GOBIERNO DE ESPAÑA
MINISTERIO DE MEDIO AMBIENTE Y MEDIO RURAL Y MARINO
CONFEDERACIÓN HIDROGRÁFICA DEL SEGURA

SEGURA PILOT RIVER BASIN:

- SRI indicator reviewed

- Soil moisture indicator

Budapest, 31st March, 2011

Adolfo Mérida Abril

INDEX:

1. SRI indicator reviewed

2. CHS Index

3. Soil Moisture indicator

1. SRI Reviewed

1.1 SRI Reviewed: INTRODUCTION

- **Key message**: Increasing the knowledge about plausible trends of hydrological drought events, will improve the knowledge about the dynamics of flows in order to take appropriate measures both to conserve aquatic ecosystems and minimize impacts on water uses.

- **Data Source**: data provided by Segura River Basin Authority

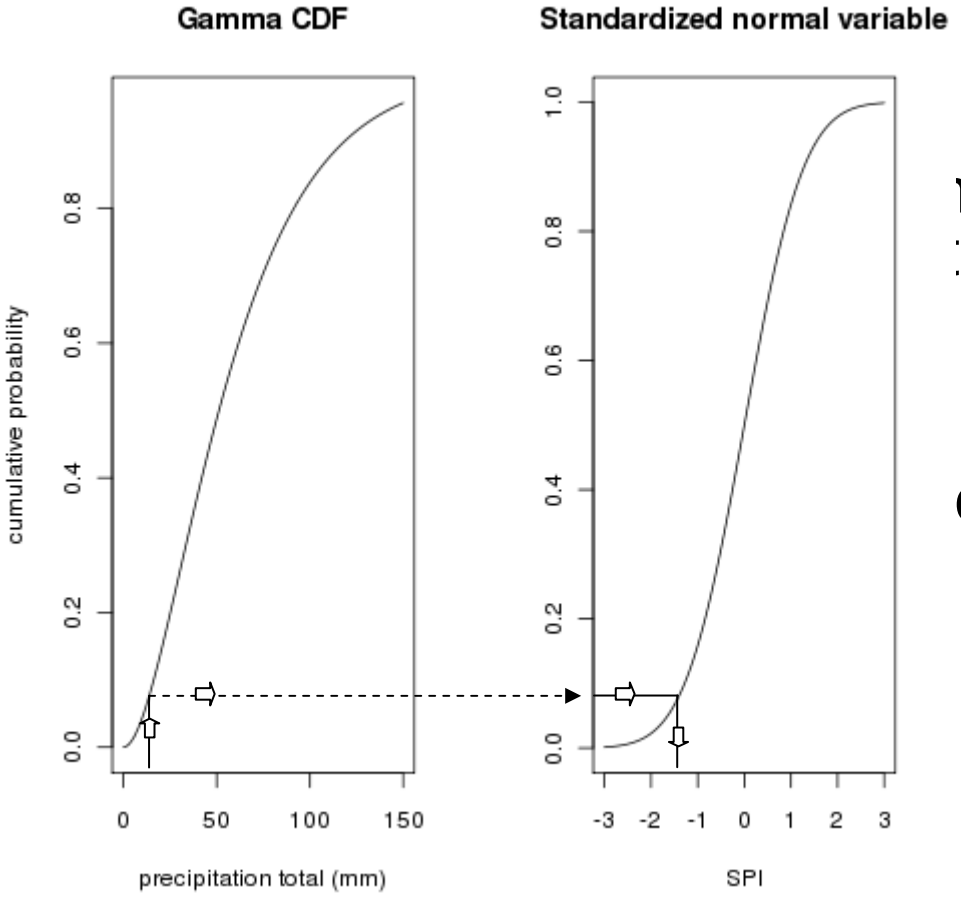
- **Indicator Relevance:** The focus in this work is runoff, a primary concern for water managers. The standardized runoff index (SRI), which is similar to the SPI, is used to classify hydrological drought.

1.2 SRI Reviewed: METHODOLOGY

- **Indicator va**
  aggregation of rur
  gauge stations. T
  the probability of
  for any timescale

- **Spatial Sca**
  to the Segura Riv

- **Time scale**
  starts in 1980.



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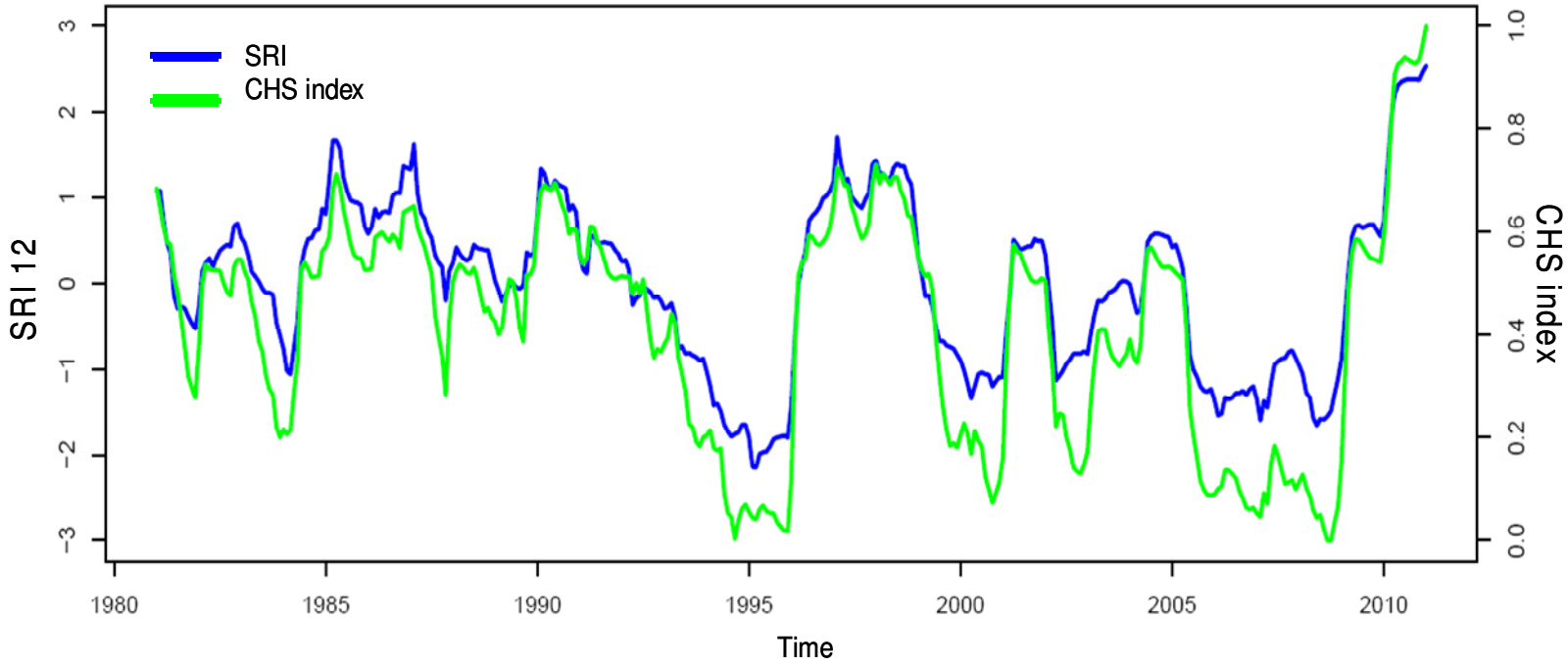
1.3 SRI Reviewed: Gauge Stations

- Representative of natural conditions.
- Coherent with water management system.
- Minor demands upstream gauge stations are reported.
- No mayor connections with aquifers.

1.4 SRI Reviewed: PERFORMANCE

- Comparison of monthly SRI12 values with CHS Index since 1980.



Other comments: thresholds issue

1.5 SRI Reviewed: KEY IDEAS

- It is reasonably representative of natural conditions of the basin.
- It monitors hydrological drought.
- It shows a very good correlation with CHS Index.
- Thresholds must be defined.

Other comments: some research about connected indices might be carried out (ig, the Regional Deficiency Index- RDI[1])

1: used in project ARIDE and used in EA/Defra project on “Spatial coherence of European droughts

2. CHS Index

PURPOSE

- Justifying the use of CHS Index when assessing indicators.
- Clarifying the CHS Index origin
- Sharing Spanish Drought Management Plan experience

2.1 CHS Index: Legal Background

European Level: WFD

National level: several laws and regulations

Spanish DMP Guidelines

DMP1

DMP2

.....

DMP9

Year 2007

River Basin 1

River Basin 2

River Basin 9

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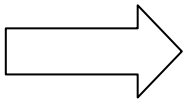
2.2 CHS Index: Step 1

Spanish DMP Guidelines

- Indicator 1: Reservoir
- Indicator 2: GW
- Indicator 3: Precipitation
- Indicator 4: Run-Off
- Indicator 5: Released W
- Indicator 6: Snow pack



Basin 1	Basin 2	Basin 3	.....	Basin 9
X		X		X
	X			
X	X	X		
X				
		X		
		X		

Set of common indicators

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2.3 CHS Index: Step 2

Spanish DMP guidelines:

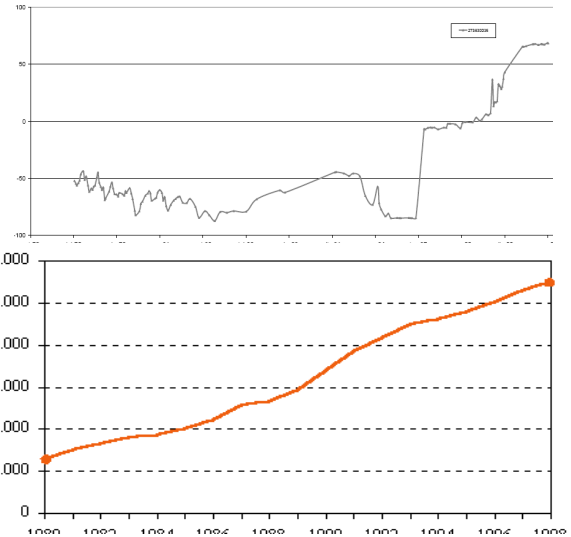
- Time step: Monthly
- Time series: 1980-2005

Each basin: evaluation of selected indicators

Indicator 1-

Indicator 2-

….



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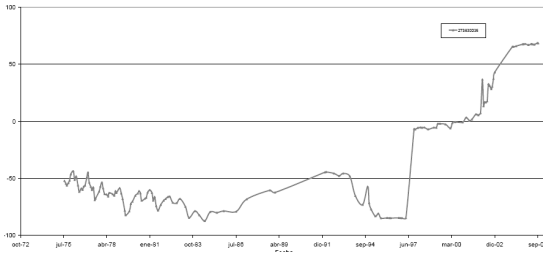
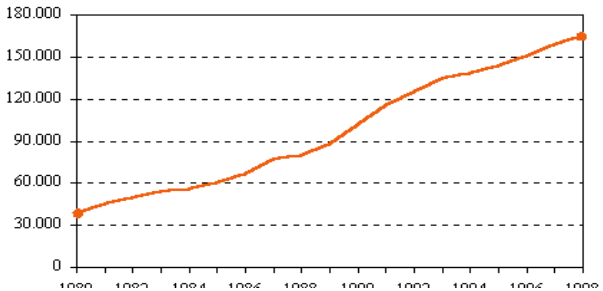
2.4 CHS Index: Step 3

Indicator 1



Indicator 2



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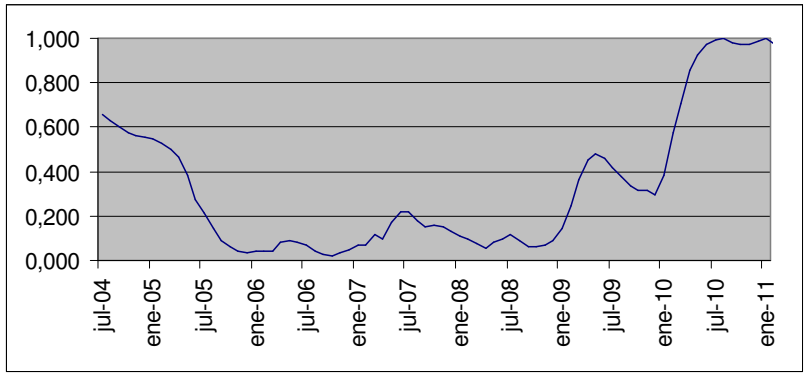
Composite indicator:

a1*indicator1 + a2*indicator2 + …



Key assumption: indicators time series must show a **good correlation with water availability time series**.

CHS Indicator (Ve)= 2/3*Annual_Run-off + 1/3*Water in reservoirs

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2.5 CHS Index: Step 4

Basin 1:

Composite indicator 1

Basin 2:

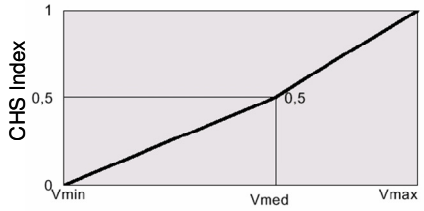
Composite indicator 2

……

Basin 9:

Composite indicator 9

Normalization



Basin 1:

Index 1

Basin 2:

Index 2

……

Basin 9:

Index 9

2.6 CHS Index: Example of DMP Measures

Pre-warning:

• Awareness and preparedness measures.

Warning:

• Activation of City Emergency Plans for urban supply.

• Increasing of the abstraction of GW bodies, in order to obtain up to 29 hm3.

• Agriculture water supply restrictions up to 25% of total demand.

Emergency:

• Checking the performance of City Emergency Plans for urban supply.

•Increasing of the abstraction of GW bodies, in order to obtain up to 110 hm3.

• Agriculture water supply restrictions up to 50% of total demand.

2.7 CHS Index: Summary

Step 1: Selecting preliminary indicators from a set of common indicators.

Step 2: Evaluation of selected indicators.

Step 3: Obtaining a composite indicator.

Step 4: Normalization

2.7 CHS Index: Summary

DMP Report (November, 2007; Pg 11):

"To obtain an indicators system and determine representative indicators, it is necessary to select, aggregate and weight basic indicators based on the associated resources and demands. Finally, the calibration of indicators through historical series, allows adjusting the weights given to each indicator, and obtaining an aggregated group of indicators, suitable for and representative of the basin. Summary global basin indicators can also serve to establish national indicator systems, since they are representative of the each basin situation.

Indicators could be normalized in an appropriate threshold, e.g. from 0 to 1, to allow easy comparisons among different kind of indicators and the classification among severity drought categories. This classification, and colour association, can be for example: Normal status (green), Pre-alert status (yellow), Alert status (orange), Emergency or extreme status (red)."

3. Soil Moisture indicator

3.1 SOIL MOISTURE: INTRODUCTION

- **Key message**: Droughts cause the reduction of soil moisture, affecting the potential agriculture productivity of the affected area and increasing the water stress.

- **Data Source**: data provided by JRC

- **Indicator Relevance:** it is closely linked with agriculture productivity and its related impacts. The WMO considers that "*There is a strong need for better soils information and establishment of soil moisture monitoring networks where they do not currently exist" (*WMO, 2011. Agricultural Drought Indices Proceedings of an expert meeting, pg 215: http://www.whycos.org/WMO/clw/agm/documents/AgriculturalDroughtIndicesProceedings29311.pdf*)*

3.2 SOIL MOISTURE: METHODOLOGY

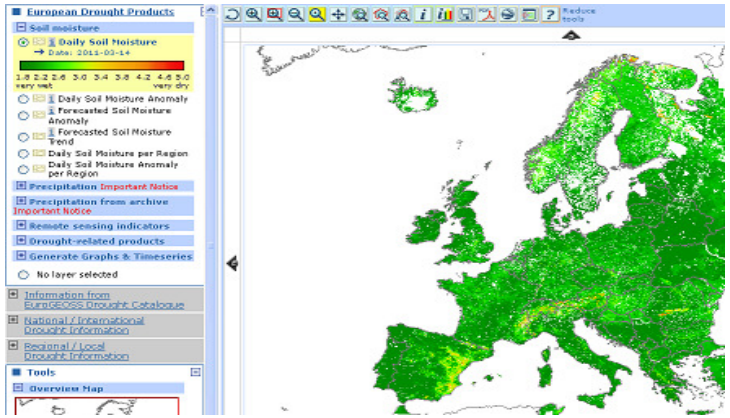
- **Indicator value:** Information on soil moisture is presented in form of **soil suction (pF) values** of the top soil layer, that commonly range between 1.5 for very wet conditions up to 5.0 for very dry soils.

- **Spatial Scale:** the spatial resolution is 5 Km. The area considered corresponds to the Segura River Basin.

- **Time scale**: Daily. For the analysis, a monthly average has been calculated.

3.2 SOIL MOISTURE: DETAILED METHODOLOGY

- **Soil Moisture**: Values show an instantaneous image of the top soil water content as modelled by LISFLOOD. Meteorological input information is derived from measured and spatially interpolated meteorological point data provided by the MARS (now Agri4Cast) activity of IPSC.

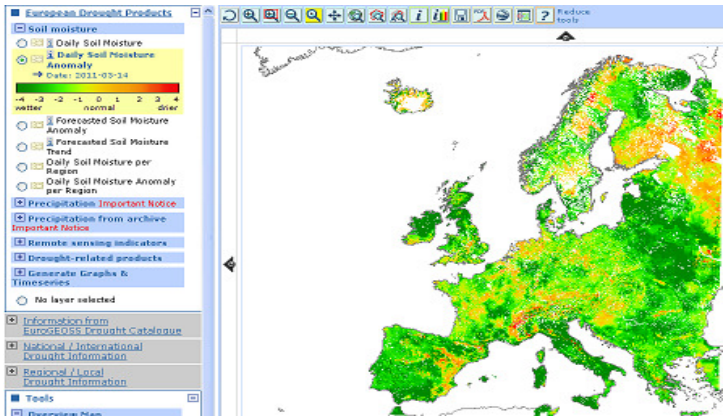


Soil moisture-
14th March, 2011

http://edo.jrc.ec.europa.eu/php/index.php?action=view&id=201

3.2 SOIL MOISTURE: DETAILED METHODOLOGY

- **Soil Moisture anomaly**: it is obtained by comparison with to the long-term daily average of soil moisture at each location, resulting in a normalized soil moisture product that allows for the evaluation of the current situation as compared to a climatological average. It is ranging from -4 to +4.

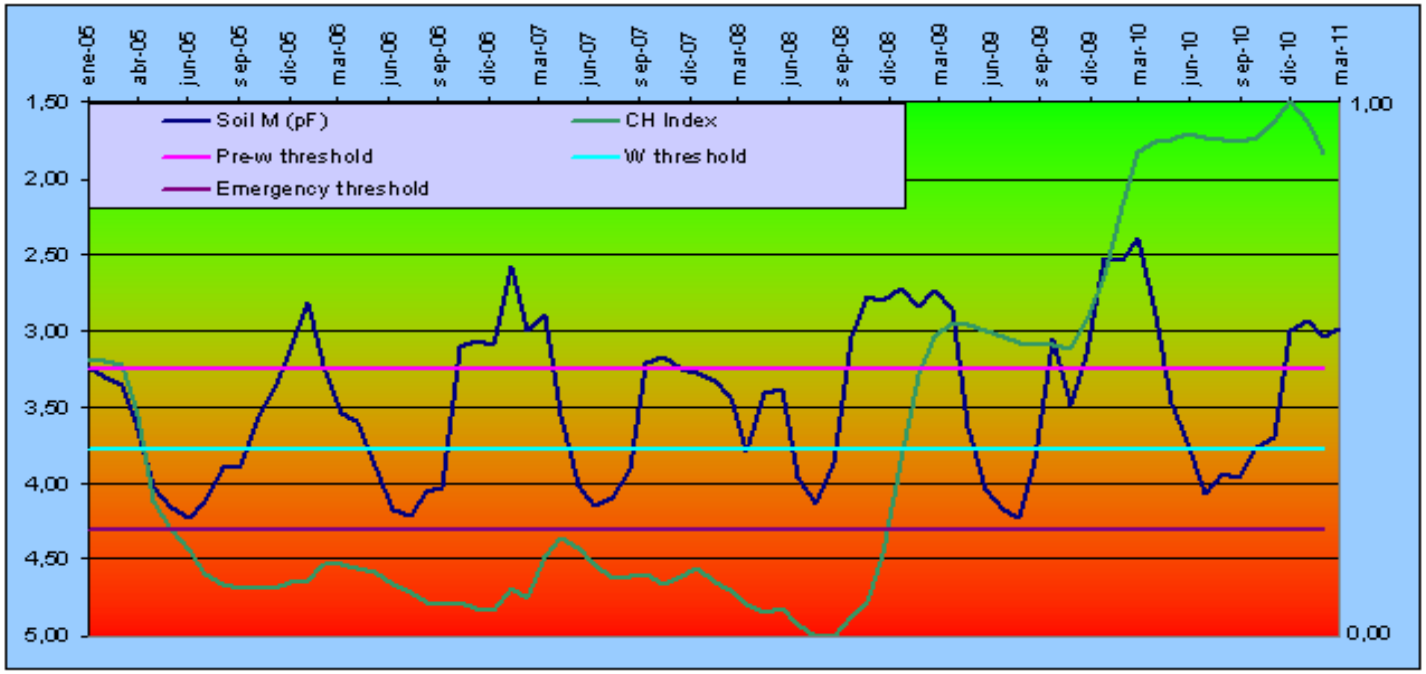


Soil moisture anomaly- 14th March, 2011

http://edo.jrc.ec.europa.eu/php/index.php?action=view&id=201

3.3 SOIL MOISTURE: PERFORMANCE

- Comparison of monthly Soil moisture values with CHS Index during the last drought period suffered in the Segura River Basin (2005-2010)



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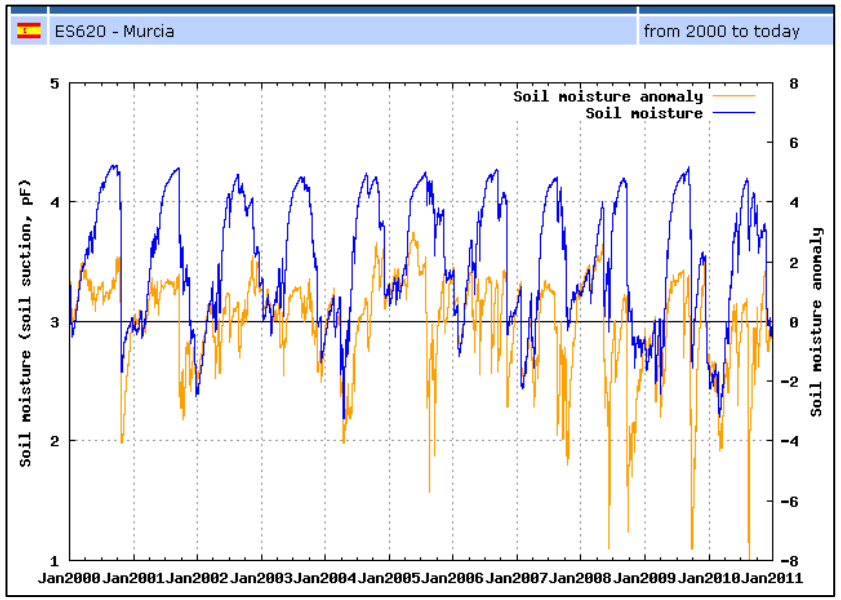
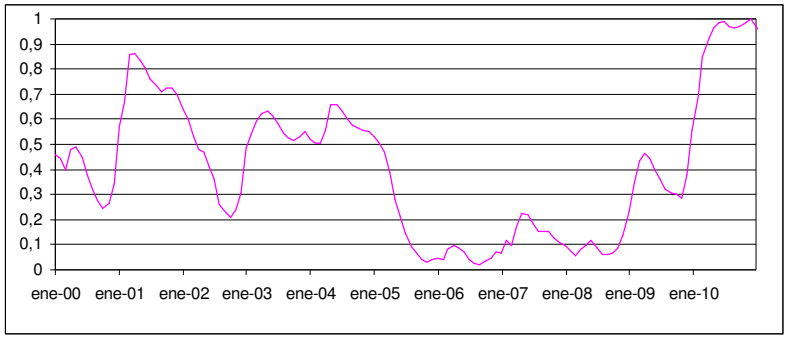
3.3 SOIL MOISTURE ANOMALY: PERFORMANCE

- Comparison of monthly Soil moisture and monthly Soil moisture anomaly values with CHS Index from 2000.





3.4 SOIL MOISTURE: KEY IDEAS

ADVANTAGES	DISADVANTAGES
Agricultural Impacts	Parameter variety
The estimation and interpretation is easy and simple	Affected by human activity in irrigated areas
	SM does not provide relevant information.
	SMA is too erratic

Other comments: some research about connected indices must be carried out (ig, the Standardized Soil Wetness Index-SSWI[1])

1: Multilevel and multiscale drought reanalysis over France with the Safran-Isba-Modcou hydrometeorological suite