

SEGURA PRB

Indicator testing and evaluating

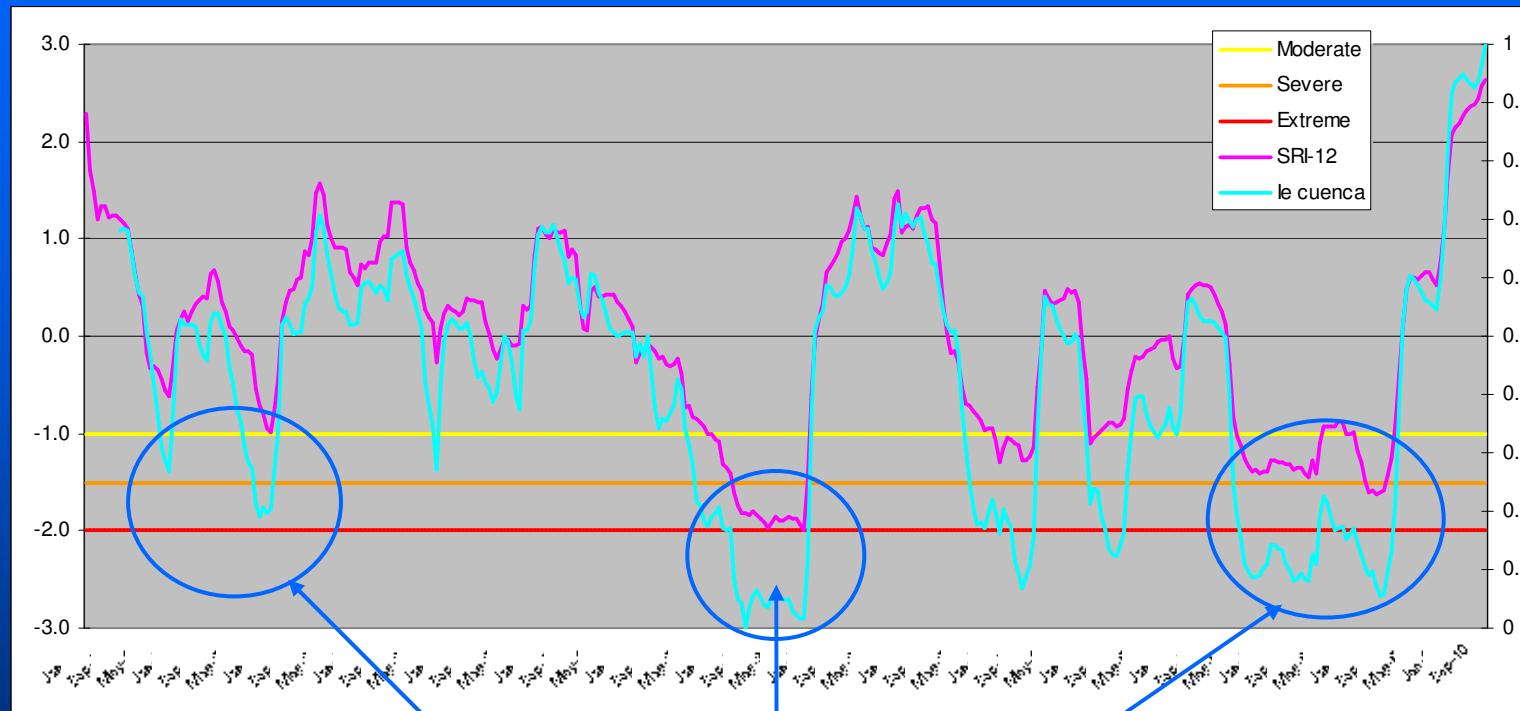
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Standardized Runoff Index (SRI)

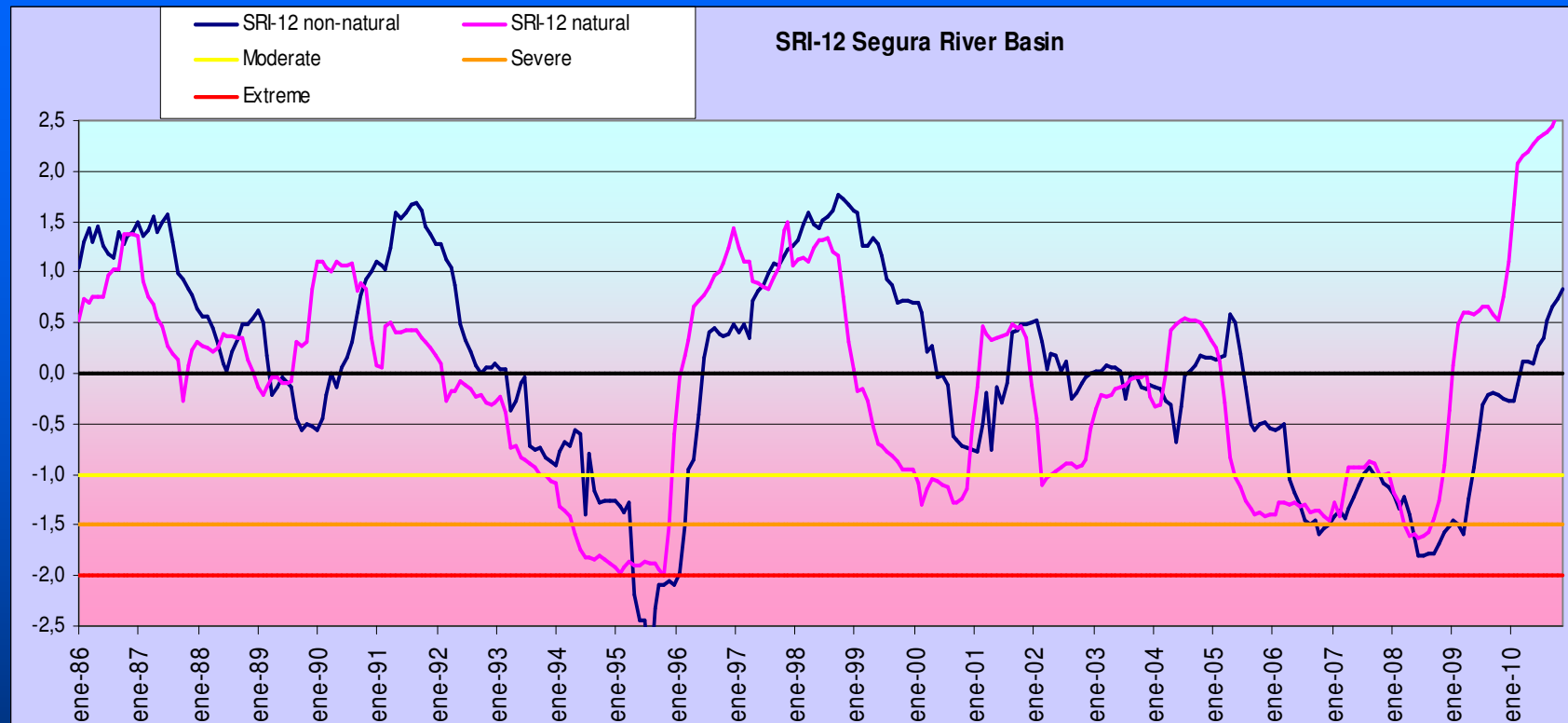
- This index (SRI) is used to classify hydrological drought.
- The SRI can be computed the same way as the SPI, but it is based on the monthly average runoff time series. The gamma probability density function is used.
- Data can be obtained from stream gauges or from spatial models as SIMPA.
- SRI has been applied to the Segura River Basin. All gauge stations upstream the main dams have been selected in order to obtain an indicator which can be applied to the whole basin.
- The data provided by gauge stations must be as natural as possible, although the methodology is also suitable for gauge stations affected by human activity.
- From these gauge stations a monthly time series of accumulated water volume is obtained, assessing the annual accumulated water volume afterwards. This series is treated statistically to obtain the SRI-12.
- It's been observed in the Segura RB that the average runoff has decreased since 1980 to these days. Based on these considerations, the *Segura Drought Management Plan (Segura DMP)* recommends the use of runoff data from 1980 to 2010 for calculating the indicator.
- SRI-12 has been compared with the historical drought series obtained from Segura DMP and the indicator identifies quite well one of the most important droughts that have occurred in this period: 2005-09, but has a two years delay identifying the 1990-95's drought, which lasted from 1993 to 1995 according to this indicator.
- It also identifies the 1980 to 1983 dry period; however, severity thresholds should be revised as they are not reproducing properly the real severity that this drought and the last one have had.
- In addition, it's been compared with "non-natural SRI-12" which doesn't identify droughts as well as SRI-12, but gives an idea of how important it is to select the appropriate gauge stations.

Standardized Runoff Index (SRI)



DRY PERIODS IDENTIFY BY SEGURA DROUGHT CONTINGENCY PLAN

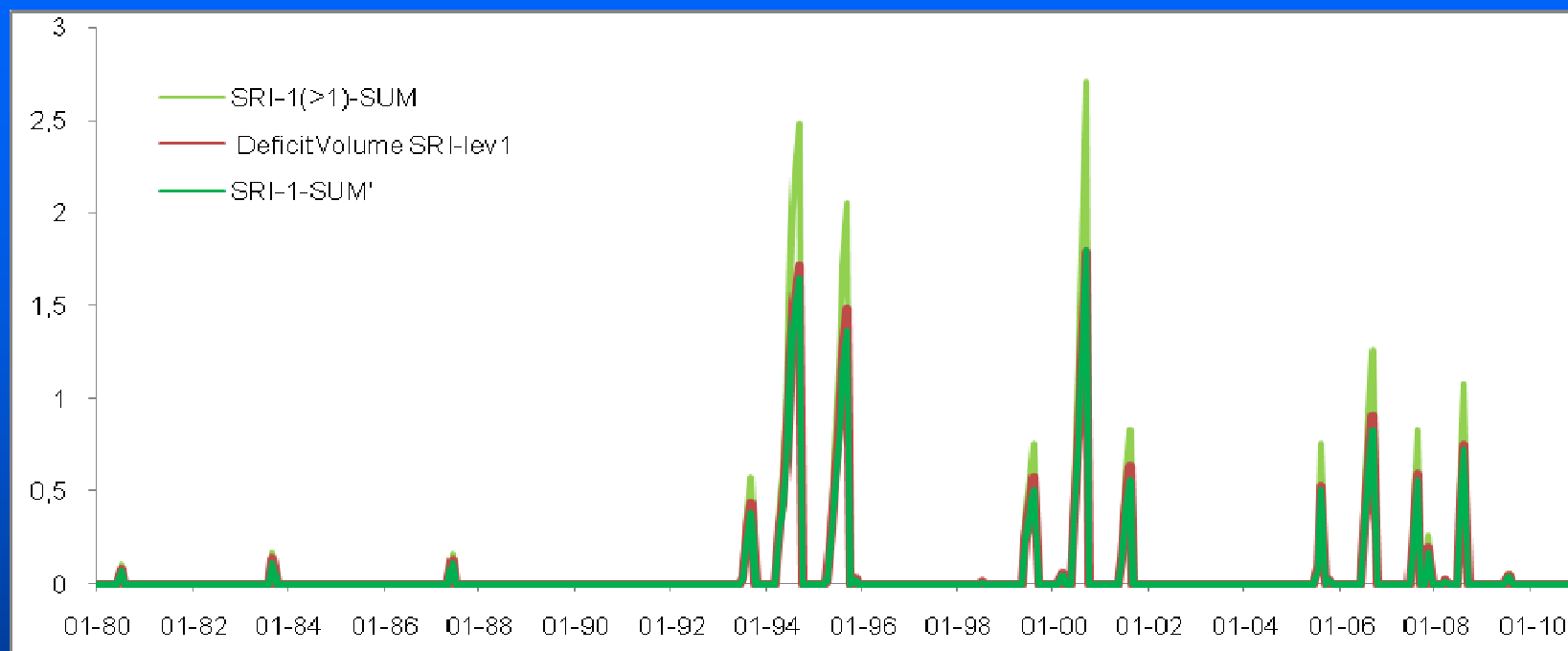
SRI assessed in non-natural gauge stations



MAIN CONCLUSIONS:

- It still provides useful information regarding drought monitoring
- Relevant dam affection
- Drought perception is more related to the blue line (non-natural)

SRI and NDVI



RELEVANT FACTS:

- If treated homogeneously, both indicators are equivalent.
- NDVI uses empirical statistical distribution while SRI uses Gamma distribution.
- NDVI takes into account indicator values of previous months when estimating drought severity

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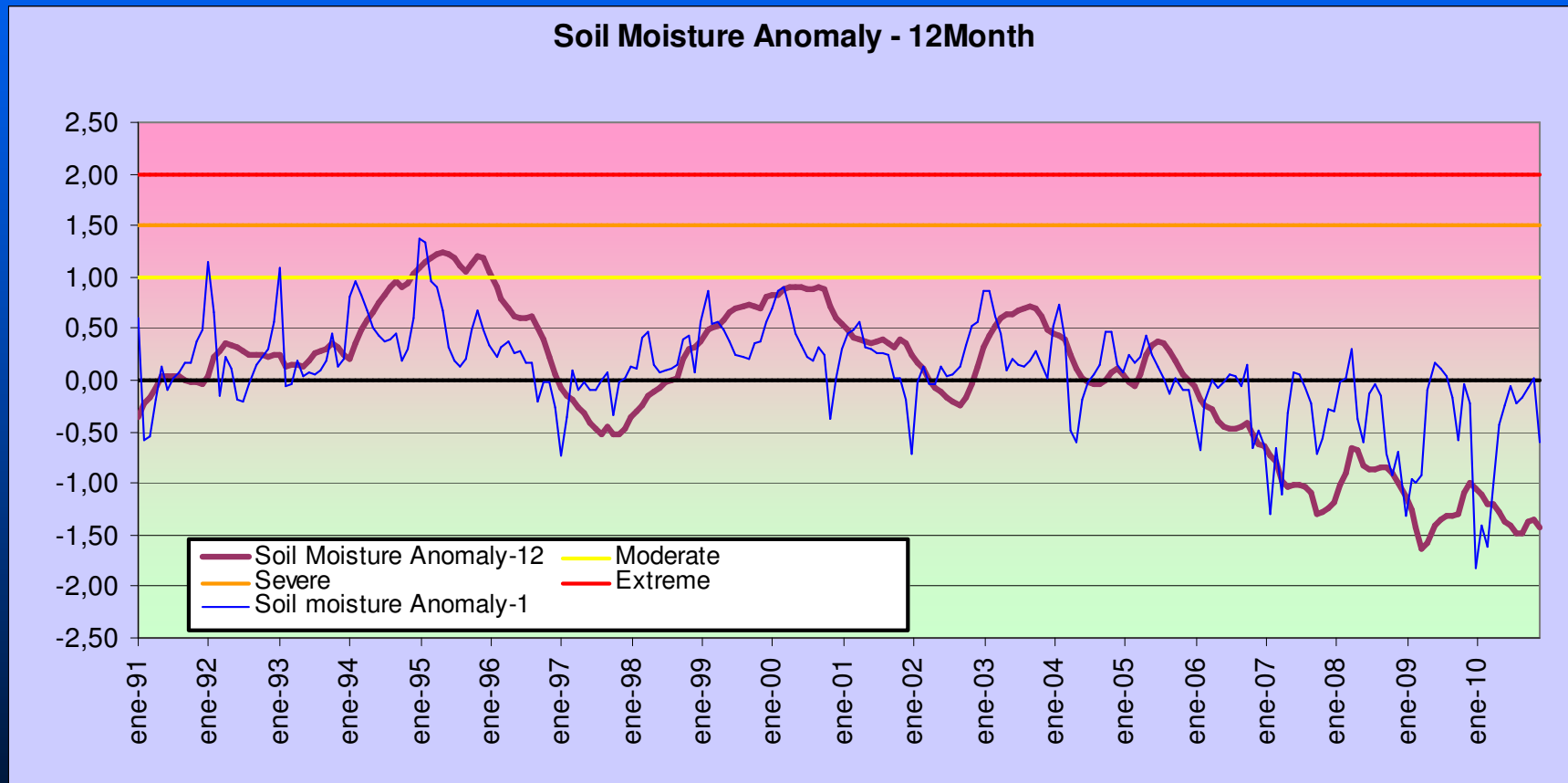
Soil Moisture Index

- Information on soil moisture is presented in form of soil suction (pF) values of the top soil layer: forces necessary for plants to apply in order to extract water from the soil for their use.
- It incorporates variations in the water holding capacity of different soil types and thus allows for comparison of the soil water status at different locations throughout Europe.
- Information on soil moisture is also presented in form of Soil Moisture Anomaly, obtained using the Gamma distribution, monthly and annual
- The spatial resolution is 5Km. Data are collected every 10 days, 3 images per month. Monthly averages have been assessed.
- This indicator might be affected by non natural factors when assessed in irrigated areas, therefore, the area must be carefully selected.
- Anomalies depend on the length of the time series used to calculate the long-term average. 21 years length time series is used, with data from 1990 to 2011 kindly provided by JRC.
- Soil moisture anomaly obtained in the Segura River Basin shows deviations from normal trends. Monthly values are a bit erratic but drought trends are properly represented.
- The index applied in the Segura River Basin identifies the drought period suffered in the Basin during the mid 90's, although it doesn't describe it as deep as it was.
- Furthermore the last drought period of the Basin, which took place from 2005 to 2009, does not seem to be properly described by the indicator.

Soil Moisture Index: factsheet update

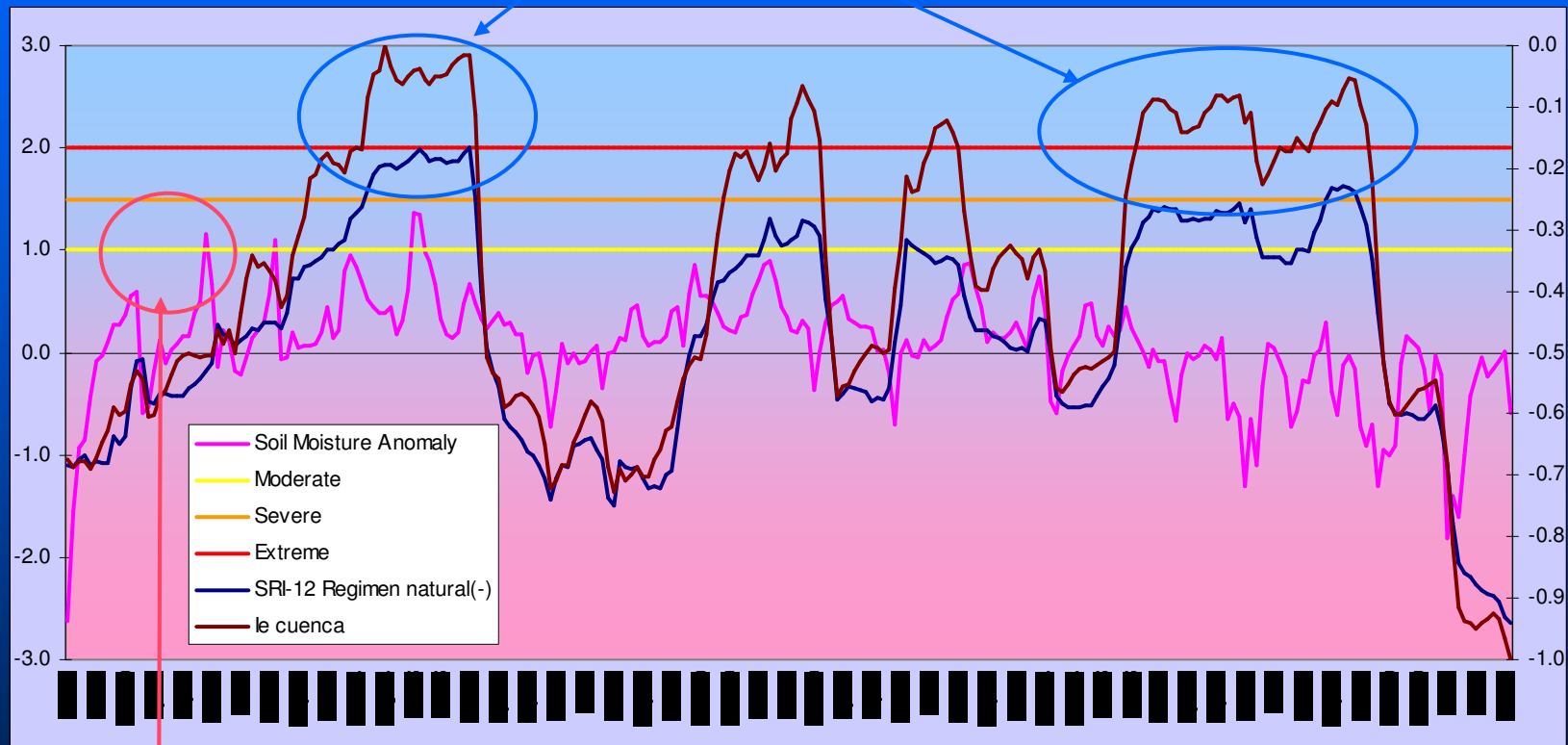
UPDATES:

- Detailed data have been kindly provided by JRC
- Longer time series for Soil Moisture monthly anomaly has been obtained for the whole Segura RB.
- Soil moisture Annual anomaly has been assessed for the whole Segura RB



Soil Moisture Index

DRY PERIODS IDENTIFIED BY SEGURA DROUGHT MANAGEMENT PLAN



Dry period not identified by Segura Drought Management Plan.