

## **“KCurrent Model”**

**Tidal Current Prediction for Kuwait Waters and Arabian Gulf**

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## *User Interface For Prediction of Wave “KCurrent Model”*

### **Introduction.**

A new Tidal Current prediction technique is developed for hind-cast, now-cast and forecasting of Tidal current conditions over the Kuwaiti territorial water and the Arabian gulf. It is an interactive, online model. The computer simulation time required for this new modeling technique for Tidal Current history prediction is very little. The present technique is validated and named as **KCurrent model**. The results of this technique are compared with RMA model results and are found to be good.

The following files contain executable and linked data files for the **KCurrent model**:

Kcurrent.exe -- VisualBasic source code Interface for tidal Current prediction.

Cur-ADMequil. – Fixed input data describing the Kuwait stations.

Cur-gulf-ADMequil. – Fixed input data describing the Arabian Gulf stations.

### **Procedure for Stand-Alone Usage of “KCurrent model”**

Kuwait Tidal Current model is an efficient and interactive model and easy to use for any user with a little experience in a computer usage. Although more advanced features are anticipated to evolve in the future, this version is sufficiently user-friendly and can provide the base information for water circulation for Kuwait Waters. The information provided by this model can be further used to calculate sediment/pollutant transport for Kuwait waters. In this section of the report, step-by-step instructions are given for use of **KCurrent model**. The procedure outlined here to run the model, click on (**KCurrent Tide**) icon. Fig.1 will display for user three options to select as:

Option 1. Kuwait water

Option 2. Arabian Gulf

Option 3. Time Series

If user selects **option 1 (Kuwait Waters)** as shown in fig 1 before selecting Kuwait waters, user must select the Location from the map shown in fig. 1 by using the mouse. Click on the interest location, fig.2 will display to check the selected location.



Fig. 1

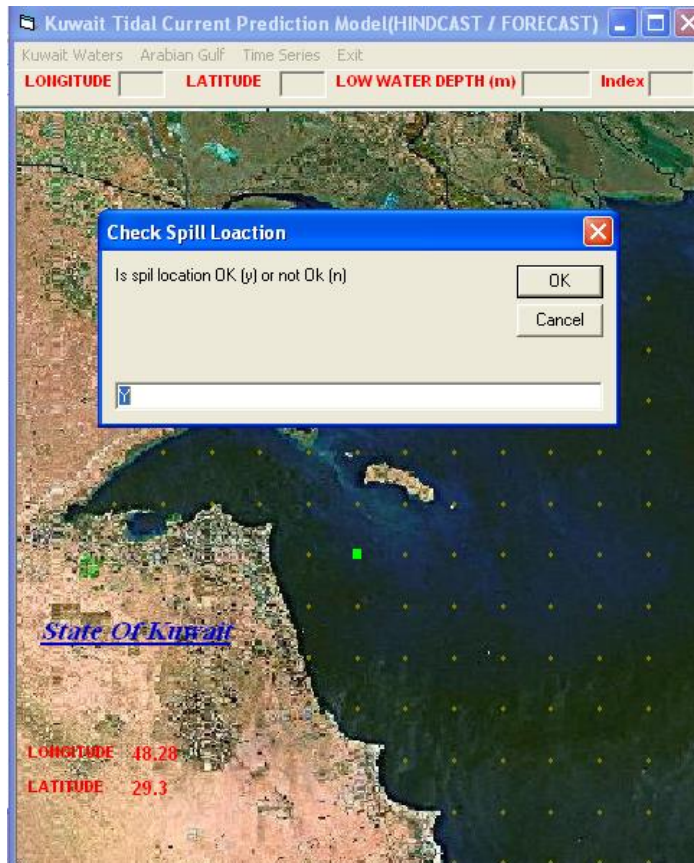
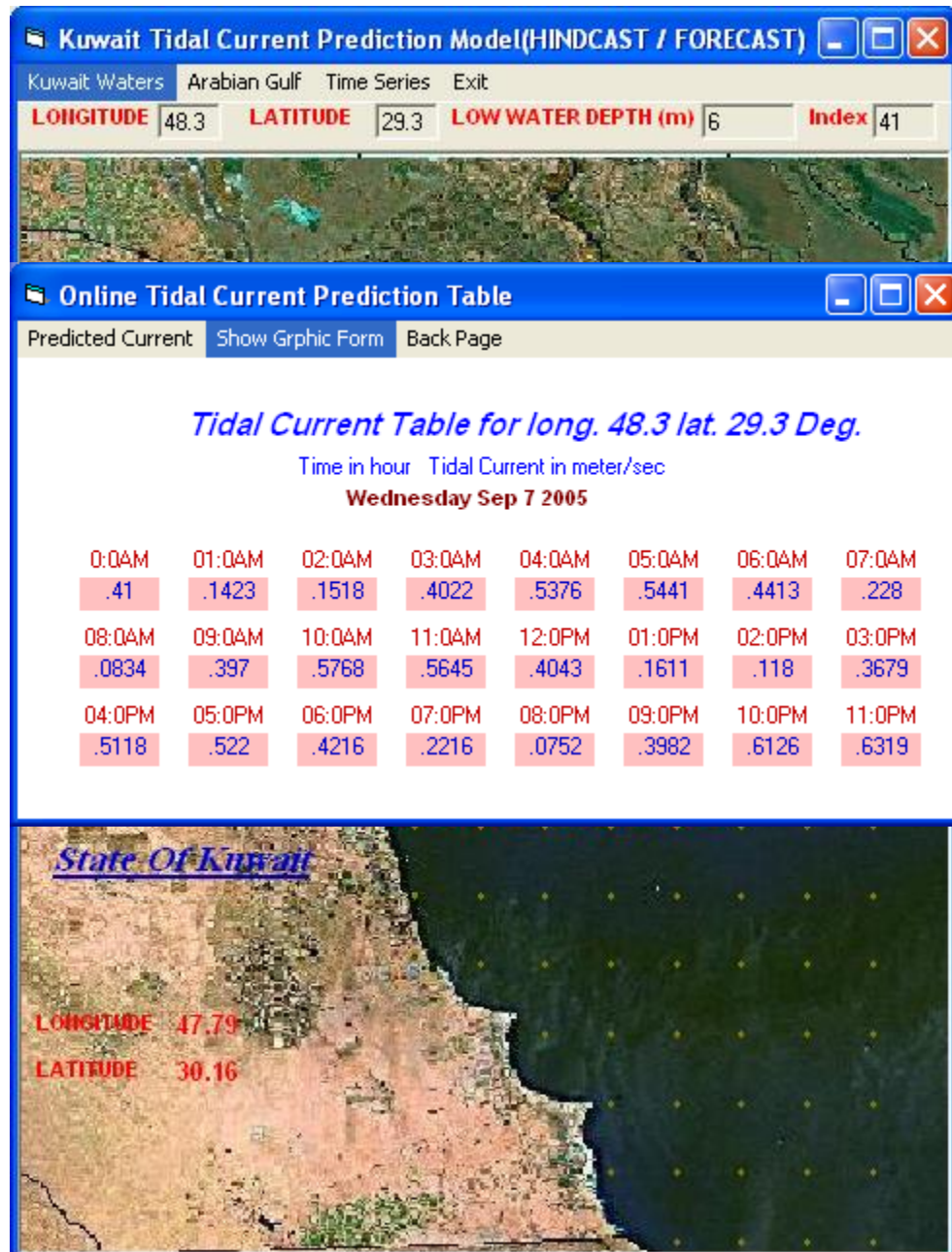


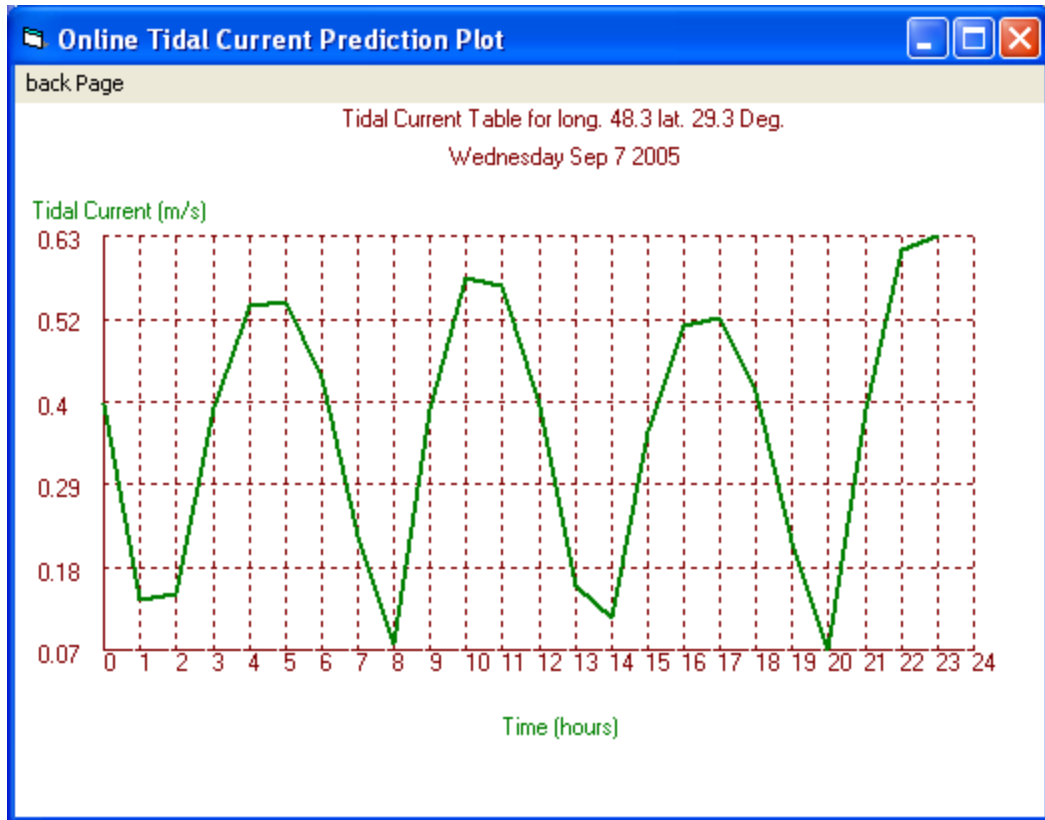
Fig. 2

Then user should select **Kuwait Waters** to run the tidal current prediction model to forecast the 24 hours for the current date then displayed the 24 hours forecasting table as shown in fig.3.

Then if user wants to display the 24 hours tidal current forecasting information as in graphically form user should select **Show Graphic form** fig. 4 will display the tidal current plot.



**Fig. 3**



**Fig. 4**

If user want to HindCast , Nowcast , Forecast or change location should select **Predicted Current** as shown in fig. 3. Then fig.5 will display two sub-option as:

- 1-Select Date
- 2-Select Station (long/lat)

User should select first Sub-option 1 **Select Date** to setup the prediction Date from (1 Jan 1970) until (31 Dec 2037) as shown in fig 6.

Then user should select Sub-option 2 **Select Station** to change a different location for tidal prediction (based on Longitude and Latitude in Degrees) as shown in fig 6.

Then fig. 7 will display the tidal current predicted information.

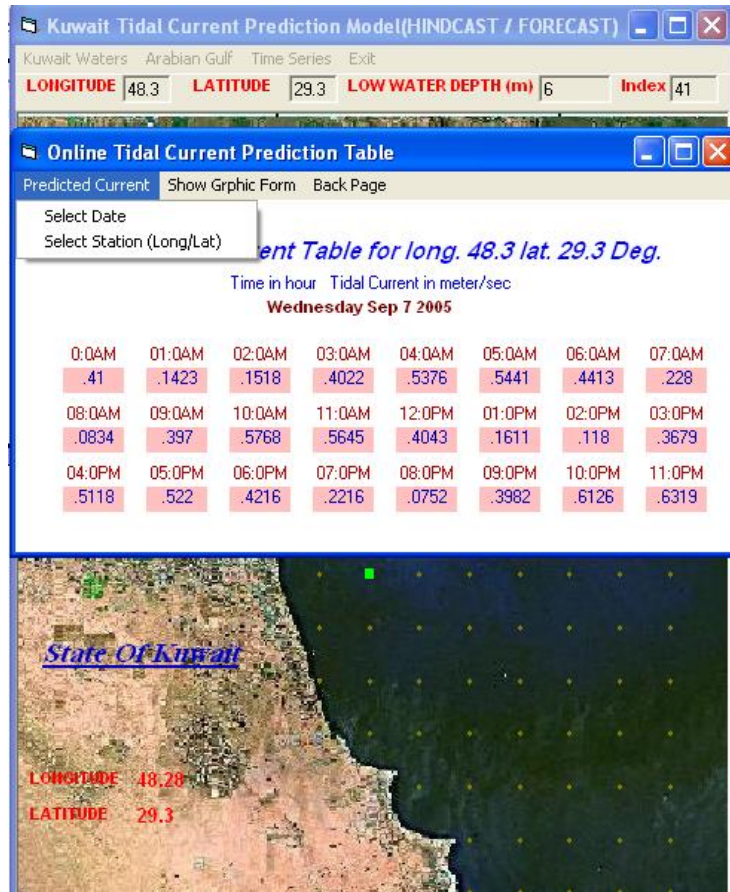


Fig. 5

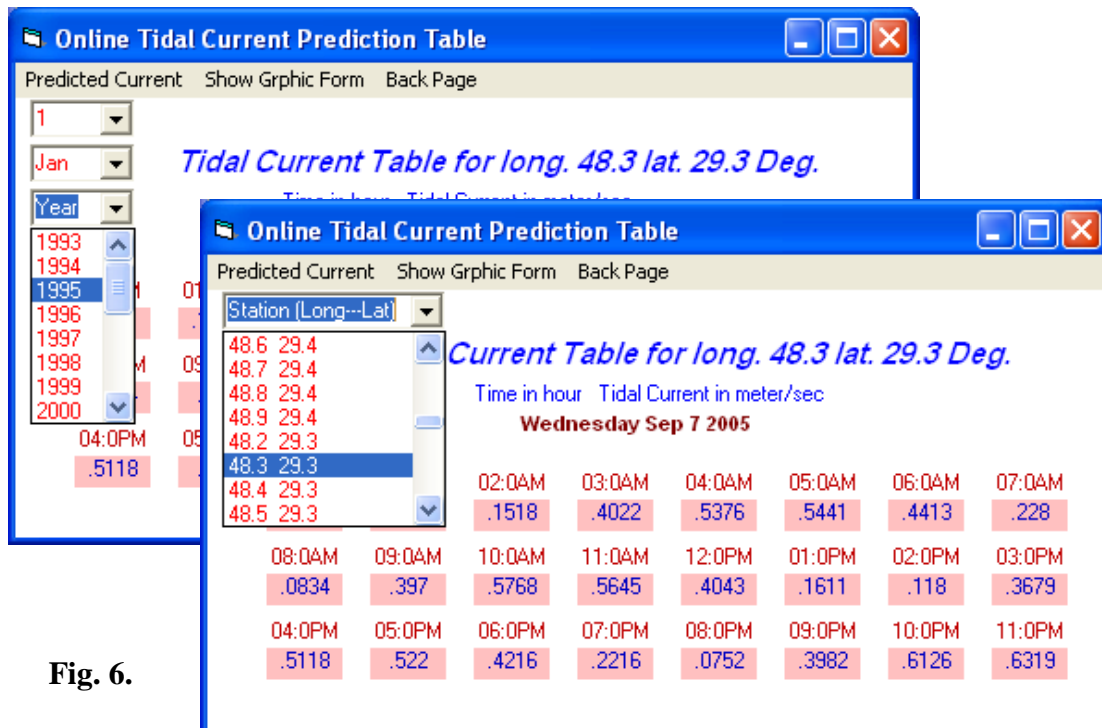
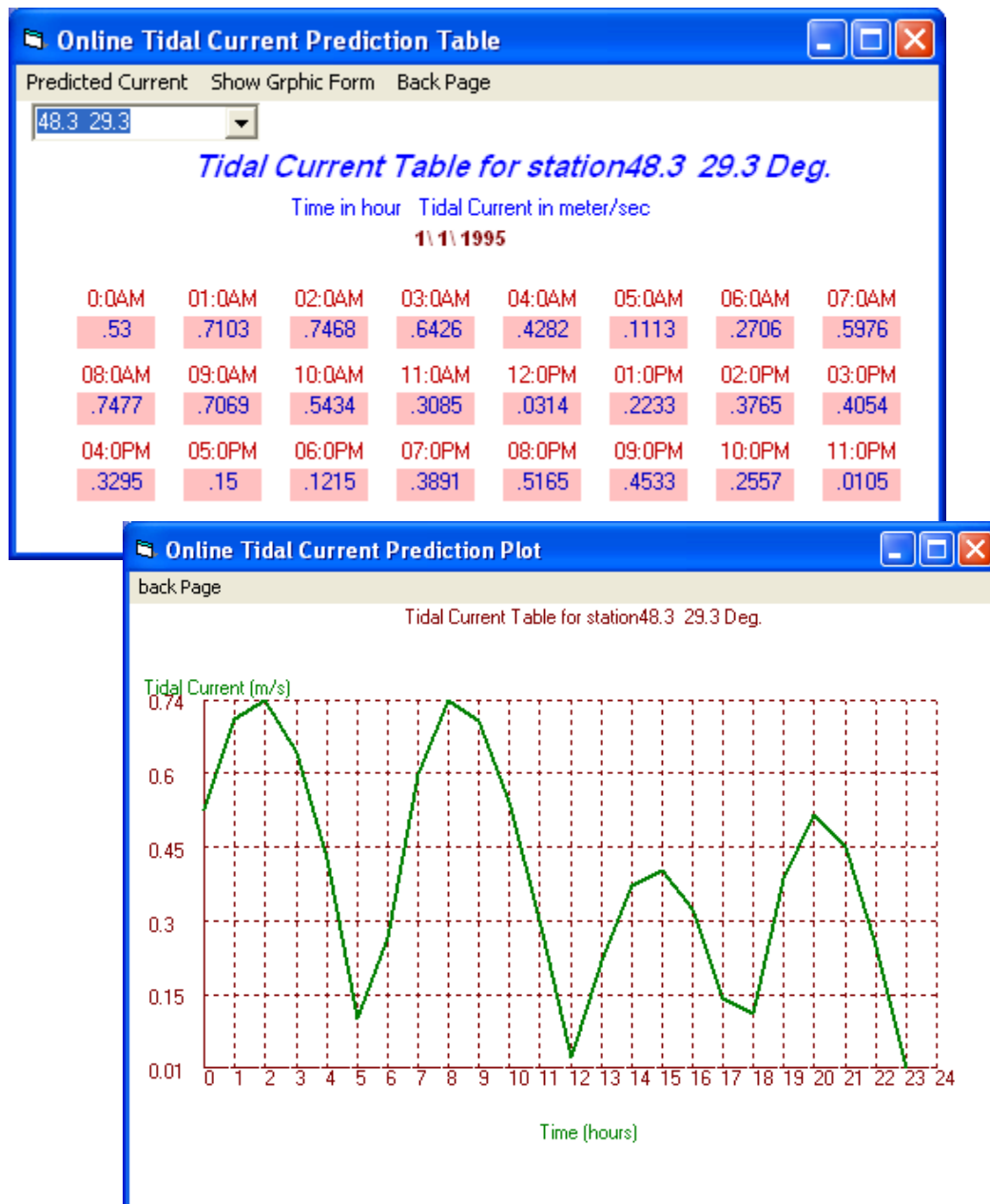


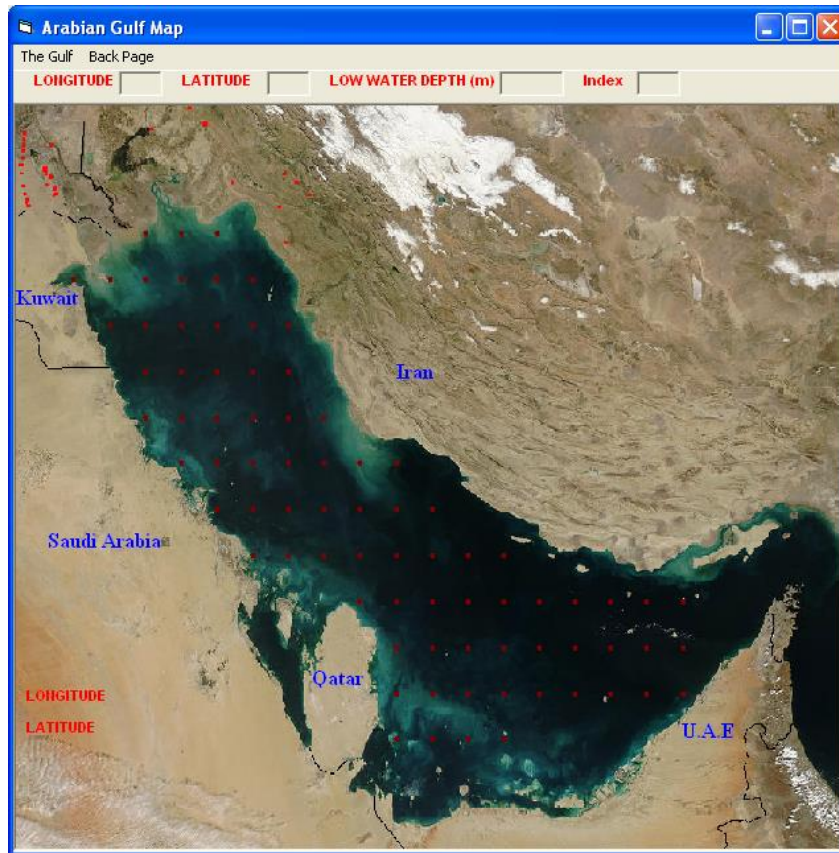
Fig. 6.



**Fig. 7**



If user select **option 2 (Arabian Gulf)** as shown in fig 1.Fig.8 will display the Arabian Gulf Map for user to select the interest Location from the map shown in fig.8 by using the mouse. Click on the interest location, fig.9 will display to check the selected location.



**Fig. 8**

Then user should select **The Gulf** to run the tidal current prediction model to forecast the 24 hours for the current date then displayed the 24 hours forecasting table as shown in fig.10.

Then if user wants to display the 24 hours tidal current forecasting information as in graphically form user should select **Show Graphic form** as shown in fig. 10. Fig 11 will display the tidal current plot.

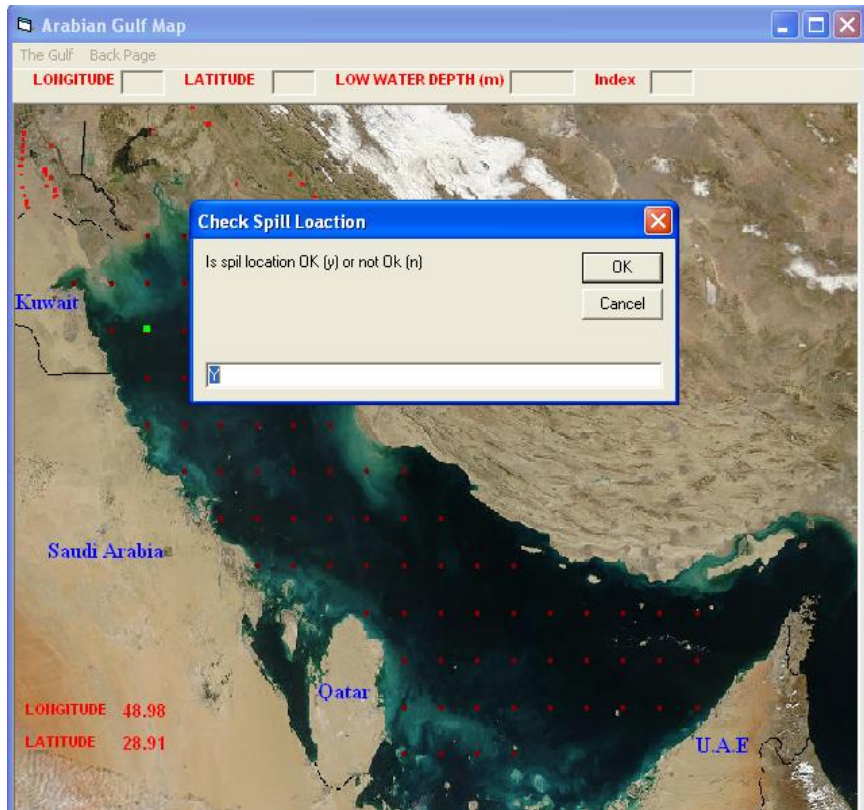


Fig 9

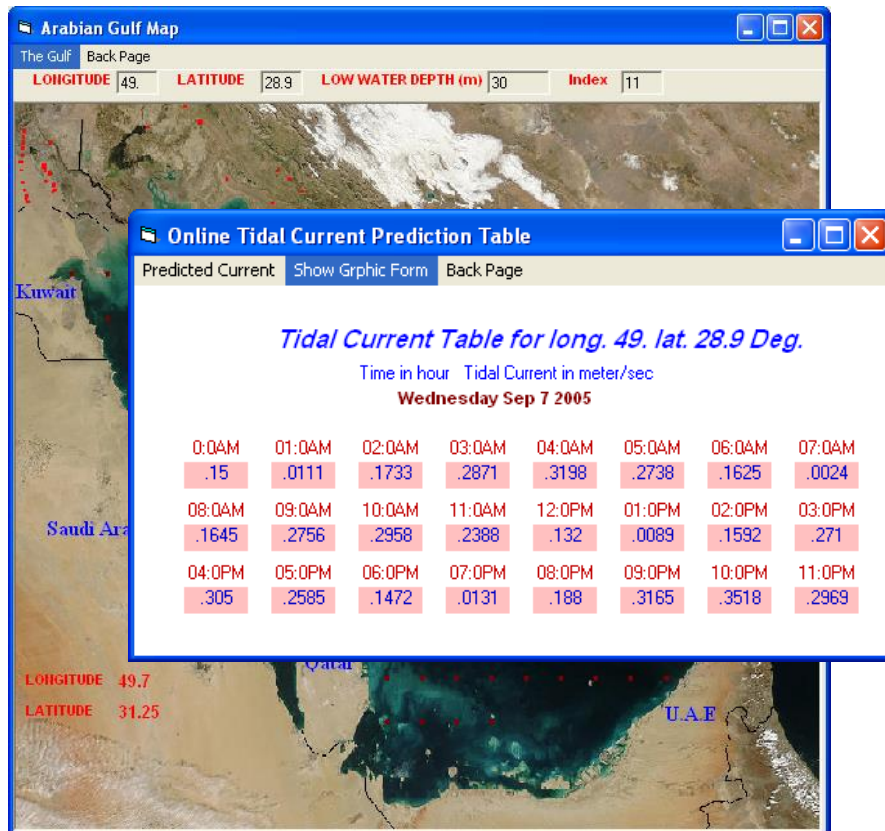
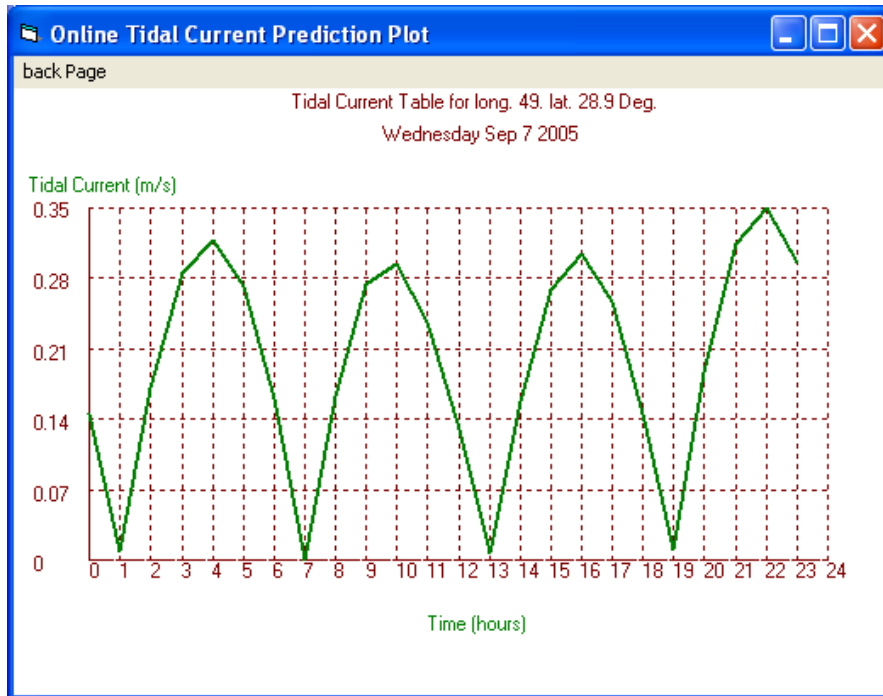


Fig. 10



**Fig. 11**

If user want to HindCast , Nowcast , Forecast or change location should select **Predicted Current** as shown in fig. 12. Then fig.13 will display two sub-option as:

- 1-Select Date
- 2-Select Station (long/lat)

User should select first Sub-option 1 **Select Date** to setup the prediction Date from (1 Jan 1970) until (31 Dec 2037) as shown in fig 13.

Then user should select Sub-option 2 **Select Station** to change a different location for tidal prediction (based on Longitude and Latitude in Degrees) as shown in fig 13. Then fig. 13 will display the tidal current predicted information.

Online Tidal Current Prediction Table

Predicted Current Show Grphic Form Back Page

*Tidal Current Table for long. 49. lat. 28.9 Deg.*

Time in hour Tidal Current in meter/sec

**Wednesday Sep 7 2005**

0:0AM	01:0AM	02:0AM	03:0AM	04:0AM	05:0AM	06:0AM	07:0AM
.15	.0111	.1733	.2871	.3198	.2738	.1625	.0024
08:0AM	09:0AM	10:0AM	11:0AM	12:0PM	01:0PM	02:0PM	03:0PM
.1645	.2756	.2958	.2388	.132	.0089	.1592	.271
04:0PM	05:0PM	06:0PM	07:0PM	08:0PM	09:0PM	10:0PM	11:0PM
.305	.2585	.1472	.0131	.188	.3165	.3518	.2969

**Fig. 12**

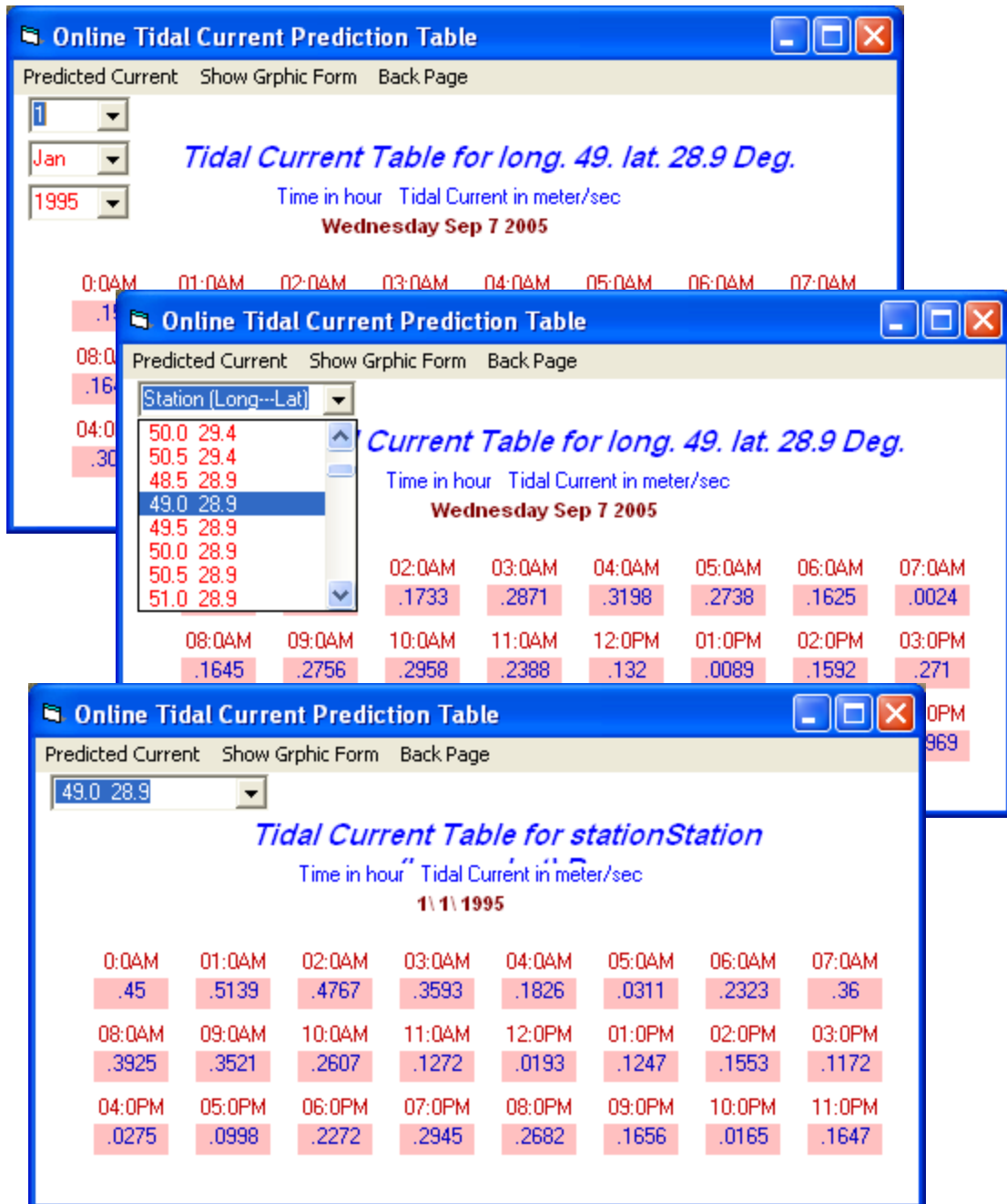
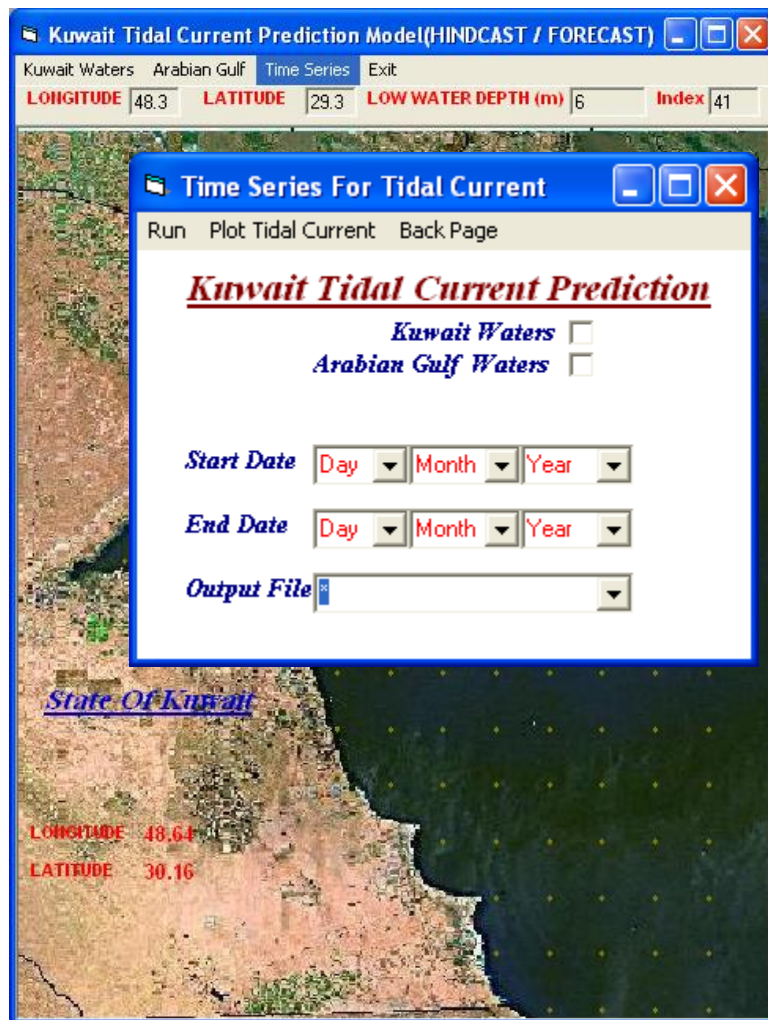


Fig 13

If user select **Option 3.Time Series** as shown in fig 14. Fig 15 will display for user to enter the request input data as:

1. User must select (the area for prediction ether Kuwait waters or Arabian Gulf)
2. Enter the location in (longitude/latitude) in degree.
3. Input Staring Date for prediction as ( Day/Month/Year )
4. Input End Date for prediction as (Day/Month/year)
5. Output File Name must be entered.

Fig . 15 display the input information for prediction; Then User must select **Run** as shown in fig. 15 to start tidal current prediction for the Selected time period.



**Fig. 14**

Then if user wants to display the tidal current information as in graphically form user should select **Plot Tidal Current** as shown in fig. 15. Fig 16 will display the tidal current plot.

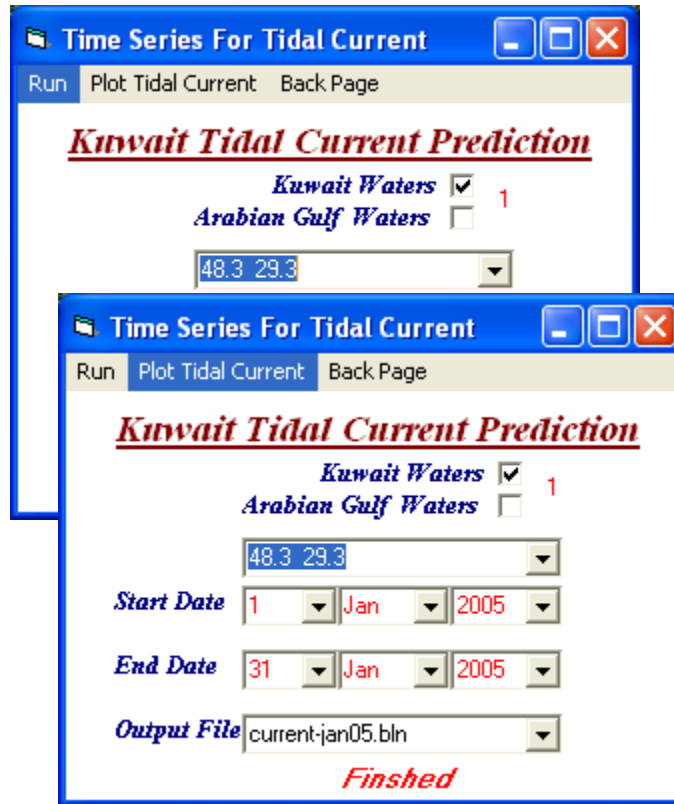


Fig. 15

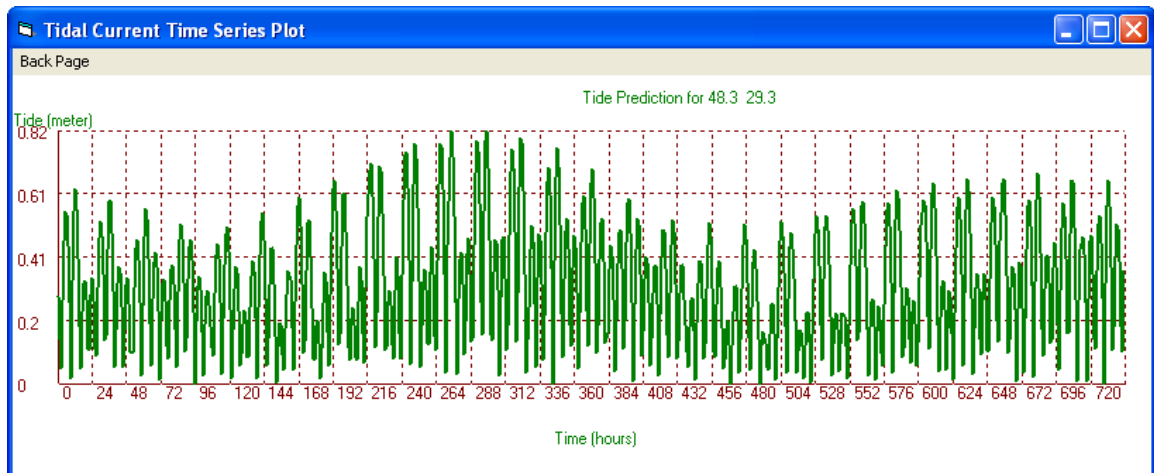
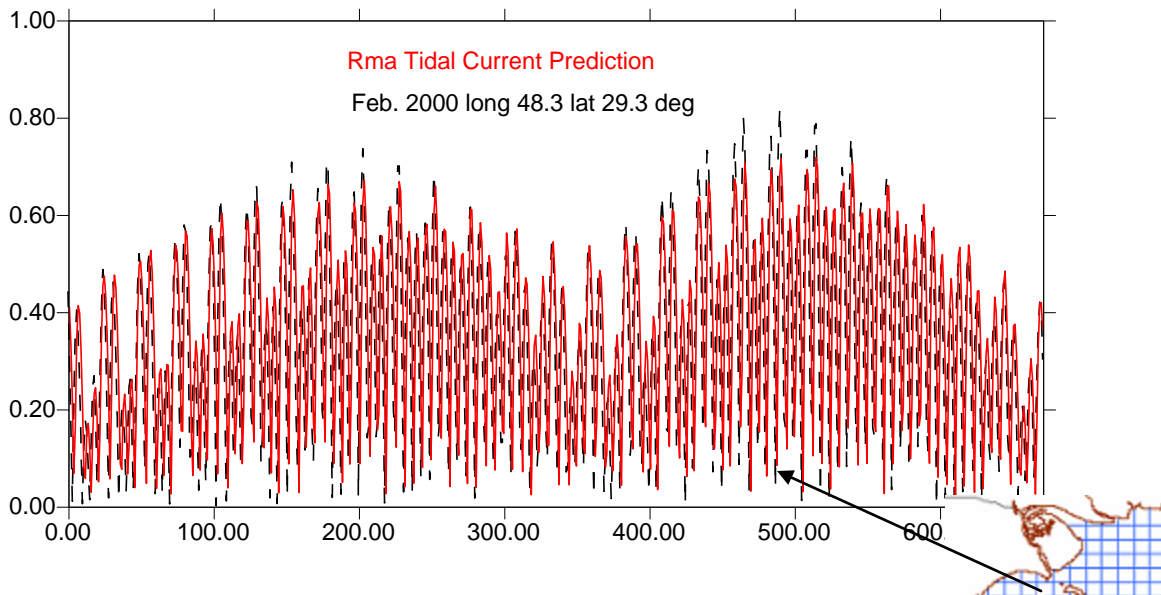


Fig. 16

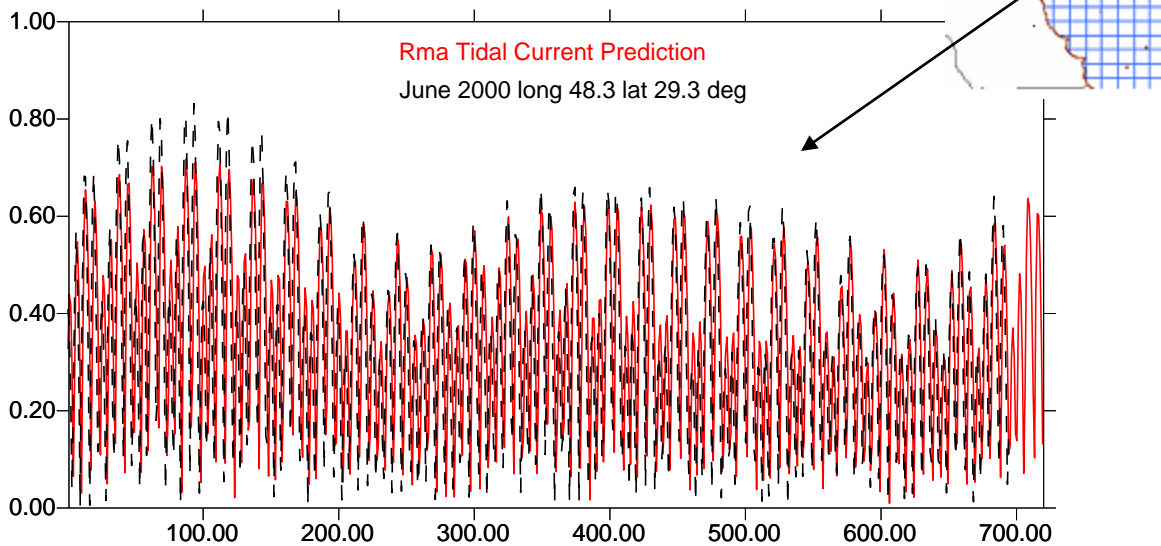
### Validation of the Tidal Current Prediction Model

A number of these applications are presented here both to validate Kuwait Tidal Current Model and to demonstrate its ability for tidal Current prediction.

**Case 1.** Located at longitude (48 deg 18 min E) and latitude (29 deg 18 min N). Figs 17,18 show a comparison between tidal current predicted from Kuwait Tidal Current (**KCurrent Model**) and the **RMA Model**. Close results can be observed for period of (Feb. 1 to 28, 2000. ) as in fig 17 and (Jun. 1 to 31, 2000. ) as in fig 18

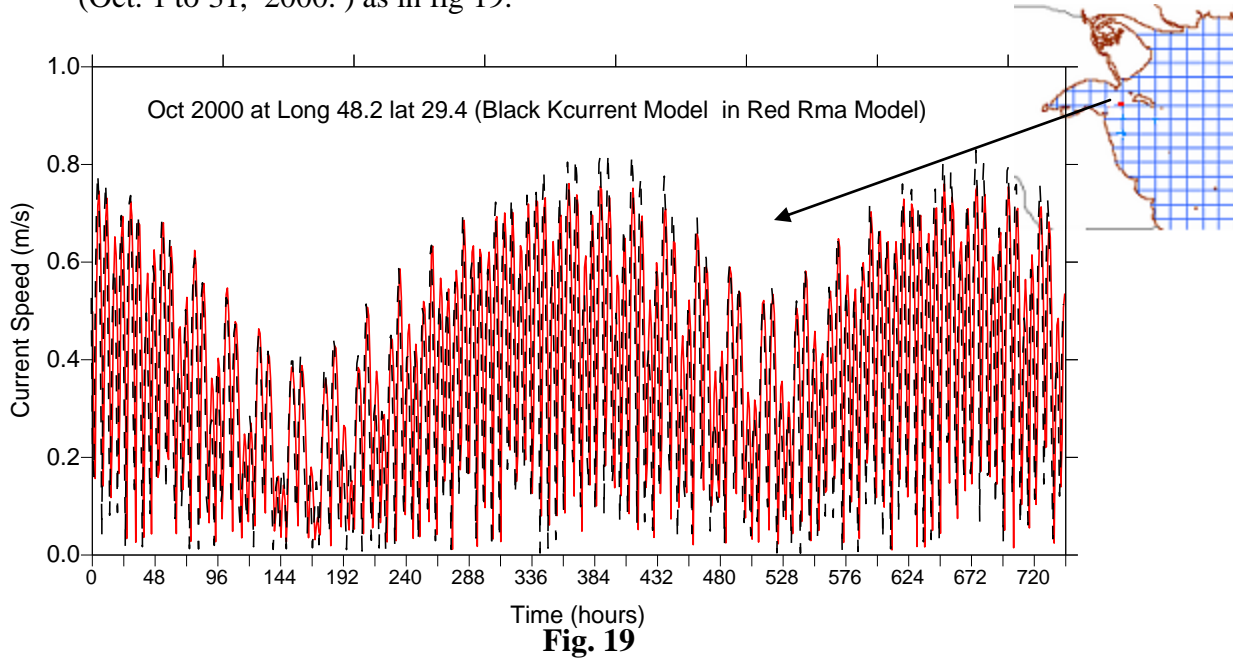


**Fig 17.**



**Fig. 18**

**Case 2.** Located at longitude (48 deg 12 min E) and latitude (29 deg 24 min N). Fig. 19 show a comparison between tidal current predicted from Kuwait Tidal Current (**KCurrent Model**) and the **RMA Model**. Close results can be observed for period of (Oct. 1 to 31, 2000. ) as in fig 19.



**Fig. 19**



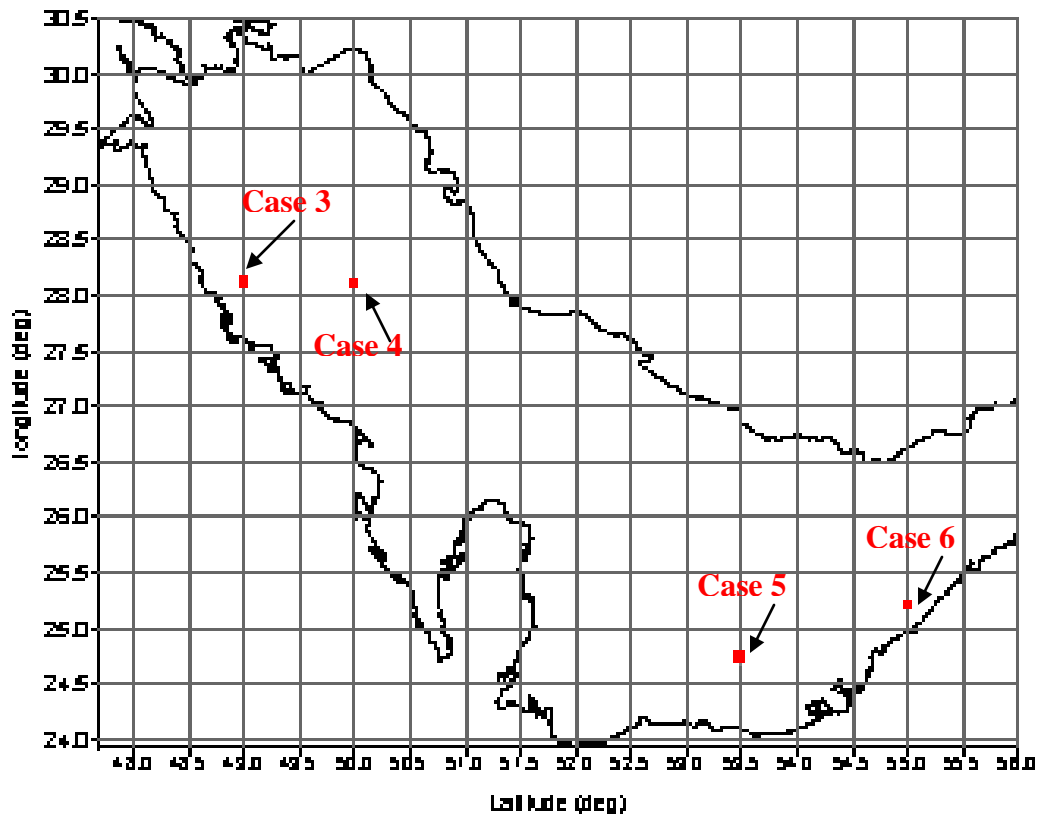


Fig 20

**Case 3.** Located at longitude (49 deg 00 min E) and latitude (28 deg 24 min N). Fig. 21 show a comparison between tidal current predicted from Kuwait Tidal Current (**KCurrent Model**) and the **RMA Model**. Close results can be observed for period of (Feb. 2000) as in fig 21.

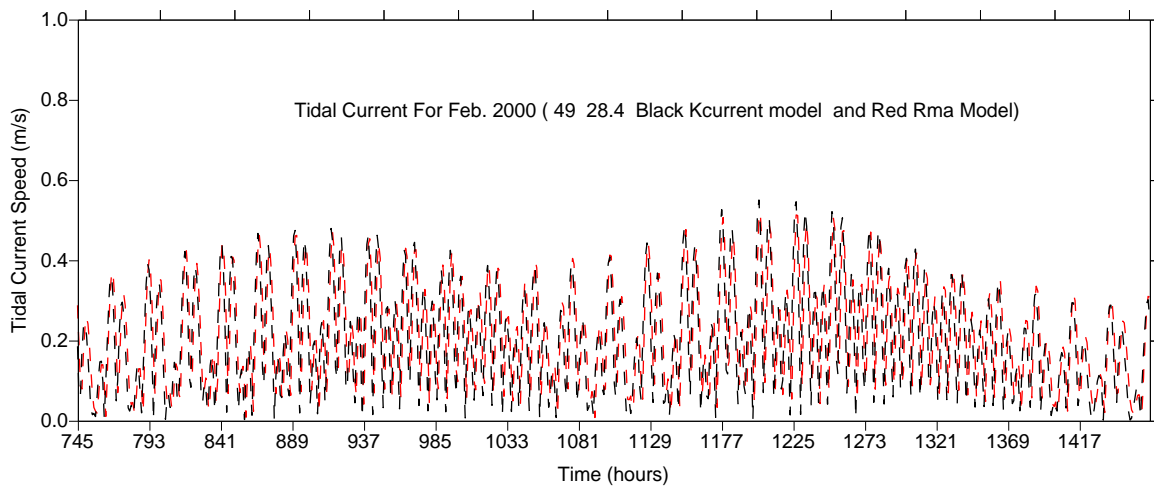
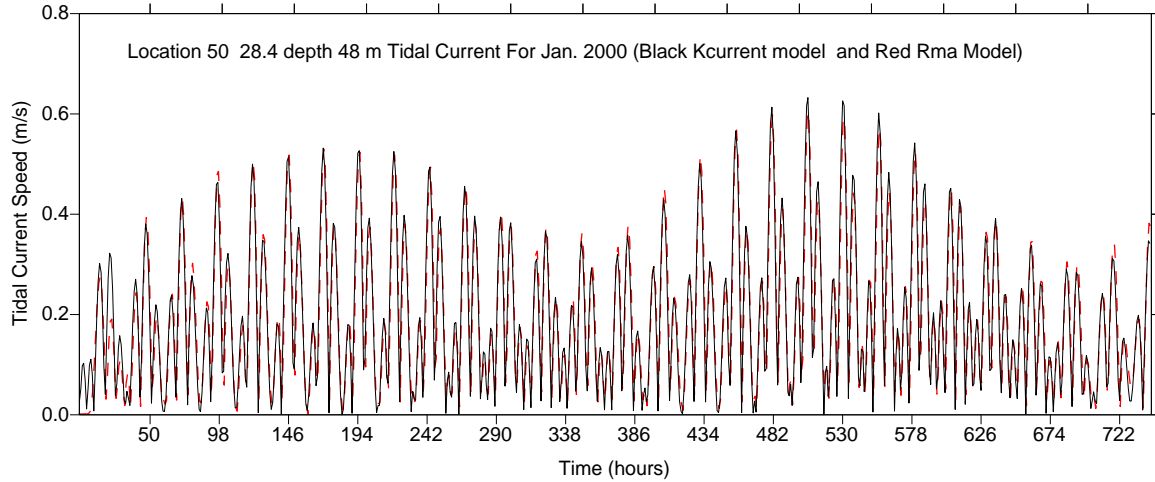
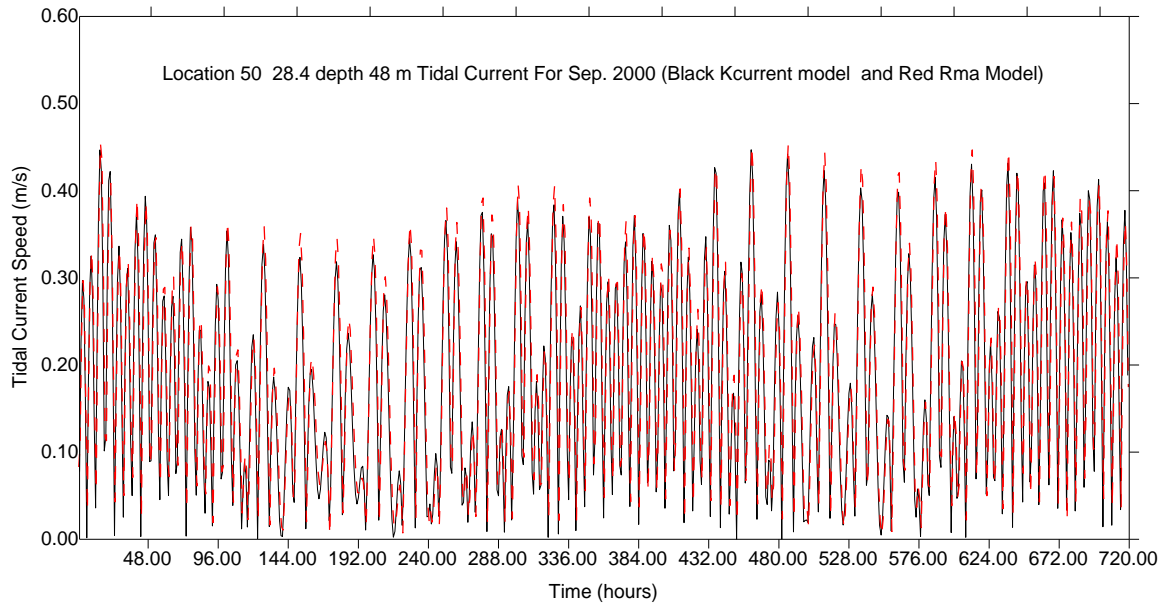


Fig. 21

**Case 4.** Located at longitude (50 deg 00 min E) and latitude (28 deg 24 min N). Figs. 22,23 show a comparison between tidal current predicted from Kuwait Tidal Current (**KCurrent Model**) and the **RMA Model**. Close results can be observed for period of (Jan. 2000) as in fig 22 and (Sep. 2000) as in fig 23.

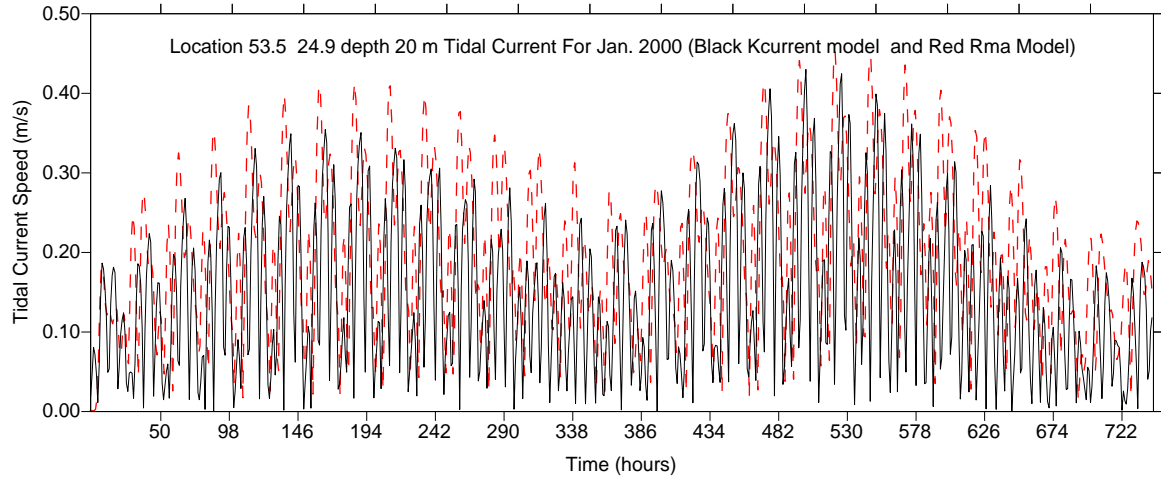


**Fig. 22**

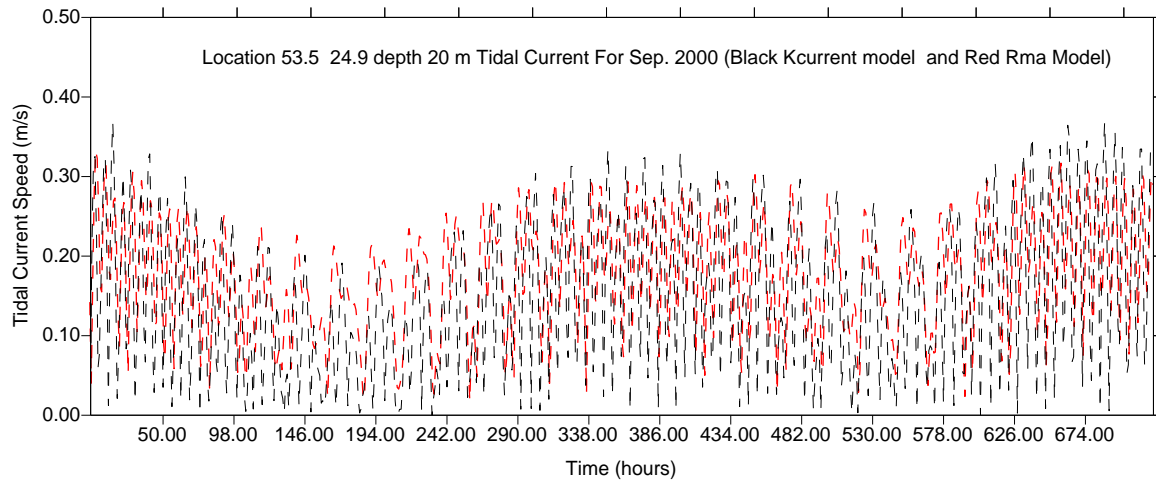


**Fig. 23**

**Case 5.** Located at longitude (53 deg 30 min E) and latitude (24 deg 54 min N). Figs. 24,25 show a comparison between tidal current predicted from Kuwait Tidal Current (**KCurrent Model**) and the **RMA Model**. Close results can be observed for period of (Jan. 2000) as in fig 24 and (Sep. 2000) as in fig 25.

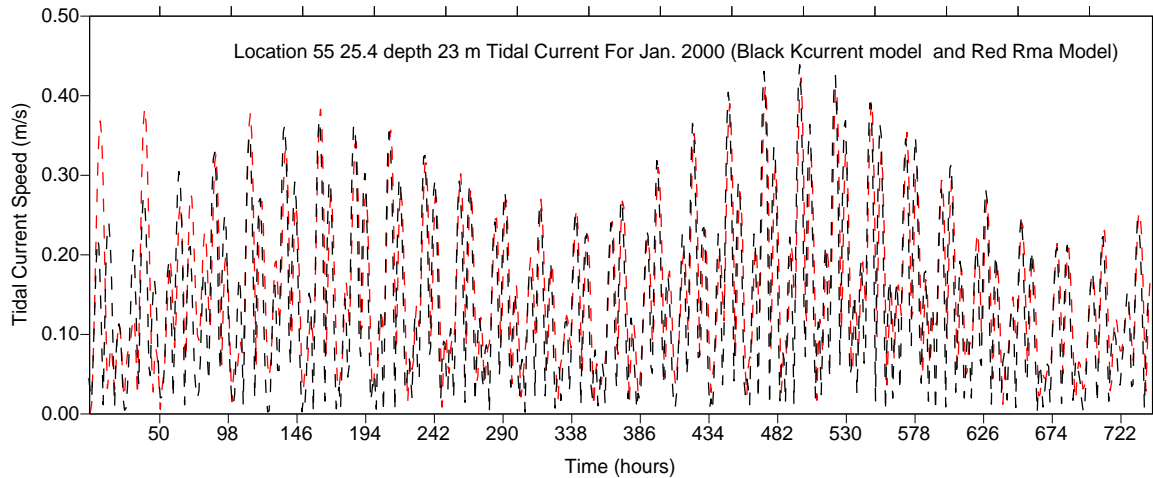


**Fig. 24**

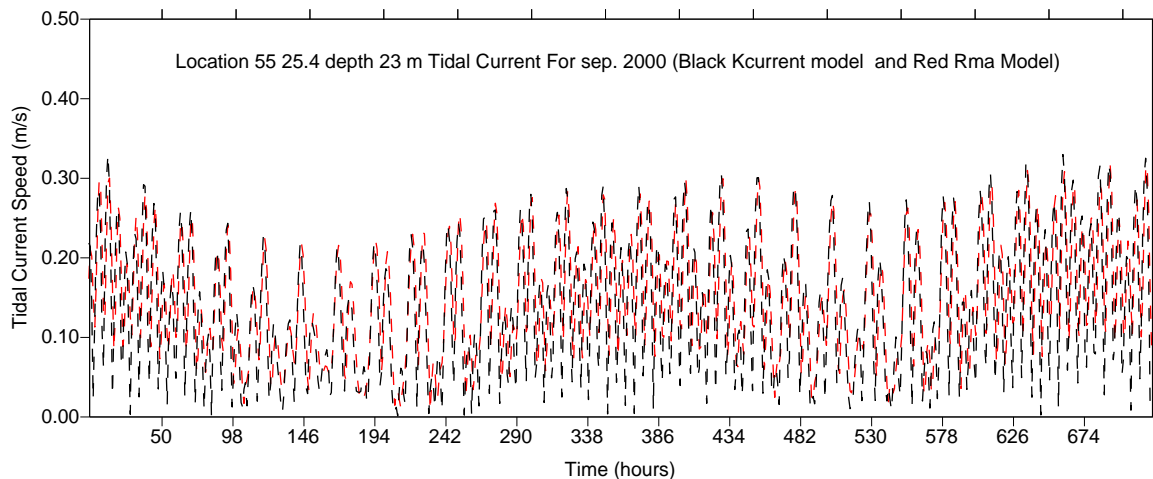


**Fig. 25**

**Case 6.** Located at longitude (55 deg 00 min E) and latitude (25 deg 24 min N). Figs. 26,27 show a comparison between tidal current predicted from Kuwait Tidal Current (**KCurrent Model**) and the **RMA Model**. Close results can be observed for period of (Jan. 2000) as in fig 26 and (Sep. 2000) as in fig 27.



**Fig. 26**



**Fig. 27**

### **Conclusions**

A tidal current Prediction model for Kuwait was developed to provide a useful tool for the generation of tidal current within the Kuwaiti territorial waters and The Arabian Gulf waters. It is capable of hind-casting, Now-casting and forecasting water circulation at a numbers of stations in Kuwait waters .and the Arabian Gulf. The Kuwait Tidal Current prediction model (**KCurrent Model**) was shown to provide good estimates for water circulation variations as compared to results using other Validated model.

In conclusion, it could be said that the numerical model postulated (that was validated by the results of other study and models), the analytical methodology followed in this work and the results obtained so far, are very satisfactory for the implementation of this model for tidal current prediction on short-term and long-term.