Direction de la Météorologie Nationale
MOROCCO

CLIMATE EXTREMES:

Observationnal uncertainties

and knowledge gaps

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With thanks to Xuebin Zhang ,Fatima Driouech and Michael Wehner

Outline

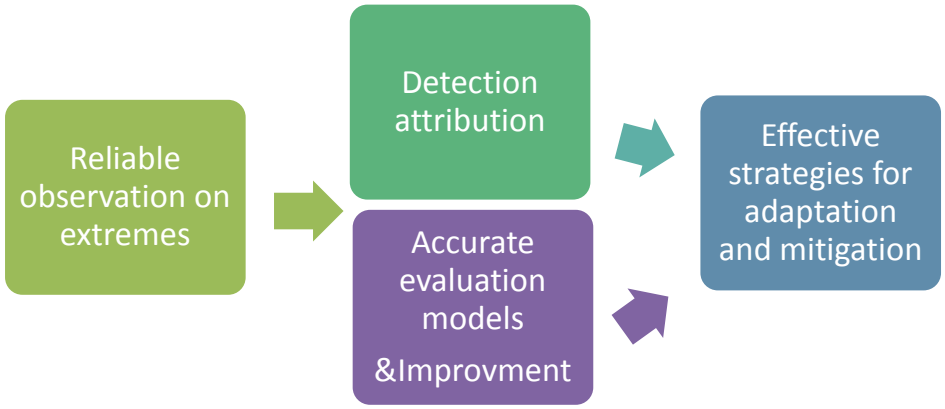
- Introduction
- Observationnal uncertainties sources
- Knowledge gaps on climate extremes
- Conclusion&Perspectives

Introduction

Climate Extreme

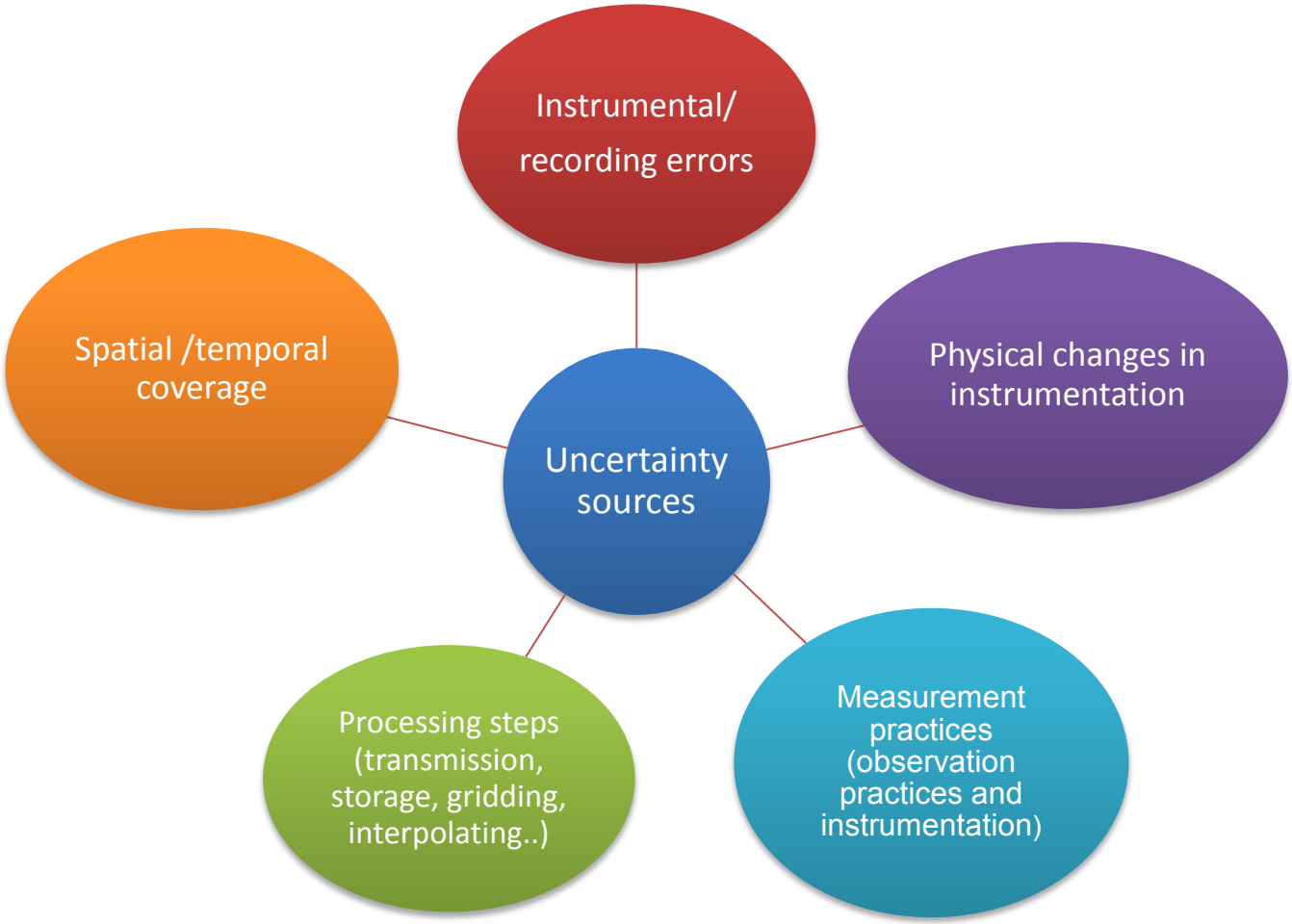
(Heat and cold waves, heavy precipitation ….)

Critical impact on socio-economic sectors



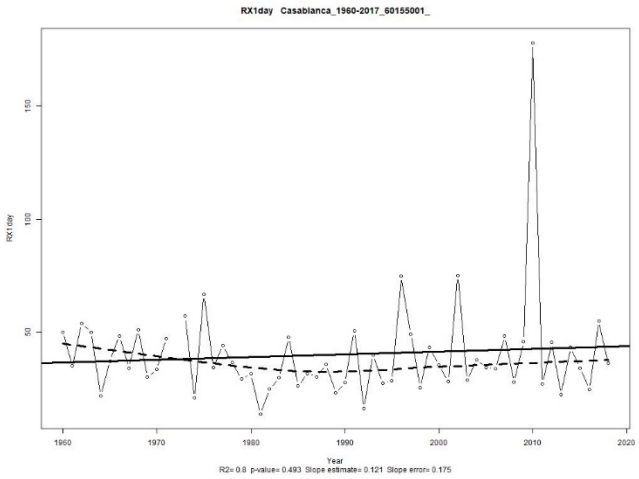
Observationnal uncertainty sources

Sources of observationnal uncertainty



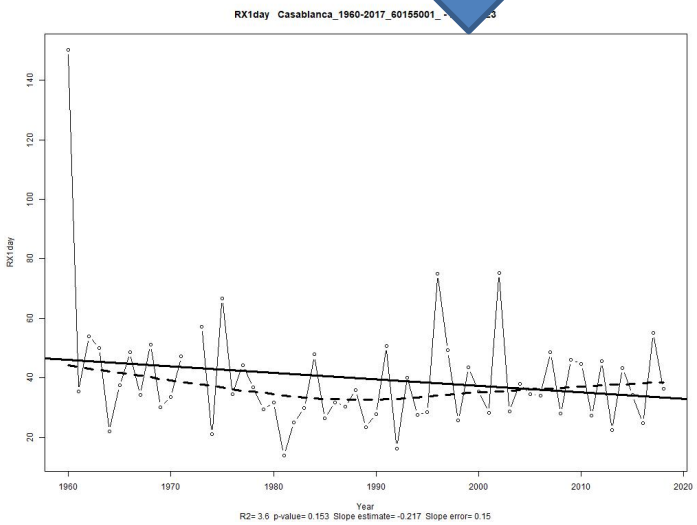
Observationnal uncertainty sources

Illustrative example:typing error



Increase 7mm over p.o.r

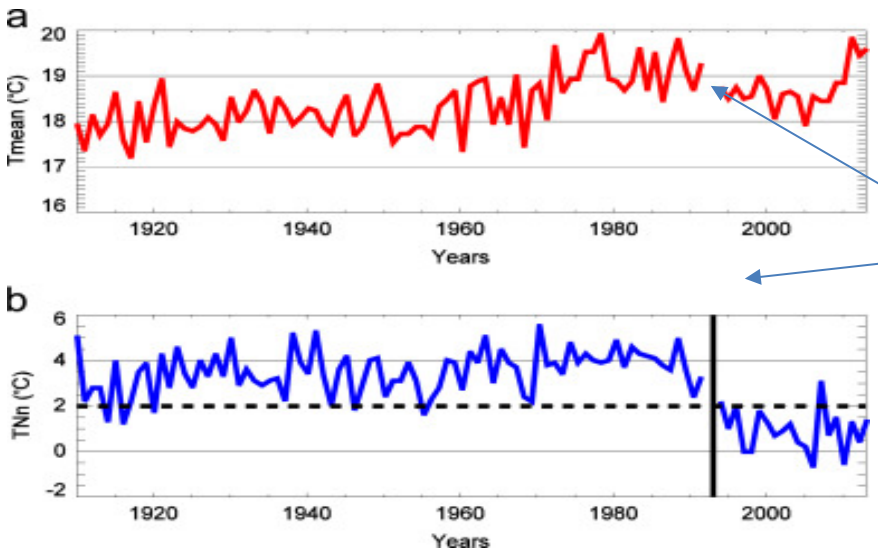
Changing one value at the beginning of the serie



Decrease 12 mm over p.o.r

Observationnal uncertainty sources

- Station relocation



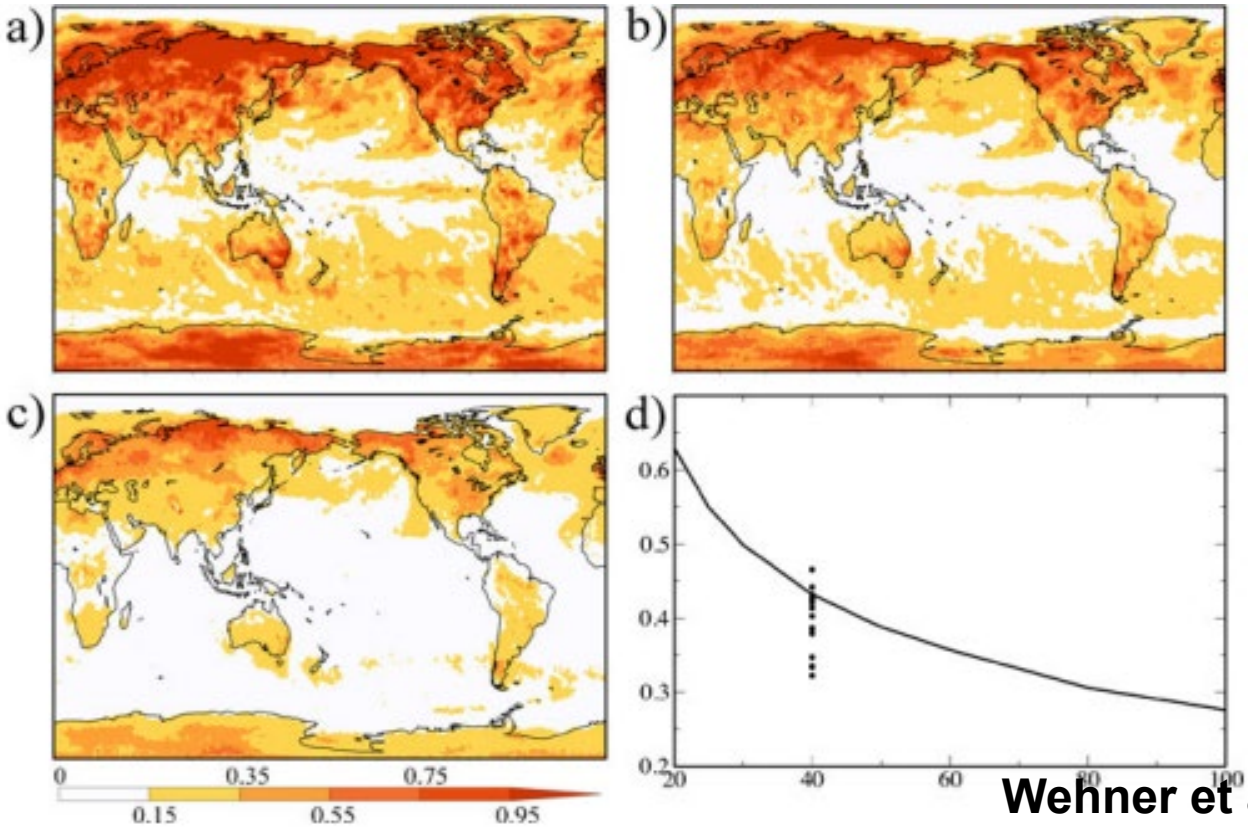
Changing location 1993

Example of how inhomogeneity can affect extremes differently from the mean

Alexander et al.2016

Observationnal uncertainty

- **Uncertainty from statistical fit**



Wehner et al. 2010

Fig. 3 The standard deviation (kelvins) of the 20-year return value of the annual maxima of daily surface air temperature calculated due to the uncertainty in the fit of the GEV parameters calculated by the method of Hosking and Wallis (1997). **a** Results from CCSM3.0 using 20 year sample size. **b** Same using a 40 year sample size. **c** Same using a 100 year sample size. **d** The average over land as a function of sample size for CCSM3.0 (*solid line*) and the 40 year sample size results for the rest of the climate models considered in this study (*dots*). Same color scale as Fig. 2.

Observationnal uncertainty

- Spatial resolution& choice dataset

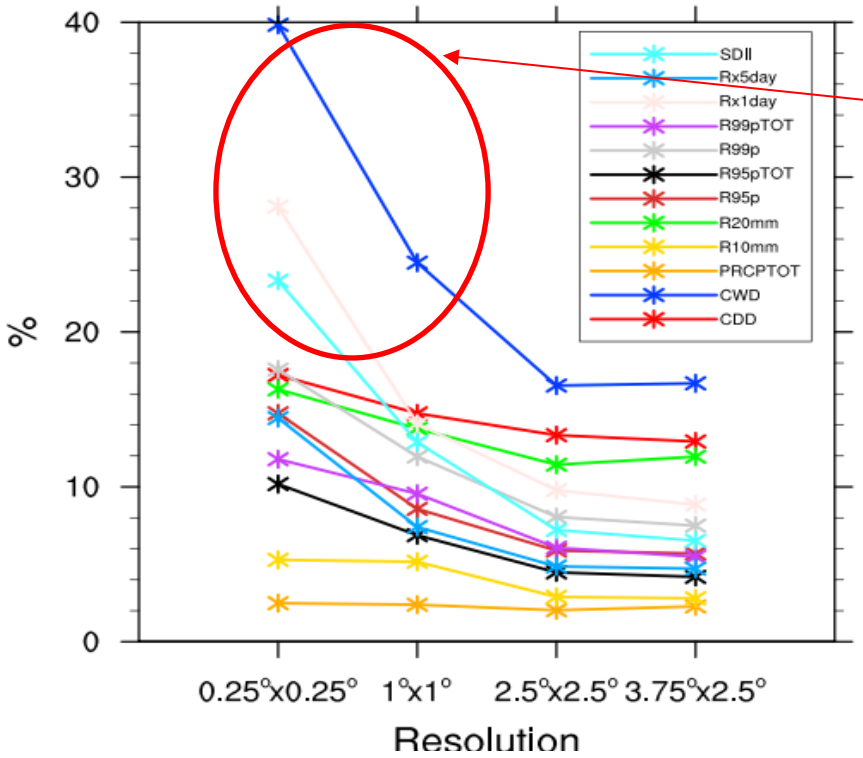


Figure 1. Interproduct spread (coefficient of variation) for each index at each resolution. See section 3.1 for explanation. See Table 2 for index definitions.

- CWD, Rx1day, and SDII exhibit the highest sensitivities to resolution and choice of dataset
- PRCPTOT and R10mm exhibit the lowest interproduct spread and sensitivity to resolution.

Herold et al.2017

Observationnal uncertainty

- Spatial resolution& choice dataset

In case of evaluating precipitation extremes in high-resolution global climate models , interproduct differences will be particularly problematic

Instead of objectively determining a single best data set, multiple observational products must be used in evaluating modelled precipitation extremes

Herold et al.2017

Gaps in observed climate extremes

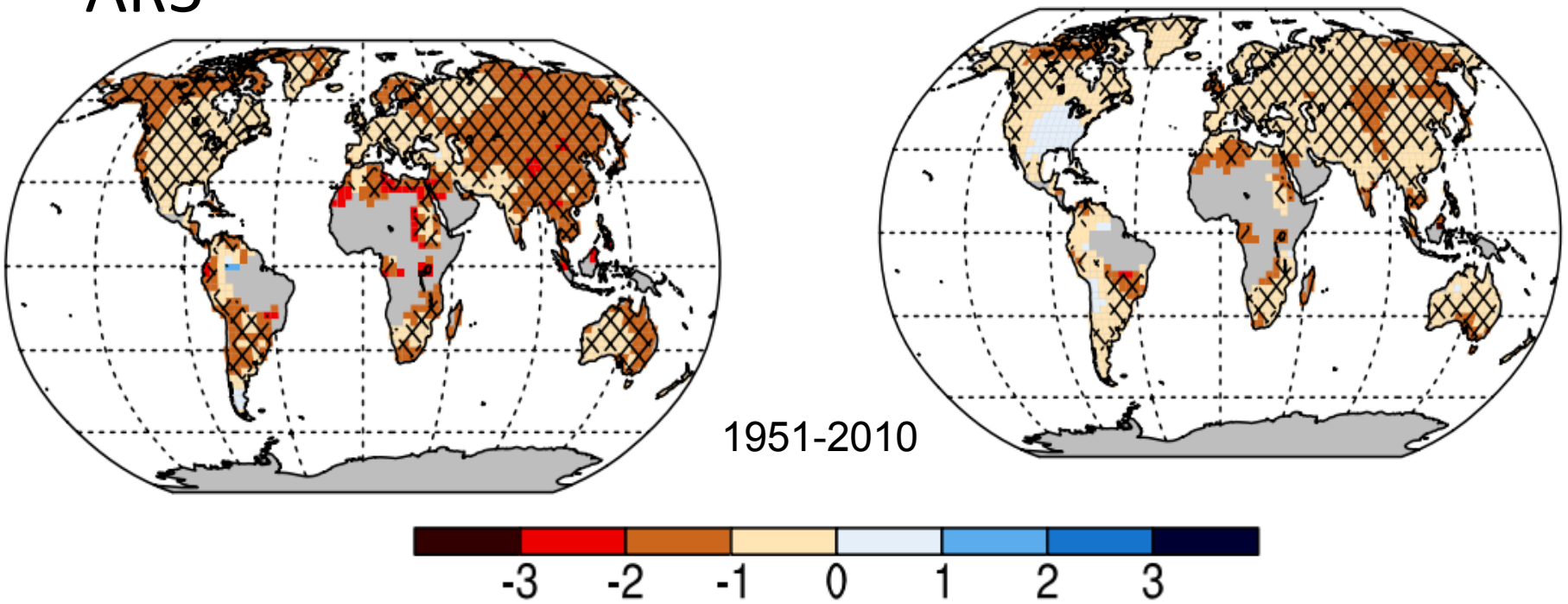
Gaps in observed extreme temperature

Cold extremes

Cool nights

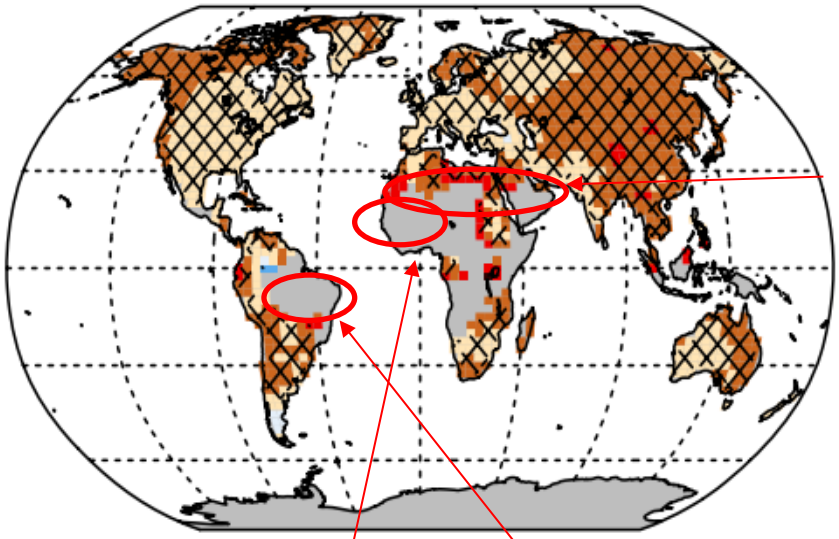
Cool days

- AR5

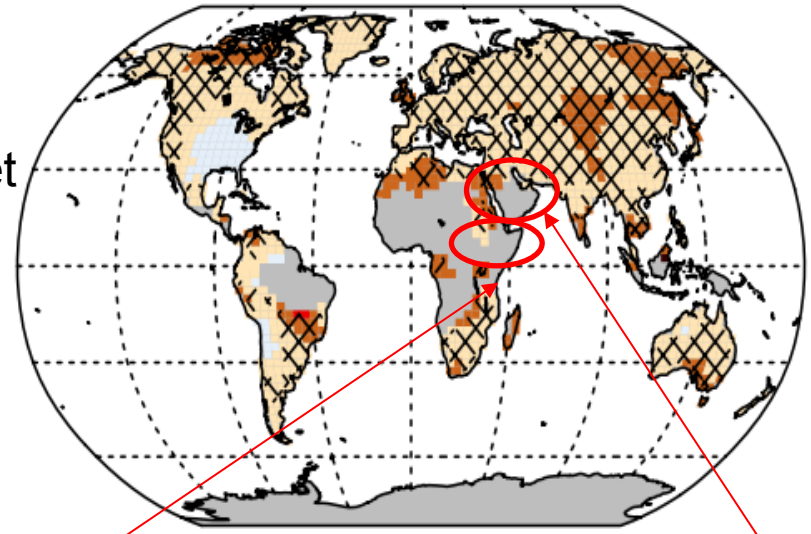


From AR5, generally cold extremes such as cool days and nights have decreased over almost all the globe.

Gaps in observed extreme temperatu



Donat et al.2014



Barry et al., 2018; Chaney et al., 2014)

Zandonadi et al.2015

Omondi et al., 2014

Almazroui et al., 201

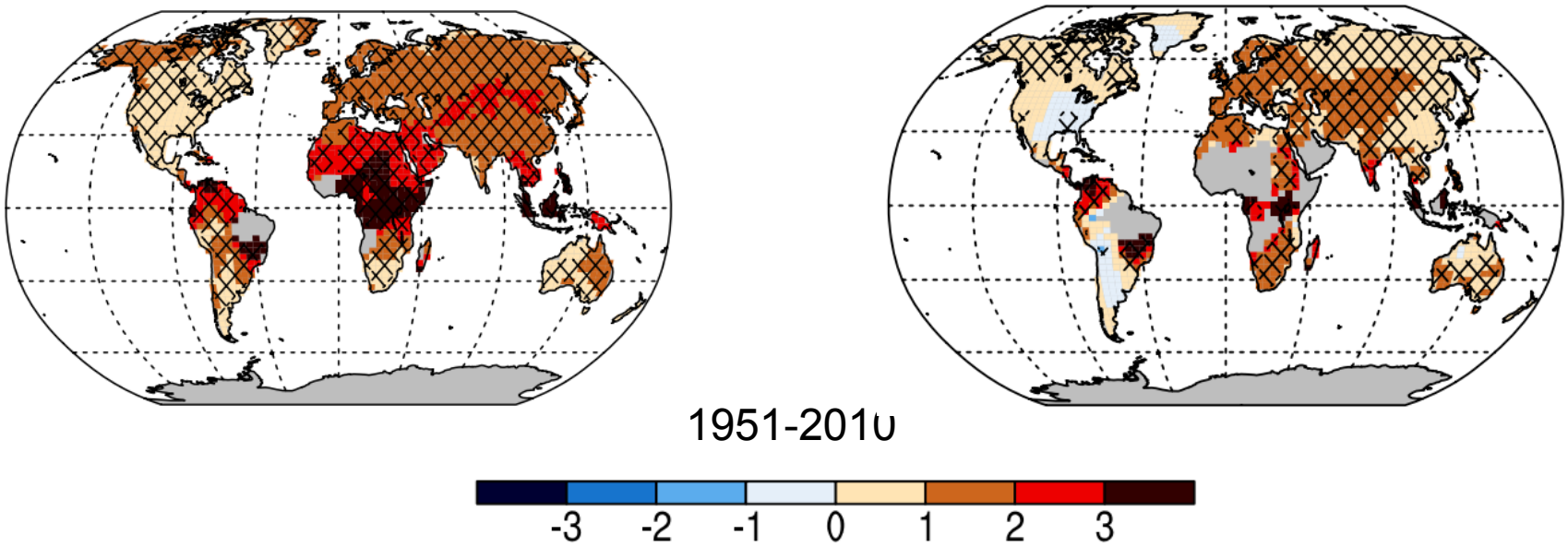
Gaps in observed extreme temperature

- AR5

Warm extremes

Warm nights

Warm days



For warm extremes, AR5 has reported increase in warm days and nights over most of globe.

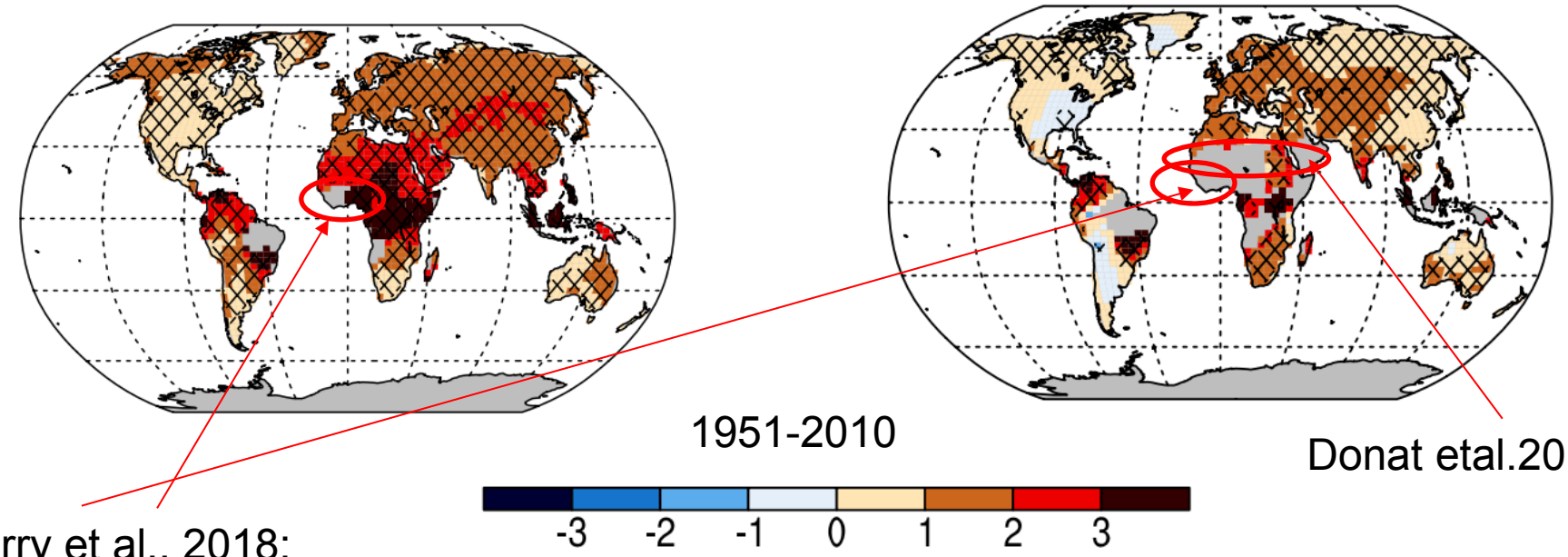
Gaps in observed extreme temperature

- AR5

Warm extremes

Warm nights

Warm days

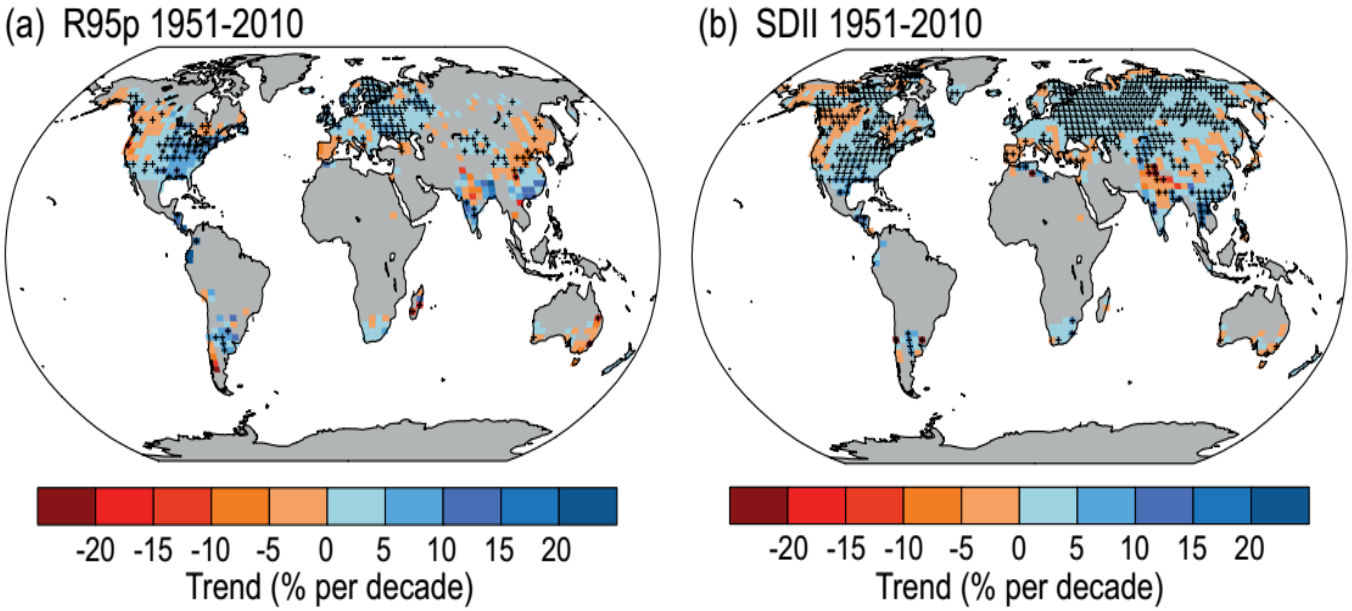


Barry et al., 2018;
Chaney et al., 2014

Donat etal.2014

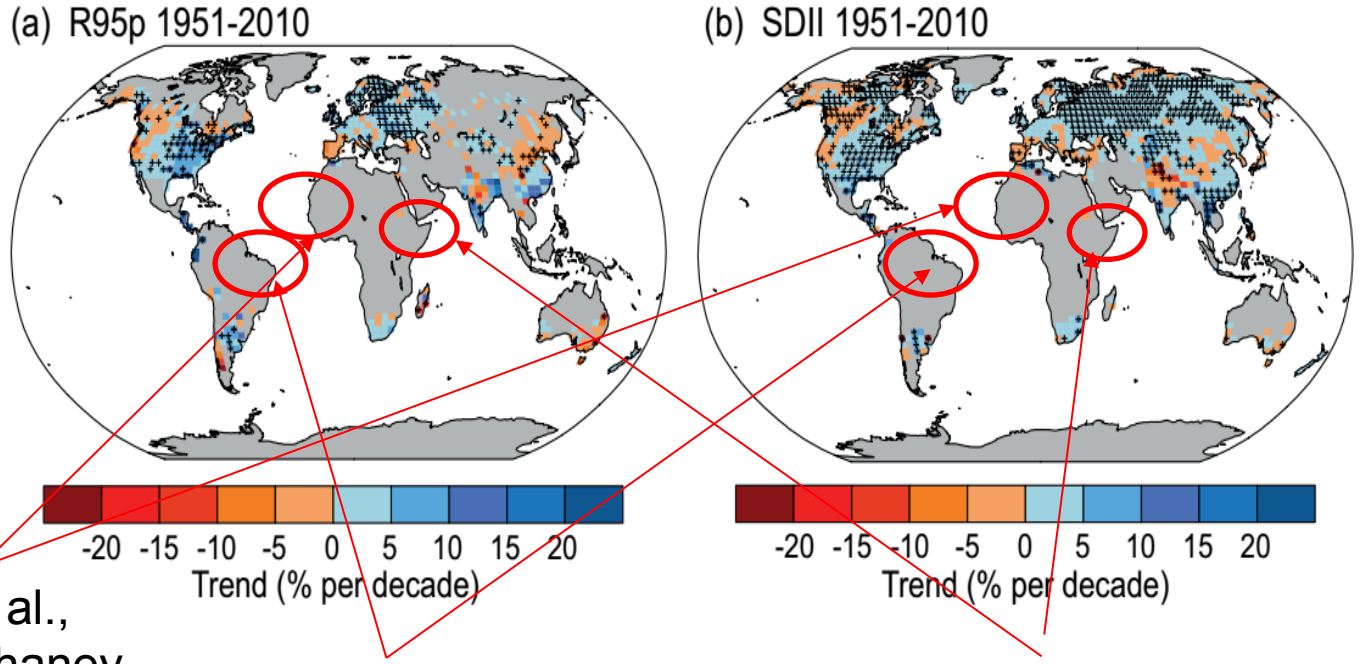
Gaps in observed extreme precipitation

AR5



AR5 has reported an increase in heavy precipitation than decrease but with low to meduim confidence owing to lack of data

Gaps in observed extreme precipitation

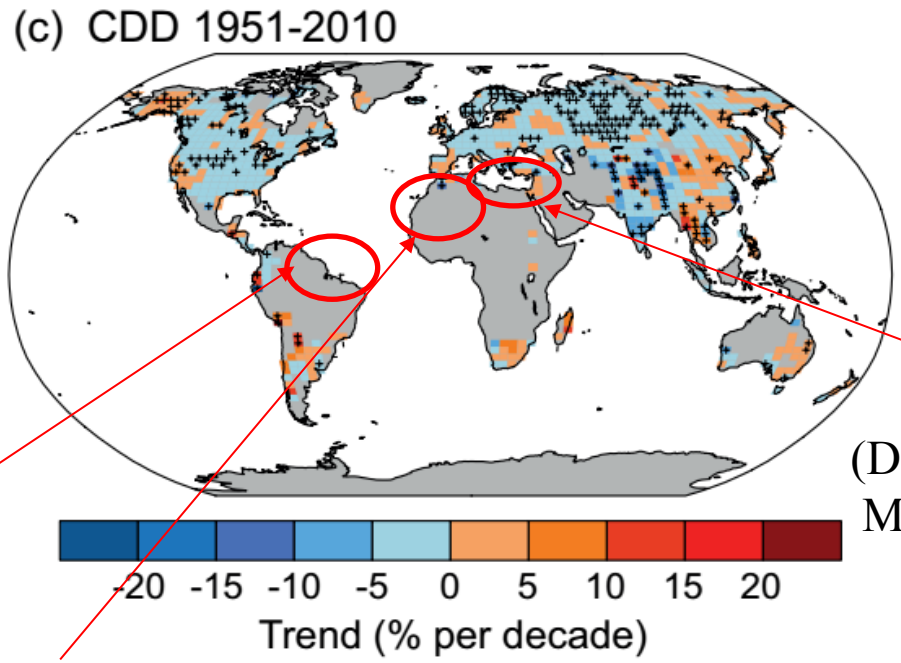


Barry et al., 2018; Chaney et al., 2014)

Zandonadi et al.2015

Omondi et al., 2014

Gaps in observed dryness



Alexander 2016

(Donat et al., 2014a; Mathbout et al., 2018b)

Zandonadi et al.2015

Barry et al., 2018; Chaney et al., 2014)

Conclusion&Perspectives

- Enhance data accessibility and availability
- Promote regional coordination initiative for capacity building with respect to data quality and homogeneity
- Increase spatial and temporal resolution (sub-daily) to deal with severe local weather events
- Enhance regional research
- Develop procedure allowing to integrate output from studies


THANK YOU