

# Development of Global Heatwave Risk Alert using EPS Products



香港天文台  
HONG KONG OBSERVATORY

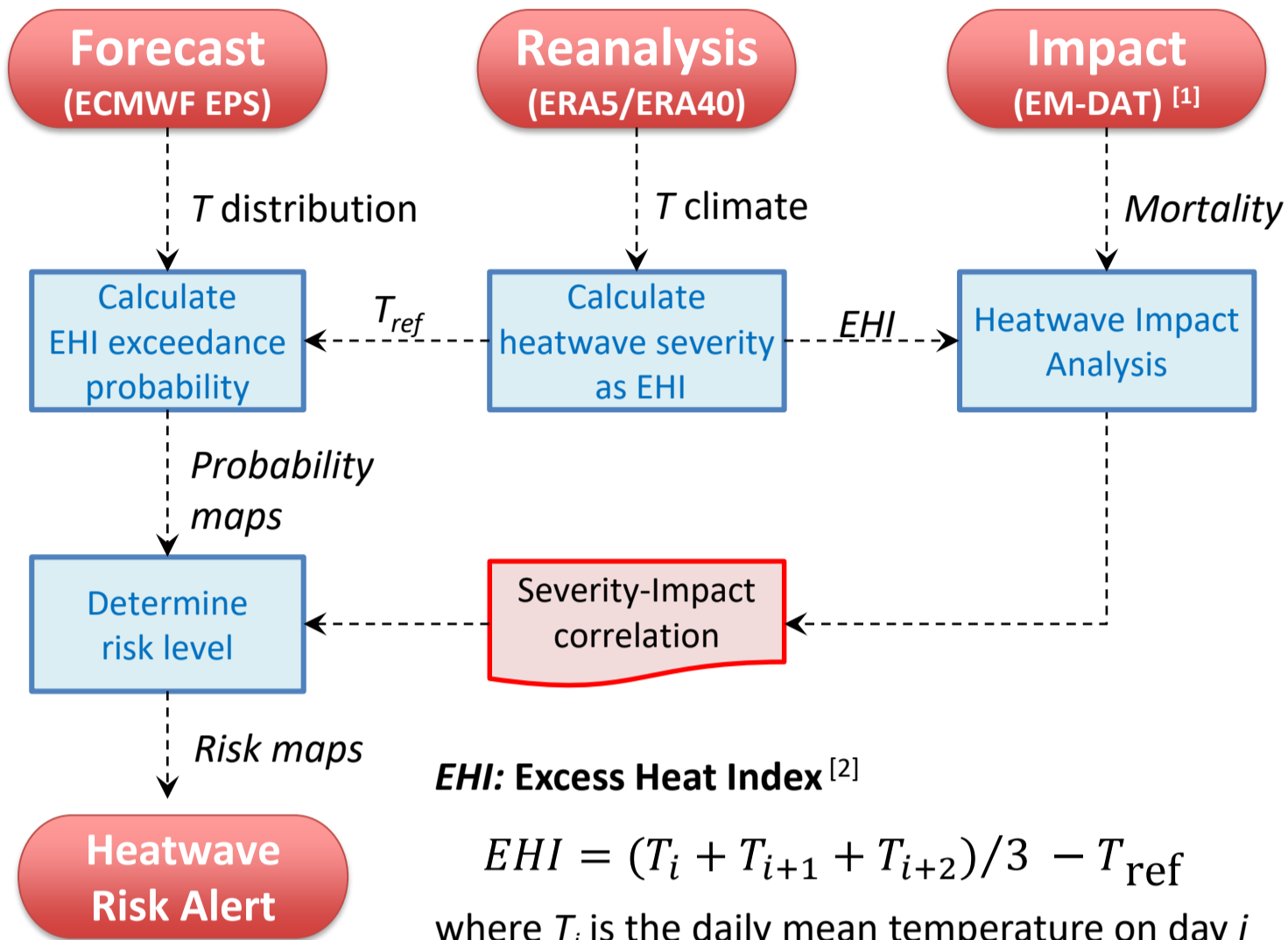
Chun-kit HO<sup>1</sup> Hon-yin YEUNG<sup>1</sup> Sui-shing YEA<sup>2</sup>

1 Hong Kong Observatory 2 Earth System Science, The Chinese University of Hong Kong

## Motivation

- Effective early risk alert products for high-impact weather, e.g. heatwaves, are useful for response planning.
- How can model EPS products be used to generate risk-based alert products?

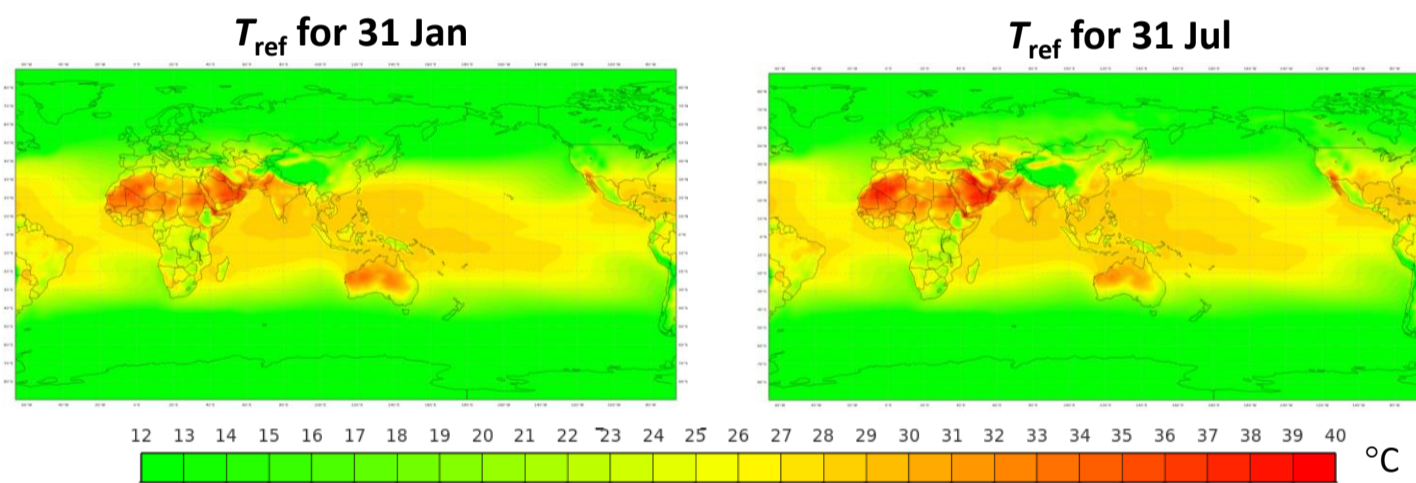
## Methodology



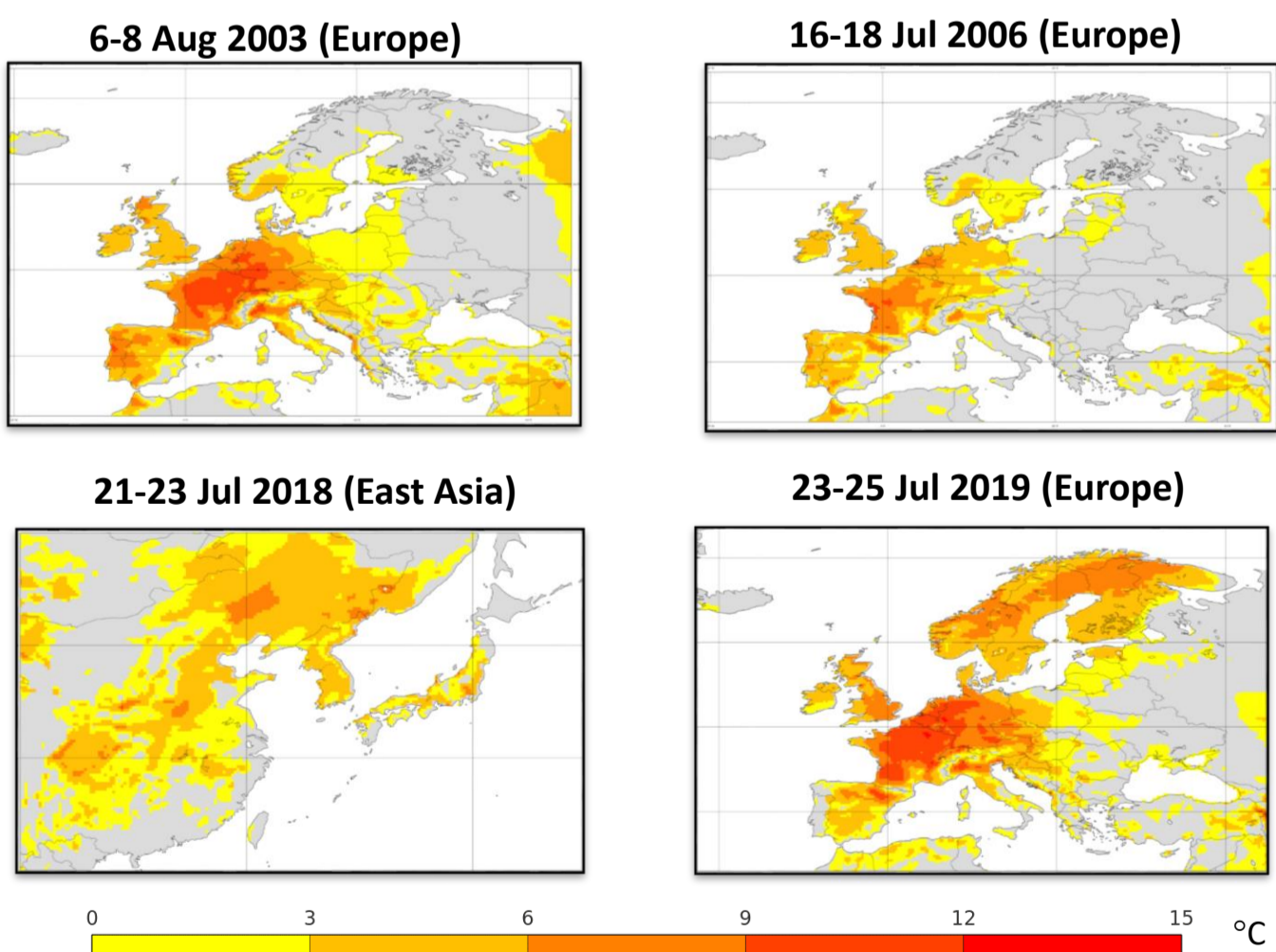
**EHI: Excess Heat Index** [2]

$$EHI = (T_i + T_{i+1} + T_{i+2})/3 - T_{ref}$$

where  $T_i$  is the daily mean temperature on day  $i$  and  $T_{ref}$  is the 0.95 quantile of  $T_i$  adjusted for seasonality.

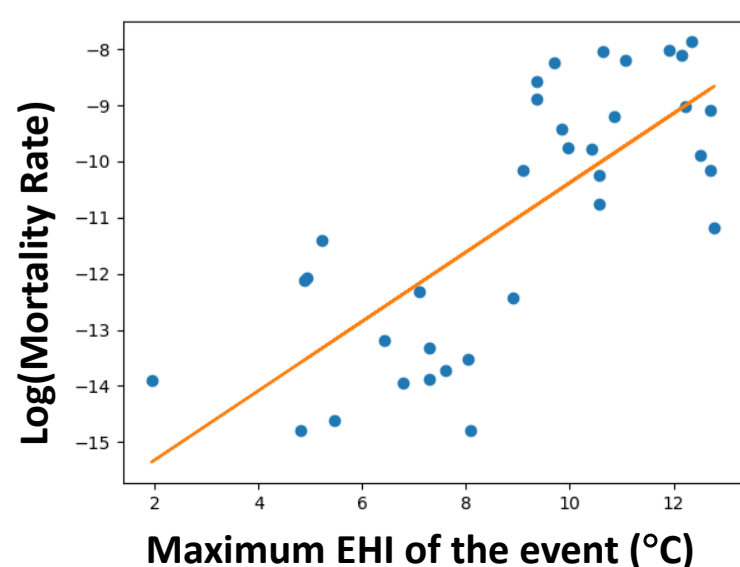


## Examples of EHI in Past Heatwave Events

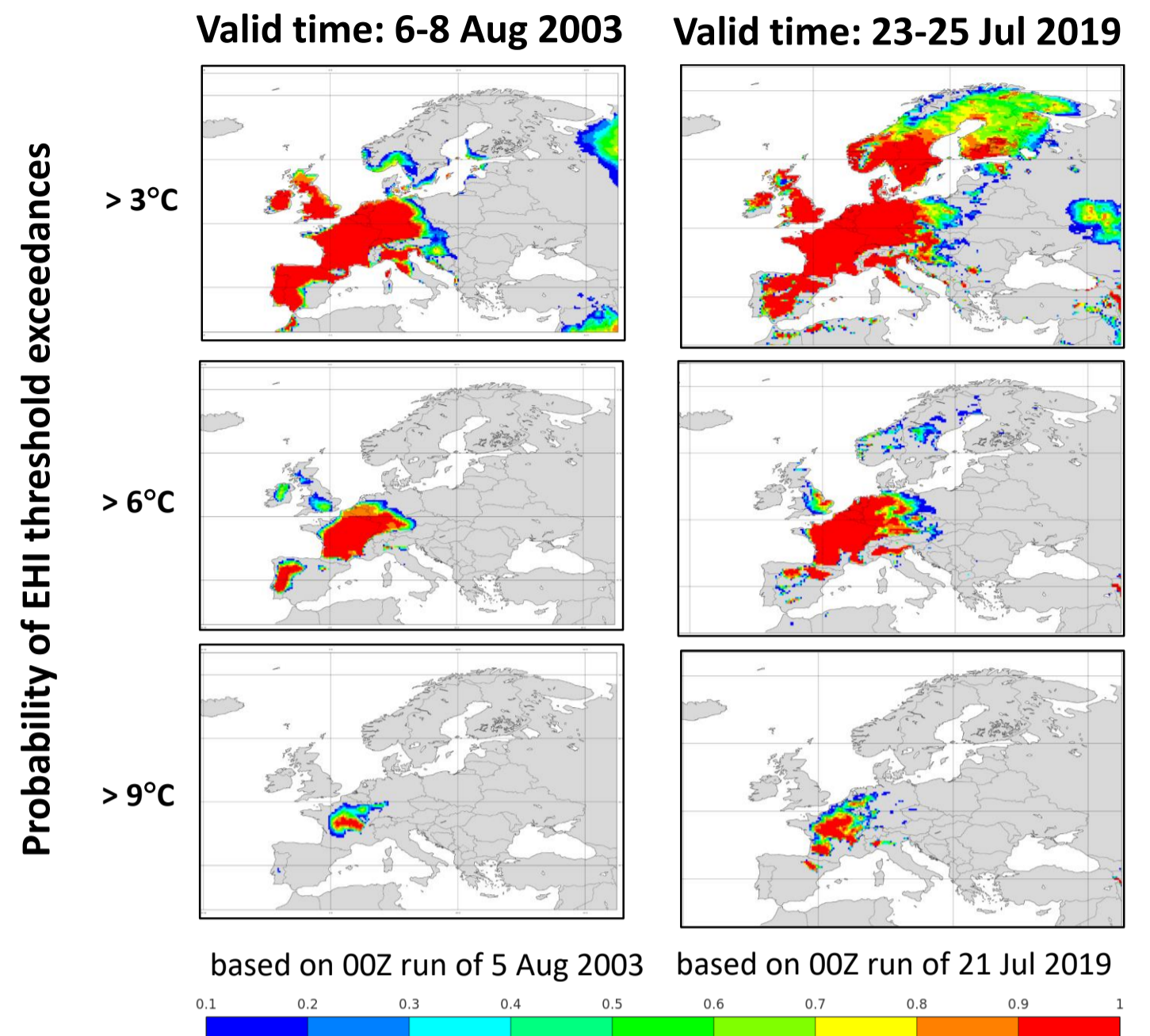


## Linking Heatwave Severity to Impact

- Mortality rate of past heatwave events was found to positively correlate with maximum EHI.

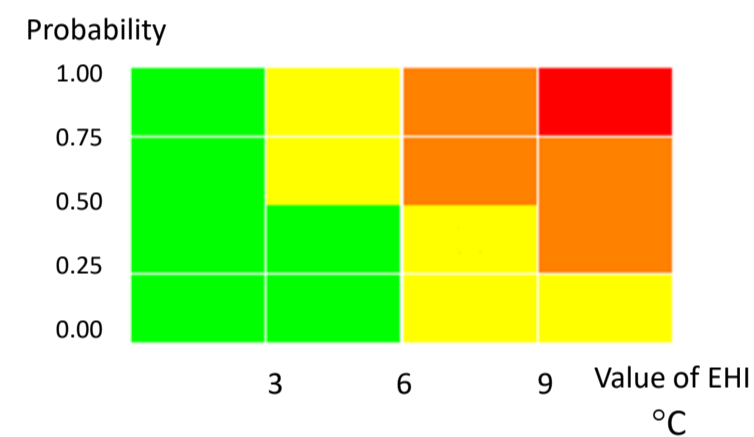


## Examples of Heatwave Probability Maps using ECEPS forecasts



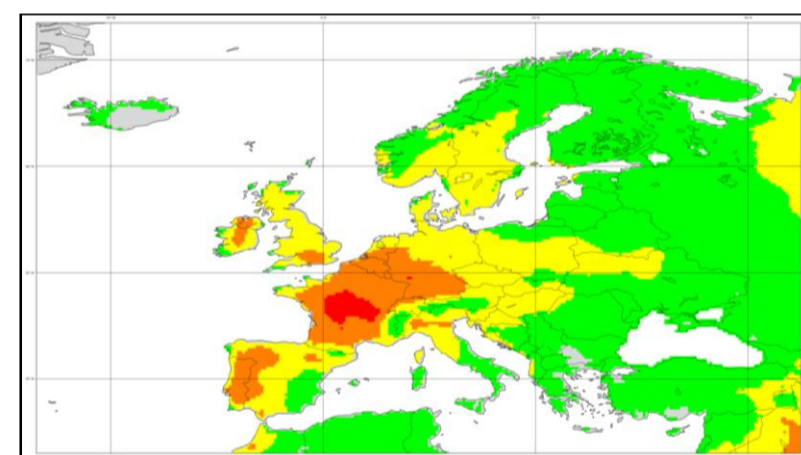
## Examples of Heatwave Risk Alert Maps

- Heatwave risk alert maps could be produced by assigning different risk level [3] according to the probability of threshold exceedance of EHI.



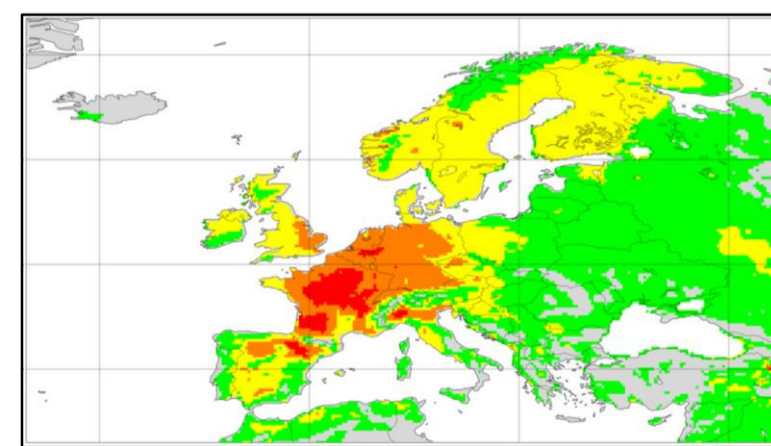
### Valid time: 5-14 Aug 2003

(maximum risk over running 3-day periods)



based on 00Z run of 5 Aug 2003

### Valid time: 21-23 Jul 2019



based on 00Z run of 21 Jul 2019

### Number of heat-related deaths in Aug 2003 [1]

Italy	> 20000
France	> 19000
Spain	> 15000
Germany	> 9000
Portugal	> 1000
Belgium	> 1000
Netherlands	> 900

### Number of heat-related deaths in Jul 2019

France	> 800
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## Conclusions

- Objective heatwave risk alert maps could be generated by considering EPS-based threshold exceedance probability of the EHI. Areas with high risk were found to correspond with elevated mortality figures.
- Applications for other types high-impact weather require further investigation.

## References

- Mortality data from EM-DAT, Centre for Research on the Epidemiology of Disasters. URL: <https://www.emdat.be/>
- WMO-WHO, 2015, Heatwaves and Health, Guidance on Warning-System Development.
- WMO, 2015, WMO Guidelines on Multi-hazard Impact-based Forecast and Warning Services.