Forecasting Drought Impacts

Henny A.J. Van Lanen

WAGENINGEN UNIVERSITY
WAGENINGEN UR

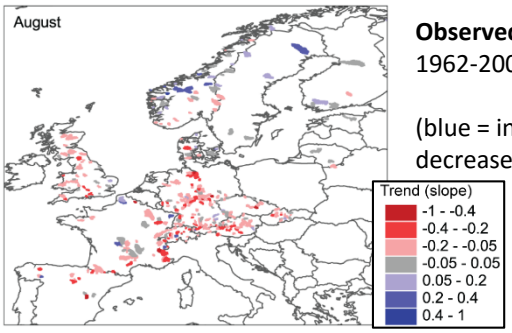
Introduction

Drought is one of the most extreme weather-related natural hazard. Millions of people across the world are annually exposed to droughts that seriously affect economic development and environment. In Europe almost 80.000 people died due to associated heatwaves and forest fires over the period 1998–2009. Overall losses were estimated to be as high as €4940 billion over the same period. Severe drought has a transnational nature and usually it lasts longer than other weather and climate-related natural hazards. Adequate drought management and policy making requires seamless prediction, i.e. from weeks, seasons to decades.

Wildfire, Veluwe, The Netherlands, dry spring 2014

Low Flow, River Gardon, France, 2003 drought

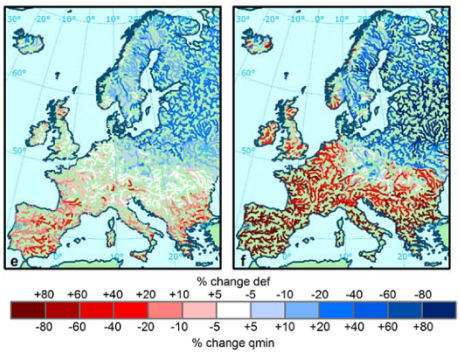
Trends in Historic and Future Hydrological Drought



Observed flow in August 1962-2004

(blue = increase, red = decrease)

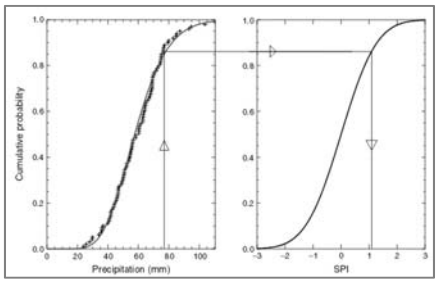
(Stahl et al., HESS, 2010)



Future Hydrological Drought
Change in 20 yr return level Minimum Flow (left) and Deficit Volume (right)
2050 vs. 1961-1990
(SRES A1B,
12 GCMs/RCMs, 1 GHM)

(red = dryer, blue = wetter)
(Forzieri et al., HESS, 2014)

Methods to identify Drought



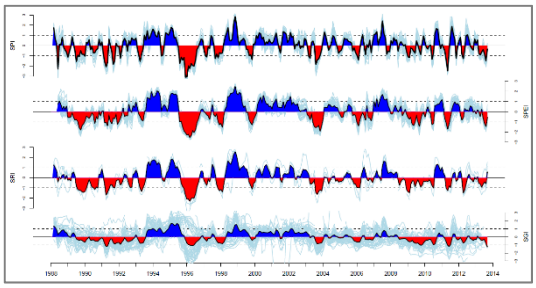
Standardized Precipitation Index (SPI)

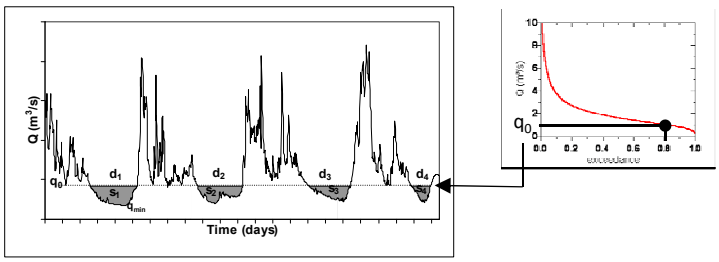
SPI	drought
< -1	moderate
< -2	severe

(McKee et al., 1993)

3-month anomalies in:
- precipitation (SPI)
- precipitation – evaporation (SPEI)
- groundwater (SGI)
- river flow (SRI)

(Ten Broek et al., 2014)



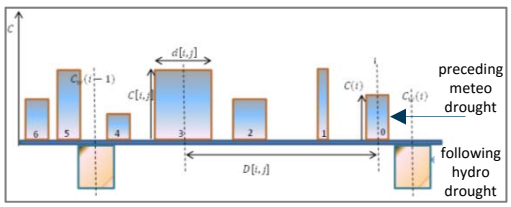


Threshold Approach

Drought Characteristics
- onset / recovery
- duration (d_1, d_2, ..)
- deficit volume (s_1, s_2, ..)

(Hisdal et al., 2004)

(hydrological) Drought Forecasting

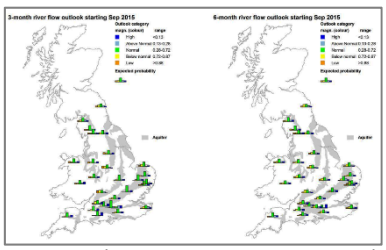


(Wong et al., HSJ, 2013; Beyene, 2014)

Methods (examples):
- statistical methods (teleconnections, persistence and historical analogues) predicting, e.g. river flow
- ensemble hydrological predictions using physically-based hydrological models and ensemble weather forecasts

(e.g. Arnal; Ionita; Prudhomme, HEPEX, 2015)

Next: drought identification



(Prudhomme et al., 2015)

Hydrology and Quantitative Water Management Group, Wageningen University, The Netherlands
Tel: + 31 6 8359 6767
E-mail: henny.vanlanen@wur.nl
Web site: https://www.vcard.wur.nl/Views/Profile/View.aspx?id=3920&ln=eng

ANYWHERE
Task 2.6 Forecasting algorithm to assess drought impacts

edc
European Drought Centre

UNESCO- International Hydrological Programme, phase VIII

friend water