SWIM and Horizon 2020 Support Mechanism

Working for a Sustainable Mediterranean, Caring for our Future

Training

Presented by:

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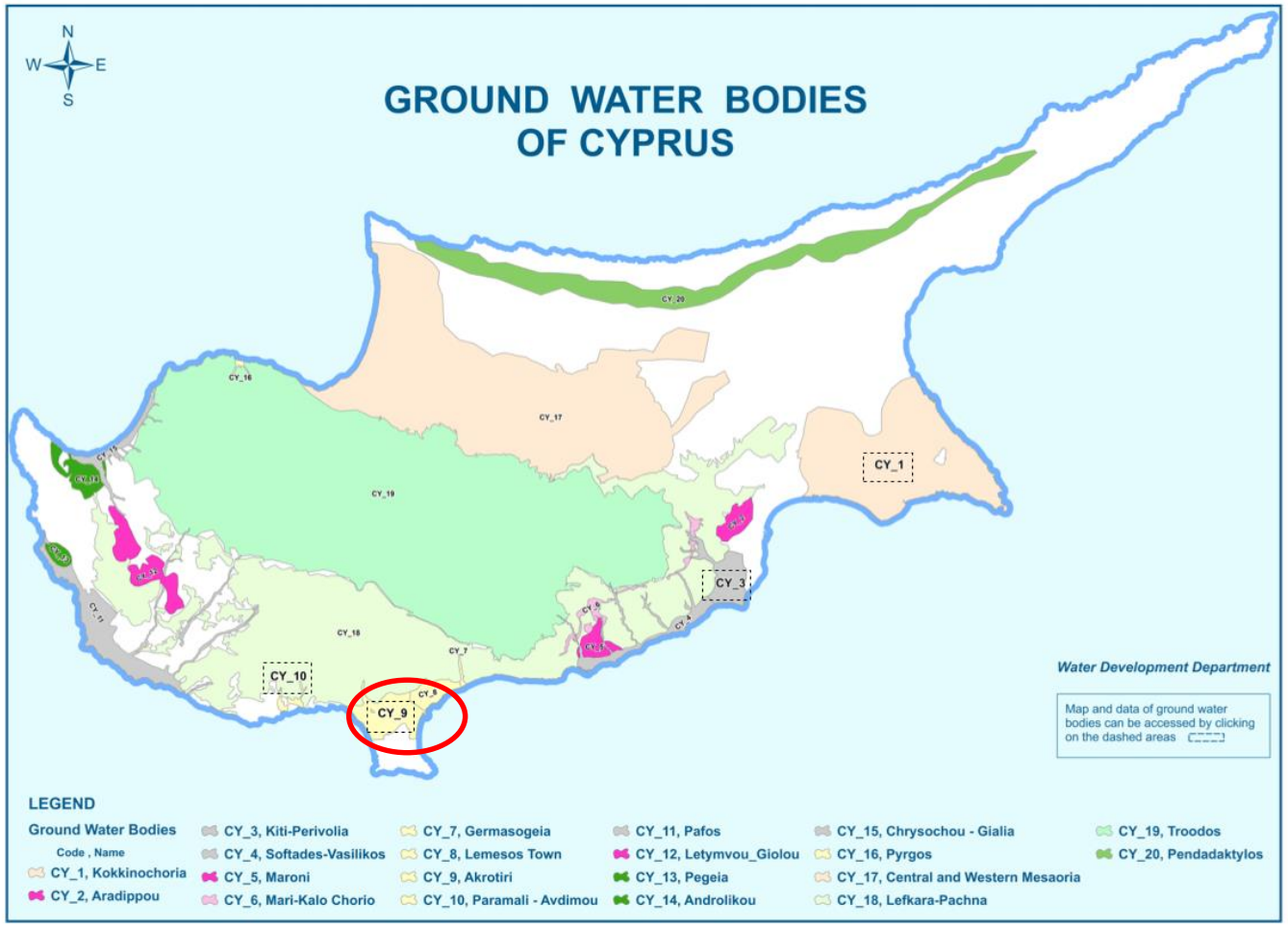
Case study: CY9 Aquifer in Cyprus



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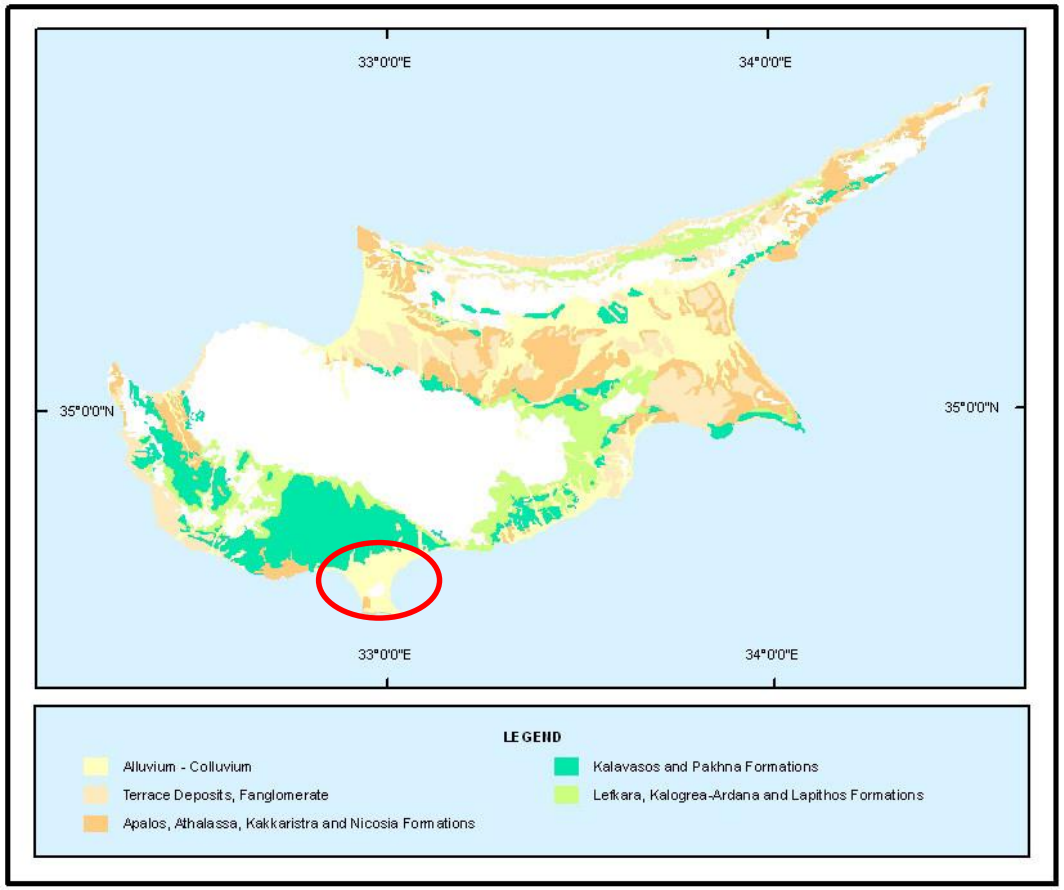
Case study: Akrotiri (CY)9 Aquifer in Cyprus

- Alluvium aquifer: unconsolidated soil or rock
- Inflow is in balance with outflow
- Area: 61.8 km2
- 9 meters above sea lvel



1a. Excel file Training.xls

- 4 worksheets
  - Groundwaterlevel: water levels registered since 1961
  - Precipitation: monthly recorded precipitation since 1916
  - Potential evaporation: monthly recorded potential evaporation (1991-2008)
  - Standardised Precipitation-Evapotranspiration Index: 1965 -2010

1b. Precipitation

Task 1

- Evaluate the trend in precipitation
- What is the long term trend?

1c. Groundwater level fluctuations

Task 2 Rough estimation of trends in groundwater level

- What is the long term trend in groundwater level ?
- Which trends can be related to droughts?
- And which trends probably not?
- Calculate the Standardized Water Level Index:
  - **SWI = (Seasonal Water level – Long term seasonal mean) / σ**
  - What is a good month for seasonal low groundwater levels?
  - What is a good month for seasonal high groundwater levels?

1d. Potential evaporation

- Evaluate the trend in potential evaporation. What is your conclusion?
- The actual evaporation is not known. Do you expect the same trend? If not why not?

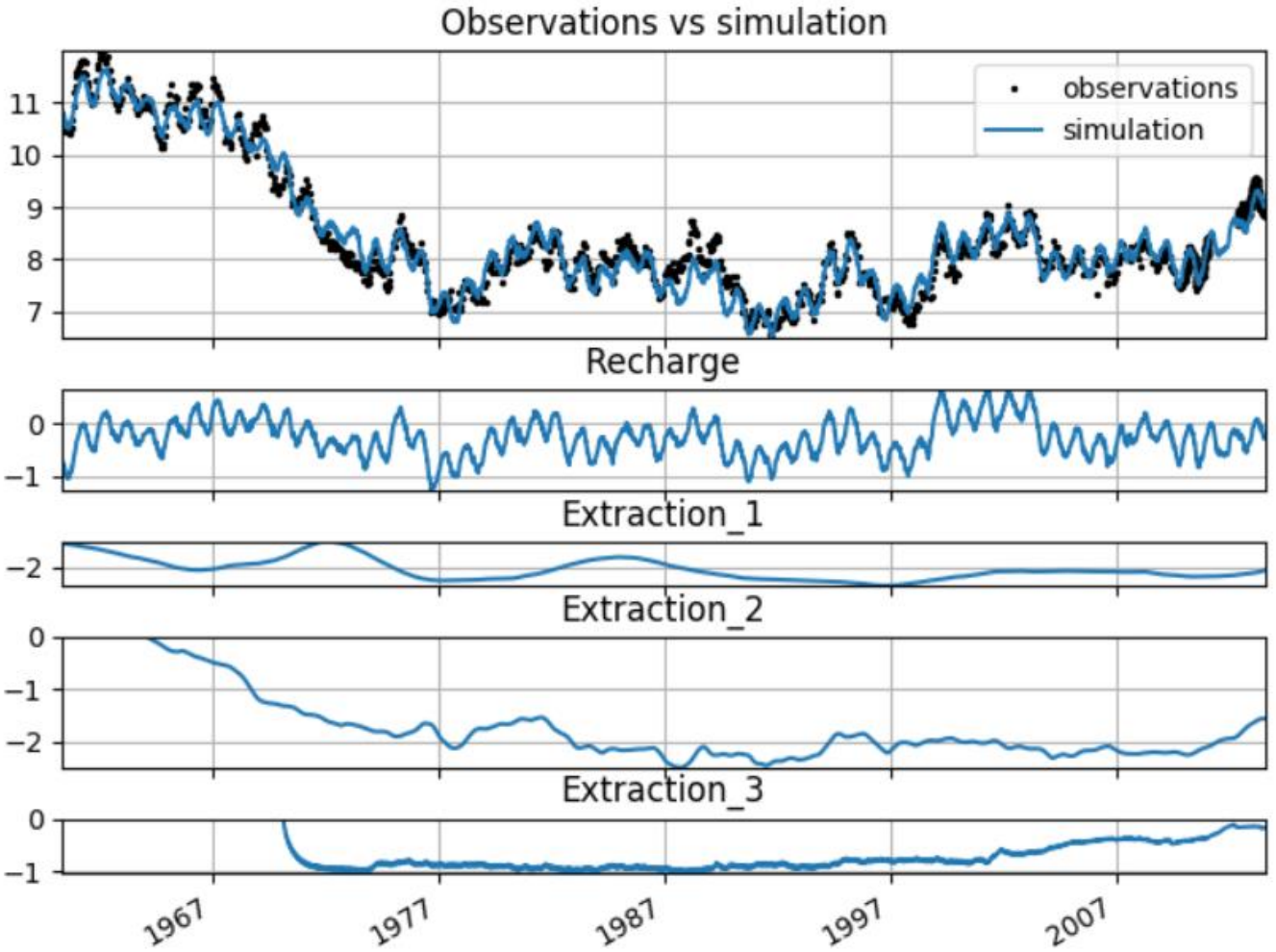
1e. Correlation SPEI and groundwater levels

- SPEI 1,6, 12 and 24 is available
- Evaluate the four series. What is the difference?
- The correlation of groundwater levels with SPEI 24 is calculated
- Calculate the correlation with SPEI 1,6 and 12
- Which series have the best fit?
- What time frame has the best fit and why?
- Compare your calculatedSWI with the SPEI values
- Which SPEI (1-24) fits best?

2a. PASTAS

- PASTAS is an open source python package
- For processing, simulating and analyzing hydrological time series
- Time series models can be created, calibrated, and analyzed
- Built-in optimization, visualization, and statistical analysis tools
- Multiple regression methods where the system is seen as a black box
- Transformation of series of observations on the input (the explanatory variables) into a series of the output variable (the response variable)
- A time-series model consists of one or more StressModels
- Simulation = a Constant + Noise Model
- Stress Models use a response-function
    - Gamma, Exponential or One

2b. PASTAS


Observations vs simulation
observations
simulation
11
10
9
8
7
Recharge
0
−1
Extraction_1
−2
Extraction_2
0
−1
−2
Extraction_3
0
−1
1967
1977
1987
1997
2007

2c. Run PASTAS

1. Run Anaconda
2. Run Jupyter Notebook
3. Open the provided notebook (Pastas Introduction - Cyprus.ipynb)
4. The Notebook shows step by step a simulation
5. To run a cell select, shift + enter)

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Thank you for your attention.

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