

Quadrennial Report (2015 - 2019) of the International Commission on Climate (ICCL) of the International Association of Meteorology and Atmospheric Sciences (IAMAS)

Neil Holbrook (President) and Jianping Li (Executive Secretary)
July 2, 2019

1. Introduction

The interests and concerns of the **International Commission on Climate (ICCL)** extend across all areas of climate science (climate variability and climate change) – as well as impacts and adaptation – and on all times scales. The potential scope of the ICCL is very large. There is considerable activity in the climate space, with numerous programmes ongoing, including the World Climate Research Programme (WCRP), Intergovernmental Panel on Climate Change (IPCC), and the Climate Variability and Predictability Programme (CLIVAR), to name just a few. There are also many organisations and activities ongoing around the world.

In an attempt to complement some of the important ongoing activities and programmes around the world, the ICCL has focused its efforts over the past several years on contributing to, and better understanding, two topic areas in climate science. These are: (1) decadal climate variability, and (2) extremes – with the extremes' focus being on marine heatwaves, an area that is poorly understood. First, there is still a way to go to understand the key mechanisms that underpin decadal climate variability. Improving understanding of decadal climate variability is essential in order to improve the prospects for better decadal climate prediction – one of the WCRP Grand Challenges (near-term prediction). Second, understanding climate extremes (including heatwaves) is also one of the WCRP Grand Challenges. Several **ICCL contributed publications** have been produced around these themes (see **Section 6**).

2. Membership

Dr Toshiyuki Nakaegawa (Japan), Dr Juan Feng (China), Dr. Zhaomin Wang (China), Dr. Seok-Woo Son (South Korea), Dr. Léon Chafik (Sweden) and Dr. Emilie Capron (Denmark) have been appointed as new members of the ICCL in the past four years. Prof Neil Holbrook and Prof Jianping Li were re-elected as President and Executive Secretary, respectively, of ICCL at IUGG2015 in Prague, Czech Republic. The ICCL currently

comprises of 30 members, including two Executive members, 16 regular members and 12 Emeritus members.

Full membership details are provided in **Appendix A**.

3. Summary of ICCL contributions to the IUGG 2019 Conference

The ICCL (co-) organised and (co-) sponsored five (5) IAMAS symposia and two (2) Joint symposium for IUGG 2019 Assembly in Montreal, Canada.

Details of these symposia are provided in **Appendix B**.

4. Summary of ICCL contributions to the IUGG 2015 Conference

The ICCL (co-) organised and (co-) sponsored five (5) IAMAS symposia for the IUGG 2015 Assembly in Prague, Czech Republic.

Details of these symposia are provided in **Appendix C**.

5. Summary of ICCL contributions to the IAPSO-IAMAS-IAGA 2017 Conference

The ICCL (co-) organised and (co-) sponsored six (6) IAMAS symposia and one (1) Joint symposium at the IAPSO-IAMAS-IAGA 2017 Conference in Cape Town, South Africa.

Details of these symposia are provided in **Appendix D**.

6. ICCL workshop contributions to climate science

ACTIVITY 1

The **13th General Circulation Model Simulations of the East Asian Climate (EAC) workshop** took place at Beijing Normal University in Beijing, China from 24-25 March 2016 with about 100 participants, among which 13 were from Japan, South Korea, USA, and about 50 were students and early careers researchers. The workshop was organised by Beijing Normal University, National Natural Science Foundation of China (NSFC), Ministry of Science and Technology (MOST), State Key Laboratory of Numerical Modelling for Atmospheric Sciences and Geophysical Fluid Dynamics (LASG), Institute of Atmospheric Physics (IAP), Chinese Academy of Sciences, the International Commission on Climate (ICCL), and IUGG Union-Commission on Climatic and Environmental Change (CCEC).

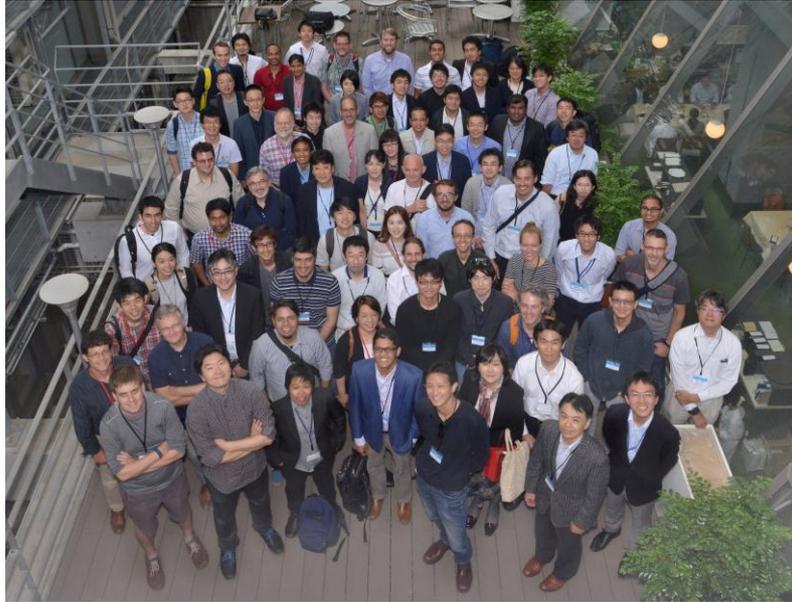
The workshop included 4 sessions (1. Detection and Attribution, 2. Climate Variability, 3. High-Impact Weather and Extremes, and 4. Predictability, Prediction and Projection) with 33 Oral presentations and 34 posters.



ACTIVITY 2

The **Fourth international conference of Hydrology delivers Earth System Sciences to Society (HESSS)** took place from 16 to 19 May 2017 in Tokyo, Japan. The series of workshops have provided forums for strengthening synergies between the modelling and monitoring research communities in hydrology and water resources since 2007. This fourth conference was hosted by the Institute of Industrial Science, the University of Tokyo (IIS) and co-sponsored by ICCL/IAMAS and the GEWEX Global Land Atmosphere System Study (GLASS) Panel. The workshop focused on “Climate Extremes and Global Energy, Water and Carbon Cycles: Improving and Integrating Knowledge Across Disciplines” and discussed on-going model intercomparison projects (MIPs) including both natural and anthropogenic hydrological cycles: the Global Soil Wetness Project Phase 3 (GSWP3), the Inter-Sectoral Impact MIP (ISIMIP), Earth System Model-Snow MIP (ESM-SnowMIP), Land Surface, Snow, Soil-moisture MIP (LS3MIP) and Land Use MIP (LUMIP).

The workshop provided five symposium sessions in the program on the following topics: (1) Changes of Climate Forcing and Terrestrial Feedback, (2) Changing Climate and the Natural-Human System, (3) Satellite Remote Sensing and Model Integration, (4) Uncertainties in Model Simulations, and (5) Delivering Science to Society.



4th International Conference of the Hydrology delivers Earth System Science to Society
2017, May 16-19

ACTIVITY 3

Workshops: Understanding Marine Heat Waves

Workshop 1: Physical Drivers and Properties of Marine Heat Waves

Venue: Oceans Institute, University of Western Australia

Dates: 19-21 January 2015

Conveners: Thomas Wernberg (University of Western Australia), **Neil Holbrook** (President ICCL, University of Tasmania), Eric Oliver (University of Tasmania), Dan Smale (Marine Biological Association, UK)

Objective: *To define marine heat waves, and examine temporal trends in their frequency, magnitude, and distribution, using both historical hand-collected temperature datasets, more recent remotely-sensed datasets at global scales, and where possible climate models*

Brief Description:

The conveners co-lead a targeted three-day workshop on marine heat waves – an area of research that is currently in its infancy – from 19-21 January 2015 at the University of Western Australia. The workshop brought together 15 invited international participants from the United Kingdom (Plymouth, Aberystwyth (Wales) and Oban (Scotland)), United States of America (Portland, Maine), and Australia.



Workshop: Physical Drivers and Properties of Marine Heat Waves, Oceans Institute, University of Western Australia, 19-21 January 2015.

Five theme areas were considered during the workshop, and tackled in both breakout group and plenary sessions. These themes comprised:

- #1: Drivers and mechanisms of marine heat waves
- #2: Refining definitions of marine heat waves and how to measure them
- #3: Changing frequency of marine heat waves from observational records
- #4: The spatial distribution of marine heat waves
- #5: Climate projections and the detection and attribution of marine heat waves

Outcomes: Key outcomes of the workshop were:

- 1) A hierarchy of definitions for marine heat waves (led by Alistair Hobday)
- 2) An improved understanding of the links between climate drivers, ocean processes and marine heat waves globally (led by Neil Holbrook)
- 3) An improved understanding of the spatial and temporal distribution of marine heat wave trends globally (led by Eric Oliver)

Outputs: Three substantial manuscripts drafted. These are:

- 1) Paper entitled “A hierarchical approach to defining marine heatwaves (Hobday et al. 2016)
- 2) Paper entitled “A global assessment of marine heatwaves and their drivers” Drivers” (in prep., and led by Assoc Prof Neil Holbrook)
- 3) Paper entitled “Ocean warming brings longer and more frequent marine heatwaves” (submitted, and led by Dr Eric Oliver)

Acknowledgments: Funding and/or co-sponsorship for the first workshop included a University of Western Australia Research Collaboration Award, a UWA School of Plant Biology Synthesis Grant, the ARC Centre of Excellence for Climate System Science, with the workshop making a contribution to the interests and activities of the International Commission on Climate of IUGG.

Workshop 2

A separate paper is being prepared that will link the marine heatwave definition and physics to marine ecological impacts. This was advanced at a second workshop held in Plymouth, UK, in July 2015.

Workshop 3

A third international workshop, entitled “Marine Heatwaves – Global Patterns of Impacts and Risks”, was held at Ao Nang Beach, Krabi, Thailand from 21-23 February 2017. This workshop was funded by a UK National Environmental Research Council (NERC) grant. The key motivation for this third workshop was to better connect biological impacts with marine heatwave event frequencies, intensities and duration. Various papers are being drafted from this workshop that will make contributions to the ICCL. The co-conveners of this workshop were Dan Smale (MBA, UK), Thomas Wernberg (University of Western Australia), Neil Holbrook (President ICCL, University of Tasmania) and Eric Oliver (University of Tasmania). There were 10 international participants from Australia, New Zealand, and UK.

ACTIVITY 4

Training School on stratosphere-troposphere interactions

Venue: University of Cape Town, Cape Town, South Africa

Dates: 2-5 September 2017

The IUGG/WCRP-SPARC training school on stratosphere-troposphere interactions is jointly organised by SPARC (Stratosphere-troposphere Processes And their Role in Climate, a core project of the World Climate Research Programme), the Climate Systems Analysis Group (CSAG) at the University of Cape Town, and the International Commission on the Middle Atmosphere (ICMA). **The President of the ICCL, Associate Professor Neil Holbrook**, is one of the organisers of the workshop, and representative of the ICCL.

The training school will take place directly after the IAPSO/IAMAS/IAGA international conference (Cape Town from 28 August to 1 September 2017).

The training school is supported by:

- IUGG (International Union of Geodesy and Geophysics)
- WCRP-SPARC
- CSAG (Climate Systems Analysis Group)
- University of Cape Town
- ACCESS (Applied Centre for Climate and Earth System Science)
- EGU (European Geosciences Union)

The first three days of the training school will be dedicated to introducing the themes (mornings) and to exercises using reanalysis and model data as well as discussions (afternoons). During the discussion time, the topics of the mini-projects will be selected and worked on. The last day is fully dedicated to the mini-projects, with time for working on writing the reports in the morning and discussing these reports in the form of oral presentations (one per project) during the final afternoon session.

Organising committee

Elisa Manzini (Max Planck Institute, Hamburg)

Bernd Funke (Instituto de Astrofísica de Andalucía, Granada)

Babatunde Abiodun (CSAG, University of Cape Town)

Fiona Tummon (SPARC Office, ETH Zurich)
Neil Holbrook (University of Tasmania, Hobart)
Katja Matthes (GEOMAR, Kiel)
Olivia Rompainen-Martius (University of Bern, Bern)

ACTIVITY 5

International Workshop on STUDIES OF CLIMATE CHANGE USING DYNAMIC SCALE REDUCTION APPLICATIONS: CASE OF PANAMA

- Climatic Projections

Date: 18-29 September 2017

Venue: The Water Center for the Humid Tropics of Latin America and The Caribbean (CATHALAC)

The Technological University of Panama (UTP), Panama City, Panama

<http://proyeccionesclimaticas.utp.ac.pa/>

ACTIVITY 6

ENSO Extremes and Diversity: Dynamics, Teleconnections and Impacts

Venue: The University of New South Wales, Sydney, Australia;

Dates: 4-6 February 2015

Organisers: Agus Santoso (UNSW, Australia), Wenju Cai (CSIRO, Australia), Mat Collins (University of Exeter, UK), Fei-Fei Jin (University of Hawaii, USA), Mike McPhaden (NOAA/PMEL, USA), Eric Guilyardi (LOCEAN/IPSL, France), Dietmar Dommenges (Monash University, Australia), Gabriel Vecchi (GFDL, USA), Guojian Wang (CSIRO, Australia)

Objective: To review recent progress in El Niño – Southern Oscillation (ENSO) research and determine the present state of understanding of ENSO in terms of its extreme and diverse behavior and its overarching physical implications.

Publication: Santoso A, W Cai, M Collins, M McPhaden, F Jin, E Guilyardi, G Vecchi, D Dommenges and G Wang, 2015: ENSO extremes and diversity: dynamics, teleconnections, and impacts. Bulletin of the American Meteorological Society, Meeting Summary, pp 1969-1972, doi:10.1175/BAMS-D-15-00141.1.

The workshop summary is available at:

<http://journals.ametsoc.org/doi/abs/10.1175/BAMS-D-15-00141.1>

Acknowledgments: It was formally acknowledged that the ENSO workshop makes a contribution to the interests of the International Commission on Climate of IAMAS/IUGG. Prof Mat Collins (ICCL member) was an organizer of this meeting and coauthored the BAMS Report. Neil Holbrook (President, ICCL) also participated in the workshop, and was acknowledged for providing comment on, and helping proofread, the BAMS Report.

ACTIVITY 7

The **14th “General Circulation Model Simulations of the East Asian Climate” (EAC) workshop** was held at City University of Hongkong in Hongkong, China from 27-29 April 2019 with 109 participants, among which 17 were from Japan, South Korea, USA, and about 50 were students and early careers researchers. The workshop was organised by City University of Hongkong, Beijing Normal University, Ministry of Natural Resources of the People’s Republic of China, National Natural Science Foundation of China (NSFC), the International Commission on Climate (ICCL), and IUGG Union-Commission on Climatic and Environmental Change (CCEC).

The workshop included 4 sessions (1. Detection and Attribution, 2. Climate Variability, 3. High-Impact Weather and Extremes, and 4. Predictability, Prediction and Projection) with 49 Oral presentations and 86 posters.



ACTIVITY 8

Training Workshop of Access and Utilization of Regional Climate Downscaled data of Southeast Asia Regional Climate Change Information System

Venue: Center of Regional Climate Change and Renewable Energy, Ramkhamhaeng University (RU-CORE), Bangkok, Thailand

Dates: 22 January 2019

The training workshop is organized as a part of the activities of CORDEX-Southeast Asia in order to disseminate regional dynamical downscaled (DDS) future climate scenarios by bringing both producers and users in this workshop. More than eighty participants attended at this workshop. Their institutions are not only academia but also governmental officers interested in climatic impact assessments and adaptation against the climate changes.

The workshop is supported by: RU-CORE, The National University of Malaysia (UKM), the Meteorological Research Institute (MRI), CORDEX-Southeast Asia, Asia-Pacific Network for Global Change Research, Ministry of Education, Culture, Sports, Science and Technology, Japan. Organizing members are Drs. Jerasorn Santisirisomboon (RU-CORE), Fredolin Tangang (UKM), and Tosiyyuki Nakaegawa (MRI and a member of ICCL).



ACTIVITY 9

The 48th Session of the Intergovernmental Panel on Climate Change (IPCC-48) and the 1st Joint Session of Working Groups I, II and III of the IPCC

Venue: Songdo Convensia Incheon, Republic of Korea

Dates: 1 to 6 October 2018

Prof. Jianping Li, ICCL Executive Secretary-General attended as the representative of IUGG and an observer in the sessions.

7. Publications: ICCL contributions

The following include papers published, submitted for peer-review, or in preparation. All of these publications are contributions by or to the International Commission on Climate. They make contributions to the focus areas of climate extremes (marine heatwaves) and decadal climate variability.

- Hobday AJ, LV Alexander, SE Perkins, DA Smale, SC Straub, ECJ Oliver, JA Benthuisen, MT Burrows, MG Donat, M Feng, NJ Holbrook, PJ Moore, HA Scannell, A Sen Gupta and T Wernberg, 2016: A hierarchical approach to defining marine heatwaves. *Progress in Oceanography*, **141**, 227-238, doi:10.1016/j.pocean.2015.12.014.
- Hobday AJ, ECJ Oliver, A Sen Gupta, JA Benthuisen, MT Burrows, MG Donat, NJ Holbrook, PJ Moore, MS Thomsen, T Wernberg and DA Smale, 2018: Categorizing and naming marine heatwaves. *Oceanography*, **31**(2), doi:10.5670/oceanog.2018.205.
- Holbrook NJ, HA Scannell, A Sen Gupta, JA Benthuisen, M Feng, ECJ Oliver, LV Alexander, MT Burrows, MG Donat, AJ Hobday, PJ Moore, SE Perkins-Kirkpatrick, DA Smale, SC Straub and T Wernberg, 2019. A global assessment of marine heatwaves and their drivers. *Nature Communications*, **10**, Article 2624, doi:10.1038/s41467-019-10206-z.
- Oliver ECJ, JA Benthuisen, NL Bindoff, AJ Hobday, NJ Holbrook, CN Mundy and SE Perkins-Kirkpatrick, 2017: The unprecedented 2015/16 Tasman Sea marine heatwave. *Nature Communications*, **8**, 16101, DOI:10.1038/ncomms16101.
- Oliver ECJ, MG Donat, MT Burrows, PJ Moore, DA Smale, LV Alexander, JA Benthuisen, M Feng, A Sen Gupta, AJ Hobday, NJ Holbrook, SE Perkins-Kirkpatrick, HA Scannell, SC Straub and T Wernberg, 2018: Ocean warming brings longer and more frequent marine heatwaves. *Nature Communications*, **9**, Article number 1324, DOI:10.1038/s41467-018-03732-9.
- Santoso A, H Hendon, A Watkins, S Power, D Dommenges, MH England, L Frankcombe, NJ Holbrook, R Holmes, P Hope, E-P Lim, J-J Luo, S McGregor, S Neske, H Nguyen, A Pepler, H Rashid, A Sen Gupta, AS Taschetto, G Wang, E Abellan, A Sullivan, MF Huguenin, F Gamble and F Delage, 2019: Dynamics and predictability of El Niño – Southern Oscillation: An Australian perspective on progress and challenges. *Bulletin of the American Meteorological Society*, doi:10.1175/BAMS-D-18-0057.1.
- Smale DA, T Wernberg, ECJ Oliver, M Thomsen, BP Harvey, SC Straub, MT Burrows, LV Alexander, JA Benthuisen, MG Donat, M Feng, AJ Hobday, NJ Holbrook, SE Perkins-Kirkpatrick, HA Scannell, A Sen Gupta, B Payne and PJ Moore, 2019: Marine heatwaves threaten global biodiversity and the provision of ecosystem services. *Nature Climate Change*, doi:10.1038/s41558-019-0412-1.

8. Nominations, awards and honours

- Professor Mat Collins (UK) was nominated to the IAMAS bureau as liaison to WCRP in 2015
- Dr Ruiqiang Ding (China), recommended by the ICCL, was awarded an Early Career Scientist Award from IUGG in 2015
- Prof Jianping Li (China) was elected as IUGG Fellow in 2015
- Associate Professor Lisa Alexander (Australia) was co-nominated by ICCL and appointed as IAMAS Member at Large in 2015
- Dr. Qiuzhen Yin, ICCL member, awarded an Early Career Scientist Award of IUGG in 2019
- Dr. Emilie Capron, new ICCL member, awarded an Early Career Scientist Award of IUGG in 2019.

APPENDIX A

Bureau

HOLBROOK, Neil [President]	Australia	2011
LI, Jianping [Executive Secretary]	China	2011

Members

DING, Ruiqiang	China	2011
DIODATO, Nazzareno	Italy	2011
HALENKA, Tomas	Czech Republic	2009
RODHE, Johan	Sweden	2009
MYSAK, Lawrence	Canada	2007
ABE-OUCHI, Ayako	Japan	2013
COLLINS, Matthew	U. K.	2013
DIMA, Mihai	Romania	2013
LATIF, Mojib	Germany	2013
YIN Qiuzhen	Belgium	2013
FENG, Juan	China	2015
NAKAEGAWA, Toshiyuki	Japan	2015
WANG, Zhaomin	China	2017
SON, Seok-Woo	South Korea	2017
CHAFIK, Léon	Sweden	2019
CAPRON Emilie	Denmark	2019

Emeritus Members

McGUFFIE, Kendal	Australia
HENDERSON-SELLERS, Ann	Australia
BERGER, Andre	Belgium
LI, Chongyin	China
FU, Congbin	China
JONES, Phil	United Kingdom
MacCRACKEN, Michael	USA
ALVERSON, Keith	UNEP/DEPI
MASSON-DELMOTTE, Valerie	France
BROCCOLI, Anthony	USA
MOKHOV, Igor	Russia
STEFAN, Sabina	Romania

APPENDIX B

ICCL (co-)sponsored IAMAS symposia at IUGG 2019 in Montreal, Canada

1. **M07- Stratosphere Couplings to the Troposphere and Ocean**
Convener: E. Manzini, Co-conveners: B. Funke, **N. Holbrook**
2. **M12 - High-impact Weather and Climate Extremes**
Conveners: R. Grotjahn, Co-conveners: J. Keller, B. Golding, **N. Holbrook**, X. Zhang, R. McTaggart-Cowan, O. Martius, A. Srivastava
3. **M17 – Past and Future Changes in Polar Climate System and Their Global Linkages**
Convener: **Z. M. Wang**, Co-conveners: K. Moore, K. Nicholls, A. Jahn, J. Lenaerts
4. **M18 – Natural Climate Variability and Predictability on All Time Scales**
Convener: **N. Holbrook**, Co-conveners: **M. Latif**, **M. Collins**, **Q. Z. Yin**, E. D. Lorenzo, **L. Mysak**
5. **M19-Role of Ocean-Atmosphere Interactions in Constraining Regional Climate Change**
Convener: **M. Collins**, Co-conveners: N. S. Keenlyside, **T. Halenka**, **M. Latif**, S. Minobe, H. Nakamura, S. P. Xie

Joint symposia from ICCL at 27th IUGG General Assembly

6. **JM03 - Advances and Frontier Challenges in Global Monsoon Studies: Dynamics, Convection and Interactions with Hydrological and Land Surface Processes (IAMAS, IAHS)**
Convener: **J. Li** (IAMAS), Co-Conveners: A. Turner (IAMAS), S. Nigam (IAMAS), I. Cavalcanti (IAMAS), E. Hugo Berbery (IAMAS), K. J. Ha (IAMAS), F. Kucharski (IAMAS), A. Giannini (IAMAS), S. Janicot (IAMAS), K. Thonicke (IAMAS), E. Lakshmanan (IAHS)
 7. **JP04 - Past Changes, in the Atmosphere, Oceans and Cryosphere, and Their Relevance for Future Climate. (IAPSO, IAMAS, IACS, IAGA)**
Convener: K. Kohfeld (IAPSO), Co-Conveners: **Q. Z. Yin** (IAMAS), A. Vernal (IAMAS), T. Dobeneck (IAGA), M. Petterson (IACS)
- [Note: **boldface** identifies ICCL members]

APPENDIX C

ICCL (co-)sponsored IAMAS symposia at IUGG 2015 in Prague, Czech Republic

1. **M10 Global Monsoons and Climate Change**
Convener: **Jianping Li**
Co-conveners: Andrew Turner, Tianjun Zhou, Bin Wang, Ernesto Hugo Berbery, Harry Hendon, Jun Matsumoto, Allesandra Giannini, Serge Janicot
2. **M17 Science of Adaptation to Climate Change**
Convener: **Keith Alverson**
Co-convener: Tom Beer
3. **M18 Past Climate Changes: a Key for the Future**
Convener: **Andre Berger**
Co-conveners: Alan Haywood, Kurt Lambeck, **Mike MacCracken**, Andrew Mackintosh, Axel Timmermann, **Qiuzhen Yin**
4. **M19 El Niño / Southern Oscillation and Decadal Variability under Climate Change**
Convener: Fei-Fei Jin (Manoa, USA)
Co-convener: **Jianping Li** (Beijing, China), Soon-Il An (Seoul, Korea)
5. **M20 The Ocean's Role in Climate Variability, Change and Predictability**
Convener: Shang-Ping Xie
Co-conveners: **Ruiqiang Ding**, Hisashi Nakamura, **Mojib Latif**

[Note: **boldface** identifies ICCL members]

APPENDIX D

ICCL (co-)sponsored IAMAS symposia at IAPSO-IAMAS-IAGA 2017 Conference

1. **M04 - Past Climate Changes: a key for the future**

Convenor: **Andre Berger**

Co-Convenors: A.Haywood, **Q.Z.Yin**, A Timmermann, **M.MacCracken**

2. **M16 - Resilience: The Science of Adapting to Climate Change**

Convenor: **Keith Alverson**

Co-convenor: Zinta Zommers

3. **M17 - High-impact Weather and Climate Extremes**

Convenors: Richard Grotjahn, Julia Keller

Co-convenors: Lisa Alexander, Brian Golding, **Neil Holbrook**, Richard Swinbank, Xuebin Zhang

4. **M18 - Advances and Frontier challenges in Global Monsoon Studies Climate Change**

Convenors: **Jianping Li**, Andrew Turner

Co-convenors: E. Hugo Berbery, Harry Hendon, Jun Matsumoto, Kyung-Ja Ha, R. Krishnan, Fred Kucharski, Allesandra Giannini, Serge Janicot

5. **M20 - Role of Ocean-Atmosphere Interactions in Climate Variability, Change and Predictability**

Convenors: Hisashi Nakamura, Noel S. Keenlyside

Co-convenors: **Mat Collins**, Meghan F. Cronin, **Ruiqiang Ding**, **Mojib Latif**, Shoshiro Minobe, Mathieu Rouault, Tomoki Tozuka, Tim Woollings, Shang-Ping Xie

6. **M22 - Sub-seasonal to Seasonal Prediction--except extremes**

Convenors: Frederic Vitart

Co-convenors: Iracema Cavalcanti, Chris White

Joint symposia from ICCL at IAPSO-IAMAS-IAGA 2017 Conference

1. **JM4 - Future Climate for the African Continent (IAMAS, IAPSO)**

IAMAS: Charlie Williams

Co-convenors:

Richard Washington (IAMAS), Katy Altieri (IAPSO), Ross Maidment (IAMAS), Rosalind Cornforth (IAMAS), Amadou Gaye (IAMAS)

[Note: **boldface** identifies ICCL members]