
River Pang, Berkshire. 2006 drought. Ned Hewitt

New developments in drought monitoring

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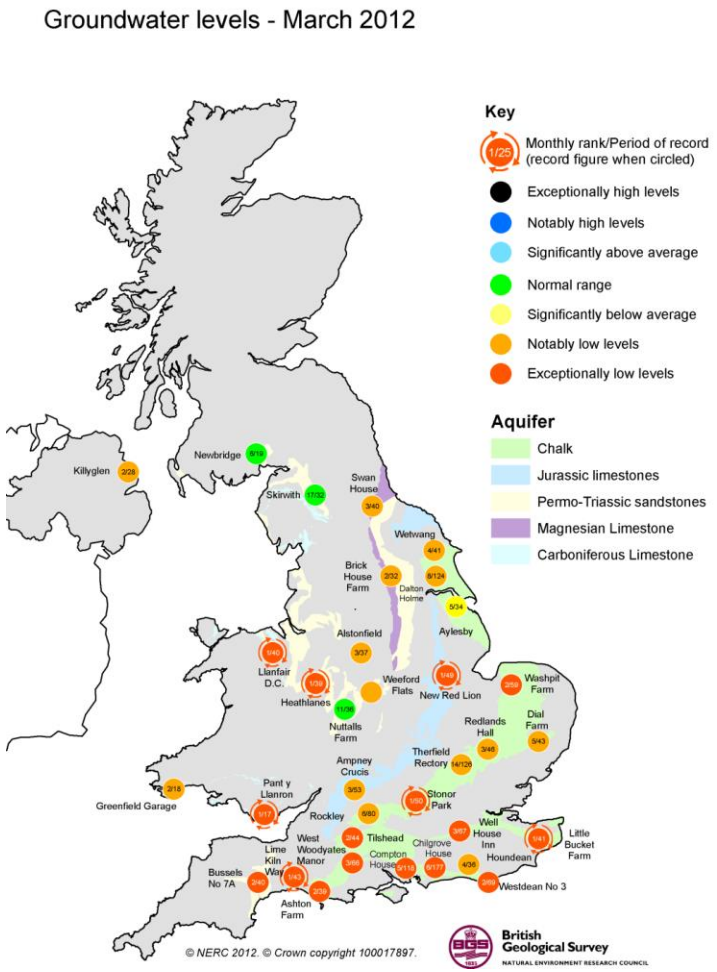
Current approaches to monitoring

CEH/BGS Hydrological Summaries

- December 1988 – Present
- Places events in a historical context
- Focuses on rainfall, river flows, groundwater levels and reservoir stocks.
- Audience includes: scientists, media, policy makers, water companies, general public
- Available for free at http://www.ceh.ac.uk/data/nrfa/nhmp



Monitoring the 2010 - 2012 drought

Met Office

British Geological Survey
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Drought monitoring workshop, Wallingford, March 2015.

44 delegates: government, regulators, water suppliers, farmers, power generation, public health

Soundbites:

- "Types of drought": met, ag, hydro; but also **navigational drought, whisky drought, salmon droughts…?** Sector specific indicators and impacts, regional vulnerabilities
- Impacts define drought but often in hindsight – not systematically monitored.

➢ **Can improved indicators help enable consistent messaging?**

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Collins et al. BAMS, in press. Report at: http://nora.nerc.ac.uk/513143/

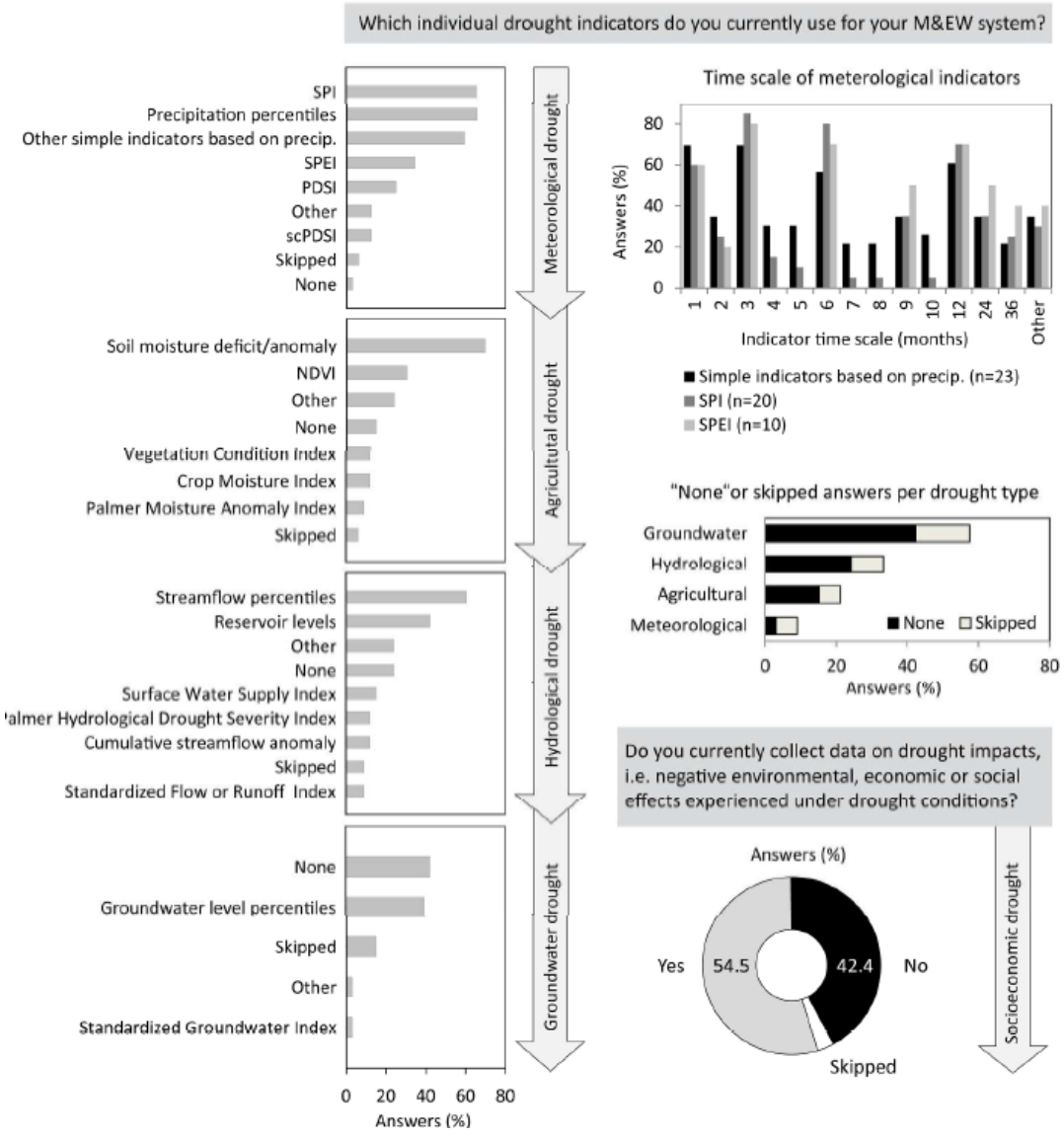
Global state-of-the-art in drought indicators

Bachmair et al. 2016.

(1) Literature review

(2) Survey of 33 M&EW providers globally

- Wide variety of indicators used
- Less hydrological monitoring than meteo/agriculture
- Impacts not systematically monitored



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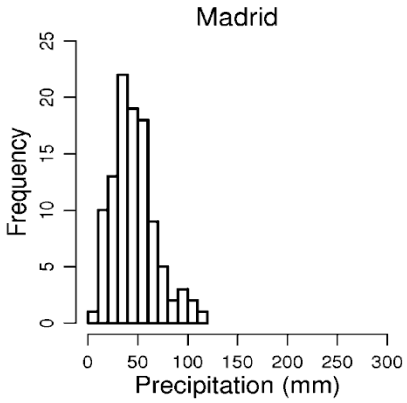
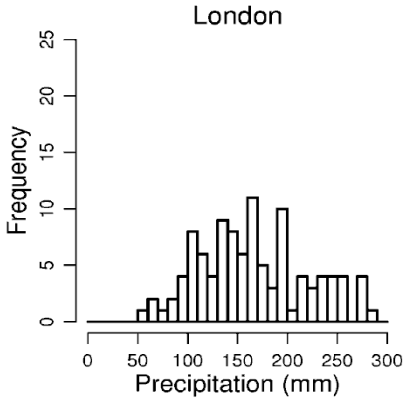
Standardised Indicators: not universal, but not apples and pears





World Meteorological Organization
Weather • Climate • Water

Table 2. Probability of recurrence

SPI	Category	Number of times in 100 years	Severity of event
0 to -0.99	Mild dryness	33	1 in 3 yrs.
-1.00 to -1.49	Moderate dryness	10	1 in 10 yrs.
-1.5 to -1.99	Severe dryness	5	1 in 20 yrs.
< -2.0	Extreme dryness	2.5	1 in 50 yrs.

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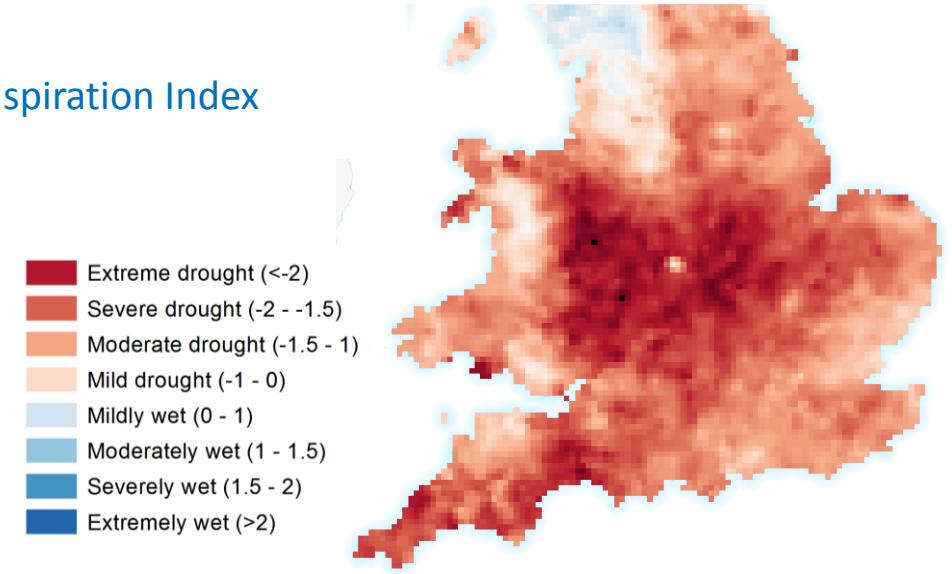
DrIVER: Drought indicators

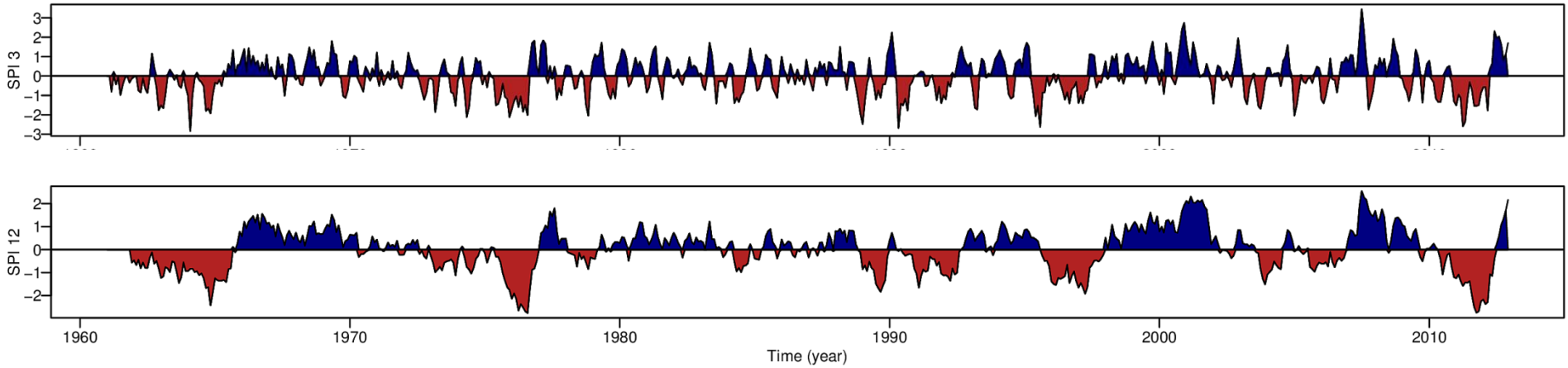
DrIVER project primarily uses standardised drought indicators:

- SPI: Standardized Precipitation Index
- SPEI: Standardized Precipitation and Evapotranspiration Index
- SSI: Standardized Streamflow Index
- SGI: Standardized Groundwater Index



Why?

- Compare fairly across space
- Compare between seasons
- Compare across variables
- Calculate for any duration
- Can assign probabilities

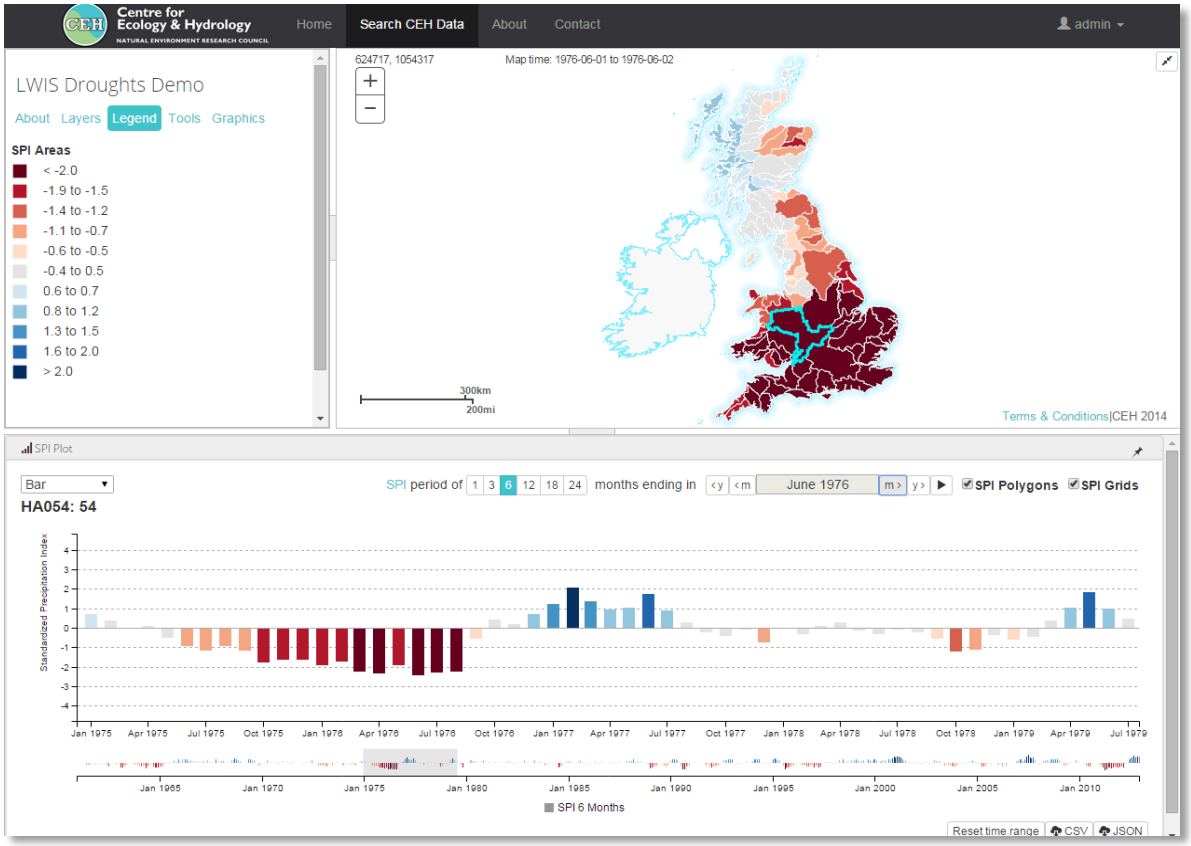


Barker et al. 2016. Hydrol and Earth Sys Sci.

The CEH Drought Portal

UK Drought Portal

- Launched July 2015
- Gridded drought indicators **(SPI and SPEI)**
- 1km and 5km resolution
- Monthly, **1961 – 2012**
- Free data downloads with DOIs



https://eip.ceh.ac.uk/apps/droughts/

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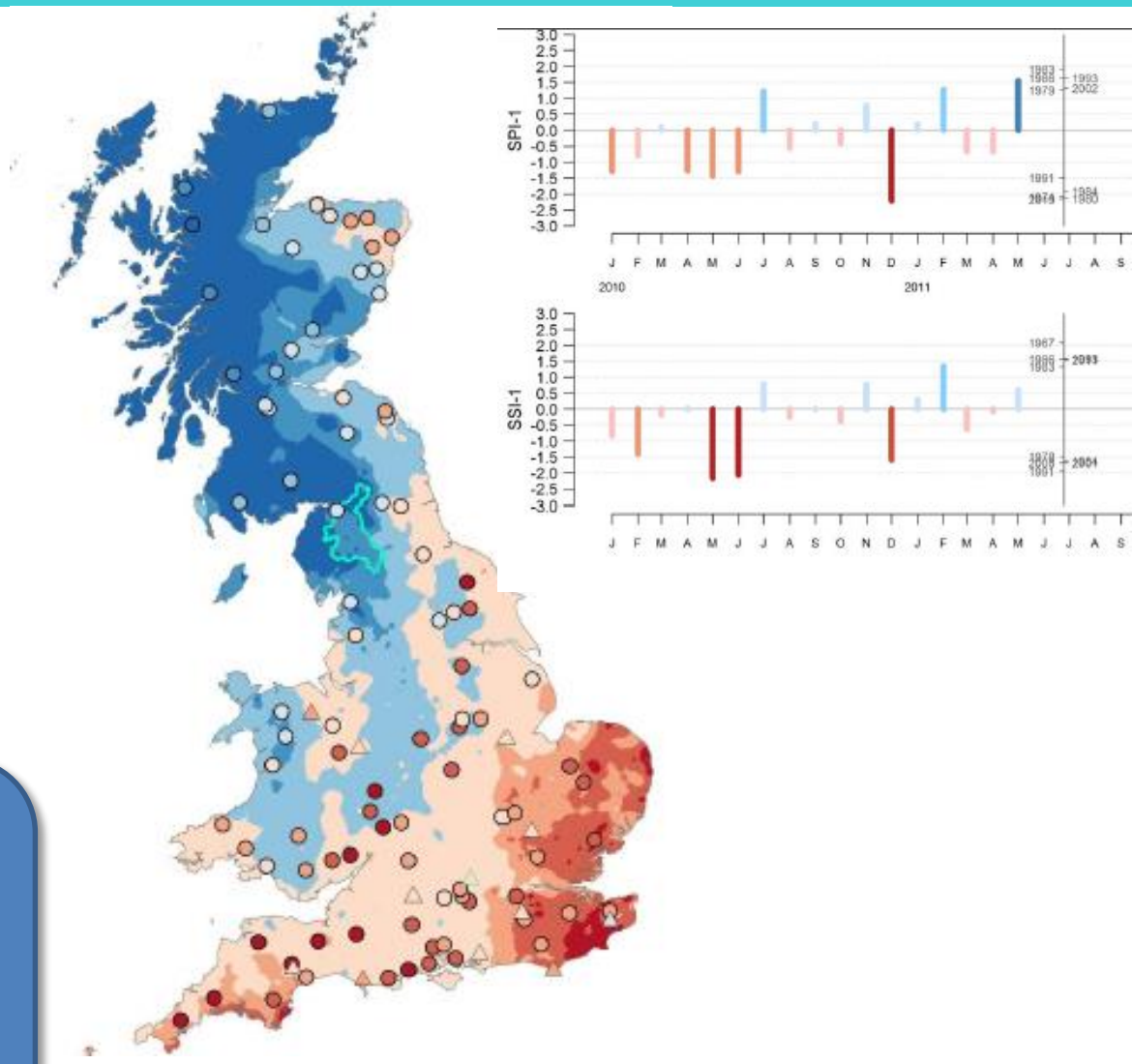
A web-based tool for visualisation and mapping (a testbed for early warning….?)

The Drought Portal – What next?

- Monthly rainfall added – near-real-time updates (early 2017)
- Streamflow
- Groundwater

….?



What else should be added and what should it look like?

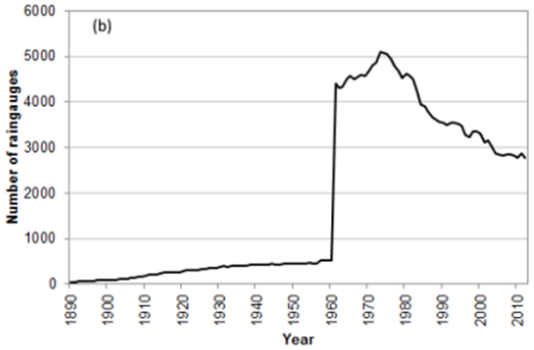
Help us shape the portal today

Integrated, interactive monitoring of precipitation, streamflow, groundwater?

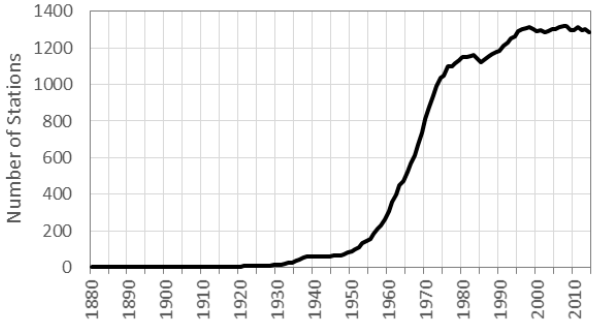
Pushing back in time

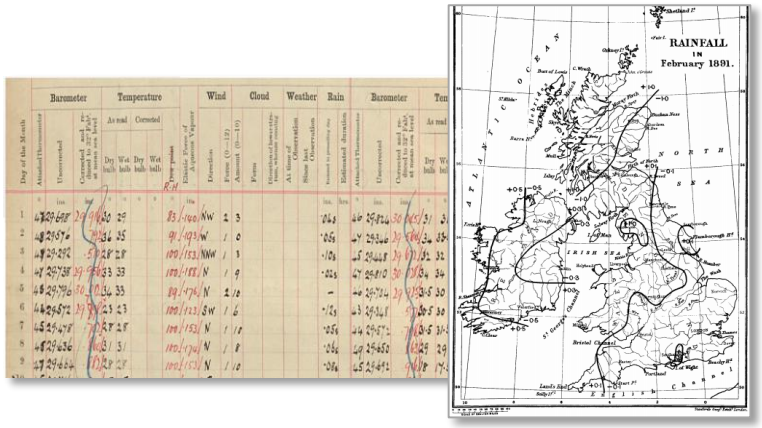
- Current data on portal: **1961 – 2012**
- “Historic droughts” is improving rainfall coverage in early 20th C
- And reconstructing hydrology back to 1880s:
  - **Streamflow (300 stations)**
  - **Groundwater level (70 boreholes)**
- Data Available spring 2017

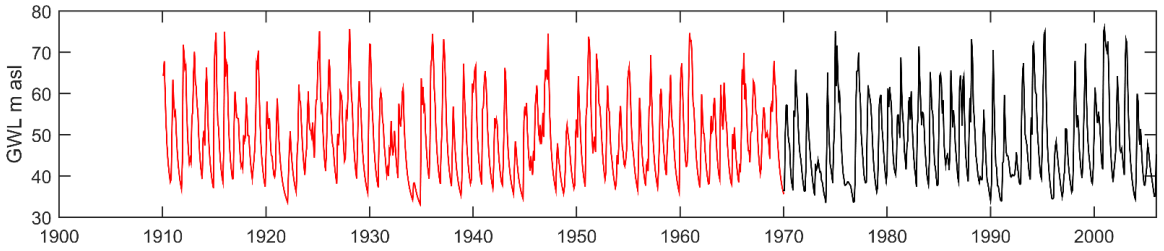
Daily Precipitation (Met Office: NCIC)



Streamflow (CEH: NRFA)





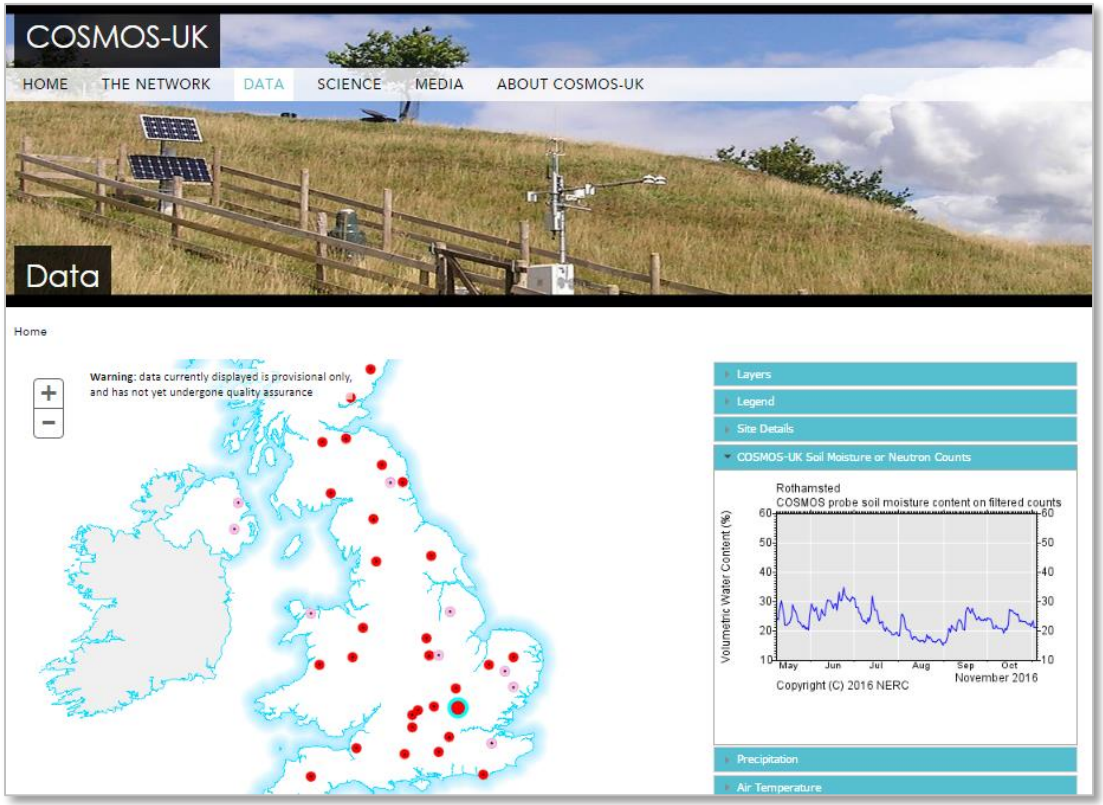


Groundwater Reconstructions (Jackson et al. 2016, Hyd Proc)

Historic Droughts

Other Developments: COSMOS UK

- Established 2013 onwards
- Network of >40 (and growing) real-time, in-situ soil moisture sensors
- Uses cosmic rays to sense soil moisture over 20 hectares



http://cosmos.ceh.ac.uk/

COSMOS-UK
UK Soil Moisture Monitoring Network

Other Developments: Earth Observation (EO)

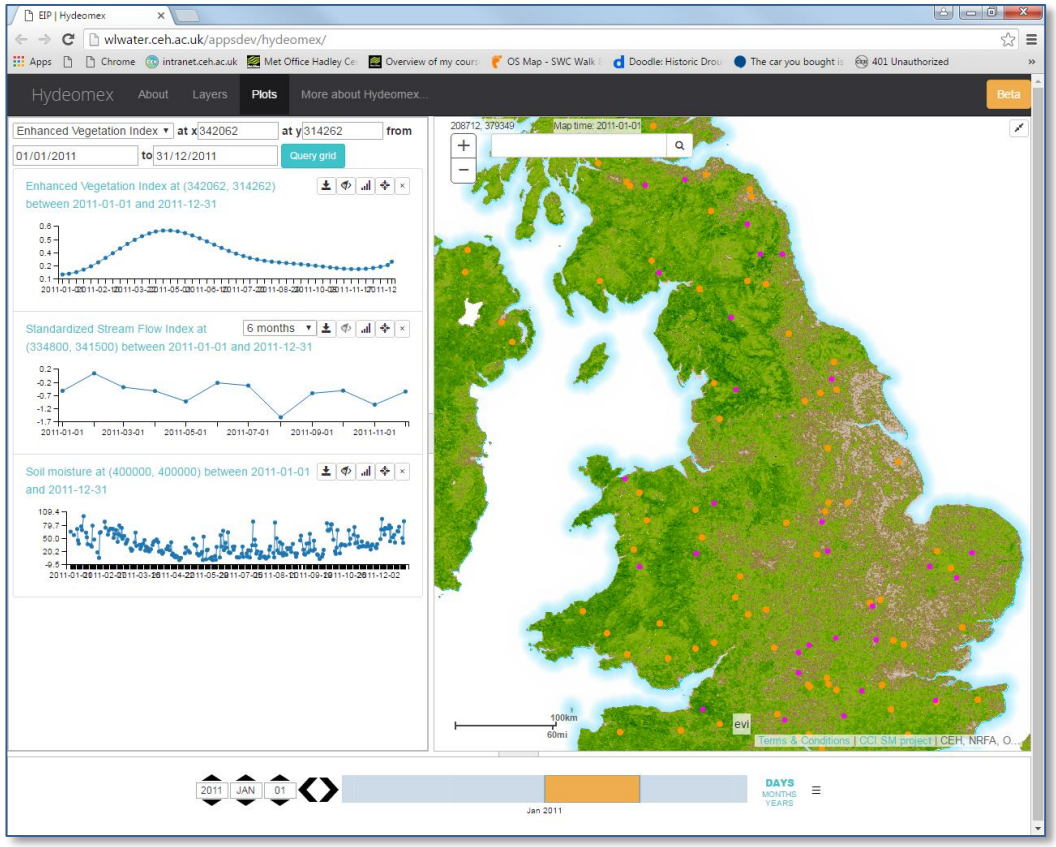
"Hydrology and Earth Observation Modelling Exploration"

Demonstration portal includes:

- **The usual rainfall, river flows…**
- **EO Soil Moisture (ESA) - 20km**
- **EO Vegetation condition (MODIS) – 500m**

Long-term capability (Sentinel-1):

- 1km soil moisture



http://wlwater.ceh.ac.uk/appsdev/hydeomex/

HydEOmex

Summary of new developments

- Standardized indicators allow comparisons across space, time of year, and between rainfall/river flow/groundwater (etc….)
- High resolution data (1km or 5km^2) – spatial variations, localised picture
- Interactive web portal to explore the data: explore drought in your region/catchment
- Indicators can put current situation in long-term context – back to 1961 (and soon to be back to late 19th C)
- Soon to be delivered in near real-time (monthly updates)
- Other tools and technologies: COSMOS, Earth Observation….
- **…potential for bringing all these datasets together at the national and regional scale to inform drought monitoring and early warning**