Basic River Current Flow Study of Laguna de Barra de Navidad

During Slack Tide

in the Wet Season

when

The Rio Marabasco is Moderately Flowing

from

One of Several Alternative River Mouth Outlets

a Finite Element Analysis using flexPDE

Craig E. Nelson - Consultant Engineer

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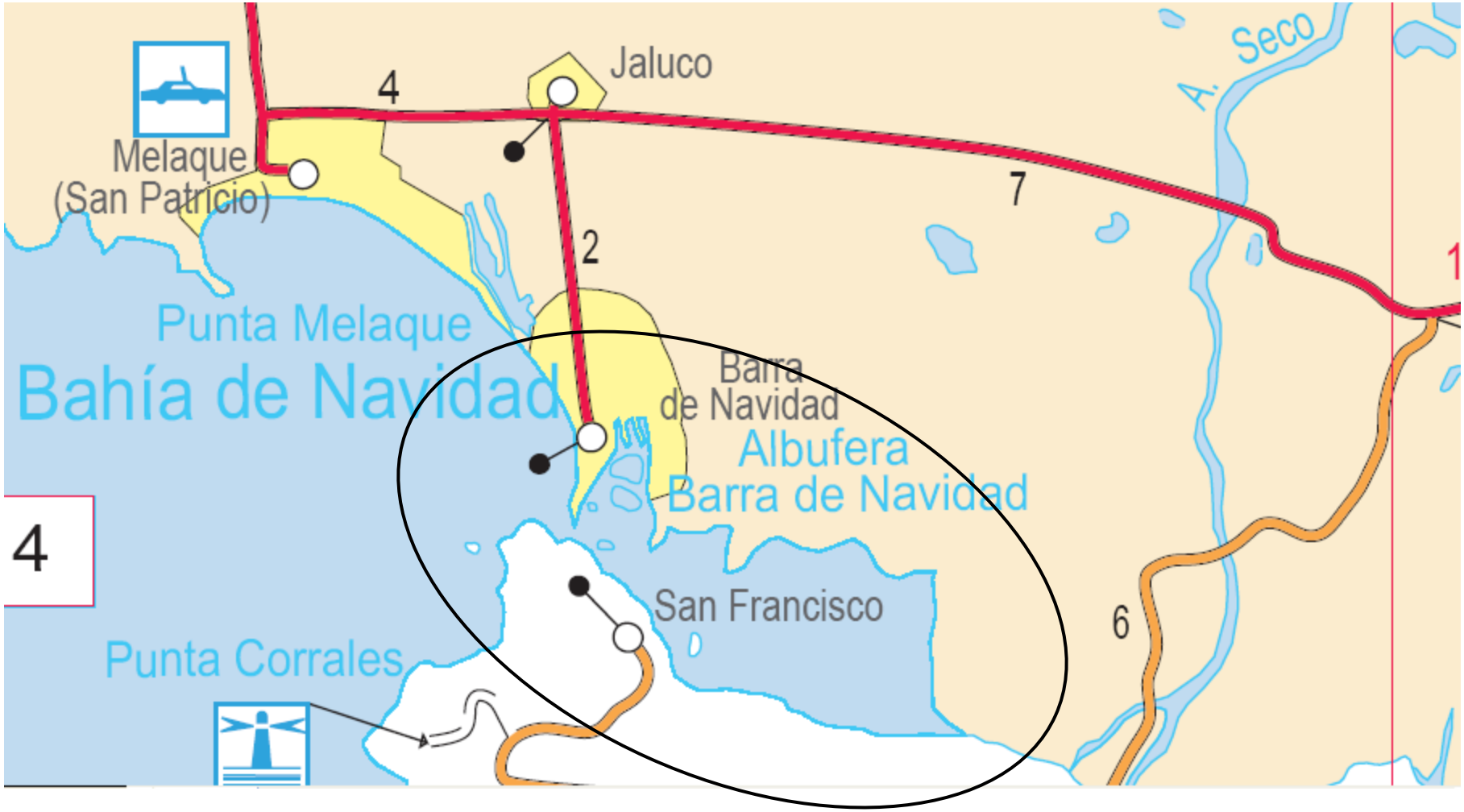

The General Region

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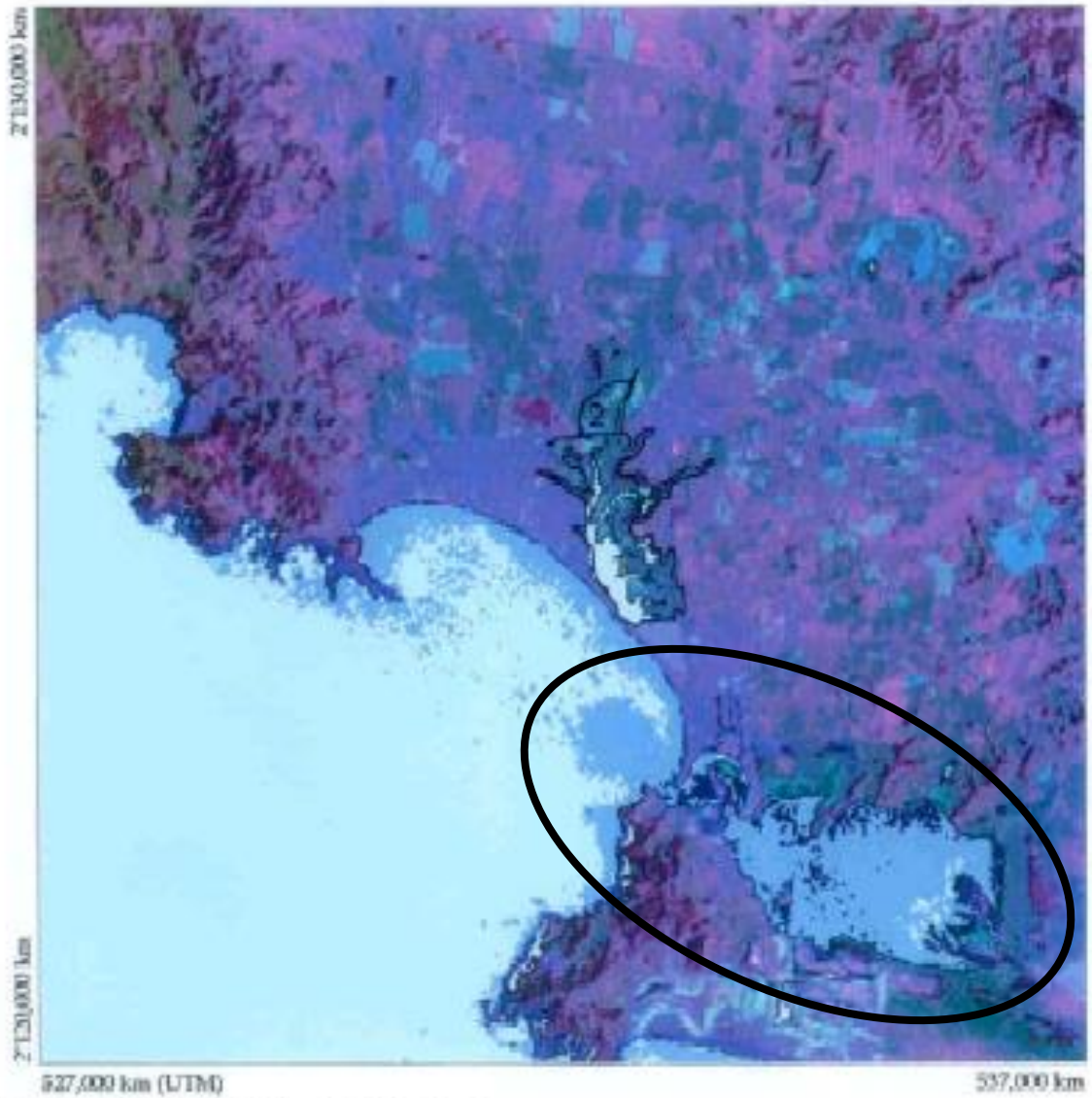
Laguna de Tule and Laguna de Navidad



Source: El Colegio de Mexico

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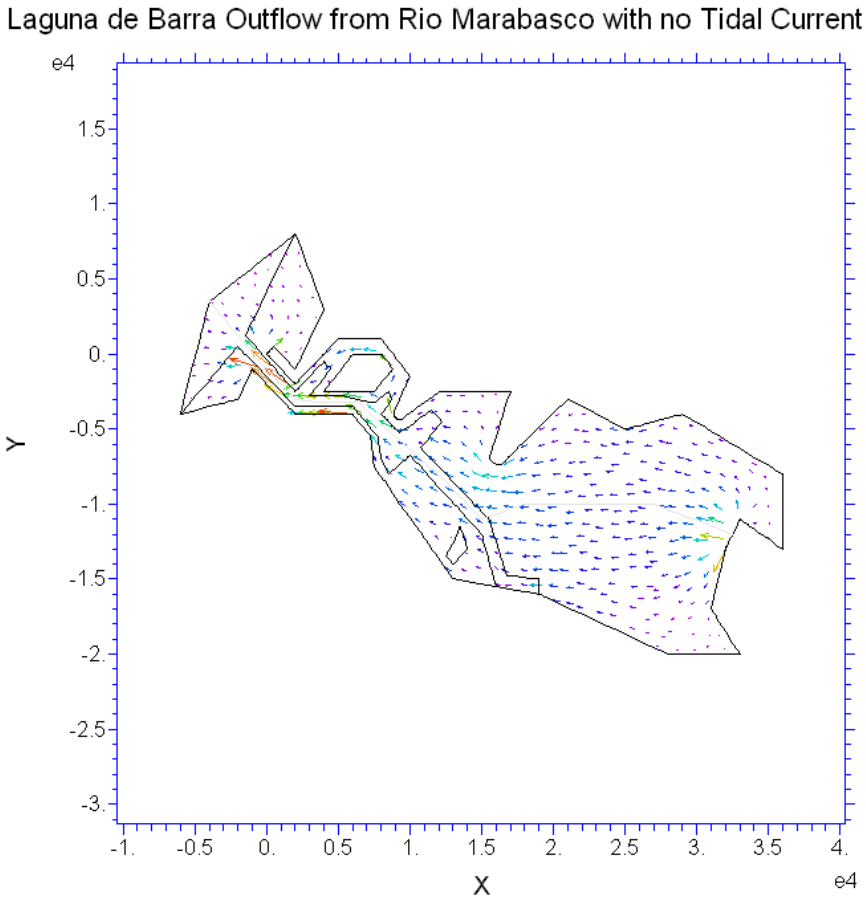

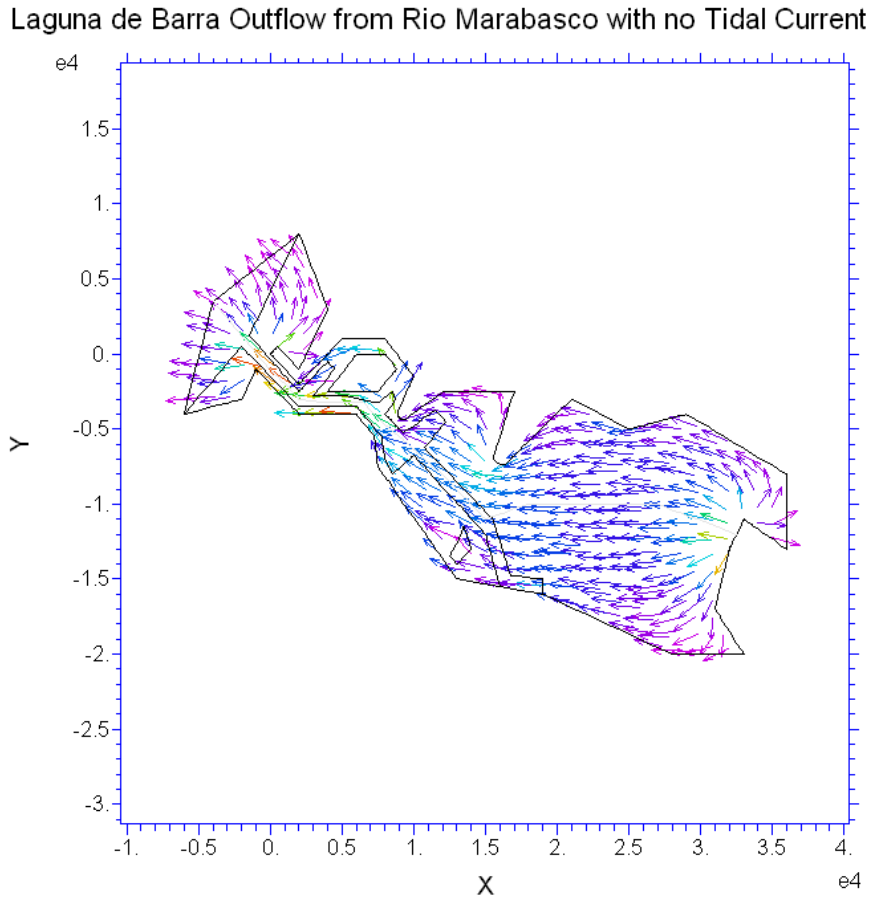

Vector Plot of River Current Velocity During Slack Tide

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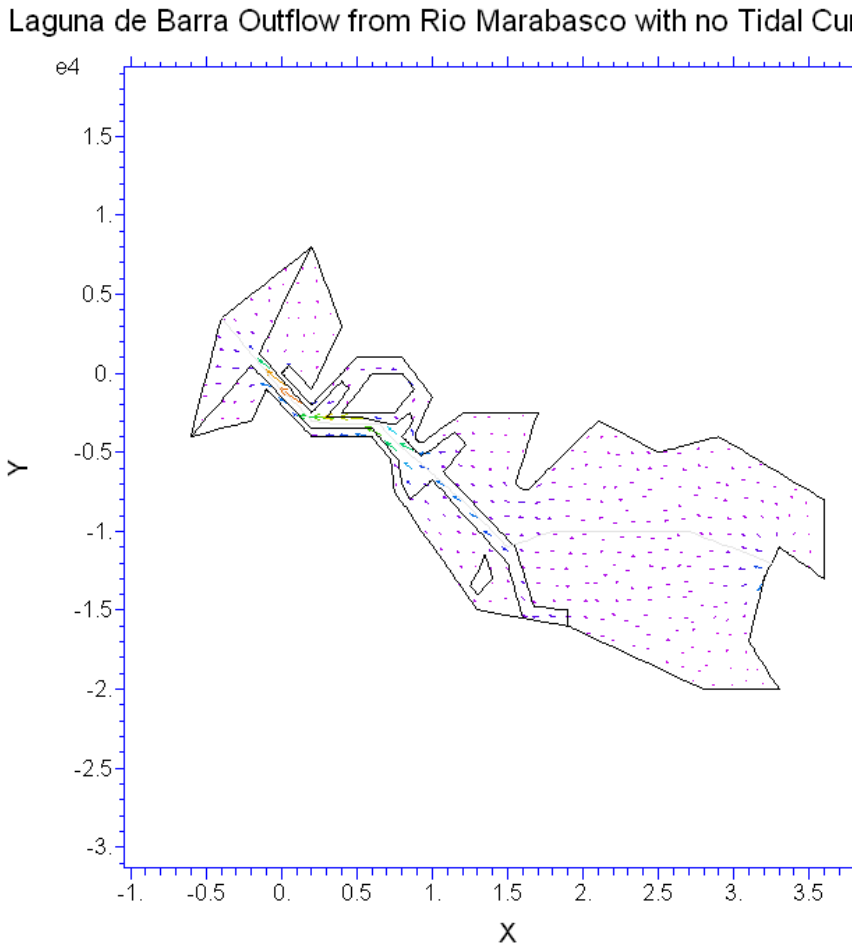

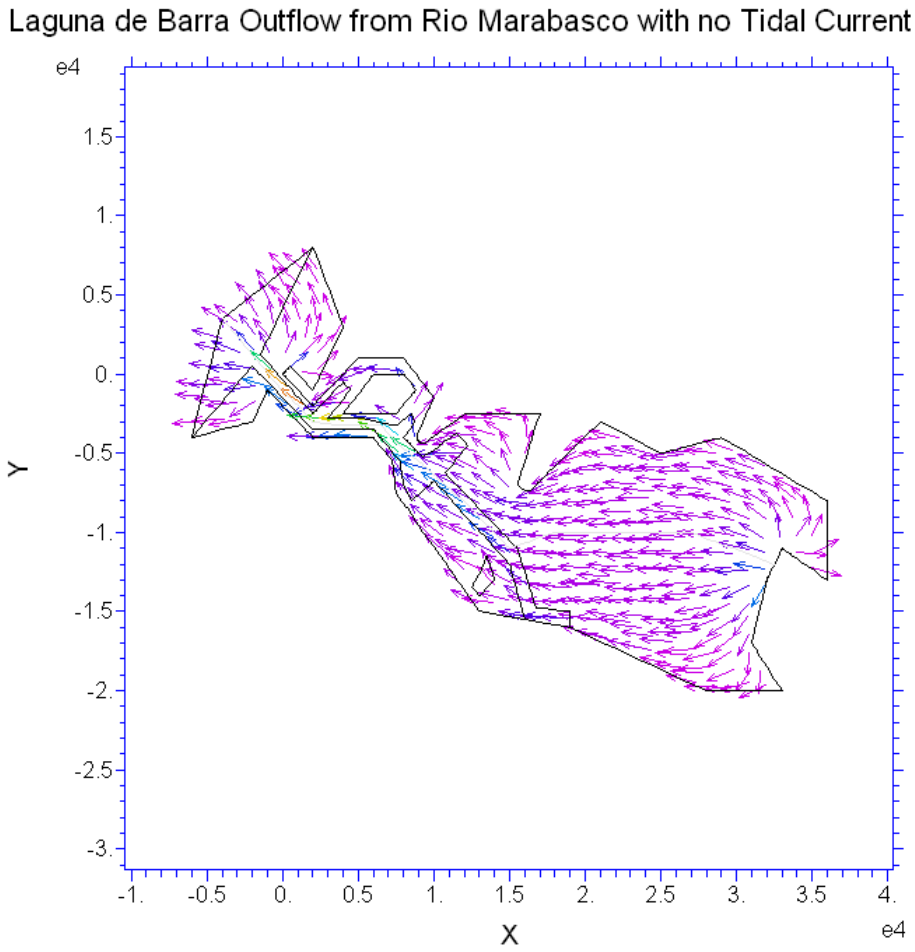

Vector Plot of Volumetric River Current Flux During Slack Tide

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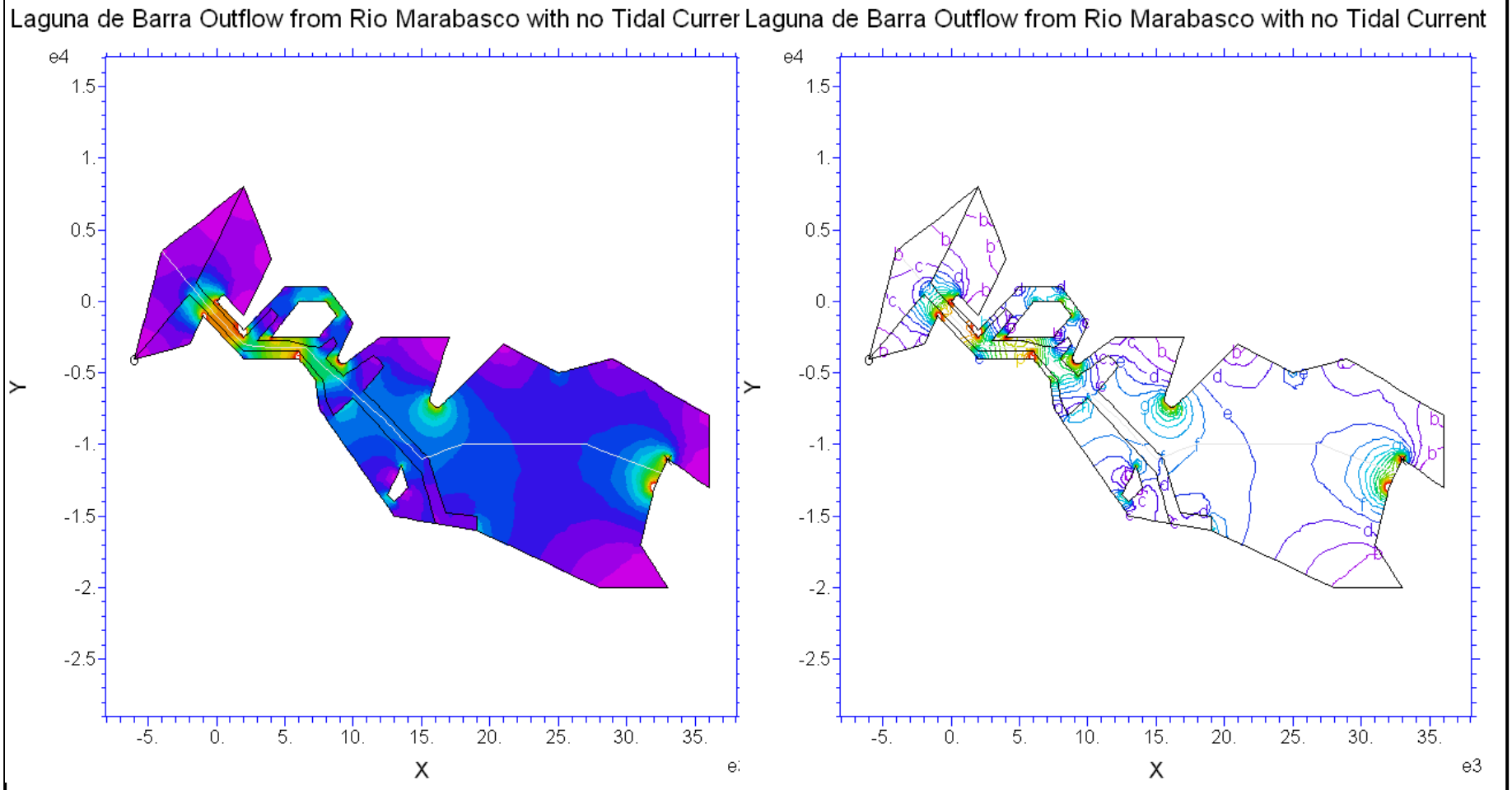

Magnitude of River Current Velocity During Slack Tide

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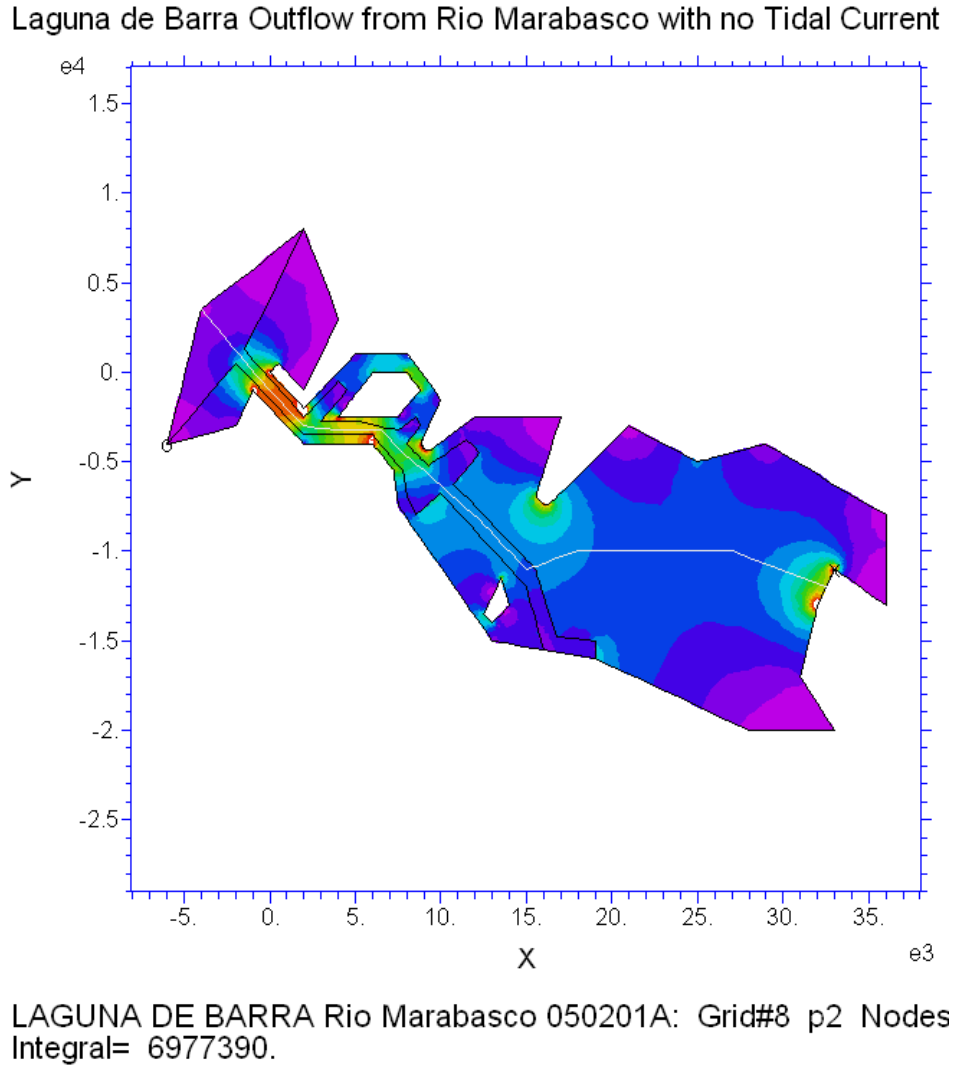

Log Base 10 Plot of River Current Velocity Magnitude During Slack Tide

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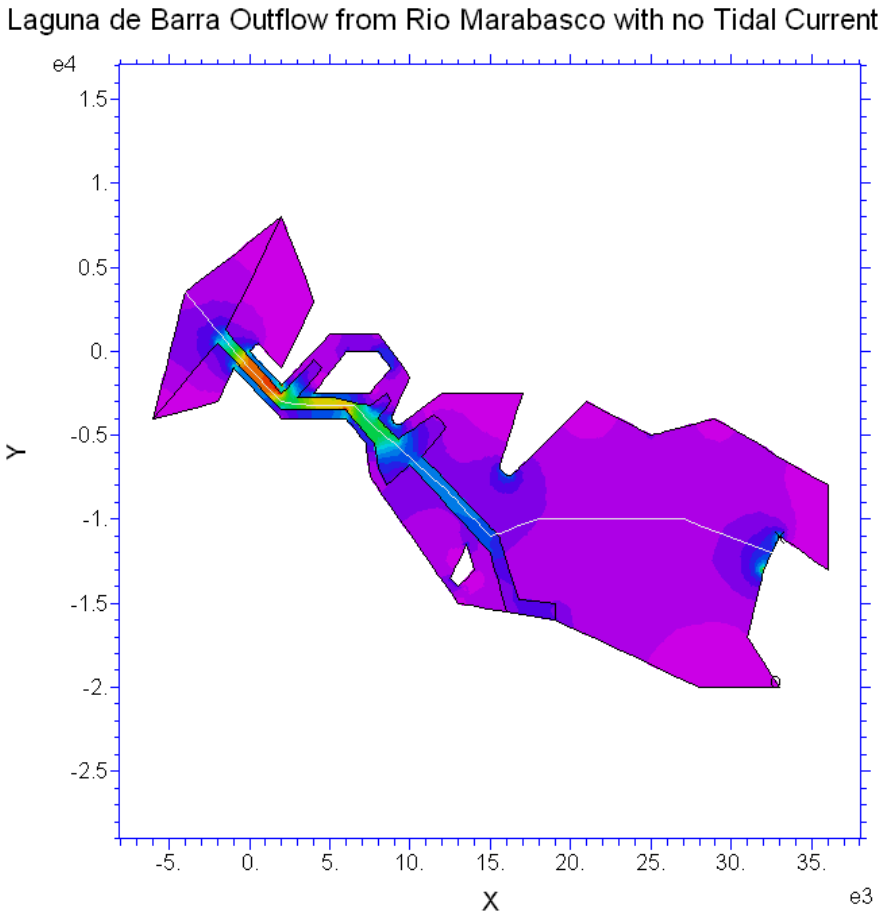

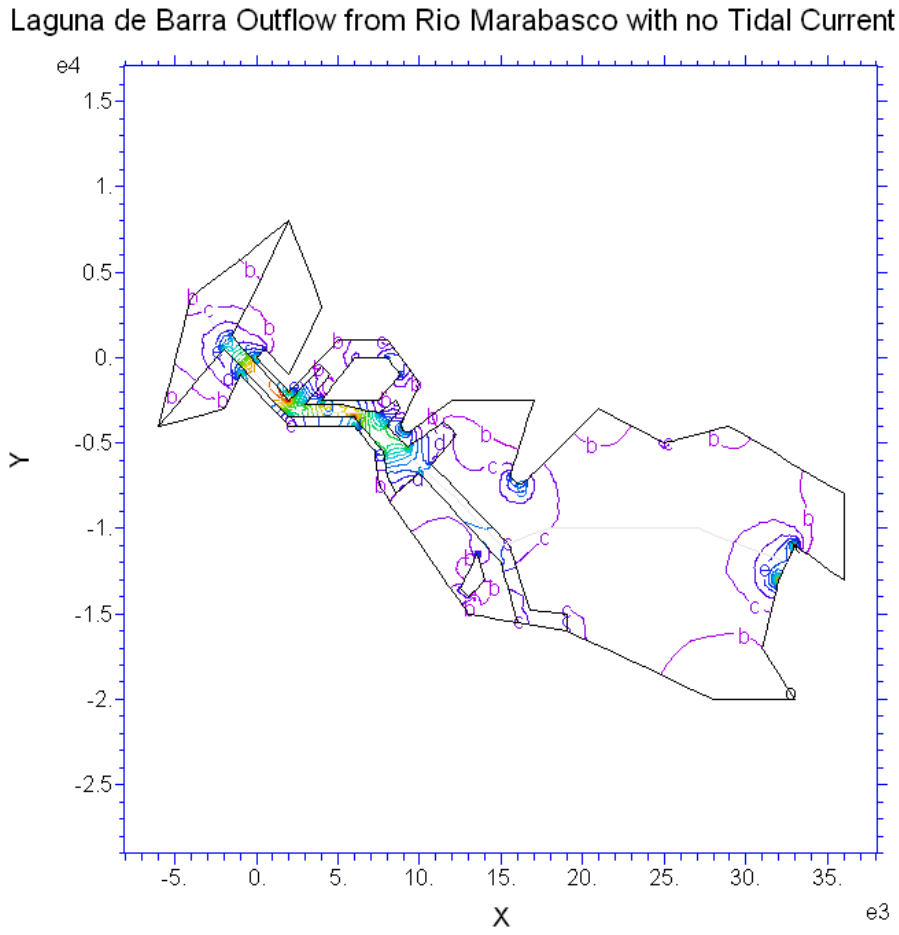

Volumetric River Current Flux Magnitude During Slack Tide

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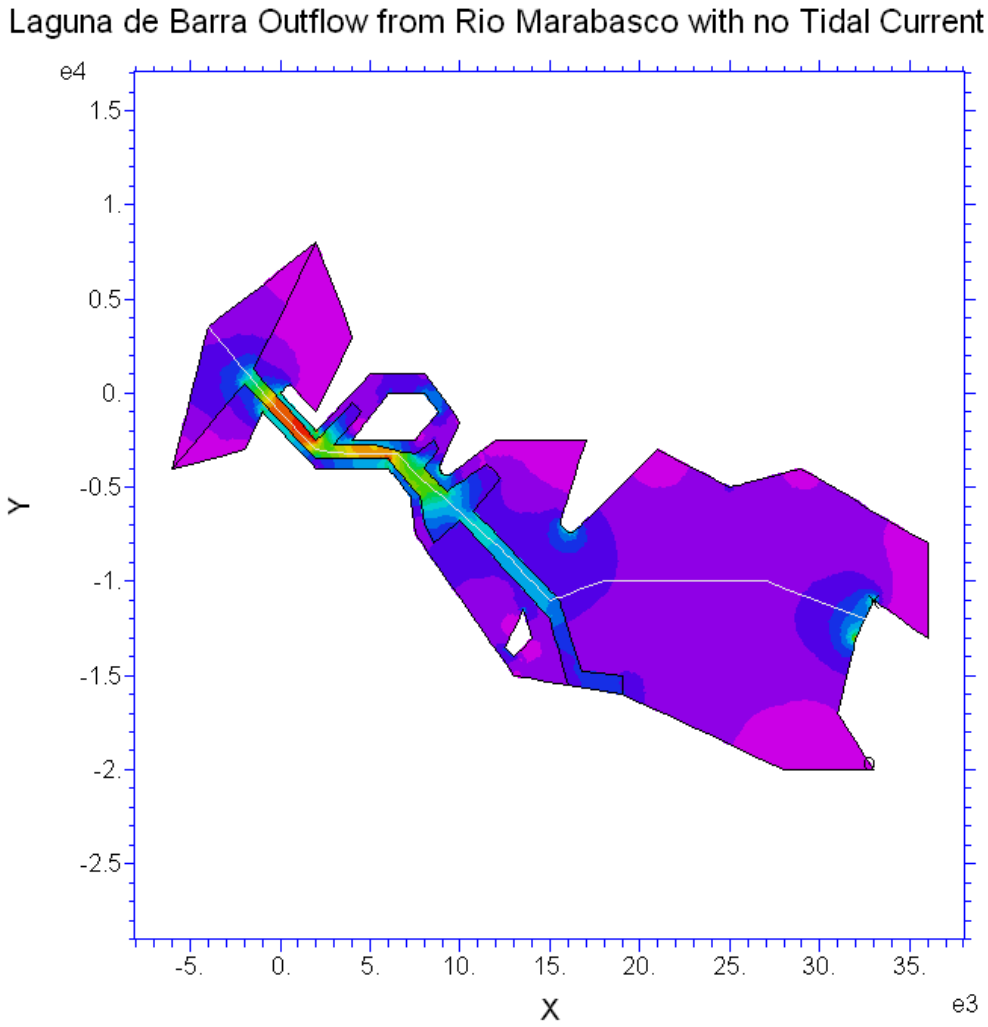

Logarithm Plot of Volumetric Current Flux Magnitude During Ebb Tide

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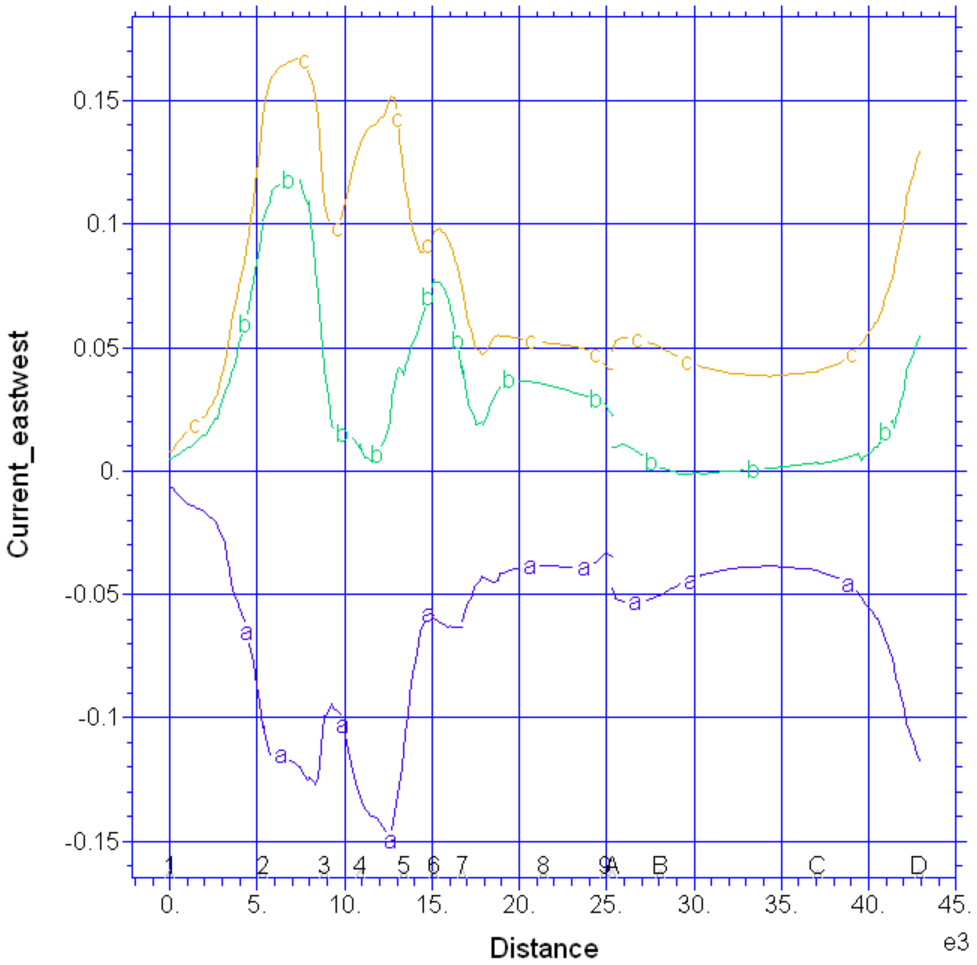
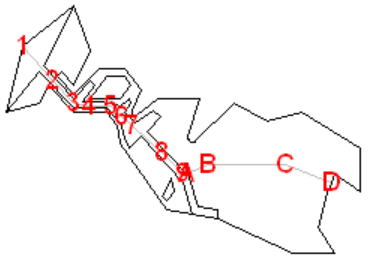
Laguna de Barra Outflow from Rio Marabasco with no Tidal Current

17:39:25 2/1/05
FlexPDE 3.01f



Current_eastwest
ON FlowPath

a: Current_eastwest
b: Current_northsouth
c: Current_mag



LAGUNA DE BARRA Rio Marabasco 050201A: Grid#8 p2 Nodes=4864 Cells=2281 RMS Err= 1.6e-5
Integral(a)= -2634.981 Integral(b)= 1209.312 Integral(c)= 3048.283

River Current Amplitude Plots Along a Central Path Within the Lagoon

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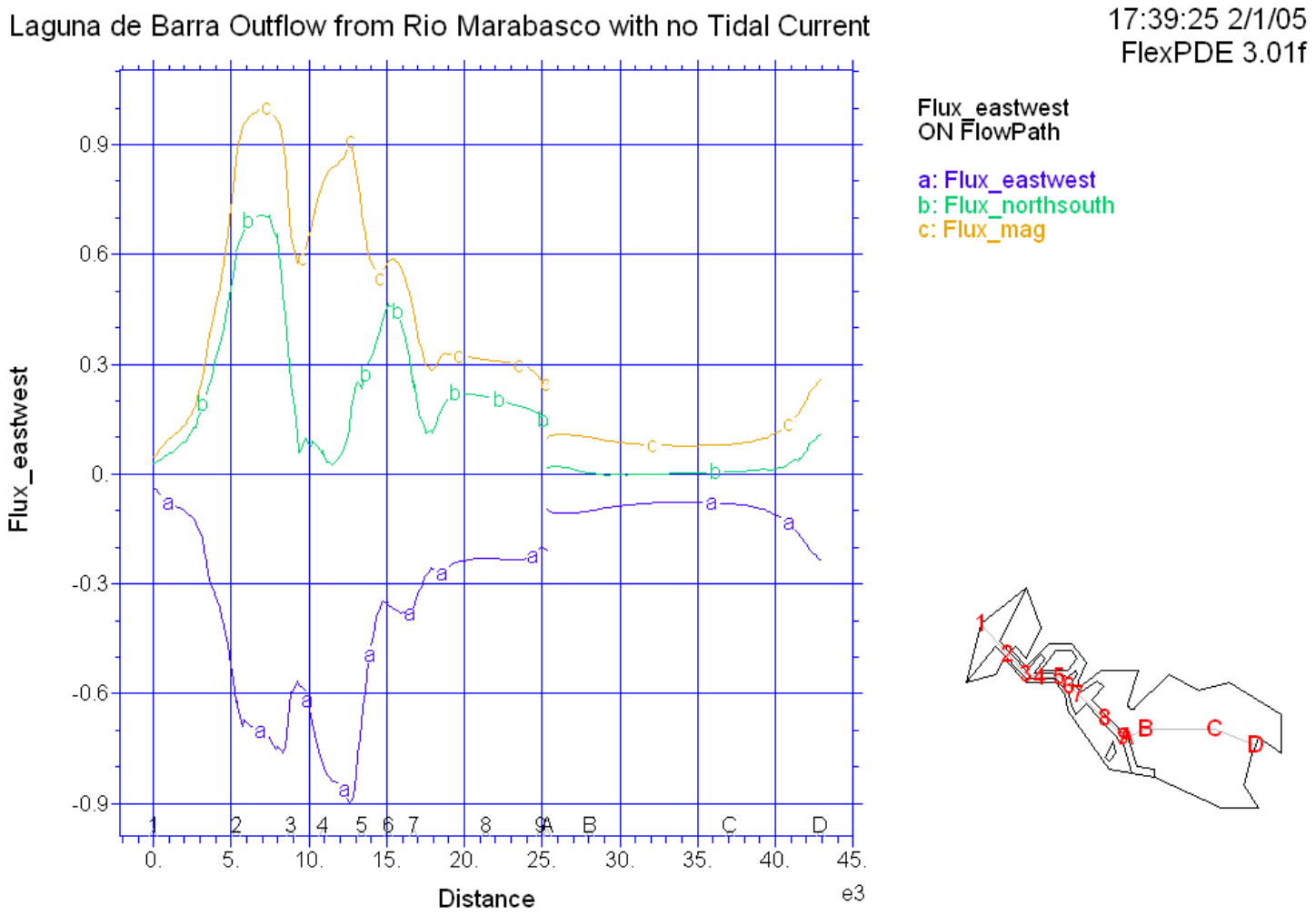

LAGUNA DE BARRA Rio Marabasco 050201A: Grid#8 p2 Nodes=4864 Cells=2281 RMS Err= 1.6e-5
Integral(a)= -12251.08 Integral(b)= 6802.938 Integral(c)= 14671.43

Volumetric River Current Flux Amplitude Plots Along a Central Path Within the Lagoon during Slack Tide

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Summary

A simple yet useful numerical model has been made for the purpose of understanding the river current flow within the Laguna de Barra de Navidad estuary outflow system during the wet season when the Rio Marabasco is moderately flowing.

The model shows general current flow characteristics during slack tide when the movement of water is from the river mouth at the east end of the lagoon to the sea and there is no current form the tide. Flow from one of several alternative river mouths is demonstrated.

With further work, many kinds of additional information can be obtained. This includes, but is not limited to, information about where pollutants will travel and where silt deposits may form.

Infrequent large tidal and river current events may be responsible for dramatic changes in sedimentation within Laguna de Barra de Navidad.

Analysis showing how strong tides and river flow currents may combine to produce large and unusual silt and heavy metal deposits may be useful to ecologists and regional planners.

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