

Report to CLIVAR SSG-20

Panel or Working Group:

1. Contributions to developing CLIVAR science and fit, where appropriate, to the CLIVAR imperatives

Anthropogenic Climate Change, and Science underpinning the prediction and attribution of extreme events:

The ET's contribution includes: 1) The ET has been working with the support of the ClimDEX Project to produce global gridded indices of temperature and precipitation extremes. This activity has produced several global datasets of these indices including HadEX2 (an updated HadEX indices product). The analyses based on these datasets improved understanding of past changes in climate extremes, contributing significantly to the on-going AR5 assessment. The data products also form basic datasets for climate model validation and detection and attribution work. 2) The ET has also organized the computation of indices based on CMIP5 model simulations. Model indices data are disseminated through a website hosted at the Canadian Center for Climate Modelling and Analysis (<http://www.cccma.ec.gc.ca/data/climdex/index.shtml>) for the climate research community. This is especially important for those who have difficulties in downloading the vast volume of daily data and in processing the data. An analysis of these model data has been published in Journal of Geophysics Research and has been highlighted as AGU Research Spotlight. This activity contributes significantly to the IPCC AR5 assessment, several chapters of the AR5 WGI report will likely have figures based on these indices data. 3) The ET is also working closely with the International ad-hoc Detection and Attribution Group (IDAG) on detection and attribution. Several ET members are also IDAG members.

Capacity Development

A principal activity of the ET is maintaining a sustained programme of regional workshops that drive capacity development in less developed regions where both data availability is scarce and/or data accessibility is difficult, helping regional climate service. The results from the workshops are published in the peer-reviewed literature and will continue to be an important contribution to the IPCC assessments. The ET continues to develop this successful workshop formula, looking at ways to increase regional collaboration and participation in international activities of scientists involved in its capacity development activities. In addition to the workshops, software for indices calculation and data homogenization and indices data derived from observations and model simulations are freely available and are becoming important resources for research on climate extremes.

Donat, M. G., and et al, 2013: Upodated analyses of temperature and precipitation extreme indices since the beginning of the twentieth century: The HadEX2 dataset. *J. Geophys. Res.*, doi: 10.1002/jgrd.50150.

Sillmann, J., V. V. Kharin, F. W. Zwiers, X. Zhang, and D. Bronaugh, 2013a: Climate extremes indices in the CMIP5 multi-model ensemble. Part 1: Model evaluation in the present climate. *J. Geophys. Res.*, doi:10.1002/jgrd.50203.

would contribute to the WCRP Grand Challenges as identified by the JSC at its most recent meeting¹

ETCCDI's activities are central to the Grand Challenges on the science underpinning the prediction and attribution of extreme events and provision of skillful future climate information on regional scales. Several ETCCDI members are involved in the development of WCRP Grand Challenges on climate extreme documents and implementation plan.

3. Key new science findings in the context of the new ocean-atmosphere CLIVAR (1-3 suggestions)

4. Key science questions that you anticipate your community would want to tackle in the next 5-10 years within the context of the new ocean-atmosphere CLIVAR (1-3 suggestions)

- a) Detection and attribution of anthropogenic influence on weather and climate extremes at regional scale and attribution to causes of extreme climate events.
- b) Mechanisms by which modes of ocean-atmosphere variability affecting weather and climate extremes.
- c) If and how these modes of ocean-atmosphere variability may change under global warming and possible impacts on future weather and climate extremes.

5. Cooperation with other WCRP projects, other global change bodies (e.g. IGBP) and links to applications

In addition to CLIVAR/GEWEX, ETCCDI has two sponsors – the WMO Commission for Climatology (CCI) and the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM).

The CCI perspective is that the work of ETCCDI is directed at improving climate change detection and indices with a strong focus on capacity development. ETCCDI contributes to the provision of climate services through its regional capacity development workshops and its continued recommendation of free observational data exchange.

ETCCDI collaborates with the following CCI Task Forces:

- OPACE-I Task Team on Climate Data Rescue (TT-DARE)
- OPACE-II Task Team on National Climate Monitoring Products (TT-NCMP)

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1. Provision of skillful future climate information on regional scales (includes decadal and polar predictability)
2. Regional sea-level rise
3. Cryosphere response to climate change (including ice sheets, water resources, permafrost and carbon)
4. Improved understanding of the interactions of clouds, aerosols, precipitation, and radiation and their contributions to climate sensitivity

- OPACE-IV Expert Team on Climate Risk and Sector specific Climate Indices (ET-CRSCI)

JCOMM provides the mechanism for international coordination, regulation and management of oceanographic and marine meteorological observing, data management and services systems. JCOMM is interested in the use of indices and in developing an improved suite of indices to provide information for its stakeholders.

Despite CLIVAR and JCOMM co-sponsorship, the ET recommended list of indices are currently only land based. However, JCOMM has made significant effort to address this issue. JCOMM has nominated three members (with the nomination for the 4th member pending) recently. They have developed a plan with tangible deliveries including: 1) investigation of climate indices and trends from the ICOADS data base, especially near coasts, as a complement to and comparison with existing land-based activities within ETCCDI; 2) Contribution from the COWCLIP project on historical and projected future changes in wave climate, and associated databases; 3) Contribution from the storm surge climatology activities of ETWCH, in particular in the initial stages, on historical data bases and climate analysis of sea level measurements including the GLOSS network.

There is also interest among the GODAE OceanView/JCOMM ETOOFS and the CLIVAR WGOMD and GSOP communities to create a Task Team to nominate a small number of ocean subsurface indices that could be of scientific and societal relevance for routine evaluation, updating and sharing with the wider community. Three different categories of indices are obvious: those that involve status reporting of the world ocean (e.g. ocean heat content over a specified depth range, world ocean sea level); those that are well correlated with the familiar surface repeating patterns of climate variability that are known to have societal impact (e.g., the warm water volume of the western tropical Pacific and ENSO) and those which are well correlated with significant regional climate phenomena but are not of basin scale (e.g., one imagines there might be one for the upwelling zone off Sumatra and the Tropical Indian SST anomaly region there.)

The TT would make use of a range of model generated data sets of different space and time extent that have been produced recently in the work of the different communities to explore possible index definitions and to agree on how best to evaluate these routinely. The WGOMD and GSOP have data sets of multi-decadal duration and nearly world-ocean coverage, while the GOV/ETOOFS have multi-year data sets of regional to near-world-ocean extent of quite high spatial resolution. Long time series would be prepared from the WGOMD and GSOP 20th century data sets and GOV/ETOOFS data sets would be used to extend these time series to the present and to keep them updated. Significant work would likely be expected to determine how best to make use of the several data sets and to construct time series that can be shared with the wider community.

It's envisioned that the TT would have a two-year duration and two to three members from each community. Progress would be reported to the CLIVAR SSG and ETCCDI leadership annually. If technical difficulties are difficult to surmount the TT duration might need to be extended for another two year period.

6. Activities in the context of scientific capacity building and career support?

ETCCDI workshops and supporting software have been successful in enhancing scientific capacity in less developed world. There are more than 1000 registered users for ETCCDI software, many of the users are students. A large fraction of the users are from developing countries. The climate extreme indices derived from observations and model simulations are basic datasets for studying climate extremes for climate research community and beyond. ETCCDI is also been involved to develop WCRP Summer School on climate extremes.

ETCCDI organized or was involved in the organization of the following capacity building workshops: Caribbean workshop (Mona, Jamaica, May 2012), Pacific Island Countries workshop (New Caledonia, May 2012), WMO Region-II of Asia workshop (Nanjing, China, March 2013).

7. Activities in the context of knowledge exchange with societal actors?

ETCCDI works with WMO OPACE-II Task Team on National Climate Monitoring Products (TT-NCMP) and OPACE-IV Expert Team on Climate Risk and Sector specific Climate Indices to enhance knowledge exchange with societal actors. ETCCDI is involved in the discussion with TT-NCMP on national climate monitoring products, two of six WMO recommended products for NHMSs are from ETCCDI defined indices.

A CLIVAR ETCCDI member (L. Alexander) chairs the OPACE-IV Expert Team on Climate Risk and Sector specific Climate Indices to ensure maximum exchange between the two groups. This Expert Team aims to develop methods and tools including standardized software for, and to generate, sector-specific climate indices, including their time series based on historical data, and methodologies to define simple and complex climate risks. The indices should emphasize climate variability and trends that are particularly relevant for economic sectors and help characterize the climate susceptibility of these sectors. The team will develop the training materials needed to raise capacity and promote uniform approaches in applying these techniques. It will work with the relevant WMO Technical Commissions to facilitate the use of climate information in users' decision-support systems for climate risk management and adaptation strategies.

8. New activities being planned, including timeline, request for endorsements, potential for new funding opportunities

ETCCDI is actively involved in the organization of WCRP Summer School on climate extremes. WCRP is preparing in collaboration with the ICTP: a jointly sponsored Summer School on Extreme Event Attribution and Prediction in 2014. The Summer School will train the participants in indices, extreme value theory, and event attribution, in each case with the objective of gaining understanding, and tools, for the analysis of the past, and the evolution of the future (in terms of both prediction and projection).

on climate extremes across WCRP projects.

9. Workshops / meetings planned

A meeting is planned for Feb. 2012 involving all members of the ET. The objective of the meeting is to scope the work for the next few years in view of new CLIVAR/WCRP priorities/grand challenges.

10. Issues for the SSG

Annex A

Proforma for CLIVAR Panel and Working Group requests for SSG approval for meetings

Requests should be made through D/ICPO (rogbar@noc.ac.uk), against the following headings:

- 1. Panel or Working Group: ETCCDI**
- 2. Title of meeting or workshop: ETCCDI Scoping meeting for next term**
- 3. Proposed venue: Toronto, Canada**
- 4. Proposed dates: Feb 24-26, 2014**
- 5. Proposed attendees, including likely number:**
ETCCDI members (4 from CLIVAR, 4 from CCI, 4 from JCOMM, 1 from GEWX). 1 CLIVAR/WCRP Rep, 1 CCI Rep, 2-3 invited non-member experts.
- 6. Rationale, motivation and justification, including: relevance to CLIVAR themes & JSC cross cutting topics and any cross-panel/working group links and interactions involved:**
This is scoping meeting to discuss future work of the ET in light of new priority of WCRP and new CLIVAR project, and ETCCDI's contribution to WCRP Grand Challenge on climate extremes.
- 7. Specific objectives and key agenda items:**
To develop ETCCDI work plan for the next 4-yrs.
- 8. Anticipated outcomes (deliverables):**
Detailed work plan.
- 9. Format:**
Short presentation by members but most of time will be devoted to discussion.
- 10. Science Organising Committee (if relevant)**
- 11. Local Organising Committee (if relevant)** X. Zhang
- 12. Proposed funding sources and anticipated funding requested from**

CCI to cover CCI members and Rep

JCOMM to cover expenses for JCOMM members

WCRP to cover expenses for members representing WCRP projects, ETCCDI
CLIVAR staff member and 2-3 invited non-member experts (7-10 people in total)

Environment Canada (EC) will cover logistic expenses (meeting room, coffee breaks
etc.)