



Drought characterisation

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(10 min)

Parameters for drought identification

- Intensity
- Duration
- Cumulated deficit
- Timing
- Spatial Extent
- Frequency

Types of Drought

- Meteorological drought
- Hydrological drought
- Agricultural drought
- Urban drought
- Socio-economic drought
 - **Note:** Drought is a meteorological phenomenon. The above characterisation is due to the affected sector.

Basic notions for the application of drought indices

- Normal Conditions
- Time step
- Reference period
- Spatial interpolation of meteorological data
- Spatial integration

Overview of Drought Indices

- General Indices
 - Deciles
 - Standardised Precipitation Index (SPI)
 - Palmer Drought Severity Index (PDSI)
 - Reconnaissance Drought Index (RDI)
- Other Drought Indices
 - Bhalme-Mooley Drought Index (BMDI)
 - Rainfall Anomaly Index (RAI)
 - Total Water Deficit
 - Palmer Hydrological Drought Severity Index (PHDI)
 - Surface Water Supply Index (SWSI)
 - Crop Moisture Index (CMI)
 - Palmer Moisture Anomaly Index (Z-Index)
 - Soil Moisture Anomaly Index (SMAI)

Deciles

- The P totals for the preceding 3 months are ranked against climatological records
- Under drought conditions \Rightarrow if the sum falls within the lowest decile of the historical distribution of 3-month totals
- The drought ends when
 - P during the past month is in or above the 4th decile
 - P total for the past 3 months is in or above the 8th decile.
- The 1st decile is the P amount \leq lowest 10% class

Standardised Precipitation Index

- Year-round index
- Variety of time scales
- Monthly precipitation database with data of at least 30 years
- Data fitted to a probability distribution ⇒ transformed into a normal distribution
- Uniquely related to probability

Reconnaissance Drought Index (RDI)

- Initial Value of RDI (α_k)

$$\alpha_k = \frac{\sum_{j=1}^k P_j}{\sum_{j=1}^k PET_j}$$

- Normalised RDI (RDI_n)

$$RDI_n(k) = \frac{\alpha_k}{\alpha_k} - 1$$

- Standardised RDI (RDI_{st})

$$RDI_{st}(k) = \frac{y_k - \bar{y}_k}{\hat{\sigma}_k}$$

Thresholds for the Indices Used

SPI value	RDI _{st} value	Deciles Value	Category
2.00 or more	2.00 or more	deciles 9-10: highest 20%	Extremely wet
1.50 to 1.99	1.50 to 1.99	deciles 7-8: next highest 20%	Severely wet
1.00 to 1.49	1.00 to 1.49		Moderately wet
0 to 0.99	0 to 0.99	deciles 5-6: middle 20%	Mildly wet
0 to -0.99	0 to -0.99		Mild drought
-1.00 to -1.49	-1.00 to -1.49	deciles 3-4: next lowest 20%	Moderate drought
-1.50 to -1.99	-1.50 to -1.99	deciles 1-2: lowest 20%	Severe drought
-2 or less	-2 or less		Extreme drought

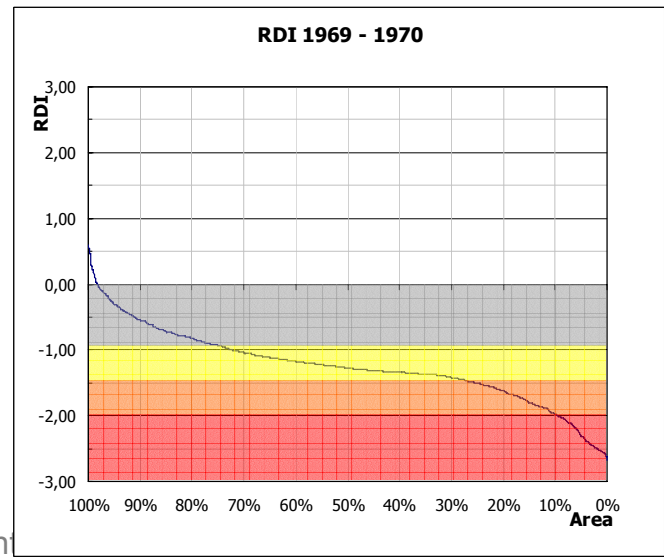
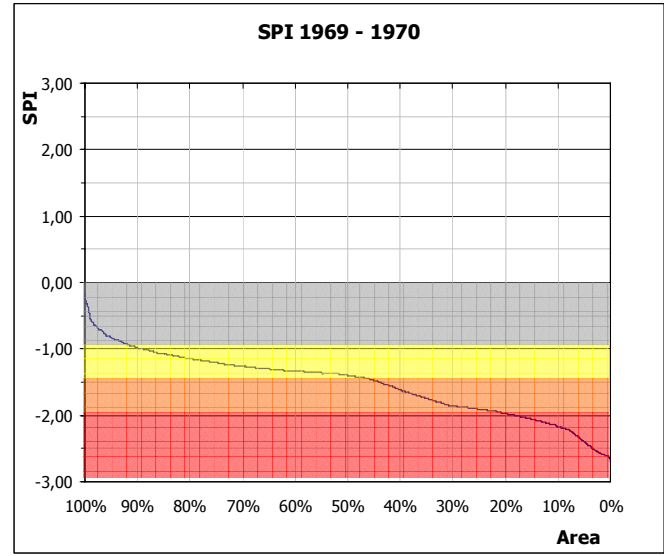
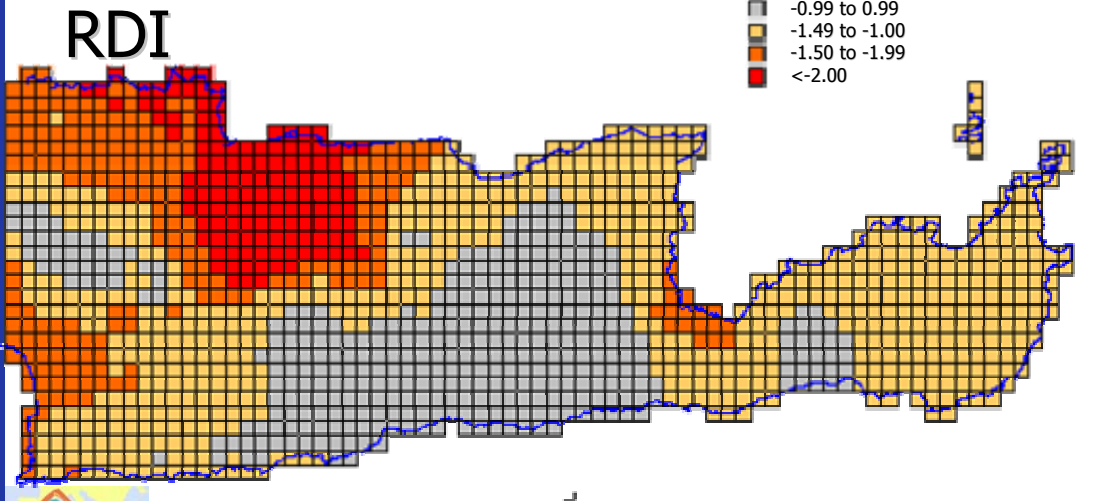
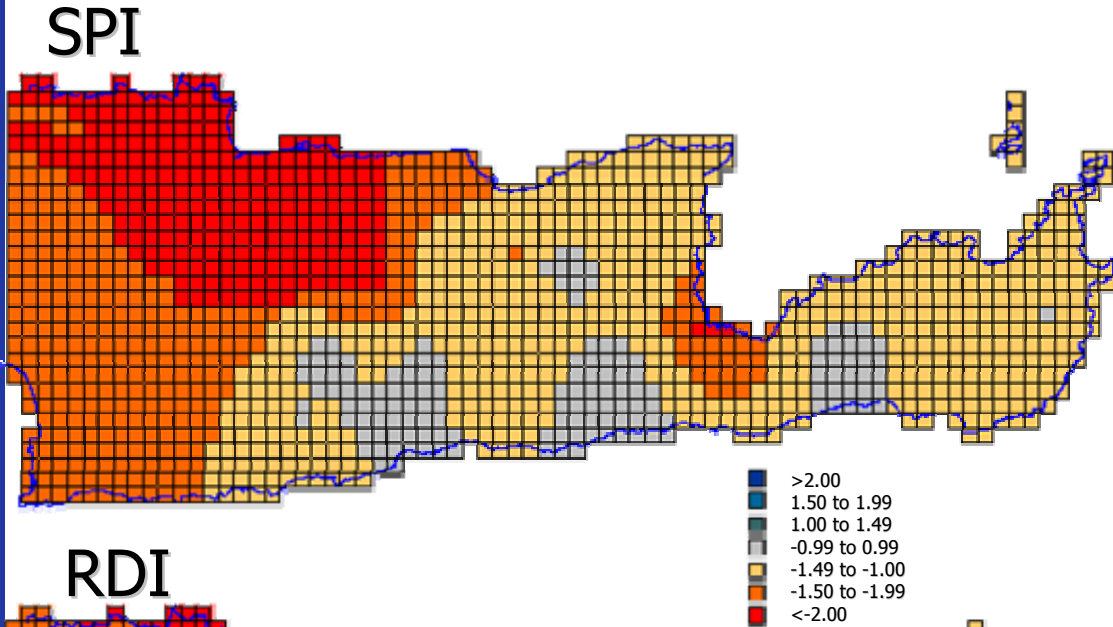
Two Dimensional Representation

- Regional phenomenon
- Variable intensity in space
- Comparison of affected area to critical area
- Various levels of A_c can be considered
 - (eg. Area under drought > 50%
Area under drought > 25%)



OR MORE OGIVE CURVES

Spatial Drought Assessment "Or More Curves"



Concluding Remarks

- Need for common characterisation
 - Common severity index
 - Common reference periods
- Severity indices
 - SPI seems to be universal for analysis and monitoring
 - RDI improved characterisation
- Need for spatial integration (e.g. river basin level)
- Assessment of consequences through indices location specific