Caspian Environment Programme

Realtime Storm Surge Forecasting System (data – model interface and first results)

Nr WLF 35L

Consultants Report
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1. ACCOMPLISHMENT OF MIKE 21 SIMULATION IN ON-LINE MODE

It is continuing the work on MIKE 21 model testing. With the help of GetFtp utility the data from European Center of the Weather Forecast came in local computer. However, 40 % of data were rejected, by time and by set as well. In stead of 60 maps sometimes came in 3 maps, and during rest days often there were no one. As a result of this, the problems with daturence surface appeared.

In the presence of the total set of the maps, the calculations were made by model with the grid step 10 km, and then in semi-automatic regime, they transferred on model with the grid step 2 km. This process requires a definite quality of time and henceforth it should be automated.

As an example there were given 26 tests of forecasts (Fig. 1-26). As you can see from, the results of the forecasting were checked with a help of comparison of forecasting and measured levels in the station of Bolshoy Peshnoy Island. On the figure 1-10 there is a good quality of the forecast. On figures 11-14, 19, 24, 25, 26 – it is satisfactory, and on figures 20-23 – the forecasting levels are less then measured.

The forecasts of good quality relate to the cases, when amplitude of the level fluctuations did not exceed 50 cm. It is necessary to note that forecasts for three days was justified better then for 5 days, that is naturally.

Thus, as a result of southwestern action on April 28-29 there was observed the surge on North-east coast of the Caspian Sea. The sea level in the region of Bolshoy Peshnoy Island arose on 80 cm and reached minus 26,4 m.

Unfortunately, the forecast for 5 days (Fig. 21) did not show this raise. In this case the best was the forecast for 48 hours (Fig. 24). Digital forecasts of baric fields came in with the grid step $1,5^0$. Not for a while yet we did not display the effect from data acquisition on $0,5^0$ of grid. To showing up this effect from data of high resolution there was made an estimation on $1,5^0$ and $0,5^0$ grid for three periods: April 25-30 (Fig. 27), May 2-7 (Fig. 28), May 6-11 (Fig. 29). There were marked the forecast of bad quality in these periods. As you can see from Fig. 27-29, the forecast quality was no improved.

Beginning from may, after the consultation with expert of Danish Hydraulic Institute, Dr. Rene Jensen, there is a testing of the model with the usage of forecasting data of high resolution. However, the data from Meteocenter (UK Met Office) come in up to now not regularly and no in corpore, the information in the table 1 testifies about this. In this connection, the experts have had to contact with Dr. R. Wardlaw every day. In spite of difficulties, there were made 15 tests of a good quality in May and June. Maximal forecasting error was not exceeding 20 cm, and average error equal to observation accuracy of the sea level 5-7 cm.

Verification of the forecasting levels, calculated using the model with the step 2 km, is carried out by the sea level, measured on the station Bolshoy Peshnoy Island. It is necessary to have an effective data on water level in all parts of the Caspian Sea coast for the most qualitative verification of the model.

On the next stages of the work it is necessary to improve the quality of the forecast in the following way:

- Carry out the regular comparison of the calculated forecasts of baric field and wind over Caspian Sea with the forecast of Republic State Enterprise “KazHydromet”. For this purpose it is necessary to have on a local computer a video rendering on wind speed, in the convenient for comparison form;
- Investigate the influence of the river flow;
- Carry out the model verification by majority of gauging stations;
- In spring and autumn periods it is necessary to run model on daily basis, as in this time it is most probable the occurrence of storm surges;
- Process the method of calculations of an initial background sea level under the daily improvement of the model.

1.1. Comparison of Measured and Simulated Water Level for Caspian Sea at Island Big Peshnoy (Warning Lead Time 120 Hours Ahead)

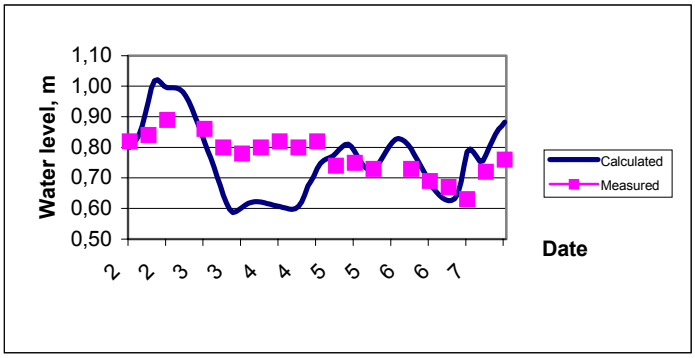


Figure 1 Simulation period from 2 to 7 April, 2001

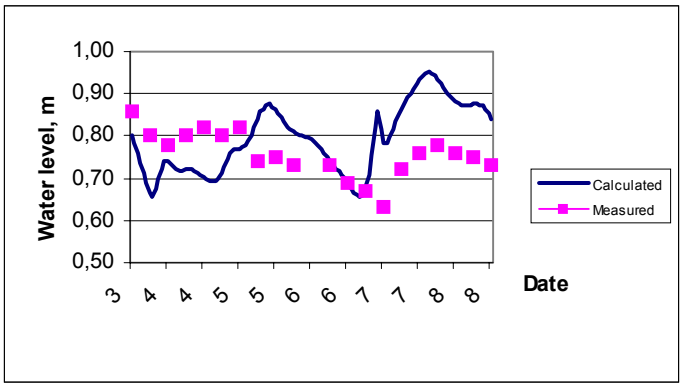


Figure 2 Simulation period from 3 to 8 April, 2001

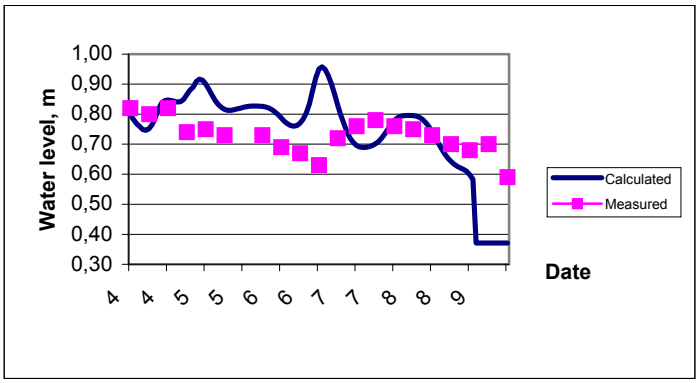


Figure 3 Simulation period from 4 to 9 April, 2001

Figure 4 Simulation period from 5 to 10 April, 2001

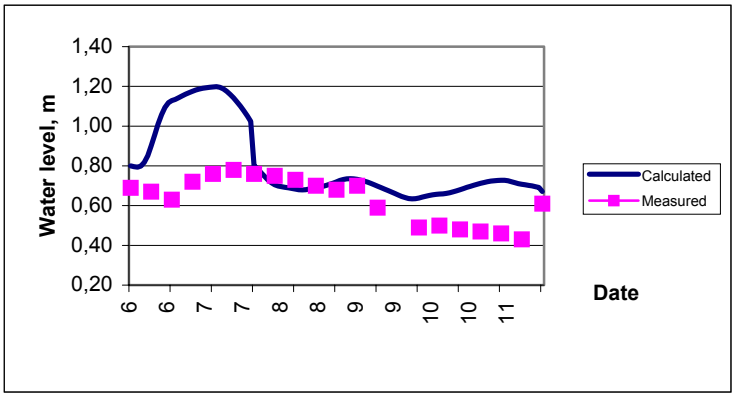


Figure 5 Simulation period from 6 to 11 April, 2001

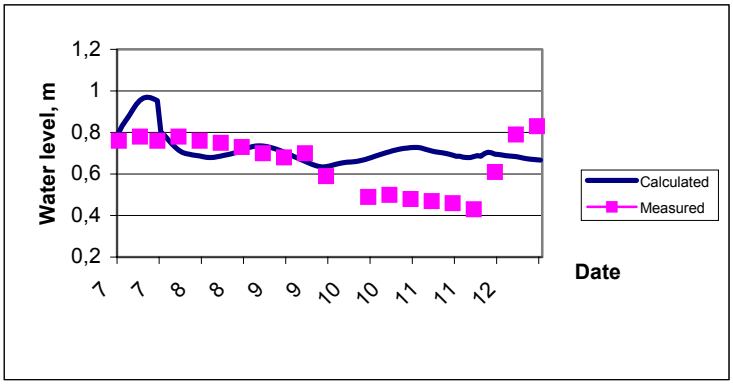


Figure 6 Simulation period from 7 to 12 April, 2001

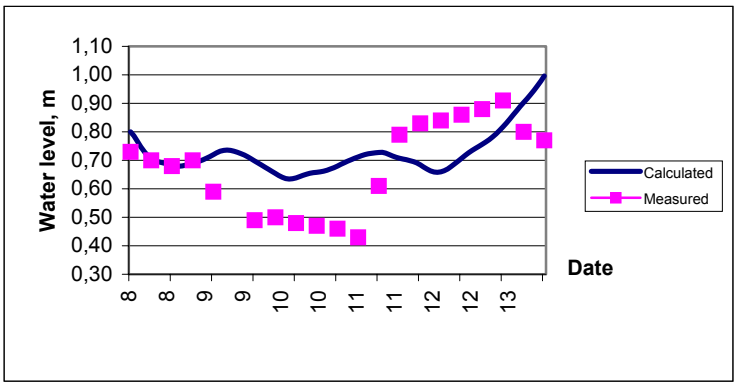


Figure 7 Simulation period from 8 to 13 April, 2001

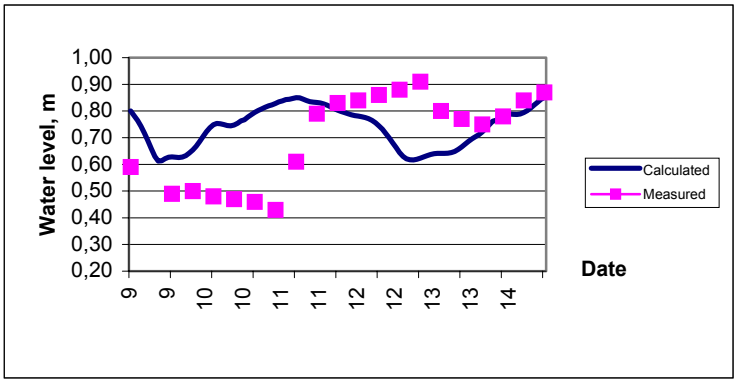


Figure 8 Simulation period from 9 to 14 April, 2001

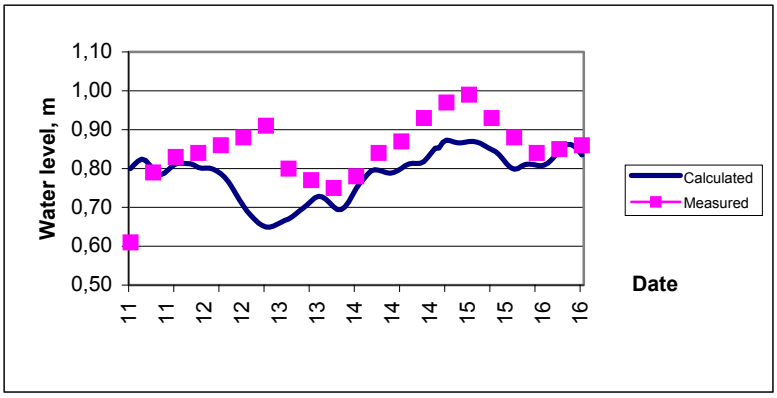


Figure 9 Simulation period from 11 to 16 April, 2001

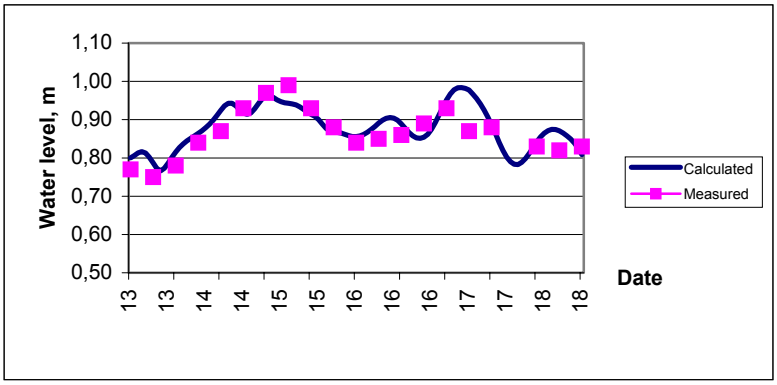


Figure 10 Simulation period from 13 to 18 April, 2001

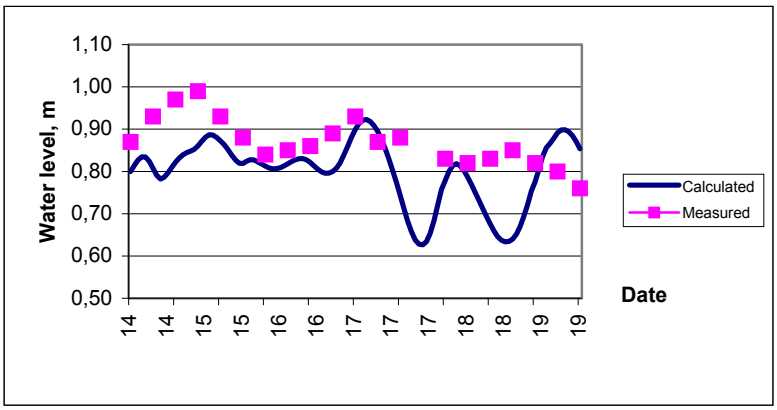


Figure 11 Simulation period from 14 to 19 April, 2001

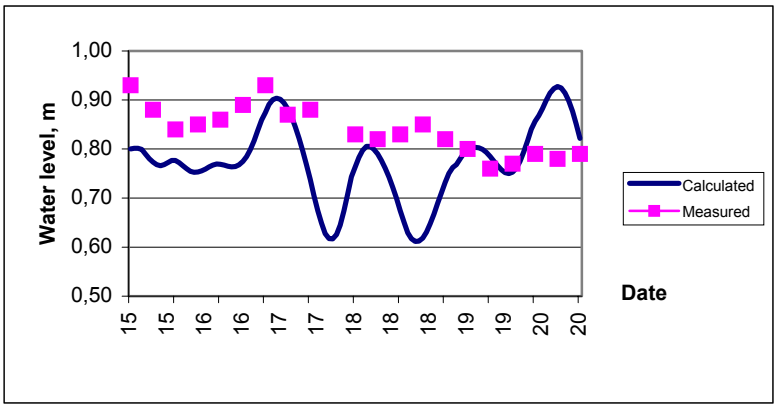


Figure 12 Simulation period from 15 to 20 April, 2001

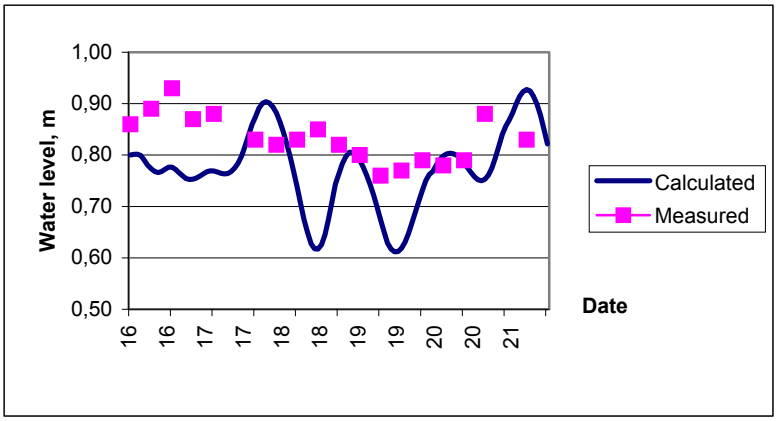


Figure 13 Simulation period from 16 to 21 April, 2001

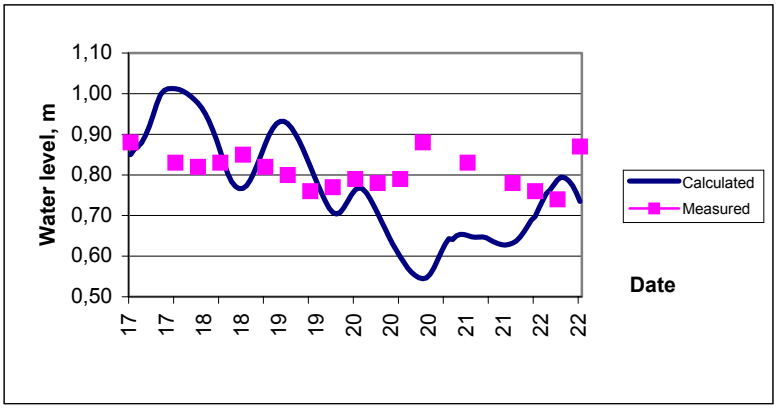


Figure 14 Simulation period from 17 to 22 April, 2001

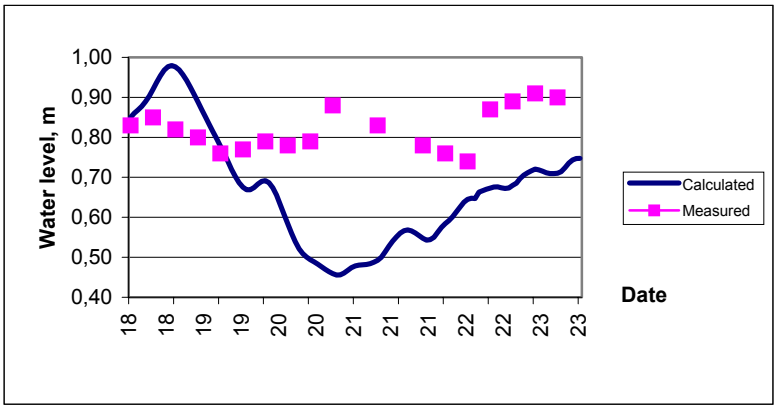


Figure 15 Simulation period from 18 to 22 April, 2001

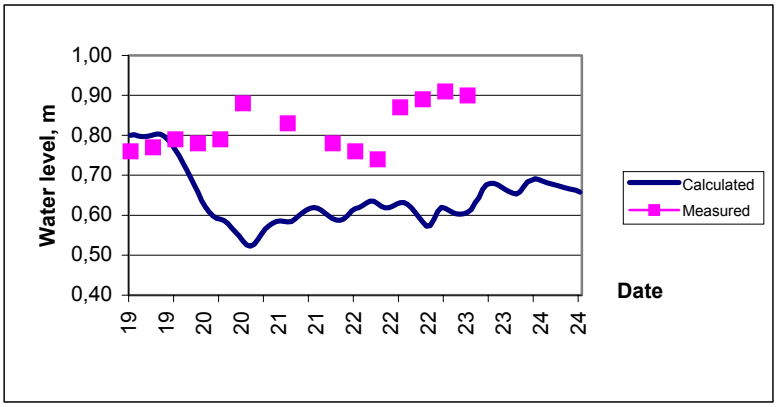


Figure 16 Simulation period from 19 to 24 April, 2001

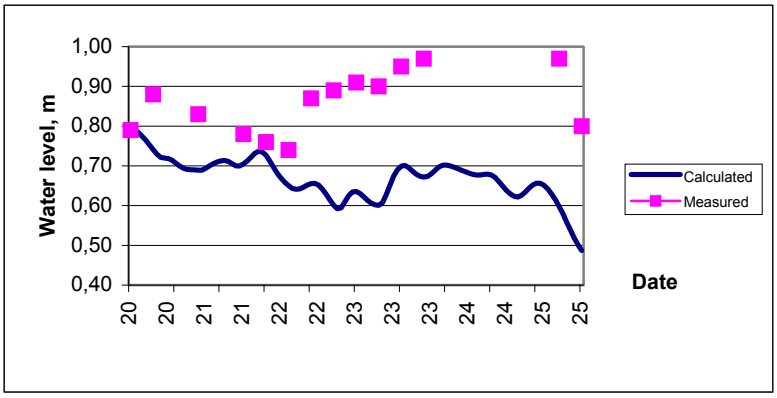


Figure 17 Simulation period from 20 to 25 April, 2001

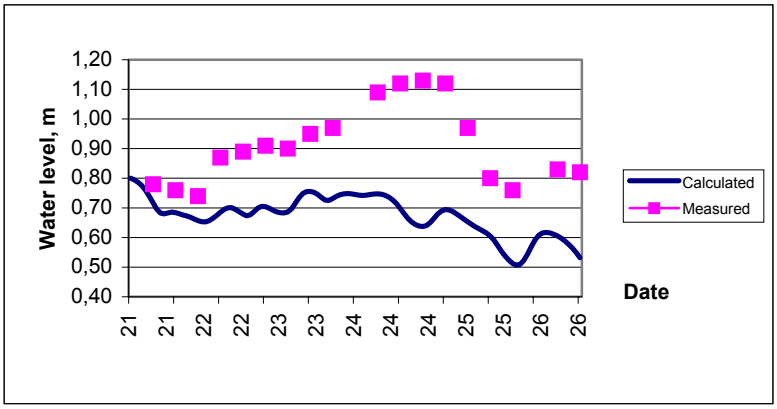


Figure 18 Simulation period from 21 to 26 April, 2001

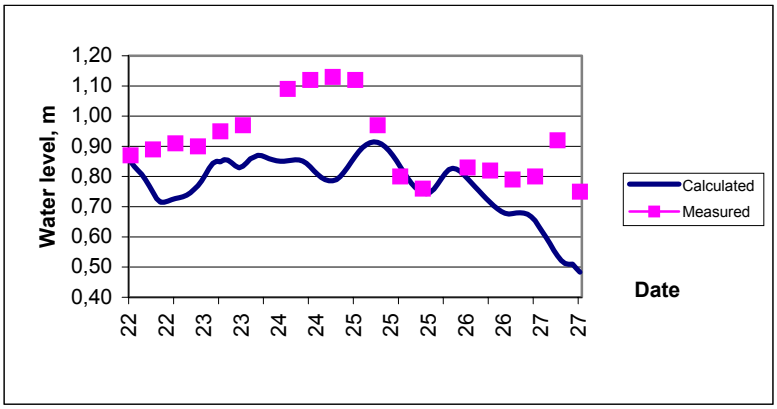


Figure 19 Simulation period from 22 to 27 April, 2001

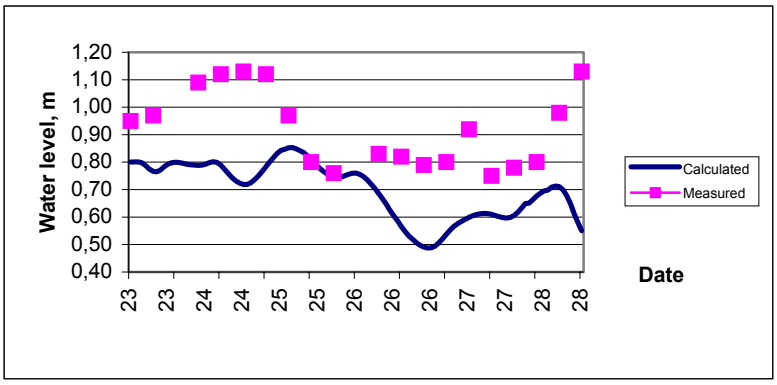


Figure 20 Simulation period from 23 to 28 April, 2001

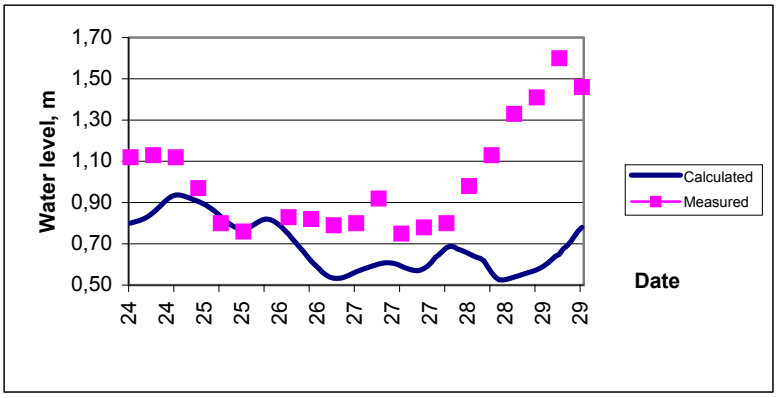


Figure 21 Simulation period from 24 to 29 April, 2001

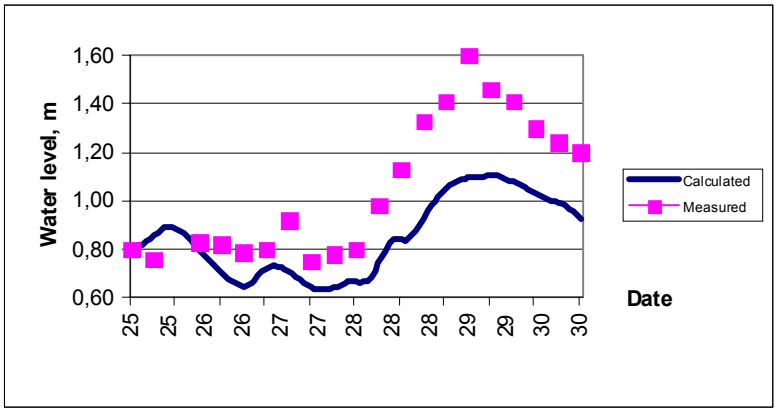


Figure 22 Simulation period from 25 to 30 April, 2001

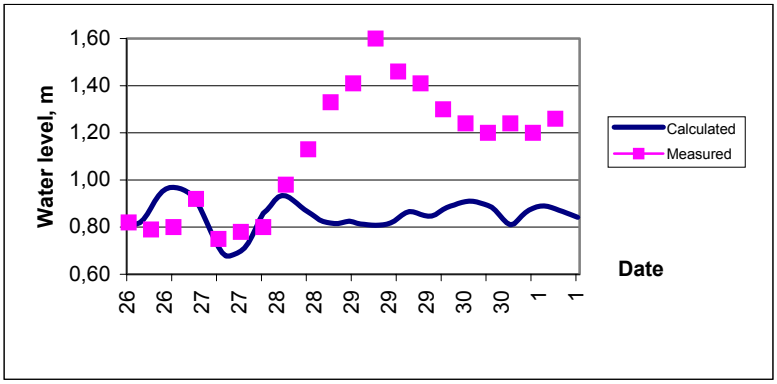


Figure 23 Simulation period from 26 April to 1 May, 2001

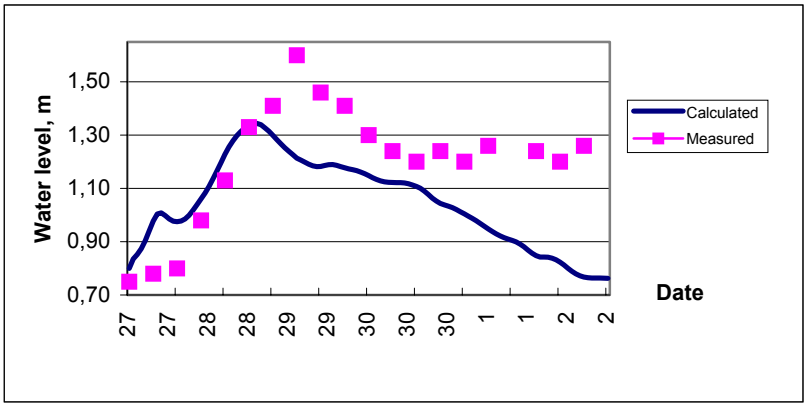


Figure 24 Simulation period from 27 April to 2 May, 2001

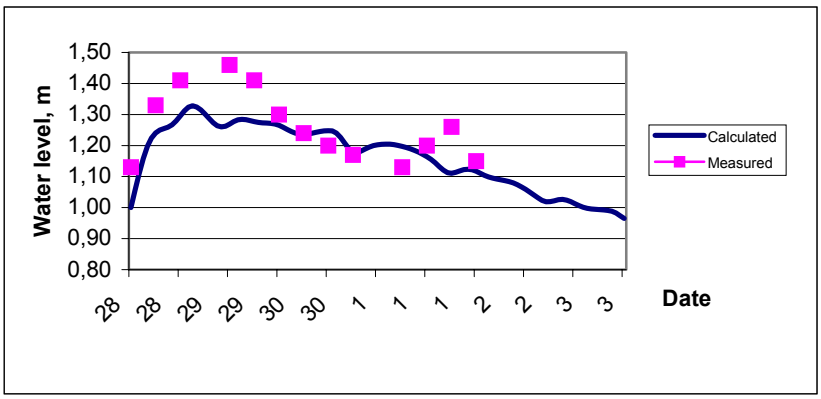


Figure 25 Simulation period from 28 April to 3 May, 2001

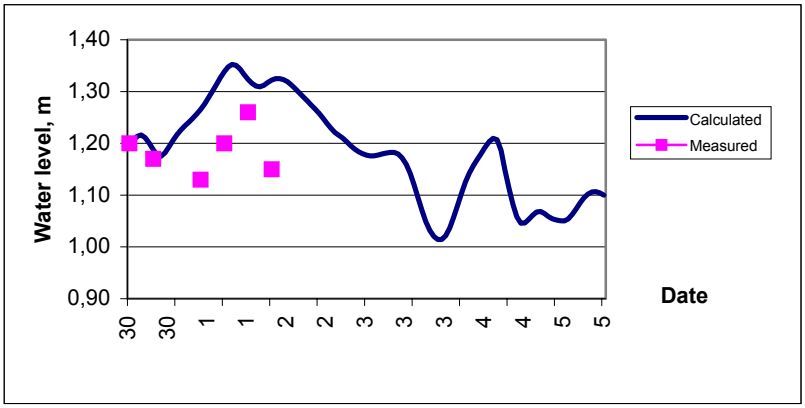


Figure 26 Simulation period from 30 April to 5 May, 2001

1.2 Comparison of Measured and Simulated Water Level for Caspian Sea at Island Big Peshnoy (Warning Lead Time 120 Hours Ahead)

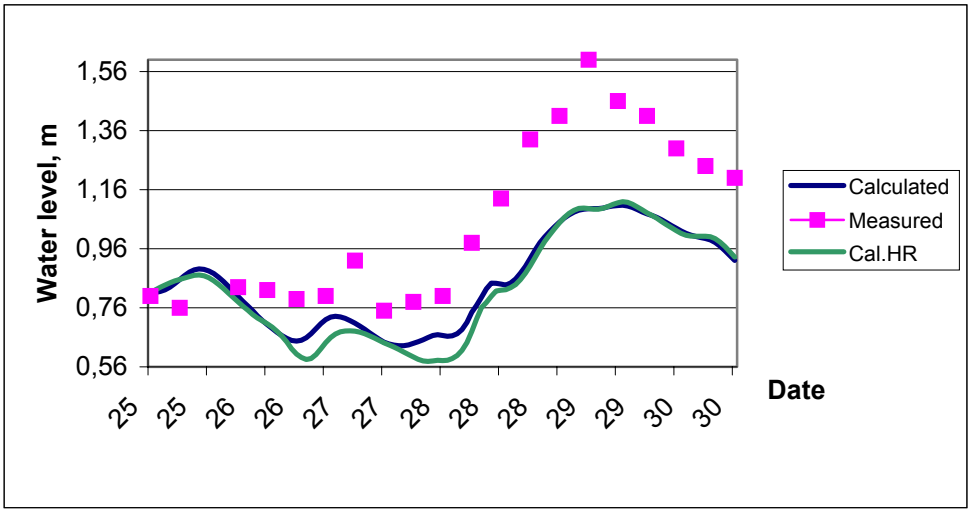


Figure 27 Simulation period from 25 to 30 April, 2001

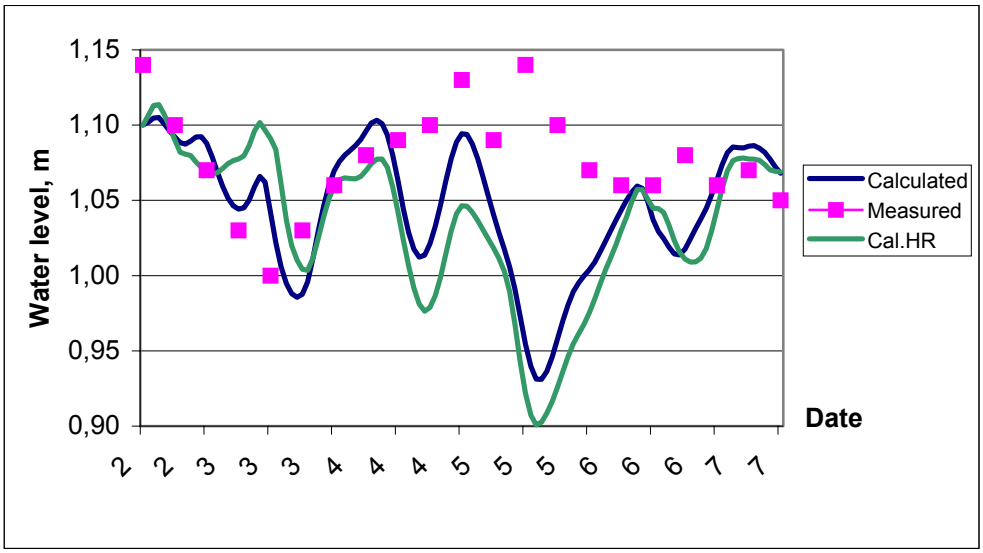


Figure 28 Simulation period from 2 to 7May, 2001

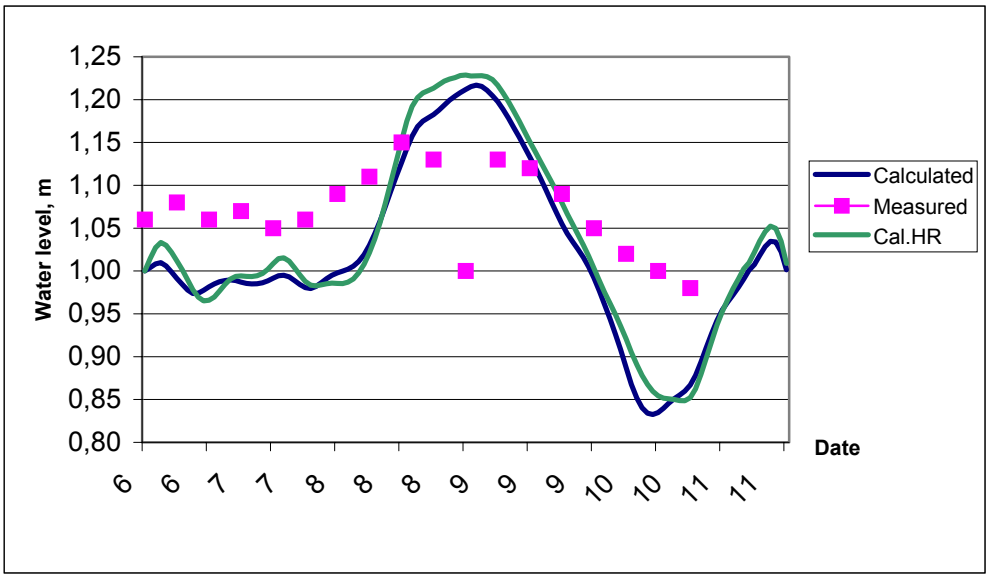


Figure 29 Simulation period from 6 to 11May, 2001

Table 1 Time and Motion Study of Information from UK Met Office

Date of Obtaining Meteorological Information	Simulation Period	Resolution $1,5^0$	Resolution $0,5^0$
February, 2001			
010214	13-18	Calculation	
010215	14-19	Calculation	
010216	15-20	Rejects*	Rejects* - data are not completed
010217	16-21	Calculation	
010218	17-22	Rejects	
010219	18-23	Calculation	
010220	19-24	Calculation	
010221	20-25	Calculation	
010222	21-26	Calculation	
010223	22-27	Calculation	
010224	23-28	No Information	
010225	24 - March 1	No Information	
010226	25 - March 2	Rejects	
010227	26 - March 3	Rejects	
010228	27 - March 4	Rejects	
47 % Reject Maps			
March, 2001			
010301	February 28- March 5	Calculation	
010302	1-6	Rejects	
010303	2-7	No Information	
010304	3-8	No Information	
010305	4-9	No Information	
010306	5-10	Calculation	
010307	6-11	Calculation	
010308	7-12	Calculation	
010309	8-13	Calculation	
010310	9-14	Calculation	
010311	10-15	Calculation	
010312	11-16	Calculation	
010313	12-17	Calculation	
010314	13-18	Calculation	
010315	14-19	Calculation	
010316	15-20	Calculation	
010317	16-21	Calculation	
010318	17-22	Calculation	
010319	18-23	Calculation	

Date of Obtaining Meteorological Information	Simulation Period	Resolution $1,5^0$	Resolution $0,5^0$
010320	19-24	Rejects	
010321	20-25	Rejects	
010322	21-26	Rejects	
010323	22-27	Rejects	
010324	23-28	Rejects	
010325	24-29	Rejects	
010326	25-30	Rejects	
010327	26- 31	Calculation	
010328	27 - April 1	Calculation	
010329	28 - April 2	Calculation	
010330	29 - April 3	No Information	
010331	30 - April 4	Calculation	
39 % Reject Maps			
April, 2001			
010401	March 31 - 5	Calculation	
010402	1-6	Calculation	
010403	2-7	Calculation	
010404	3-8	Calculation	
010405	4-9	Calculation	
010406	5-10	Calculation	
010407	6-11	Calculation	
010408	7-12	Calculation	
010409	8-13	Calculation	
010410	9-14	Calculation	
010411	10-15	Rejects	
010412	11-16	Calculation	
010413	12-17	Rejects	
010414	13-18	Calculation	
010415	14-19	Calculation	
010416	15-20	Calculation	
010417	16-21	Calculation	
010418	17-22	Calculation	
010419	18-23	Calculation	
010420	19-24	Calculation	
010421	20-25	Calculation	
010422	21-26	Calculation	
010423	22-27	Calculation	Calculation
010424	23-28	Calculation	
010425	24-29	Calculation	
010426	25-30	Calculation	Calculation

Date of Obtaining Meteorological Information	Simulation Period	Resolution $1,5^0$	Resolution $0,5^0$
010427	26 - May 1	Calculation	
010428	27 - May 2	Calculation	
010429	28 - May 3	Calculation	
010430	29 - May 4	Rejects	
10 % Reject Maps			
May, 2001			
010501	April 30 - May 5	Calculation	
010502	1-6	Calculation	
010503	2-7	Calculation	Calculation
010504	3-8	Calculation	
010505	4-9	Rejects	
010506	5-10	Calculation	
010507	6-11	Calculation	Calculation
010508	7-12	Rejects	
010509	8-13	Calculation	
010510	9-14	Calculation	
010511	10-15	Calculation	
010512	11-16	Calculation	
010513	12-17	Calculation	
010514	13-18	Calculation	
010515	14-19	Rejects	
010516	15-20	Rejects	
010517	16-21	Rejects	Calculation
010518	17-22	Calculation	
010519	18-23	Calculation	
010520	19-24	Calculation	
010521	20-25	Calculation	Calculation
010522	21-26	No Information	
010523	22-27	No Information	
010524	23-28	No Information	
010525	24-29	No Information	
010526	25-30	No Information	
010527	26-31	No Information	
010528	27- June 1	No Information	
010529	28- June 2	No Information	
010530	29- June 3	Calculation	
010531	30- June 4	Calculation	
35,5 % Reject Maps			
June, 2001			
010601	May 31 - 5		Calculation

Date of Obtaining Meteorological Information	Simulation Period	Resolution $1,5^0$	Resolution $0,5^0$
010602	1-6		Rejects
010603	2-7		Rejects
010604	3-8		Calculation
010605	4-9		Rejects
010606	5-10		Rejects
010607	6-11		Calculation
010608	7-12		Rejects
010609	8-13		Rejects
010610	9-14		Rejects
010611	10-15		Calculation
010612	11-16		Rejects
010613	12-17		Rejects
010614	13-18		Calculation
010615	14-19		Calculation
010616	15-20		Calculation
010617	16-21		Calculation
010618	17-22		Calculation
010619	18-23		Calculation
010620	19-24		Calculation
010621	20-25		Calculation
010622	21-26		Calculation
010623	22-27		Calculation
010624	23-28		Calculation
010625	24-29		Calculation
010626	25-30		Calculation
010627	26- 1 June		Calculation
010628	27- 2 June		Calculation
010629	28- 3 June		Calculation
010630	29- 4 June		Calculation
30,0 % Reject Maps			

2. EUROPEAN CENTRE FOR METEOROLOGICAL WEATHER FORECASTS DATA ACCESS

2.1. GetFtp Routine

Routine **GetFtp** was reconstructed for downloading forecast files from web page **http://www.civ.ed.ac.uk/caspian/** on daily basis. Because of specific features of Windows95/98/2000 operating system (there is no difference between files with upper- and lowercase letters in filenames) it was necessary to change some files on the local computer according to Table 2:

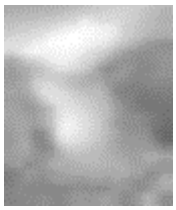
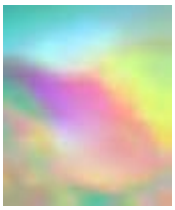
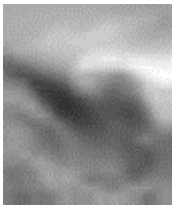
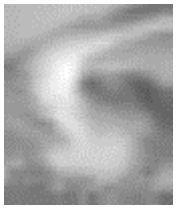
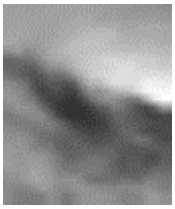
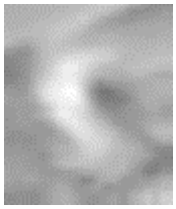
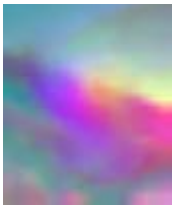
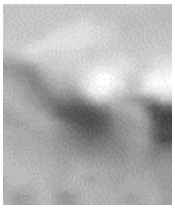
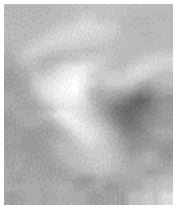
Table 2 ECMWF Data File Names for Mean Sea Level (MSL) Pressure[1]

№№	Hours of Forecast	GRIB Data File Name (web)	GRIB Data File Name (local)
1	0	ECAPX098A	ECAPX098AU
2	+ 6	ECAPX098C	ECAPX098CU
3	+ 12	ECAPX098E	ECAPX098EU
4	+ 18	ECAPX098G	ECAPX098G
5	+ 24	ECAPX098I	ECAPX098I
6	+ 30	ECAPX098K	ECAPX098K
7	+ 36	ECAPX098M	ECAPX098M
8	+ 42	ECAPX098O	ECAPX098O
9	+ 48	ECAPX098Q	ECAPX098QU
10	+ 54	ECAPX098S	ECAPX098S
11	+ 60	ECAPX098U	ECAPX098U
12	+ 66	ECAPX098q	ECAPX098ql
13	+ 72	ECAPX098W	ECAPX098W
14	+ 78	ECAPX098X	ECAPX098X
15	+ 84	ECAPX098Y	ECAPX098Y
16	+ 90	ECAPX098Z	ECAPX098Z
17	+ 96	ECAPX098a	ECAPX098al
18	+ 102	ECAPX098b	ECAPX098b
19	+ 108	ECAPX098c	ECAPX098c
20	+ 114	ECAPX098d	ECAPX098d
21	+ 120	ECAPX098e	ECAPX098el

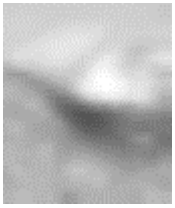
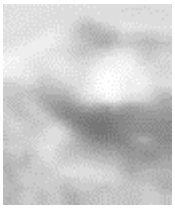
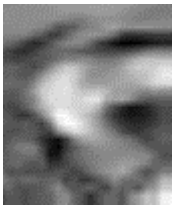
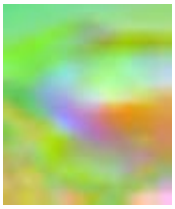
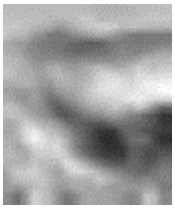
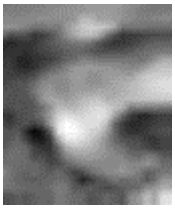
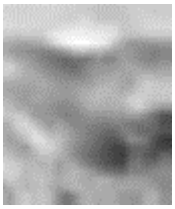
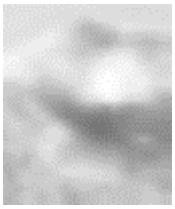
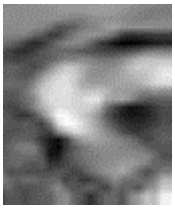
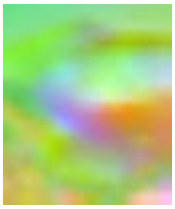
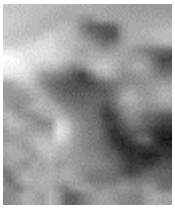
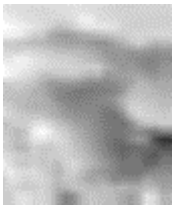
The visualization of the downloaded forecast data is represented in **Table 3.**

[1] U-wind component file names are the same but with ECAI prefix (instead of ECAP);
V-wind component file names are the same but with ECAJ prefix (instead of ECAP).

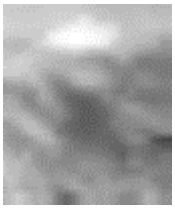
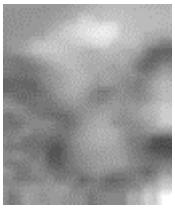
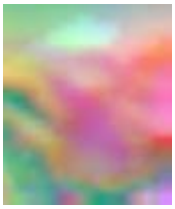
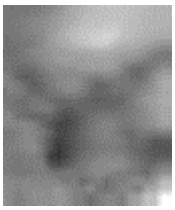
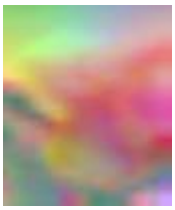
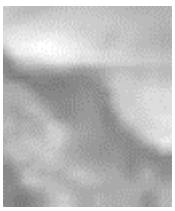
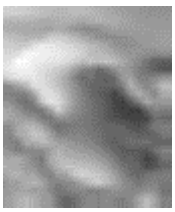
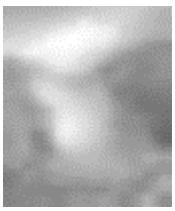
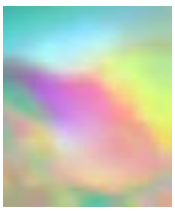
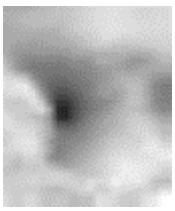
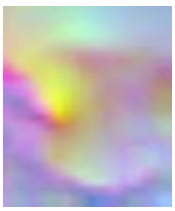
Table 3 Visualization of ECMWF Forecast Data (17.06.01 12:00)

	Pressure	U-wind component	V-wind component	PUV - coloured
0 hrs				
+6 hrs				
+12 hrs				
+18 hrs				
+24 hrs				
+30 hrs				
+36 hrs				

Continue Table 3

+42 hrs				
+48 hrs				
+54 hrs				
+60 hrs				
+66 hrs				
+72 hrs				
+78 hrs				

Continue Table 3

				
+90 hrs				
+96 hrs				
+102 hrs				
+108 hrs				
+114 hrs				
+120 hrs				

2.2. The Windows Dialogs Shell

The functions for running MIKE21 modeling system (both hot-start and cold-start) with -24 hrs hindcast and +120hrs forecast ECMWF data were added into the Windows Dialogs Shell **ForeCasp.**

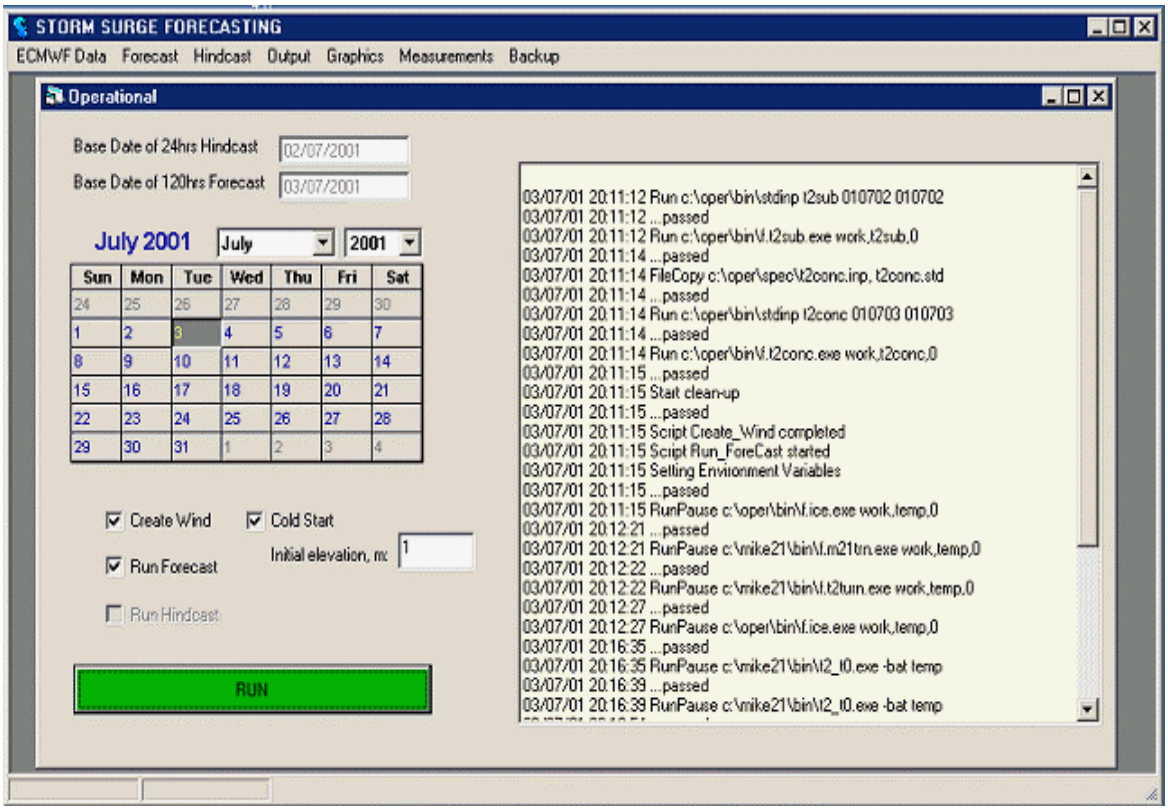


Figure 30 Dialog Window to the Automatic Computing of the Forecasted Caspian Sea Level

2.3. Automation of Charts Creation

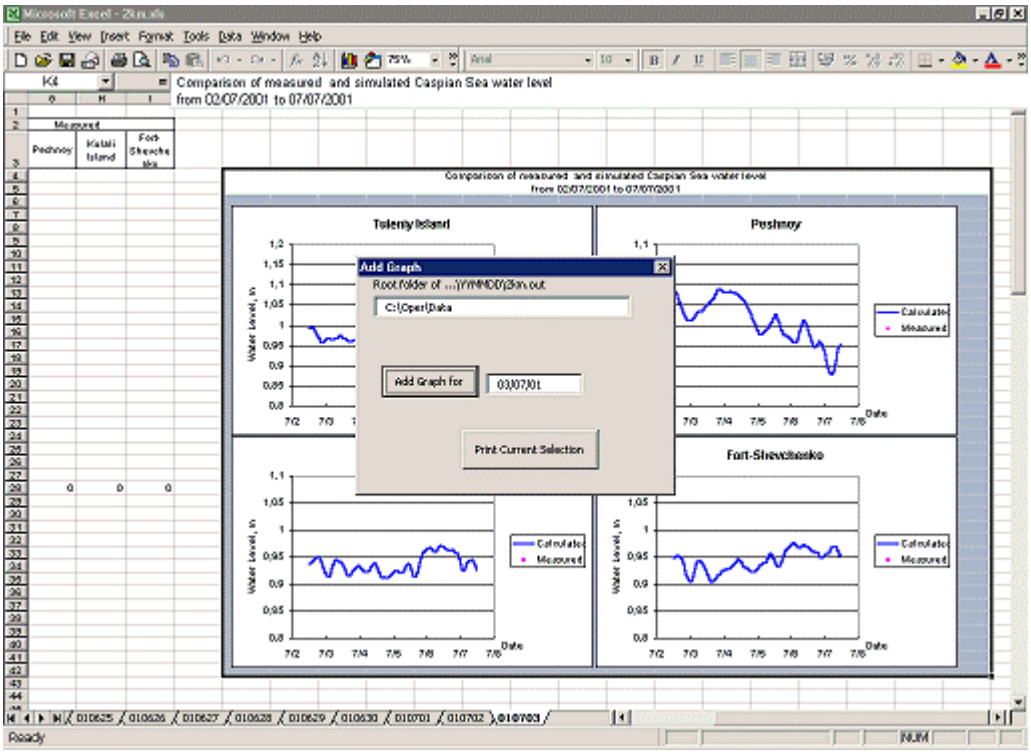


Figure 31 Page "Automatic Chart Creation of the Computed Sea Levels with Warning Lead Time 120 Hours for Kazakhstan Stations at the Northern- East Caspian Sea Seashore