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Flood forecasting model of Medjerda River in the context of Water Resources Management of Tunisia

S. Abidi, O. Hajji, L.A. Mehrez, H. Hamadi,



Tunisia



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Water resources

The use of conventional water resources in Tunisia reach its limits. Being fully aware of this situation, Tunisia has adopted a strategy to develop resources and secure a better control of demands in various socio-economic sectors. This strategy's main objectives consist to:

- Satisfy water supply for drinking all over the country.
- Extend irrigated areas and rationalize irrigation waters.
- Satisfy industrial, tourism and environmental water demands.
- The protection against floods and droughts.
- The sustainable and fair use of water resources and their preservation against all types of pollution.

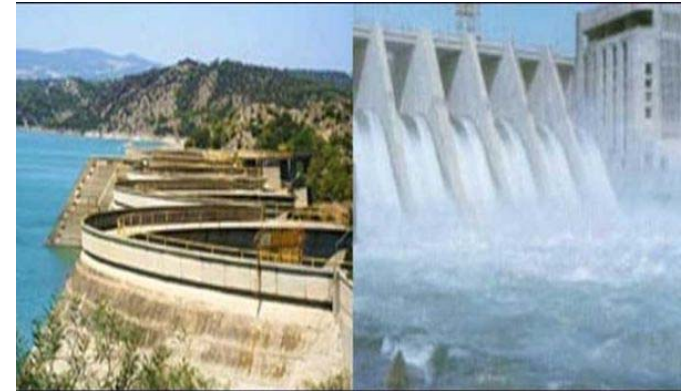
Water resources

In order to achieve these objectives, a set of measures was adopted :

- To mobilize all water resources which can be mobilized ;
- To use the most of ground resources which can be used ;
- To identify new resources in areas where surface water is not yet well controlled and ground water not well evaluated;
- To adopt a wide strategy of water economy and the use of non conventional water agriculture and industrial fields;
- To follow up the quantity and quality of water resources ;
- To develop the artificial recharge of groundwater with surface and reclaimed water.

Tunisia strategy

Water mobilization



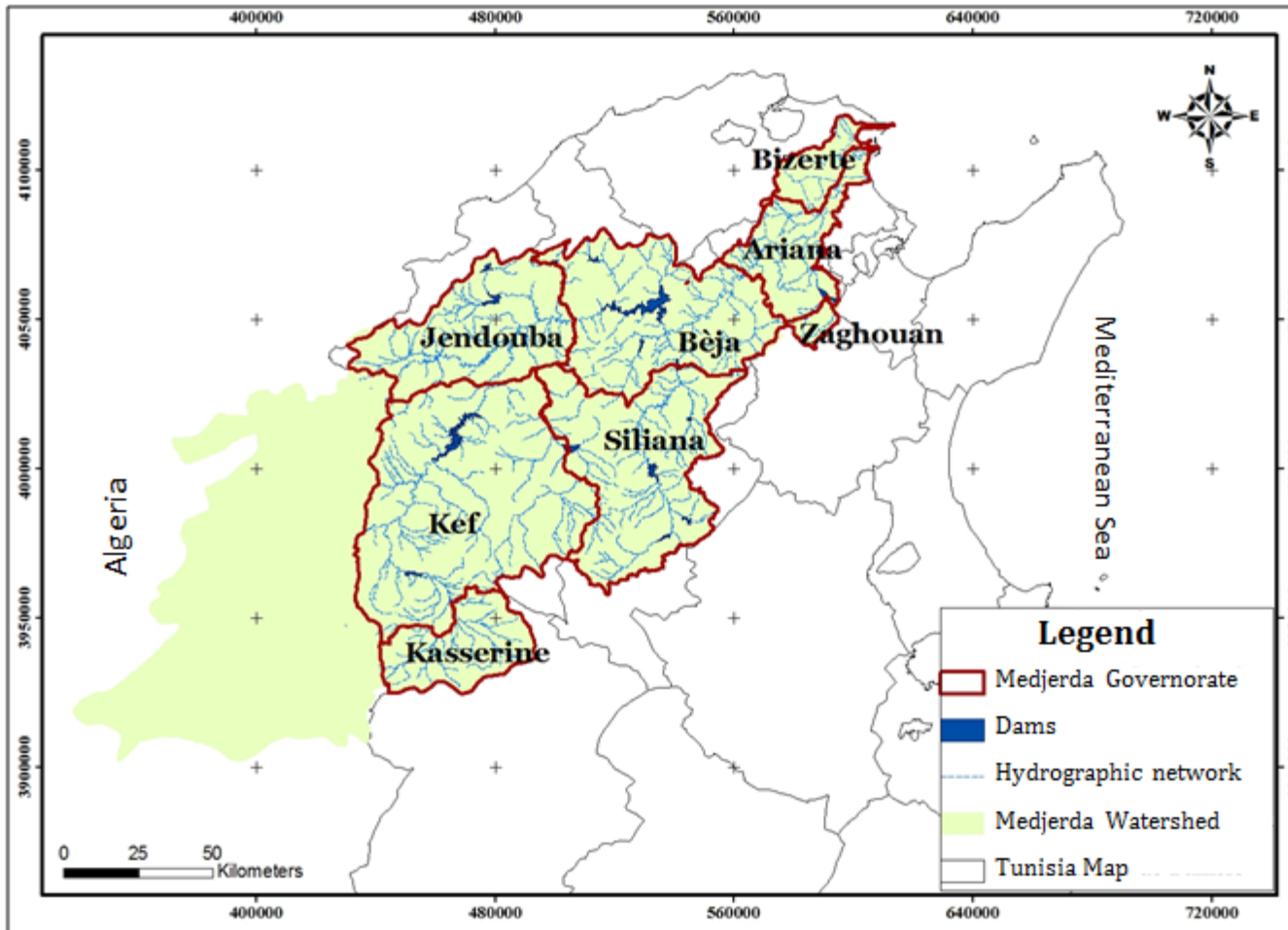
Desalination of
Groundwater



Desalination of sea water



Mejerda River



- 75% length and 67% area in Tunisia,
- covers more 80% of Tn water resources,

Medierda flooding



Solution

Problematic

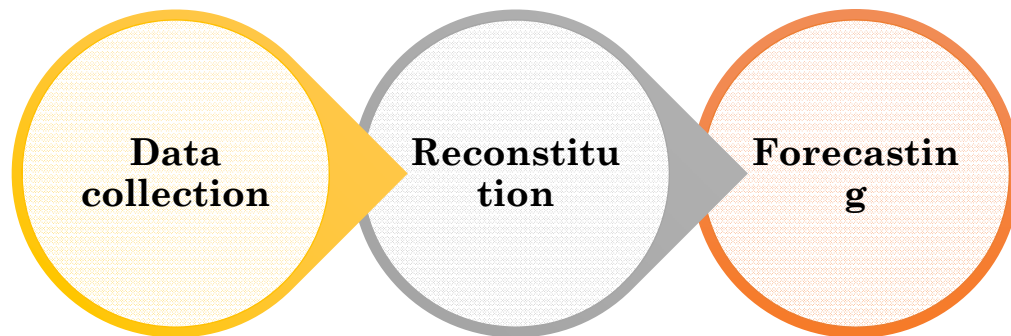
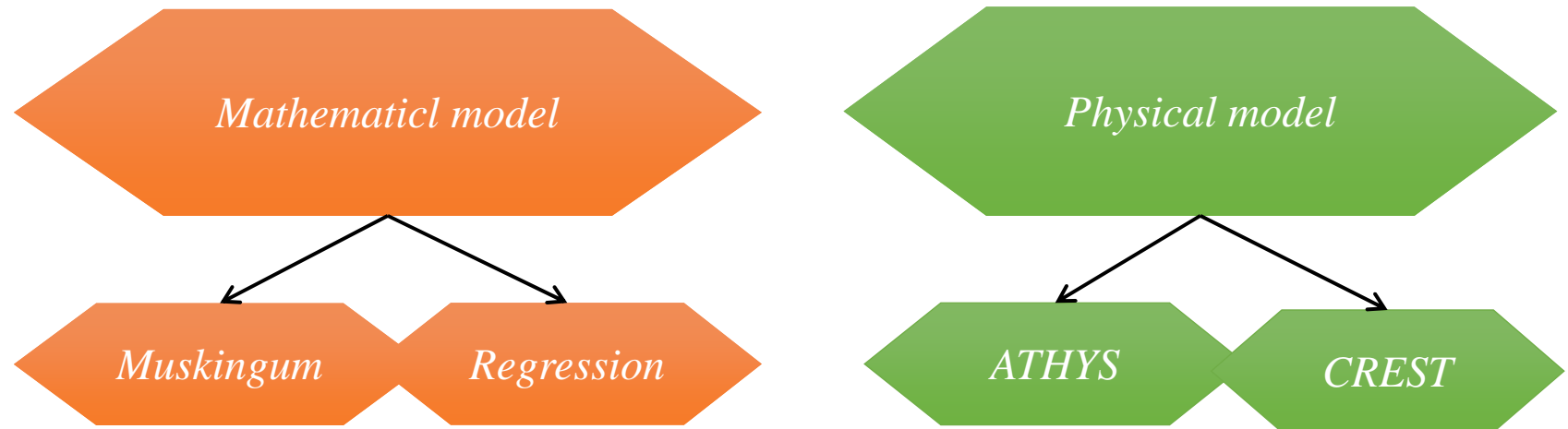
**Management of Dams
and River**



**Flood
forecasting
and
announcement**

- contribute to the management system and flood warning.

Methodology



Performance measures

Numerical criteria

Nash–Sutcliffe model coefficient : $Nash\% = 1 - \frac{\sum_{i=1}^n (Q_o - Q_c)^2}{\sum_{i=1}^n (Q_o - Q_m)^2}$

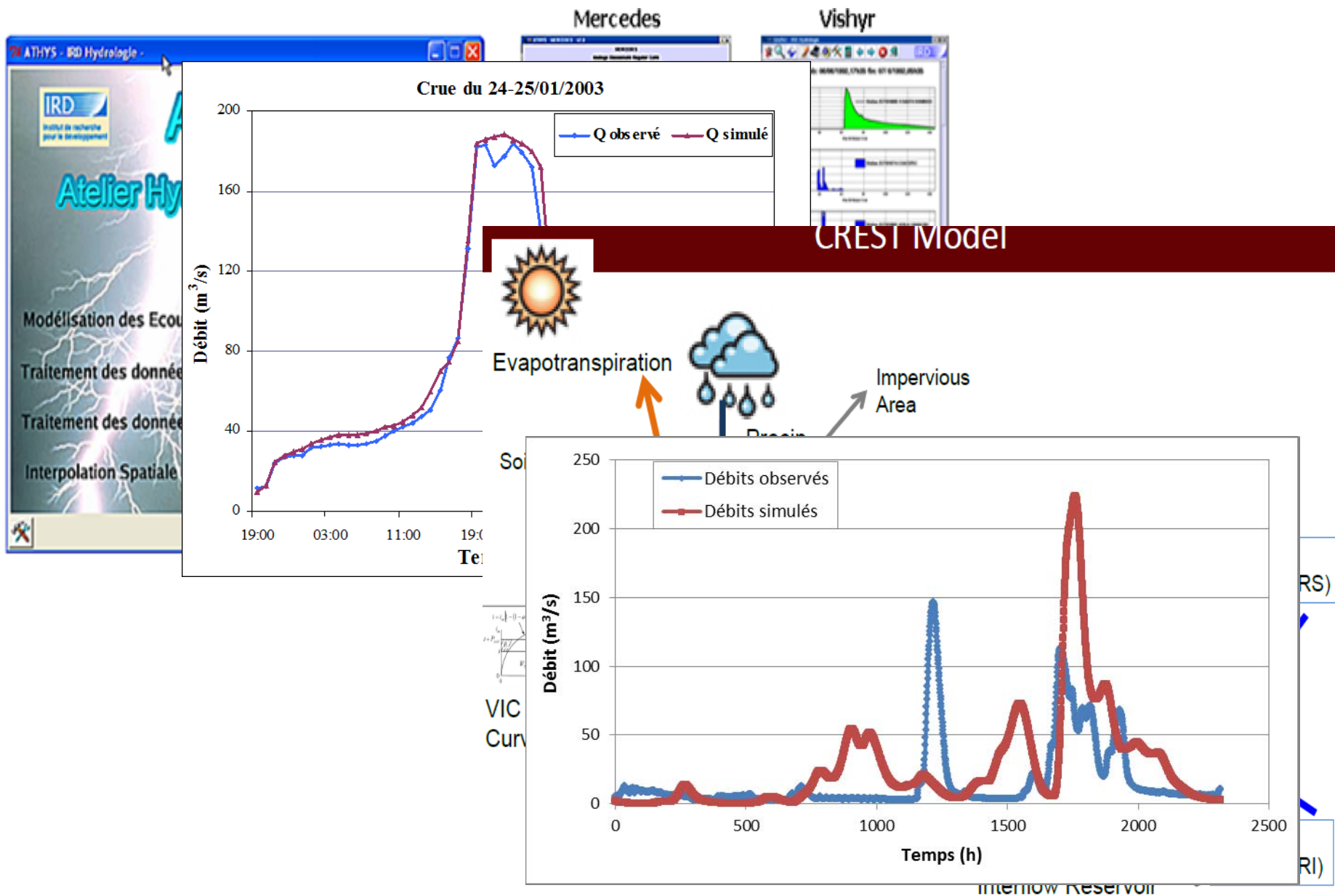
Peak relative error: $PRE = \frac{Q_c \text{ max} - Q_o \text{ max}}{Q_c \text{ max}}$

Peak time error: $PTE = t_{Q_c} - t_{Q_o}$

Graphical criteria

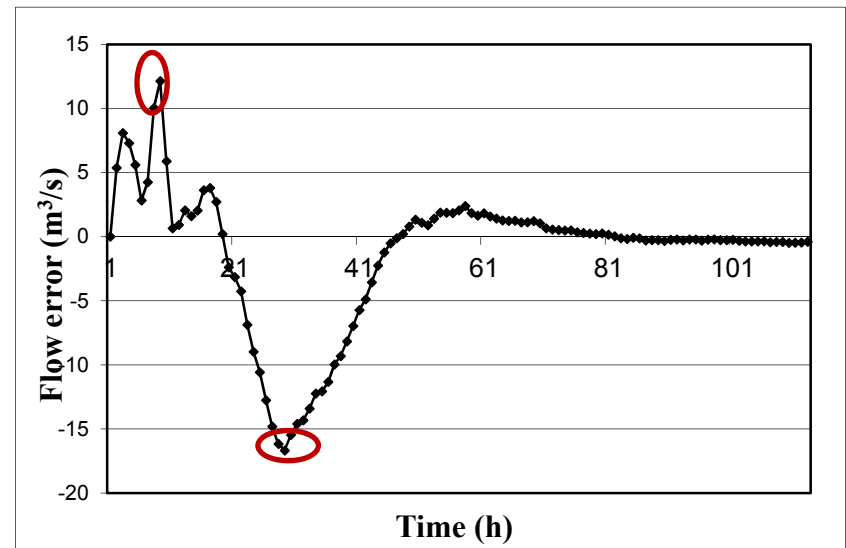
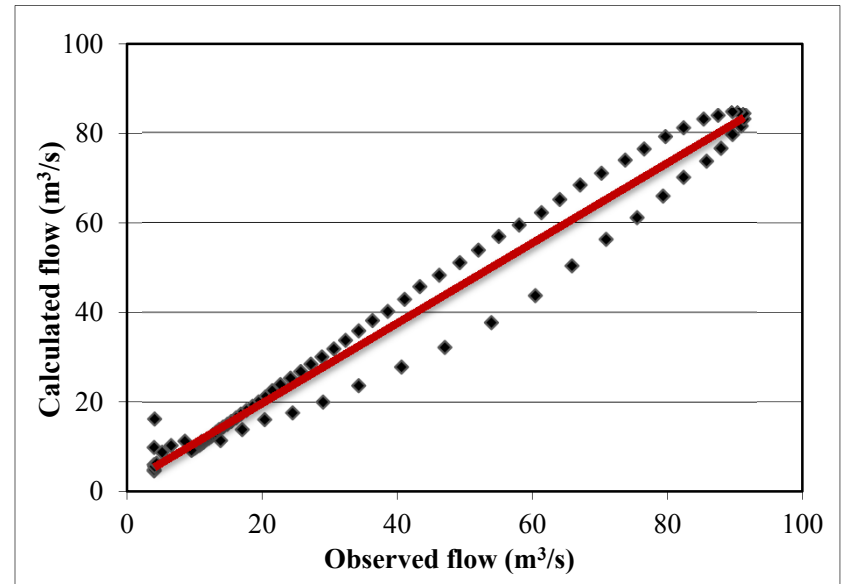
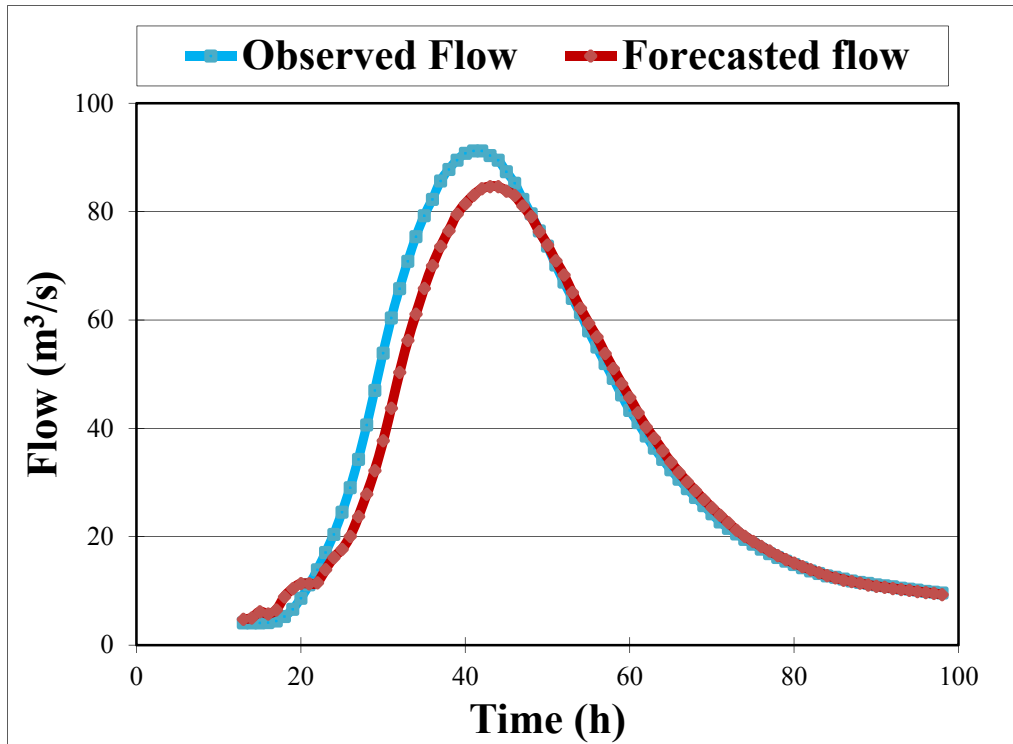
Error and the correlation between observed and forecasted flow,

Results



Flood forecasting

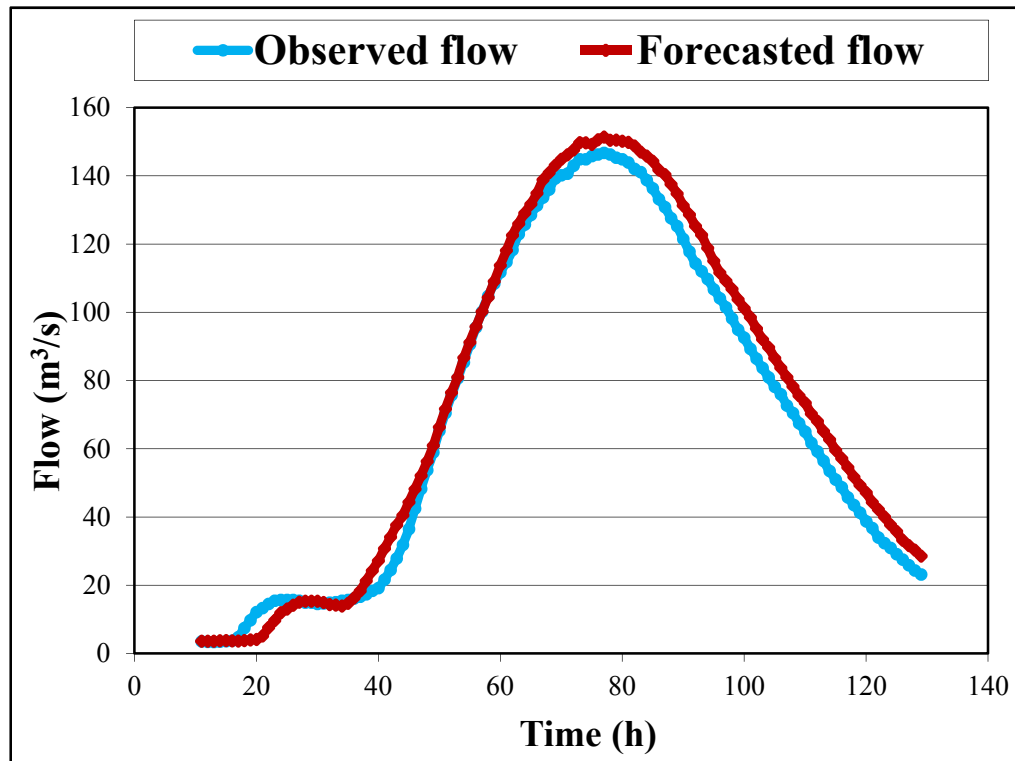
November 2010 (2h)



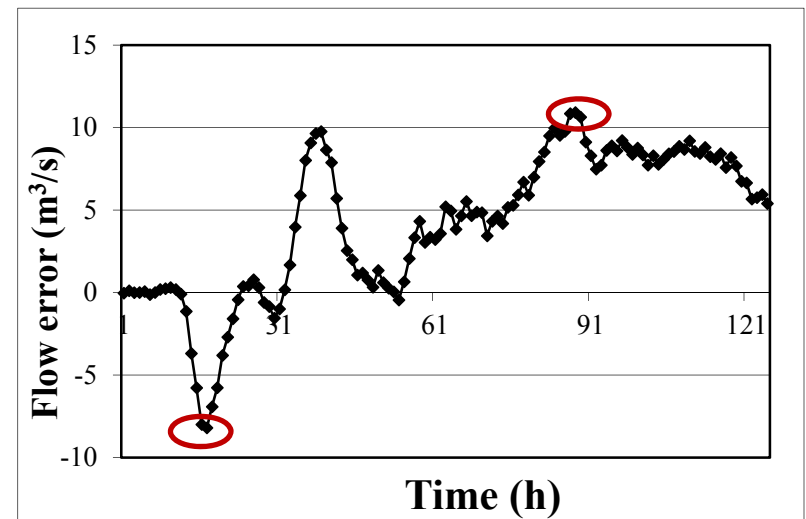
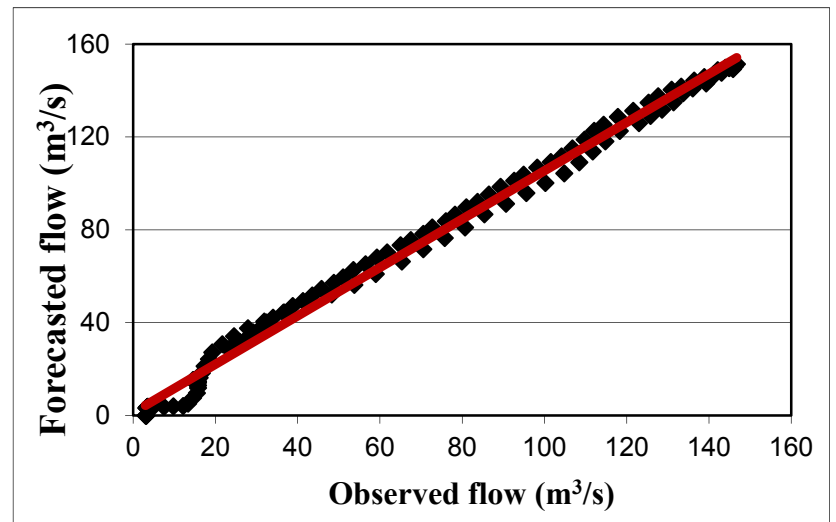
Nash=97%
PRE=-7%
PTE=2h

Flood forecasting

February 2011 (4 h)



Nash = 99%
PRE=3%
PTE=2h



Flood management system

The image displays a MATLAB R2015a environment with a data table and a simulation window. The data table contains the following information:

Date (h)	Jendouba	Bou Heurtma	M
11/01/2003 5	39,0	0	
11/01/2003 6	39,0	0	
11/01/2003 7	39,0	18	
11/01/2003 8	39,0	23	
11/01/2003 9	39,0	32	
11/01/2003 10	39,0	47	
11/01/2003 11	39,0	62	
11/01/2003 12	39,0	107	
11/01/2003 13	39,0	120	
11/01/2003 14	39,0	145	
11/01/2003 15	39,0	157	
11/01/2003 16	39,0	169,5	
11/01/2003 17	39,0	184	
11/01/2003 18	39,0	187	
11/01/2003 19	39,0	202	
11/01/2003 20	39,0	207	
11/01/2003 21	39,0	207	
11/01/2003 22	39,0	299,5	
11/01/2003 23	39,0	182	
11/01/2003 00	39,0	169,5	
12/01/2003 01	39,0	169,5	
12/01/2003 02	39,0	170	
12/01/2003 03	39,0	170	
12/01/2003 04	39,0	168	
12/01/2003 05	39,0	155	
12/01/2003 06	39,0	150	
12/01/2003 07	39,0	145	
12/01/2003 08	39,0	145	

The MATLAB interface shows a window titled "Medjerda_Prevision" with the following settings:

- Donnée: 1, 2, 3, 4
- Import: [Button]
- Saison: Automne
- Delai: 2
- Trançon: Ghardimaou-Jendouba
- Simulation: [Button]
- Prévision: [Button]

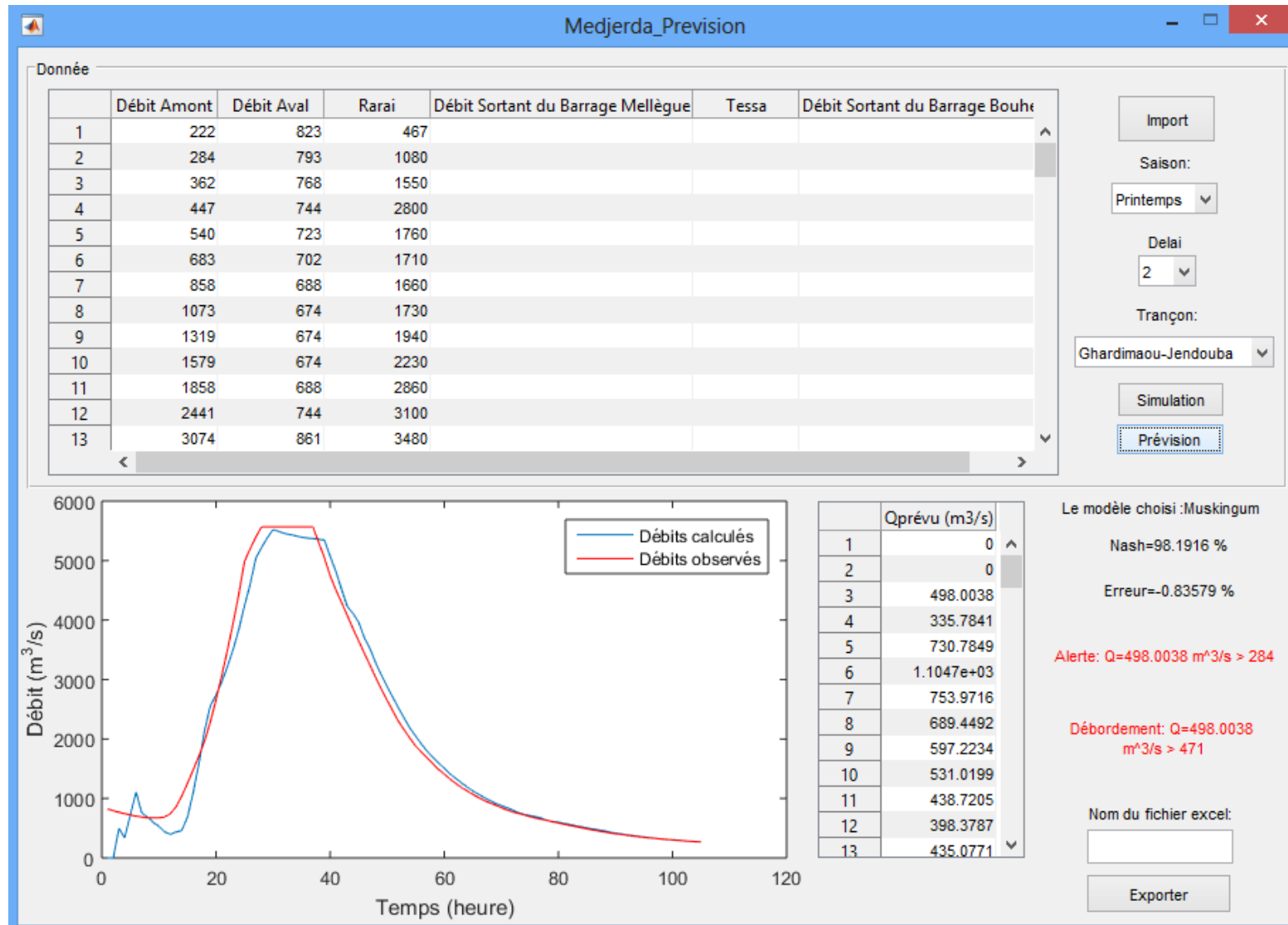
The plot area shows a graph with the y-axis labeled "Qprévu (m3/s)" ranging from 0 to 1. The x-axis ranges from 0 to 1. A table next to the plot shows the following data:

Qprévu (m3/s)
1
2
3
4

The MATLAB interface also shows a file explorer with a list of files in the "Current Folder" and a table with the following data:

Name	Value
M	183x60 d

Flood management system



Thank you for your
attention!

