the vertical distribution, especially in the UTLS region and in the upper stratosphere, are of prime importance.

15. Global observations provide the essential data-basis for our understanding of ozone, ozone depleting substances and UV radiation. Many nations around the world are contributing. These networks also provide the training for atmospheric scientists internationally, including developing countries. Measurements from these networks provide the basis of all research activities and for decision making. Networks fall into two categories, ground-based networks and space-based networks. The achievements since the 8th ORM are:

- Despite some difficulties, ground- and space-based measurements of ozone, most relevant trace gases, temperature, and stratospheric aerosol have successfully continued over the last years.
- The OMPS limb instrument on the current SUOMI NPP platform and the planned deployment of the SAGE III solar occultation instrument on the International Space Station from 2015 will reduce the imminent gap in atmospheric limb sounding instruments for ozone, aerosol, and water vapour. However, as indicated in the key recommendations below, a severe lack of limb measurement capabilities is expected for many other important gases.
- Refurbishment and re-location of unused Dobson and Brewer instruments to data-poor regions is continuing, albeit at a slow rate, about one instrument per year.
- Additional laboratory spectroscopic studies have now provided the basis for moving towards finalizing recommendations on the best ozone absorption cross-sections in the ultra-violet. Some satellite datasets are already using these new cross sections; application to ground-based observations (especially Dobson and Brewer data) should now be possible until the next ORM.
- Initial measurements of important emerging ODS replacement substances, e.g., HFCs, have been made.

Key recommendations arising from the 9th ORM:

16. Continuation of limb emission and infrared occultation observations from space is necessary for global vertical profiles of many ozone and climate related trace gases. Without such data events like the severe 2011 Arctic ozone depletion cannot be analysed and the underlying processes cannot be quantified.

17. Continuation of ground-based stations with long-term records is absolutely necessary to provide a reliable baseline for trend estimation. The steady decrease in the number of stations, especially for profile

measurements, is starting to endanger the independent monitoring of trends and the capturing of unexpected events, as well as our ability to validate satellite data records.

18. Effort should be expanded to maintain regular, long-term monitoring in key regions for troposphere stratosphere exchange, such as monsoon regions, South-East Asia, the maritime continent and the Tibetan plateau. Measurements should also be targeted to data poor areas like South America, Africa and Asia.

19. Attention must be given to the continuation of stratospheric aerosol measurements. These data allow the analysis of stratospheric transports, and possible changes in the circulation. They become even more crucial after major volcanic eruptions.

20. As most ODSs are declining, other source gases, especially N2O, CH4, and water vapour are becoming more important and will have impacts on the ozone layer. Increased efforts to monitor these gases, understand their changing fluxes, and better assess their impacts will be required.

21. Measurements of emerging ODS substitutes need to be included in the baseline monitoring programmes. Existing archives could be analysed for historic estimates of atmospheric burdens of such gases.

22. The important connection between ozone and climate change and the expected changes in the mean meridional Brewer-Dobson circulation, require monitoring of temperature and trace gas profiles especially of dynamical tracers like N2O and SF6, and of ozone and water vapour in the UTLS.

23. To maintain stewardship of long-term surface UV records, existing measurements of surface UV radiation and related parameters should be continued.

24. As technology and software have matured, new cost effective instruments are becoming available. Efforts should be made to evaluate such instruments for their suitability for deployment in the networks. Where possible, column measurements should be complemented by profile measurements.

25. Public information services need to be further implemented.

D. Data Archiving and Stewardship

Accomplishments since 8ORM and key recommendations arising from the 9th ORM

26. Submission of level-0 Dobson data

- This is an ongoing, but not yet a finalised process.

27. Need for comprehensive reporting of national ODS production and consumption to improve emission inventories continues to be addressed.

- Reporting continues successfully for most ozone depleting substances (ODS), although discrepancies of unknown origin between reported production and atmospheric observations remain for CCl4. Global reporting of non-ODS substitutes (e.g., HFCs to the UNFCCC) is currently insufficient for reconciling global-scale observations. In addition, countries should be encouraged to submit revised production and/or consumption figures from past years, when warranted.

28. The need for workshops to provide training on metadata collection and on the processes for data archiving; and the coordination/communications role for both the WMO Permanent Representatives and/or the Ozone Research Managers will be addressed in recommendations for capacity building.

Key recommendations arising from the 9th ORM:

Make arrangements for more cost efficient and effective data archiving:

29. There is a need to develop robust automated data submission with centralised processing and QA schemes to ensure timely submission, or even near-real-time (NRT) submission, to the appropriate data centre. All necessary information to process and re-process data, for example calibration histories, should be included in the processing facility. Scientific oversight is required. Satellite overpass data should be included with ground station data in the data centre so that initial quality assessments can be performed in near real-time. Databases should be configured to store multiple versions with full traceability.

30. It is necessary to digitise historical data for ozone and related species as well as for ancillary data (e.g., laboratory spectroscopic data, station information, etc.) where available and before the information gets lost, in order to include them in modern database systems.

31. Encourage data providers to submit to existing databases to avoid proliferation of databases and to avoid loss of data after the end of a campaign or project. Responsibilities for data centres should be clearly established.

32. Funding agencies need to recognise long-term archiving as resource-intensive and a critical part of any measurement program. Stewardship and succession must be a consideration. Long-term data preservation (LTDP) must be supported. In particular, Member States of ESA should commit to support the ESA LTDP program.

33. Central data archives for satellite data sets (like the DAAC at NASA) should be established by other agencies, and linked via a central portal (e.g., CEOS portal), on a sustainable basis.
The WDC-RSAT (World Data Centre for Remote Sensing of the Atmosphere, operated by the DLR in Oberpfaffenhofen, Germany) may play this role in Europe. Satellite overpass data and subsets over network stations should be readily available (e.g., a facility like AVDC and TEMIS should be sustained).

34. Enhanced linkage among data centres must be targeted. This requires that data centres work more together and make progress with exchange of metadata and interoperability. Open and user-friendly formats and data access must be encouraged; data that are not open to the community should be uncovered. Different data levels (L0 to L3; merged data sets) may be required for different users. Efforts should be continued to generate homogenous long-term data records from available sources.

35. It should be a responsibility of the data centres to provide tools to re-format, read and view the data.

36. Data publishing with an associated doi, e.g., in Pangeae or ESSD, should be encouraged to provide data to the scientific community and to give recognition to scientists and the funding agencies for providing the data. It may also offer a good solution to the archiving (including traceability) of model output or single datasets.

E. Capacity Building

37. Capacity building for ozone monitoring and research in developing countries and in countries with economies in transition comes from the general commitments anchored in the Vienna Convention. Enhancement of the GAW ozone-monitoring network in all continents and creation of local scientific communities contributing to global ozone science are the main goals of capacity building. In order to increase the awareness of the importance of compliance with the Montreal Protocol, it is of vital importance that each Party to the Protocol has resident expertise in ozone matters. This can be obtained through transfer of knowledge from the industrialised world to the developing countries. One way to accomplish this is through the establishment of monitoring programmes that will produce observational data of value to the WMO/UNEP Scientific Assessments of Ozone Depletion, carried out periodically under the Montreal Protocol on Substances that Deplete the Ozone Layer. Researchers from developing countries should be encouraged to take part in analysis of data and in scientific publications where their data is used. Many developing countries are located in the tropics, and this is also an area of the globe where there is a lack of observations.

38. While there has been progress in capacity building since the 8th ORM, much remains to be accomplished. A number of key activities have been undertaken over the last three years that have had significant impact. In particular:

Educational workshops

- The 13th Biennial Brewer Users Group Meeting, 12-16 September 2011 in Beijing, China.
- The 14th WMO-GAW Brewer User's Workshop, 24-28 March 2014 in Santa Cruz, Tenerife.

One-on-one training

The manager of the Regional Dobson Calibration Centre for South America received training at the World Dobson Calibration Centre in Boulder, Colorado in September/October 2013.

Twinning

In addition, a number of countries have developed twinning relationships that have built both capacity and scientific relationships over this time period. The following are key examples of quality twinning relationships that can be used as models for further endeavours of this kind:

- Finland – Argentina
- Netherlands – Surinam
- Spain – Algeria
- Spain – Egypt
- Spain – Morocco
- Spain – Argentina
- Switzerland – Kenya
- UK – South Africa
- USA – SHADOZ network (Costa Rica, South Africa, Vietnam, Kenya, Brazil, Surinam, Ecuador, Fiji, Indonesia)

39. The 9th ORM also recognizes that a number of other organizations (e.g., WMO GAW) support capacity-building activities such as the German GAWTEC (GAW Training and Education Centre). Nevertheless, capacity building is a long-term activity, and many of the recommendations of the 8th ORM are still fully applicable (see section on Capacity Building under Recommendations, Report of the Eighth Meeting of the Ozone Research Managers).

40. At the 8th ORM it was noted that surplus equipment exists in many developed countries and could be made available for redeployment. Two Dobson instruments, formerly deployed in Norway have been identified by the WMO/GAW Scientific Advisory Group for Ozone (O3-SAG). They will be relocated to Russia and Sri Lanka, respectively, during 2014 and 2015. Plans are to fund these activities under the Vienna Convention Trust Fund for research and systematic observation (see section below). Four additional Dobson instruments as well as Brewer instruments might become available for relocation over the next few years and the O3-SAG will coordinate the relocation of these instruments.

41. At the 8th ORM it was recommended to develop a set of metrics in order to assess the effectiveness of capacity-building activities. It was proposed that these metrics could consist of one or more of the following:

- The number of refereed publications in peer-reviewed journal from scientists in developing economies
- The quantity and quality of data submitted to the WOUDC or other appropriate archives
- Increased involvement in the Ozone Assessment through publications used, authors, reviewers, etc.

42. Extensive work has been carried out on the second bullet point above and this work has revealed that there is a considerable decline in the number of ozone observing stations submitting data to the World Ozone and UV Radiation Data Centre (WOUDC). Work is underway to identify the exact reason for this decline. Although it is assumed that some of the decline is due to station closure, part of the reason could also be due to delays in data submission. Stations are being contacted and urged to submit data in a timely manner.

Key recommendations arising from the 9th ORM:

43. *Provide training courses for station operators in developing countries.* The participants at the 9th ORM expressed the need for more training on measurement techniques, including Dobson, Brewer, and ozonesonde measurements. Such training could be supplemented with on-line materials. This will improve data-taking capabilities and enhance the quality of data records for use in assessment activities. It is important that training include elements of quality assurance and data re-processing when necessary.

44. *Establish fellowships for students from developing countries*. In the framework of Article 4 of the Vienna Convention, the participants at the 9th ORM raised the issue of education and training, and proposed that fellowships be established to allow students from Article 5 countries to study for MSc and PhD degrees at universities in developed countries. These fellowships would not all need to be funded by the Trust Fund, as several developing countries have scholarship programmes, but would require facilitation between relevant universities in non-Article 5 countries and institutes and agencies conducting monitoring and research in Article 5 countries. The relevant involved agencies would be responsible for nominating potential students, who could then return to work on research and monitoring activities following completion of their studies.

45. *Maintaining the quality of the WMO/GAW global ozone observing system through the continuation and expansion of regular calibrations and intercomparisons*. The quality of the data from the ozone-observing networks depends on such exercises. Campaigns aiming at such calibrations and intercomparisons also include transfer of knowledge from experts in developed countries to station managers in developing countries.

46. *Ozonesonde intercomparisons and reprocessing of ozonesonde data.* Intercomparisons of sondes have been ongoing since 1996 through the WMO World Calibration Centre for Ozonesondes (Jülich Research Centre, Germany) but no major activity dedicated to chamber tests by the major groups contributing data to WOUDC has taken place since 2000. With re-processing of the global sonde dataset underway according to the recommendations of the ASOPOS group and with several changes in sonde manufacturers since 2010, it is essential that another JOSIE campaign with representatives of major techniques be conducted. This needs to include a training exercise on how to re-process ozonesonde data for participants of stations from emerging countries.

F. Vienna Convention Trust Fund for Research and Systematic Observation

47. There was a detailed discussion on the accomplishments and on the future of the Vienna Convention Trust Fund for research and systematic observation. Although important activities including calibrations, intercomparisons and a training course have been implemented under the Trust Fund to date, and, despite the fact that these exercises have been useful and successful, the amount of funds in the Trust Fund is not sufficient to make substantial and sustainable improvements to the global ozone observing system. It was agreed that, rather than inviting the parties to contribute funds to the Trust Fund in a general and routine manner, it would be better to ask for support for well-defined and well-budgeted, concrete activities, with clear explanations of their necessity, expected outcomes and benefits. There was agreement that such an approach will make it clear to the donors what the “return on the investment” will be, and help to raise more funds in the future.

48. It was proposed and agreed that WMO and the Ozone Secretariat should establish a steering committee for the Trust Fund. This steering committee should consist of members of the Scientific Assessment Panel, individual scientists with expertise in ozone observations and a representative of WMO and Ozone Secretariat. This steering committee should develop a long-term strategy and implementation objectives and priorities. The objectives should be developed in the light of the four Overarching Goals given above. In addition to the long-term strategy one also needs a short-term action plan that takes into account the most urgent needs of the global ozone observing system and which will make the best possible use of the money currently in the fund.

Key recommendations arising from the 9th ORM:

49. ***Long term***

WMO and the Ozone Secretariat should establish a steering committee for the Vienna Convention Trust Fund for research and systematic observation. The committee will develop a long-term strategy, objectives and priorities for the Trust Fund as described above, and advise on the activities under the Trust Fund, including on development of proposals, prioritization and implementation.

50. ***Short term***

The following areas were identified as the priority objectives for the Trust Fund in the near future:

- Capacity building in developing countries
- Inter-calibration of instruments and training of instrument operators
- Increasing the number of ozone observations

51. The specific projects that will be accorded priority for financing by the Trust Fund in the next 3 years (the 2014-2016 time period) are listed below. Their implementation and results will be reviewed at the next ORM meeting. The costs given for the projects are approximate, and add to a total of US $255,000. The current amount of available funds in the Trust Fund is US $101,626.

Late 2014

- Relocation of Dobson no. 14 (formerly deployed in Tromsø) to Tomsk, Russia. Cost US $20,000.
- Relocation of Dobson no. 8 (formerly deployed in Spitsbergen) to Sri Lanka. Cost US $20,000.

2015

- Dobson intercomparison campaign for Asia, hosted by the Japanese Meteorological Agency. Cost US $50,000.
- Dobson intercomparison campaign for Africa, hosted by the South African Weather Service. Cost US $50,000.
- Relocation of Dobson observation hatch from Arosa, Switzerland to Nairobi. Cost US $15,000.
- Training course on ozone measurements with the Brewer instrument in conjunction with a Brewer User Group’s Meeting, to be held in Thailand during April or May 2015. Cost approximately US $40,000 to cover the participation cost of a number of participants from developing countries. Approximately half of this can possibly be covered by funds from the Canadian Brewer Trust Fund.

2016

- Dobson intercomparison campaign for Australia and Oceania, hosted by the Australian Bureau of Meteorology. Cost US $30,000.
- Dobson intercomparison campaign for South America, hosted by the National Meteorological Service of Argentina. Cost US $50,000.