

**The meeting of the Task Team on Definition of
Extreme Weather and Climate Events (TT-DEWCE)**

Tortosa, Tarragona, Spain
23-25 November 2011

Meeting Report

Edited by:

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Blair Trewin, Manola Brunet, Omar Baddour

The meeting started with welcome addresses by Dushmanta R. Pattanaik (Co-lead) of the TT-DEWCE, by Manola Brunet, Co-chair of OPACE-II and by Omar Baddour, WMO Secretariat to all the members and participants.

Session -1 (Day 1 – 23rd November 2011)

Chairman : Dushmanta Pattanaik (Co-lead TT-DEWCE)

The main session of Day 1 was started with a talk by **Omar Baddour**, WMO Chief, Data Management Applications Division about the ongoing programmes of WMO such as the Global Climate Programmes, GFCS, World Climate Service Programme (WCSP), GCOS, about the activities of GPC, RCC, Regional Climate Outlook Forums (RCOF), Data Rescue Programme(DARE), the MEDARE Initiative, etc and also about different publications of WMO (WMO annual statements and even some ad-hoc publication like unusual winter of 2009-2010 etc).

Subsequently, **Manola Brunet** (Co Chair of OPACE-II) presented about the CCI structure and the other expert teams working under OPACE-I, OPACE-II, OPACE-III and OPACE-IV under the WMO's CCI. She informed the members about the expectations from the TT-DEWCE and the importance of completing the task with a prescribe road maps and deadlines.

Subsequently, **Fumin Ren**, team lead TT-DEWCE, presented the outcome of WCRP-UNESCO (GEWEX/CLIVAR/IHP) Workshop on metrics and methodologies of estimation of extreme climate events held in Paris, France, UNESCO headquarters during 27-29 September 2010. As informed by him the WCRP workshop focused on phenomenology and methodological aspects of the quantitative estimation of different climate extremes under observed and future climate conditions using observational and model data.

Blair Trewin, a TT member, made a presentation on the IPCC Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX). The Summary for Policymakers (SPM) of this report was released on 18th November, 2011. It was advised that the full report will not be

released until Feb 2012.

José Luis Stella, a TT member, made a presentation on progress and contents of the proposed publication of WMO “Decadal Global Climate Summary (DGCS) 2001-2010”, which is scheduled to be published in March 2012.

In the post lunch session of Day-1, **Manola Brunet** presented before the members about other TTs (Task Teams) and ETs (Expert Teams) of CCI, such as the OPACE-II TT on National Climate Monitoring Products (NCMPs), OPACE-II ET on Climate Change Detection and Indices (ETCCDI) and OPACE-IV TT on Climate Risk and Sector Specific Climate Indices (ET-CRSCI). She informed the members about the Goals, Composition and Agreements of these TTs & ETs and the cross cutting issues with TT-DEWCE.

Randall S. Cerveny, a TT member, made a presentation on “WMO CCI World Climate and Weather Extremes Archive Progress Report” and the need for an Official World Climate Extremes Archive for various uses. The WMO CCI linked with Arizona State University to create a website: the “WMO World Weather & Climate Extremes Archive”, which is online at <http://wmo.asu.edu/>. He also informed about the NCDC extremes data base.

Towards the end of Day-1 the national climate products available from different Met services and the data rescue programme of WMO were discussed. In this regard following presentations were made.

- **Dushmanta Pattanaik**- National Climate products of India (www.imd.gov.in)
- **Blair Trewin**- National Climate products of Australia (www.bom.gov.au)
- **Manola Brunet** – On climate data rescue programme. “the Mediterranean climate Data Rescue” (MEDARE) www.omm.urv.cat/MEDARE
- **Fumin Ren** – Climate products available from Beijing Climate Centre (<http://bcc.cma.gov.cn>)

Session -2 (Day 2 – 24th November 2011)

Chairman : Fumin Ren (Lead, TT-DEWCE)

The initial presentation was made by Fumin Ren, where he reviewed all the Tasks of TT-DEWCE and the way forward for their accomplishment along with the Terms of Reference (TOR) and expected deliverables. He suggested combining Task 3 and Task 4 into one task, named as Task 3A and Task 3B respectively. Thus, the originally defined 5 Tasks reduce to 4 Tasks.

Followed by this presentation, the person in-charge (coordinator) of each task presented about the issues pertaining to their task. In this regard 4 presentations were made as indicated here.

Task 1: *Review the existing work and studies on extreme weather and climate events (Person in charge: Randy Cerveny),* Contributors: all TT members.

As presented by Randy Cerveny, the extreme weather and climate events are different for different audience, such as the general public, media, record keepers or the climate change scientists. Thus, to have common definitions of weather and climate extreme for all groups, he suggested to have the “Climate and Weather Extremes” into three basic “types”:

- Type I extreme events: “Societal” – significant climate and weather that impact the general public (human costs, property)
- Type II extreme events: “Absolute” – the most extreme (“extreme extreme”) weather events (singular in time-space)
- Type III extreme events: “Objective” – the scientifically statistical indexed extremes.

He also discussed about the 27 recommended indices by ETCCDI of which 16 are temperature related and 11 are precipitation related. These indices are derived from daily maximum and minimum temperature and daily precipitation.

Task 2: *Evaluate the gaps in and the need for developing common definitions of extreme weather and climate events.*

(Person in charge: Dushmanta Pattanaik, Contributors: All TT members)

In the presentation, Dushmanta Pattanaik discussed different indices used in different parts of the country for defining extreme weather and climate events such as **(i)** drought, **(ii)** heavy precipitation, **(iii)** heat wave and **(iv)** cold wave. Different indices used for defining drought like the Palmer drought severity index (PDSI), Standardized Precipitation Index, Aridity index etc were discussed along with gaps and shortcomings of these indices in applying to different conditions and different regions. Similarly, the definitions used for defining severe precipitation, heat waves and cold waves were also discussed along with their limitations of using either a threshold value or in terms of percentile, as they depend on many factors.

As there is no universal objective definition used for each of the above four extreme events, he highlighted the need of having common definitions for each extreme event having following characteristics :-

- Easily understood
- To be used operationally
- Carrying physical meaning
- Sensitive to wide range of extreme event conditions
- Independent of area of application
- Reveal the event with short lag after its occurrence
- Based on the data which are readily available

Task 3A: *Provide a guidance on methodologies and standards for defining regional extreme weather and climate events, with an advice on adequate computational tool for doing this.*

(Person in charge: Fumin Ren, Contributors: Andreas Walter, Boris Sherstyukov, Dushmanta Pattanaik, Blair Trewin , Jose Antonio Lopez)

Task 3B : *Provide an advice on developing an inter-operable data base for regional extreme weather and climate events.*

(Person in charge: Fumin Ren, Contributors: Andreas Walter, José Luis Stella, Fumin Ren, Dushmanta Pattanaik, Blair Trewin, Jose Antonio Lopez)

While presenting on Task 3A and Task 3B Fumin Ren, the person in charge of the team emphasized that an extreme event is in general a regional event with a certain affected area and a certain duration. He presented an Objective Identification Technique for Regional Extreme Events (OITREE) developed in China, which shows good ability in identifying regional extreme weather and climate events such as regional drought events, regional heavy precipitation event, regional high temperature event and regional low temperature events etc.

He also emphasized the need to create opportunities for effective international co-operations to improve the OITREE method, which could be applied to areas outside of China (other parts of the globe).

Task 4: *Provide a WMO portal which links to national/regional products and reports on extreme weather and climate events*

(Person in charge: Blair Trewin, Contributors: José Luis Stella, Randy Cervený, Dushmanta Pattanaik, Fumin Ren)

Blair Trewin, the person in charge of the task team presented about the utility of having a WMO portal in

- Providing a portal which links to authoritative information on regional extreme weather/climate events
- Making information widely available and easy to find (especially for users not familiar with the local language)

This task is somewhat different from the other tasks in that its principal objective is to produce a product in itself, not a report and/or guidance to other agencies in producing their own products. It is intended that, at least in the initial stages, such a portal would draw solely on material already being produced by NMHSs, and not involve any data analysis in its own right. A host organization (most likely a NMHS) will be needed for the portal with Australia, USA and China suggested initially as possibilities.

Followed by presentations on each task two more presentations were made as given:-

- **Boris Sherstyukov** (RIHMI-WDC, Russian Federation) on “*Changes of the climate variability*”. He basically discussed about changes of the temporal and spatial climate variability.
- **Andreas Walter**, German Meteorological Service, DWD on *Developing on “A data base for regional extreme weather and climate events”*. He presented about the climate monitoring activities by the Regional Climate Centre over WMO RA VI region.

On suggestions from the members of TT-DEWCE to know about the indices used over Iberian Peninsula to study the extreme events, two additional talks were delivered by PhD students from Centre for Climate Change (C3, the host institute) dealing with studies on extreme events like heat wave and drought over this region. The titles of the talks are (i) Spatio-temporal variability of droughts over Iberian Peninsula by **Joan Ramon Coll Benages**, PhD Student, C3 and (ii) The unprecedented character of the 2003 summer heat wave over the Mediterranean coast of the Iberian Peninsula and Statistical analysis and modeling of heat waves characteristics over the Iberian Peninsula, their relationship to large-scale circulation patterns and trends, by **M. Castellà**, C3.

Session -3 (Day 3 – 25th November 2011)

Chairman : Blair Trewin (Member, TT-DEWCE)

During this session, the final roadmap and work plan along with the conclusions and recommendations of the meeting are discussed, which was presented by Randy Cerveny and Dushmanta Pattanaik and discussed as per the details given below.

Randy Cerveny – TT Work plan and the road map for actions

Dushmanta Pattanaik – Conclusions and Recommendations

TT Work Plan and the Road Map for Actions

Task 1: Review the existing work and studies on extreme weather and climate events

Person in charge: Randy Cerveny

Contributors: all TT members

Brief description

Prepare a document on reviewing the existing studies and operational products currently issued by NMHSs on extreme weather and climate events.

Specific outputs

A 15-20 page document, well illustrated, for WCDMP.

Lead Coordinator and contributors

Randy Cerveny

Target date for completion

deadlines:

31 March 2012 : Cerveny provide (a) well-documented listing of indices associated with heat waves, cold spells, droughts and extreme precipitation events as used in existing studies and (b) a listing of internet products issued by NMHSs on extreme weather and climate events

1 June 2012: revised list or comments from TT-DEWCE members

1 July 2012 : draft document to TT-DEWCE members for other Tasks

30 Jun. 2013 : draft document for experts outside TT-DEWCE

30 Sep. 2013 : revised draft or comments from experts outside TT-DEWCE

31 Dec. 2013 : document submitted to OPACE-2

Task 2: Evaluate the gaps in and the need for developing common definitions of extreme weather and climate events

Person in charge: Dushmanta Pattanaik

Contributors: All TT members (Fumin Ren, Randy Cerveney, Blair Trewin, José Luis Stella)

Brief description

Based on task 1, prepare a document on evaluating the gaps in and the need for developing common definition related to extreme weather and climate events with particular focus on cold waves, heat waves and severe precipitation and drought so as to provide guidance towards developing common definitions, evaluation of effectiveness of point-based indices in defining high impact events

Specific outputs

An about 5 page document, well illustrated, for WCDMP

Lead Coordinator and contributors

Dushmanta Pattanaik

Target date for completion (deadlines) :

1 July. 2012 : receive draft document from Task 1

1 Sept. 2012 : finish draft document on gaps and common definitions and send
to TT-DEWCE members

30 Jun. 2013 : draft document for experts outside TT-DEWCE

30 Sep. 2013 : revised draft or comments from experts outside TT-DEWCE

31 Dec. 2013 : document submitted to OPACE-2

Task 3A: Provide a guidance on methodologies and standards for defining regional extreme weather and climate events, with an advice on adequate computational tool for doing this

Person in charge: Fumin Ren

Contributors: Andreas Walter, Boris Sherstyukov, Dushmanta Pattanaik, Blair Trewin, Jose Antonio Lopez

Brief description

Prepare a document on methodologies and standards for defining regional extreme weather and climate events, and advise on adequate computational tool for doing this;

Specific outputs

An about 15 page document, well illustrated, for WCDMP.

Lead Coordinator and contributors

Fumin Ren

Linkages with other groups

Target date for completion (deadlines):

- 1 July. 2012 : receive draft document from Task 1 (but not needed for this Task)
- 1 Sept. 2012 : receive draft document from Task 2 (but not needed for this Task)
- 31 Dec. 2012 : draft document for TT-DEWCE members (Contributors)
- 31 Mar. 2013 : revised draft or comments from TT-DEWCE members
- 30 Jun. 2013 : draft document for experts outside TT-DEWCE
- 30 Sep. 2013 : revised draft or comments from experts outside TT-DEWCE
- 31 Dec. 2013 : document submitted to OPACE-2

Task 3B: Provide an advice on developing an inter-operable data base for regional extreme weather and climate events

Person in charge: Andreas Walter

Contributors: José Luis Stella, Fumin Ren, Dushmanta Pattanaik, Blair Trewin, Jose Antonio Lopez

Brief description

Advising on developing an inter-operable data base for regional extreme weather and climate events.

Specific outputs

An about 5 page document, well illustrated, for WCDMP.

Lead Coordinator and contributors

Fumin Ren

Linkages with other groups

Target date for completion (deadlines):

- 1 July 2012 : receive draft document from Task 1
- 31 Dec. 2012 : receive draft document from Task 2
- 31 Mar. 2013 : draft document for TT-DEWCE members (Contributors)
- 30 Jun. 2013: revised draft or comments from TT-DEWCE members
- 30 Sept. 2013 : draft document for experts outside TT-DEWCE
- 30 Nov. 2013 : revised draft or comments from experts outside TT-DEWCE
- 31 Dec. 2013 : document submitted to OPACE-2

Task 4: Provide a WMO portal which links to national products and reports on extreme weather and climate events

Person in charge: Blair Trewin

Contributors: José Luis Stella, Randy Cerveny, Dushmanta Pattanaik, Fumin Ren

Brief description

Prepare a document on developing a WMO portal which links to national products and reports on extreme weather and climate events. Identify possible host site.

Specific outputs

A 5-10 page document, well illustrated, for WCDMP plus material for portal

Lead Coordinator and contributors

Blair Trewin

Target date for completion

deadlines:

1 July 2012 : receive draft document from Task 1

1 Sept. 2012 : receive draft document from Task 2

31 Mar. 2013 : draft document for TT-DEWCE members (Contributors)

30 Jun. 2013: revised draft or comments from TT-DEWCE members

30 Sept. 2013 : draft document for experts outside TT-DEWCE

30 Nov. 2013 : revised draft or comments from experts outside TT-DEWCE

31 Dec. 2013 : document submitted to OPACE-2, Portal is in operation

Conclusions and Recommendations

General

1. In order to cover most of the existing concepts in extremes, it is suggested that the name of this TT be unified as “CCI- OPACE-2 Task Team on Definition of Extreme Weather and Climate Events (CCI/TT-DEWCE).
2. A new and more operable CCI/TT-DEWCE's work plan for the next 2 years (2012-2013) has been achieved. Compared with the original work plan, the main modifications are as following:
 - The Task 3 and Task 4 combined into one task and named as Task 3A and Task 3B respectively and the Task 5 became Task 4. Thus, the originally defined 5 tasks reduce to 4 tasks.
 - For each Task, the contribution of each contributor has been specified.
 - Deadlines have been set up for preparing the documents for each Task. According to the deadlines, the CCI/TT-DEWCE's final document will be submitted to OPACE-II by 31 December 2013.
3. A special website that includes introduction of the achievement of CCI/TT-DEWCE' can be created. Initially a WIKI page for the CCI/TT-DEWCE will be created (through WMO) for sharing the information within the members. Later on to promote and maintain the achievements of the CCI/TT-DEWCE and to benefit all WMO members, a separate page can be created with the help of WMO/CCI.
4. A WMO portal which links to national/regional products on extremes needs to be constructed by the end of 2013. The institutes like NCDC, BOM, BCC or any suitable national/regional climate centres may be an option to host this portal in their web through WMO/CCI.
5. After completion of the maps on extremes with updates the “Decadal Global Climate Summary (DGCS)” of 2001-2010 will be reviewed by CCI/TT-DEWCE members.
6. The CCI/TT-DEWCE will send the meeting report to WCRP through OPACE-2 Co-Chair and the WMO Secretariat. This would be as a follow-up of CCI participation to the WCRP-UNESCO Workshop on metrics and methodologies of estimation of extreme climate events 27-29 September 2010, UNESCO headquarters, Paris, France.
7. To encourage the research scientists working in the Centre for Climate Change (C3), University Rovira i Virgili, Tarragona, to submit a proposal for the WMO young scientist award for the researchers/scientists working on extreme event in this region.

Definition of extreme events

8. Recognizing that to develop a common definition of extreme weather and climate events is a challenging task, CCI/TT-DEWCE will focus on the extreme events that could be objectively defined based on meteorological data.
9. Since an extreme event can be location specific or cover certain areas in spatial scale and certain duration in temporal scale (known as the regional extreme event) fulfilling the statistical extreme properties, the effectiveness of point-based indices in defining high impact extreme events need to be evaluated.

10. It is necessary to address the existing definitions and also their regional dependency and finally arrive to a standardized (or common) definition of extreme weather and climate events, which can be applicable throughout the year independent of seasonal variation, with some examples for specific events such as drought event, heavy precipitation event and extreme temperature events.
11. Based on above considerations, the common definition should broadly satisfy the following characteristics :-
 - Easily understood
 - To be used operationally
 - Carrying physical meaning
 - Sensitive to wide range of particular extreme event conditions
 - Independent of area of application
 - Based on the data which are readily available
12. With regard to the regional extreme event the algorithm for Objective Identification Technique for Regional Extreme Events (OITREE) developed in China is potentially a valuable model for real time extreme event detection, monitoring and operational climate watch systems as well as for research (wide area extremes). This method can be tested for gridded data, model analysis, satellite and remote sensing data having long time series.
13. Effective international co-operations are greatly encouraged by WMO to further develop and apply the algorithm OITREE in other parts of globe for the regional extreme event, such as Benchmarking the algorithm (OITREE) for past extremes in other regions, e.g. European heat wave, Russian Heat wave, extreme precipitations over Pakistan, Australia flood etc.

Linkage with other TT groups

In order to address the issues linked with other TT groups of CCI following points are considered.

14. CCI/TT-DEWCE to review the indices defined by ETCCDI and suggests any new indices to address the extreme event issue. In this regard CCI/TT-DEWCE will coordinate with the ETCCDI co-chairs for unifying definitions on selected extreme indices.
15. CCI/TT-DEWCE will suggest to ETCCDI to adapt some indices focusing on monsoon areas for monitoring of long dry spells leading to drought.
16. Similarly CCI/TT-DEWCE will co-ordinate with TT-NCMPs with regard to the climate products dealing with significant climate and weather event relevant to an area or region.
17. CCI/TT-DEWCE suggest TT-CRSCI to focus on observational studies especially these on the indices and metrics of extreme events such as
 - index of forest fire
 - low and high water on river
 - depth of seasonal soil's thaw at permafrost
 - depth of seasonal soil's freeze through
18. Finally, the TT-NCMPs, TT-CRSCI and ETCCDI will be informed about the indices defined by CCI/TT-DEWCE with regard to the definition of extreme weather and climate events.