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# FUTURE PATH OF THE WORLD CLIMATE RESEARCH PROGRAMME, RELEVANCE TO IOC, AND THE PROPOSED WCRP BUDGET AND EXTRA-BUDGETARY RESOURCES SOUGHT FOR 2008–2009

Summary. This document provides an update on main activities in 2007 and presents the overall directions of the future development of WCRP ocean climate research in the interests of IOC.

In February 2007 the WCRP (see http://wcrp.wmo.int) provided a concise report to IOC Member States on WCRP oceanographic activities up to the end of 2006. A WCRP Questionnaire to IOC Members States was attached to the report. As only few responses have been received to the Questionnaire to date, it will therefore remain accessible online (http://wcrp.ipsl.jussieu.fr/IOCQuestionnaire.html). Submission of responses from IOC Member States is strongly encouraged. This document provides an update on main activities in 2007 and presents the overall directions of the future development of WCRP ocean climate research in the interests of IOC.

The Joint Scientific Committee for WCRP discussed how to further progress WCRP science in order to meet sponsors and stakeholders needs at its 28th meeting in Zanzibar, United-Republic of Tanzania, on 26–30 March 2007 (JSC-28). In accordance with the WCRP Sponsors' Agreement, approximately one third of the JSC members have an oceanographic background. Their active participation in the discussions of the JSC-28 helped to ensure that ocean research aspects of climate science continue to be one of the main drivers for WCRP's activities and directly contribute to the IOC High Level Objective 1 and 3 of the four strategic areas in the 'IOC Medium-term Strategy for 2008–2013'. The meeting reviewed the progress of WCRP and the ways of delivering value to Sponsors and other stakeholders through progress towards the two overarching goals set for WCRP: to determine the predictability of climate and the human impact on climate. This report briefly reviews the on-going and planned activities.

**Human impact on climate and the role of ocean in it**

Future climate change and the critical role the ocean plays in it, and its impacts on society in general and, therefore, on IOC Member States have been in the centre of attention of the work of WCRP. It is widely acknowledged that WCRP research has underpinned the conclusions of the WMO/UNEP IPCC Assessments including its most recent Fourth Assessment Report (AR4), especially with respect to the physics of climate change. Assessment and detection of past changes and projection of future change in the ocean are covered in Chapters 5, 8, 9, and 10 of the AR4 Working Group I report ("The Physical Basis of Climate Change"). WCRP results also underpin several chapters in the Working Group II report ("Impacts, Adaptation and Vulnerability"). They reflect a better understanding of the impacts of climate change on the Earth as a whole and the ocean in particular, including:

- ocean acidification,
- bleaching of coral reefs and stress on multiple other ecosystems,
- estimates of changing sea levels with the consequent impact on coastal regions, and
- potential changes in the frequency or intensity of extreme events such as tropical cyclones and their coastal impacts.

To further strengthen WCRP's contribution to climate change research, including greater understanding of the role of the ocean in it, the JSC-28 agreed to establish a major crosscutting initiative on future research on **anthropogenic climate change** (**ACC**). Three other major WCRP climate change–related initiatives the JSC agreed to proceed with were (i) an activity to address changes of atmospheric chemistry, which *inter alia* create the greenhouse effect on climate and lead to its warming (this initiative entitled **atmospheric chemistry and climate** - **AC&C -** is joint with the International Geosphere–Biosphere Programme, IGBP), (ii) a continuing WCRP effort aimed at getting more accurate and reliable estimates of future **sea-level rise**, and (iii) a major undertaking on better understanding and prediction of **extreme events in a changing climate** (see the short description below). The new major WCRP initiatives in this area will thus cover research on the causes of climate change (**AC&C**), detection of climate change and prediction of its future state (**ACC**) and a range of activities aimed at assessing the impacts of climate change including impacts on the ocean.

Indeed, analysis of the responses to the WCRP Questionnaire to IOC Member States shows that the respondents consider it important to not only understand the causes of and predict future climate change, but also **to systematically address the impact of climate change on, in particular, ocean ecosystems, living and non-living marine resources and the coastal regions**. WCRP's climate change detection and prediction form the foundation for any programme that addresses the full breadth of climate change impacts. The development of a comprehensive *impacts* project would nevertheless go beyond WCRP's current mandate and it is therefore essential that WCRP partner with IOC and other programmes to adequately address these issues.

Development of further activities in which WCRP would of necessity play a major role, requires careful consideration and planning as well as the agreement and commitment of IOC Members. Views of IOC Members on the usefulness of such an initiative and their readiness to participate and contribute resources to it are invited. The 2008 ICES-PICES-IOC Symposium on Effects of the Climate Change on the World's Oceans (Gijón, Spain, 19–23 May 2008), to which WCRP is actively contributing, will set the stage for discussion of how these needs can be most appropriately met.

However, WCRP also recognizes these issues are both important and urgent. During 2006, IOC hosted a major WCRP Workshop on Understanding Sea-level Rise and Variability. The meeting Summary Statement is part of the WCRP documentation for this Assembly, and a book resulting from the conference will be completed later this year. Copies will be distributed to conference attendees and to IOC Least Developed Countries representatives. The Meeting was very successful, and as a result there is now a new initiative being formulated, in partnership with others, to hold a workshop on the coastal and island impacts of sea-level rise.

While expected changes in ocean physics are comparatively well represented in existing climate projections, the domains of ocean chemistry and biology are a fairly recent addition to the coupled models used for climate assessment. The SOLAS project (which WCRP co-sponsors – see below) conducts innovative research on the complex nature of biogeochemical interactions between the oceans and atmosphere. Impacts of atmospheric dust transport on algal blooms and the effectiveness of the ocean carbon sink mechanism, production of sea salt aerosols and their effect on the variations of the cloud cover, and reduced calcification of some organisms due to acidification of the ocean water are among the recent results obtained by SOLAS researchers.

**Predictability of climate**

The ocean plays a key role in the variability of climate on a wide variety of timescales. Following the successful WCRP research on predictability of El Niño and development of its operational prediction at the seasonal scale, WCRP is extending significantly its work on predictability. Current WCRP crosscutting initiatives in this area include **seasonal prediction, decadal predictability and prediction of monsoons**.

Prediction of temperatures and precipitation on the seasonal scale is fast developing and has already shown its potential for being interpreted in terms of predictions of future crops, water availability and health conditions. Predictions of El Niño are of critical importance for Pacific fisheries. Further applications of seasonal forecasting serving other areas of societal benefit (e.g., severity of winters, strength and timing of monsoons, character of tropical cyclone seasons, implications for agriculture, the energy sector, coastal zone management, maritime transport, etc.) will become of increasing importance and value as prediction skill improves and these applications are further developed.

As part of its cross-cutting activity on seasonal prediction, WCRP is organizing a coordinated experiment using coupled ocean-atmosphere models to test the hypothesis that there is as yet untapped seasonal predictability in the climate system due to the interactions among its various elements (atmosphere, ocean, land, ice). The experiment will be launched at a major WCRP

international workshop on seasonal forecasting (Barcelona, Spain, 4–8 June 2007), which will also seek to summarize our current understanding of, and capabilities in, seasonal prediction.

Decadal predictability is a new initiative of the WCRP aimed at exploring the possibilities for prediction of the most significant modes of variability in the ocean —atmosphere system on decadal timescales. Such modes of variability as the Pacific Decadal Oscillation, North Atlantic Oscillation and some others have significant impact on national economies. These modes tend to be associated with large-scale anomalies in the depth of the ocean thermocline, and they may have different manifestations in each of the world oceans. Detection of the thermal and current anomalies in the thermocline by ocean data assimilation and subsequent production of the ocean reanalysis fields (see below) makes it possible for WCRP to conduct experiments, which will give, for the first time, estimates of the impact of changing ocean conditions on long-term variability of atmospheric circulation so that its predictable modes could be identified. This innovative oceanographic research has the potential to contribute to the welfare of many nations.

Building on its past work in this area and a number of upcoming regional programmes, WCRP is enhancing its efforts in understanding and prediction of monsoons and their variability on all continents, which themselves impact approximately one third of the world's population. In this context, WCRP, in collaboration with IOC as part of the GOOS Programme and others, is working to enhance the ocean observing system in the Indian Ocean as well as in the Atlantic and Pacific Oceans to benefit monsoon prediction and seasonal prediction more widely.

Future efforts in this area, but with focus on seasonal to decadal timescales, could form a component of the potential future programme on climate change impacts on the ocean referred to above.

**Other overarching new initiatives**

One of the IOC High Level Objectives for 2008–2013 is the prevention and reduction of the impacts of natural hazards. One of the key impacts of climate change is the increasing vulnerability of the world to extreme events. On this understanding, the JSC-28 considered in detail and endorsed the initial scoping of a WCRP crosscutting activity on **climate extremes**. Not only will WCRP contribute to better assessment of extreme events, such as heat waves, droughts and floods, frequency and intensity of tropical and extra-tropical cyclones, extreme sea levels and storm surges, and extreme precipitation events associated with climate variability but it will also facilitate the use of predictions of future climate change in decision making. Coastal impacts will constitute an inherent part of this initiative.

WCRP is contributing a significant effort into the science programme of the International Polar Year 2007–2008 (**IPY**) and climate research is high on the IPY agenda. Approximately 30 IPY projects are affiliated with WCRP. Many of them are of oceanographic character. For example, WCRP provides the lead for the Climate of Antarctica and the Southern Ocean IPY project. WCRP was instrumental in developing the concept of the interagency IPY polar satellite snapshot, which will provide, for the first time, a full image of the polar regions during IPY. WCRP is leading the Group on Earth Observations task on IPY legacy in terms of data and observations. IPY has already been successful at forming connections —between scientists in different disciplines, and with the general public. People are more aware now of the important links between the polar regions and the rest of the global climate system. Record low summer time Arctic sea ice extents have been observed over recent years with some models predicting a complete loss of summer time Arctic sea ice cover by the end of this century. Such an event would have major impacts on Arctic ecosystems, including fisheries, as well as regional and global climate more widely. Greenland is melting at an unprecedented rate, and will directly impact sea levels around the world with significant impacts for coastal regions and small island States. It is therefore critical that the future of the Greenland Ice Sheet is understood if we are to adequately respond to rising sea levels. The impact of the Greenland melt on ocean thermohaline circulation is less clear and needs

further observations and study. IPY, and the recent IPCC report has put this on centre stage and highlights the need for increased research in predictions of ice sheet and glacier melting.

**WCRP approach to better climate predictions, with focus on the oceans**

The WCRP works individually and with relevant partners to improve climate-related observations, including those for the oceans, encourage their use in data assimilation, improve the understanding of relevant processes and represent them in climate models used in numerical prediction. An outline of recent developments in this area is as follows.

Observations

Together with GCOS and GOOS, WCRP is a sponsor of the GOOS-GCOS-WCRP Ocean Observations Panel for Climate (OOPC), which had its 12th Session in IOC Paris from 2 to 5 May 2007 and reviewed the state of ocean climate observations. During 2006 and 2007 WCRP worked actively to update requirements for ocean observations in the planned contribution of the Committee on Earth Observation Satellites to the Implementation Plan of the Global Climate Observing System. WCRP works with satellite agencies to ensure the continuity of ocean observing sensors on Earth satellites. WCRP is a member of Group on Earth Observations and leads work on several items in the Global Earth Observation System of Systems Work Plan for 2007–2008.

Together with IOC, WCRP will be one of the organizations, with OOPC, leading the preparations of a new major international conference on Ocean Observations, probably in 2009.

WCRP projects, especially CLIVAR, develops pilot studies and research arrays which are the seed bed for future operational ocean platforms. Excellent past examples include TAO/TRITON, Argo, PIRATA, and surface drifters. Significant progress has been recently achieved with planning and implementation of observing system in oceans surrounding Africa. They include support for an extension to PIRATA in association with the Tropical Atlantic Climate Experiment, now underway, which has the goal to advance the understanding of coupled ocean-atmosphere processes and improve climate prediction for the Tropical Atlantic region. CLIVAR, in collaboration with IOC and Indian Ocean GOOS is continuing to provide coordination of the implementation of an integrated observing system for the Indian Ocean. Developments to the Indian Ocean observing system are described in the October 2006 edition of CLIVAR Exchanges which was devoted to the subject of Indian Ocean climate and is obtainable from the CLIVAR website www.clivar.org. In the Pacific the TAO/TRITON array provides essential data for predictions of ENSO. CLIVAR coordinates with the Tropical Moored Buoy Implementation Panel (an action group of the WMO/IOC JCOMM Data Buoy Cooperation Panel), which plays a key role in overseeing the development and maintenance of the tropical buoy networks. Using the opportunity of IPY, the WCRP CLIVAR and Climate and Cryosphere projects are fostering the development of new observing systems in the Arctic and Southern Oceans. The role of these systems for future climate prediction, including monitoring and prediction of the Meridional Overturning Circulation, cannot be overestimated. With the rapid reduction in Arctic sea ice extent, Arctic shipping is expected to increase significantly. Safety, management of ecosystems, tourism, lifestyles of Arctic residents and erosion of coastal zones will all require reliable predictions of sea ice and ocean conditions. At the same time, the challenge of observing the ocean temperature and salinity under the remaining sea-ice cover requires novel technical solutions.

GODAE, (ocean) reanalyses and data synthesis

Meteorological reanalysis has revolutionized atmospheric studies and enabled multiple data applications. Building on the achievements and experience of the OOPC's Global Ocean Data Assimilation Experiment (GODAE), WCRP has been actively engaged in coordinating the development and assessment of systems for ocean reanalysis. The CLIVAR Global Synthesis and

Observation Panel is overseeing this process. Ocean reanalysis provides the potential and is intended to become the main means of detecting changes in the ocean, providing initial conditions for climate prediction at various scales and serving as an ocean model verification and development tool. Approximately 15 research groups participate in these ocean reanalysis activities. Both atmospheric and ocean reanalysis are necessary steps towards full climate system reanalysis.

A 3rd WCRP Reanalysis Conference is planned to take place in Tokyo, Japan, from 28 January to 1 February 2008 to take stock of developments in this area. Recent completion of the Japanese reanalysis project, updates on the ECMWF and NCEP/NCAR reanalyses, emerging regional reanalyses, and the availability of new estimates of oceanographic forcing parameters offer unprecedented opportunities for running ocean circulation, wind wave and other models to provide improved estimates of ocean parameter trends with increased certainty and detail.

The first Atlas of the WOCE Hydrographic Programme for the Southern Ocean was presented to the 23rd IOC Assembly in 2005. The work on the Atlases continues. The final version of the Atlas for Pacific and draft for the Indian Ocean are now accessible online (http://www-pord.ucsd.edu/whp_atlas) and WCRP plans their publication in 2007.

Ocean and Climate Model Development

Through the concept of 'coordinated ocean and sea ice reference experiments', the WCRP/CLIVAR Working Group on Ocean Model Development (WGOMD) is using a commonly accepted standard for forcing of ocean and sea ice models to assess their quality against standard metrics. A workshop on Numerical Methods in Ocean Models and a 7th meeting of the group will take place in Bergen, Norway, on 22–24, and 24, 25 August 2007, respectively. The WGOMD provides guidance on the development of ocean circulation models, on global, ocean basin and high resolution regional scales. A need to pay serious attention to the development of coastal models was highlighted in the responses to the WCRP Questionnaire to IOC Members States. Such an effort would need to be developed by IOC in collaboration with WCRP in the context of the new climate impacts programme.

Ocean and climate modelling will be on the agenda of a WCRP Modelling Summit, which is tentatively planned for 2008. The WCRP Working Group on Coupled Modelling (WGCM) will continue its role in development of a wide range of coordinated coupled model climate experiments with continuing focus on coordination of IPCC model runs. Indeed the IPCC AR4 motivated the formulation of the largest international global climate model experiment and multi-model analysis ever attempted. This was organized through the WGCM Climate Simulation Panel with the help of the Program for Climate Model Diagnosis and Intercomparison (PCMDI, USA). The resulting WCRP archive of climate model runs for IPCC AR4 held at PCMDI, which contains 33 Terabytes of data in 76,000 files, continues to attract huge interest by the scientific community. Already more than 200 Terabytes of data has been downloaded by participants in 553 diagnostics subprojects. A significant portion of these projects focuses on interpretation of model projections in terms of studying the changing ocean in a warming climate.

Climate Prediction and Projection

Advances in observations, process understanding and modelling form the foundation for future climate prediction. WCRP has started its work with IPCC in preparing for a fifth IPCC assessment: WCRP will actively contribute to formulation of climate change forcing scenarios, model development, coordination of model runs and archiving and analysis and interpretation of results. A GCOS-WCRP Workshop on Anthropogenic Climate Change is planned in Sydney, Australia on 4–6 October 2007. WCRP actively works with UNFCCC and the Subsidiary Body on Scientific and Technological Advice (SBSTA) for the Conference if its Parties supplying them with requirements for continuing science research.

**Recent examples of other ocean research —relevant developments in WCRP core projects and working groups**

*CLIVAR* is the main WCRP project dealing with oceans. In addition to the information given in this document, there are multiple advances in other areas of CLIVAR ocean research —please refer to the project website (http://www.clivar.org), including the CLIVAR SSG's Report to JSC-28 which can be found at http://www.clivar.org/organization/ssg/ssg.php.

*GEWEX* (http://www.gewex.org) is the main WCRP project focusing on the cycle of energy and water. It has recently achieved advances in reproducing ocean fluxes using satellite data (through its SeaFlux Project). Multiple GEWEX data sets on global and regional hydrological cycle have become available, some of them including oceanographic data, e.g. the BALTEX project.

*CliC* (Climate and Cryosphere project, http://clic.npolar.no) has completed, in partnership with its cosponsor, the Scientific Committee on Antarctic Research (SCAR), an IGOS Theme report on cryospheric observations (including sea ice, ice shelves, icebergs and polar marine observations —see http://igos-cryosphere.org). It has also initiated a project on Southern Ocean Physical Oceanography and Cryospheric LinkagES (SOPHOCLES). Such projects are necessary to study complex process in the climate system and existing feedbacks in it, for example the ice – albedo feedback.

*SOLAS* (http://www.solas-int.org) is a project sponsored together with the International Geosphere–Biosphere Programme (IGBP), the Scientific Committee on Oceanic Research (SCOR) and Commission on Atmospheric Chemistry and Global Pollution (CACGP). This project held its second international science conference in Xiamen, China, on 6–9 March 2007. SOLAS and CLIVAR cooperate with IOC on studying the ocean carbon cycle and complement IOC activities with additional research.

In collaboration with the WMO/CAS WCRP *Working Group on Numerical Experimentation*, the WCRP *Working Group on Surface Fluxes* has reinvigorated a project, SURFA, that intercompares air-sea fluxes produced by numerical weather prediction models with observations at buoys, aimed at assessing and helping to improve the quality of simulation of ocean-atmosphere interactions in predictive models.

**Work with other partners**

WCRP ocean climate research is conducted in collaboration with IOC, including IOCCP and GOOS, GCOS, IGBP, SCOR, SCAR, the Arctic Ocean Sciences Board, the International Arctic Science Committee and other international organizations and groups. However, more direct links between WCRP and IOC Regional Programmes and as well National Oceanographic Committees need to be established or strengthened. A JPS staff member Dr Vladimir Ryabinin is assigned to be WCRP contact point for IOC, its bodies, and Member States.

**Recent and planned capacity building events**

Almost all WCRP regional activities have an element of capacity building. Representatives from least developed and developing countries are invited to participate in Panel meetings, workshops as members or invited experts. Some of such activities are discussed below.

The CLIVAR Variability of the African Climate System (VACS) panel, with funding support from various organizations, ran a training workshop at the Tanzania Meteorological Agency (TMA) in Dar es Salaam, Tanzania during 10–13 July 2006. The workshop, entitled *Predictability and Prediction of southern and eastern African climate variability and impacts of the neighbouring oceans*, ran for four days and was aimed at senior operational staff responsible for long range forecasting at national meteorological services and operational staff from related agencies (hydrology, water resources, oceans). In all there were around fifty participants from over twenty

countries. Ocean agencies staff attended from Angola, Kenya, Mozambique, Namibia, South Africa, and Tanzania. An interactive CD was put together for the participants covering the workshop materials.

Plans are now being laid for follow-on workshops aimed at training African scientists to help train their fellows in the application of climate prediction tools. A WCRP African networking event was held on 28 March 2007, in Zanzibar, as part of the WCRP JSC-28. A number of young African scientists presented posters on their research related to African climate variability and change.

An electronic African Climate Atlas, aimed at capacity-building and developed at the University of Oxford, UK, through VACS is being extended to include a fifth outreach section devoted to answering Frequently Asked Questions about African Climate for e.g. journalists, educationalists etc. The other four interactive parts cover Climatology, Anomalies, Aerosol Index, Pressure level climatologies and composites from the ECMWF 40-year reanalysis. (http://www.geog.ox.ac.uk/%7eclivar/ClimateAtlas/)

CLIVAR and GEWEX both co-sponsor the international African Monsoon Multidisciplinary Analysis programme. One of the goals of AMMA is to provide the underpinning science that relates variability of the West African Monsoon to issues of health, water resources, food security and demography for West African nations and defining and implementing relevant monitoring and prediction strategies. CLIVAR efforts in the Atlantic Ocean will provide oceanographic input to AMMA. These are described in the April 2007 edition of CLIVAR Exchanges (obtainable from the CLIVAR website) which was devoted to AMMA. More widely, the developing Indian Ocean network by CLIVAR and IOC/GOOS in which a number of regional agencies are involved will provide important input for seasonal forecasting over the African continent. Needs for Indian Ocean data for research in Africa were discussed at the recent 4$^{th}$ meeting of the IOC/GOOS-CLIVAR Indian Ocean Panel (Pretoria, South Africa, 23–25 April 2007) in which a number of African scientists were involved. CLIVAR also conducts investigation into the role of warm water pools in the Caribbean. Studies of tropical eastern North Pacific are important for predicting anomalies of seasonal rainfall in Central America and the Caribbean.

In the South East Pacific, the CLIVAR Variability of the American Monsoon (VAMOS) Ocean-Cloud-Atmosphere-Land Study (VOCALS) has a major oceanographic component, including mesoscale and coastal oceanography in which oceanographic institutes/agencies in Chile and Peru are playing a significant part. A major field programme is planned for autumn 2008, which will involve many oceanographic institutions from the region as well as meteorologists and climatologist from Latin America. A VOCALS education and outreach program is currently under development.

A WCRP workshop in Trieste, Italy, on 26–30 May 2007 will help developing countries to make efficient use of the WCRP archive of climate model runs for IPCC AR4, which is described above in the Section on Ocean and Climate Model Development. This workshop will enable the scientists to access the climate change projections and use them for estimating and assessing the regional impacts including impacts on the coastal zones and regional seas.

Together with the World Climate Programme, and WMO Education and Training Programme, WCRP is preparing a workshop on climate services for polar regions, to be held in Russia at the end of 2007.

**Funding requirements**

Meteorology and oceanography are international by their nature. The overall investment into value of global climate research is or order of 10 Billion US$ (equivalent). Less then 0.1% of this amount is spent on international coordination and therefore programmes like WCRP provide a very efficient international coordination mechanism for global climate research. Climate change issues are becoming increasingly more and more important for sustainable development and achieving

the UN Millennium Development Goals. Climate observations and research underpin virtually every decision depending on future environmental conditions. The most recent IPCC Assessment made it clear that climate research is developing successfully and that climate change impact on all aspects of the life of society makes its facilitation and coordination by WCRP needed even more now and in the future.

The WCRP budget is under intense pressure. Unless further funds can be found, WCRP will need to reduce activities. WCRP is funded through the Joint Climate Research Fund (JCRF). The funding from the World Meteorological Organization that goes to the JCRF is determine by the World Meteorological Congress. With the zero nominal growth approach, the planned WMO contribution to the JCRF during 2008–2011 is estimated as CHF 7'594'000, which is roughly equivalent to US$ 1'582'000 per year (1 US$ ~ CHF 1.2). ICSU has been traditionally contributing to JCRF US$ 300'000 per year and it seeks to increase its support to WCRP to compensate at least for the recent decline of the rate of exchange of US$. The operation of the JCRF is managed by the WMO, and in 1993–2005 WMO planned the WCRP budget execution based on expected contribution from IOC of US$ 250'000 annually.

The WCRP acknowledges the decisions of the 23rd IOC Assembly (2005) and 39th Executive Council (2006) to fund its contribution to the WCRP Joint Climate Research Fund (JCRF) from the IOC Regular Budget and sees them as a positive step aimed at achieving a reliable source of funding for the JCRF, which is fully in line with IOC obligations stemming from its Agreement with WMO and ICSU to sponsor the WCRP.

On the understanding of the multiple important responsibilities of IOC and that its budget is under significant pressure as well (as is the WCRP Budget), realizing that it will be very difficult for IOC to increase its actual contribution to the JCRF, and at the same time recognizing the highest value of the ocean climate research, both for WCRP and IOC, the WCRP asks the IOC to confirm that it will continue with the same contribution to the JCRF as agreed by IOC-23 and EC-39, i.e., US$ 125'000 per year paid, preferentially, in the first quarter of a calendar year. Starting in 2005, this level of expected contribution by IOC has been used by WCRP in its planning process.

Extension of ocean climate research with inclusion of more activities aimed at adaptation and mitigation of climate change on the oceans will require contributions to the special IOC Trust Fund for WCRP by IOC Member States.

**WCRP at the 24th IOC Assembly**

There will be a WCRP stand with posters at IOC-24. Dr Ann Henderson-Sellers, the Director of WCRP, and Dr Howard Cattle, the Director of the WCRP International CLIVAR Project Office will be available for consultations on the day of WCRP report to the Assembly which will be given by Dr John Church, the Chair of the JSC for WCRP. Dr Ryabinin of the WCRP Joint Planning Staff will be available for discussion of cooperation with WCRP throughout the entire meeting.

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