REPORT ON PUERTO RICO TSUNAMI FLOOD MAPS FOR REGIONAL EVENTS

submitted to the

Puerto Rico Component of the

United States

National Tsunami Hazard Mitigation Program

and the

Puerto Rico Seismic Network

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INTRODUCTION

Please look at the report for local events for details about the modeling not included in this report for regional events.

REGIONAL EVENTS

The first two propagation runs were made for up to 4 hours of simulation and later reduced to 2.5 hours (in order to expedite the process). But due to the fact that the inundation runs run much more slowly than the propagation, the inundation runs were stopped after 2 hours of simulation. Just the 2 hours take close to two weeks of execution time. It will be seen that in some cases the sea level oscillations were still quite strong at the end of the record, and in some cases give the impression that the oscillations could have increased if the execution had been allowed to continue.

The following three tables show the input parameters for the three inundation grids (West, Central, East), which were the same as for the local events.

```
EAST
0.0050  Minimum amp. of input offshore wave (m)
5.0     Minimum depth of offshore (m)
0.1     Dry land depth of inundation (m)
0.0009  Friction coefficient (n**2)
1       Let A-Grid and B-Grid run up
200.0   Max eta before blow-up (m)
0.17    Time step (sec)
42353   Total number of time steps in run (2 hrs)
35      Time steps between A-Grid computations
5       Time steps between B-Grid computations
140     Time steps between output steps (23.5 s)
1       Time steps before saving first output step
1       Save output every n-th grid point
'/home4/amercado/NTHMP_PR/inundation/grids/grid_A_60s_inun_v2.dat'
'/home4/amercado/NTHMP_PR/inundation/grids/grid_B_9s_inun_v2.dat'
'/home4/amercado/NTHMP_PR/inundation/grids/east.dat'
'/home4/amercado/Regional_tsunamis/Caribe_Wave-Lantex_2013/propagation/'
'./'
0 0 1 1 Produce/Suppress netCDF output for grids (default: 1 1 1 0)
0    Number of timeseries locations
3 1008 1430 timeseries index (grid number, i, j)
```

```
CENTRAL
0.0050  Minimum amp. of input offshore wave (m)
5.0     Minimum depth of offshore (m)
0.1     Dry land depth of inundation (m)
0.0009  Friction coefficient (n**2)
1       Let A-Grid and B-Grid run up
```

```
200.0   Max eta before blow-up (m)
0.18    Time step (sec)
40000   Total number of time steps in run (2 hrs)
30      Time steps between A-Grid computations
5       Time steps between B-Grid computations
90      Time steps between output steps (18 s)
1       Time steps before saving first output step
1       Save output every n-th grid point
'/home4/amercado/NTHMP_PR/inundation/grids/grid_A_60s_inun_v2.dat'
'/home4/amercado/NTHMP_PR/inundation/grids/grid_B_9s_inun_v2.dat'
'/home4/amercado/NTHMP_PR/inundation/grids/central.dat'
'/home4/amercado/Regional_tsunamis/Caribe_Wave-Lantex_2013/propagation/'
'./'
0 0 1 1 Produce/Suppress netCDF output for grids (default: 1 1 1 0)
0     Number of timeseries locations
3 1008 1430 timeseries index (grid number, i, j)
```

```
WEST
0.0050  Minimum amp. of input offshore wave (m)
5.0     Minimum depth of offshore (m)
0.1     Dry land depth of inundation (m)
0.0009  Friction coefficient (n**2)
1       Let A-Grid and B-Grid run up
200.0   Max eta before blow-up (m)
0.12    Time step (sec)******** reduced (from 0.16) time step to see if we get rid of garbage
60000   Total number of time steps in run (2 hrs)
48      Time steps between A-Grid computations
8       Time steps between B-Grid computations
240     Time steps between output steps (28.8 s)
1       Time steps before saving first output step
1       Save output every n-th grid point
'/home4/amercado/NTHMP_PR/inundation/grids/grid_A_60s_inun_v2.dat'
'/home4/amercado/NTHMP_PR/inundation/grids/grid_B_9s_inun_v2.dat'
'/home4/amercado/NTHMP_PR/inundation/grids/west_v3.dat'
'/home4/amercado/Regional_tsunamis/Caribe_Wave-Lantex_2013/propagation/'
'./'
0 0 1 1 Produce/Suppress netCDF output for grids (default: 1 1 1 0)
0     Number of timeseries locations
3 1008 1430 timeseries index (grid number, i, j)
```

As stated above, these three files remain the same for each tsunami scenario with the exception of the fourth path showing where to look for the propagation results for that given scenario. So they don't need to be repeated.

On the other hand, each generation/propagation scenario input files change since we need to inform the generation/propagation executable the fault parameters. So for each different scenario a table will be supplied listing the fault parameters for that scenario. For the propagation results three figures will be shown:

- Figure of the initial bottom deformation. In this figure the lower and upper limits of the color bar is set based on the minimum and maximum deformations as computed by the executable.
- Figure of the maximum water elevation attained in each computational cell, relative to Mean High Water (this is the vertical datum of the NGDC DEM). This is what is called the Maximum Envelope of Highest Waters (MEOHW). In this figure the upper limit of the color bar is set based on the maximum sea surface elevation computed anywhere in the computational grid.

For the inundation runs, and for each one of the three inundation grids, three figures will be shown:

- A figure showing a mosaic (that is, all three inundation grids put together) of the MEOHW.
- A figure showing a mosaic of the inundation water depth (that is, relative to the local terrain elevation). This is symbolized by the string LWD.
- A figure showing the elevation time series at real, and virtual, tide gauges, around the island.

We next proceed with showing the results.

RESULTS

Since the number of events used for regional events is much less than for the local events, in what follows we will present, in addition to a table showing the input parameters indicating the fault parameters, seven figures for each event:

- Bottom Deformation (on propagation grid)
- **Maximum Envelope of Highest Waters - MEOHW** (on propagation grid)
- Mosaic of **Maximum Envelope of Highest Waters - MEOHW** (on inundation grids)
- Mosaic of **Local Water Depth - LWD** (on inundation grids)
- Time series at selected (virtual) tide gauges for the West inundation grid
- Time series at selected (virtual) tide gauges for the Center inundation grid
- Time series at selected (virtual) tide gauges for the East inundation grid

LANTEX 13

We will start with the 2013 LANTEX scenario. The fault parameters, as supplied by Dr. Victor Huerfano, are given in the table below.

Input parameter file for generation/propagation run.

```
Segment 1:
Lat: 13.35
Lon: -71.39
Strike: 90.
Dip: 17.
Rake: 90
Depth: 10
```

Length: 300
Width:100
Slip: 5.26

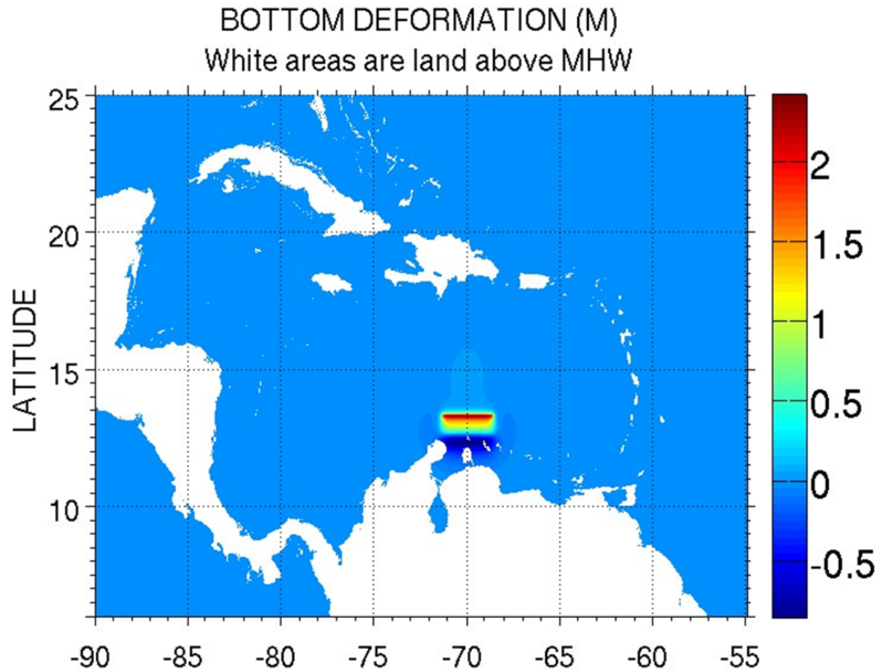


Figure 1– LANTEX 13 Bottom deformation.

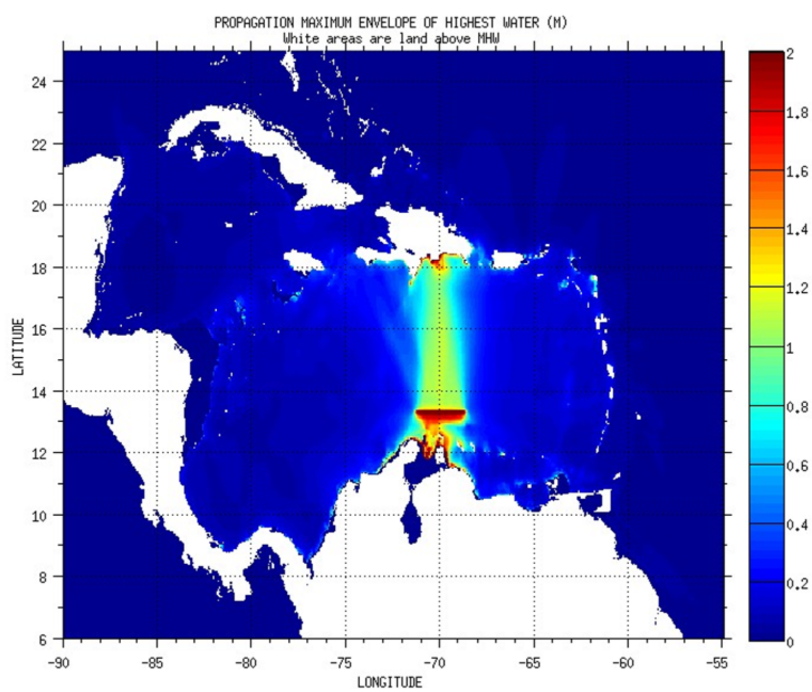


Figure 1– LANTEX 13 MEOHW propagation grid.

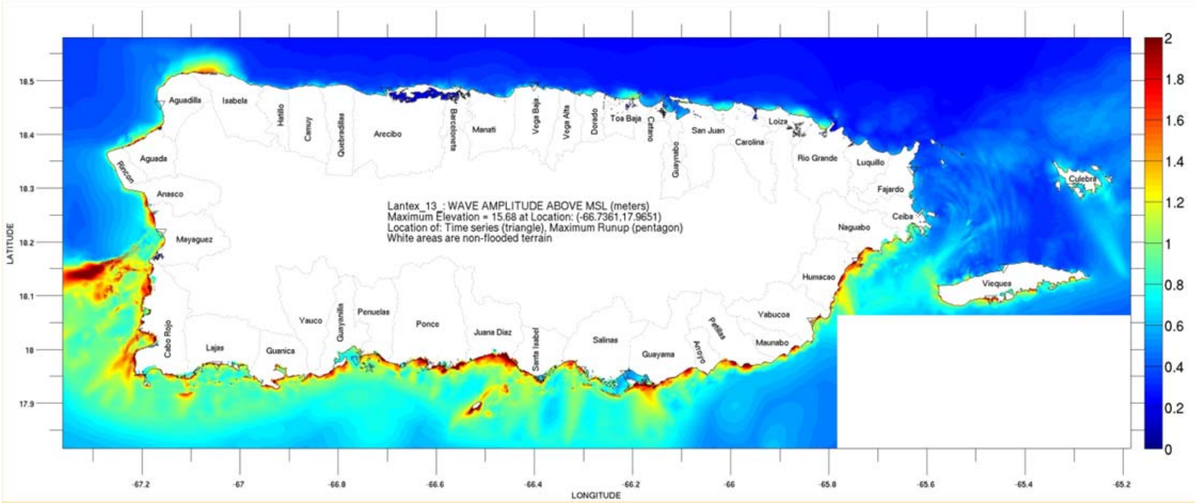


Figure 3 – LANTEX 13 MEOHW inundation grids.

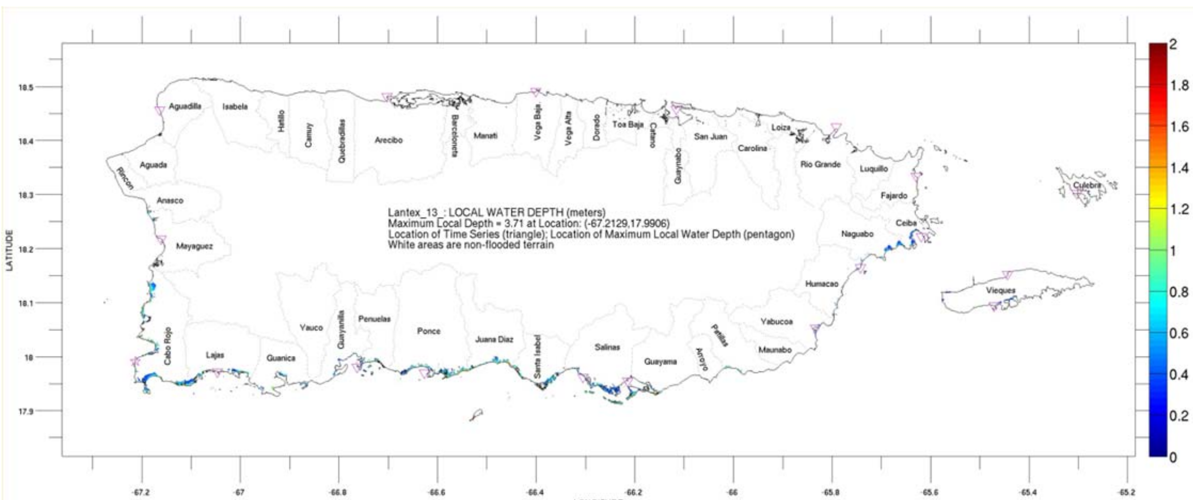


Figure 4 – LANTEX 13 LWD inundation grids.

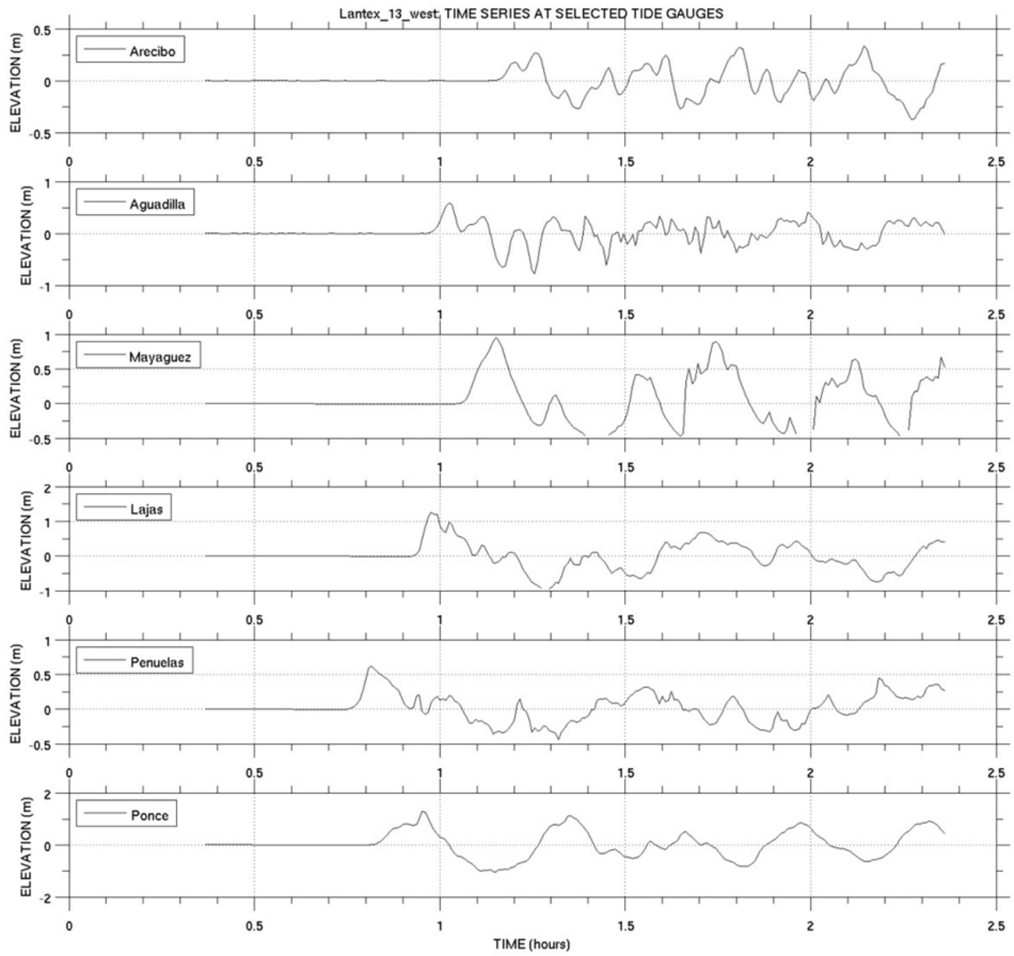


Figure 5 – LANTEX 13 West inundation grid time series.

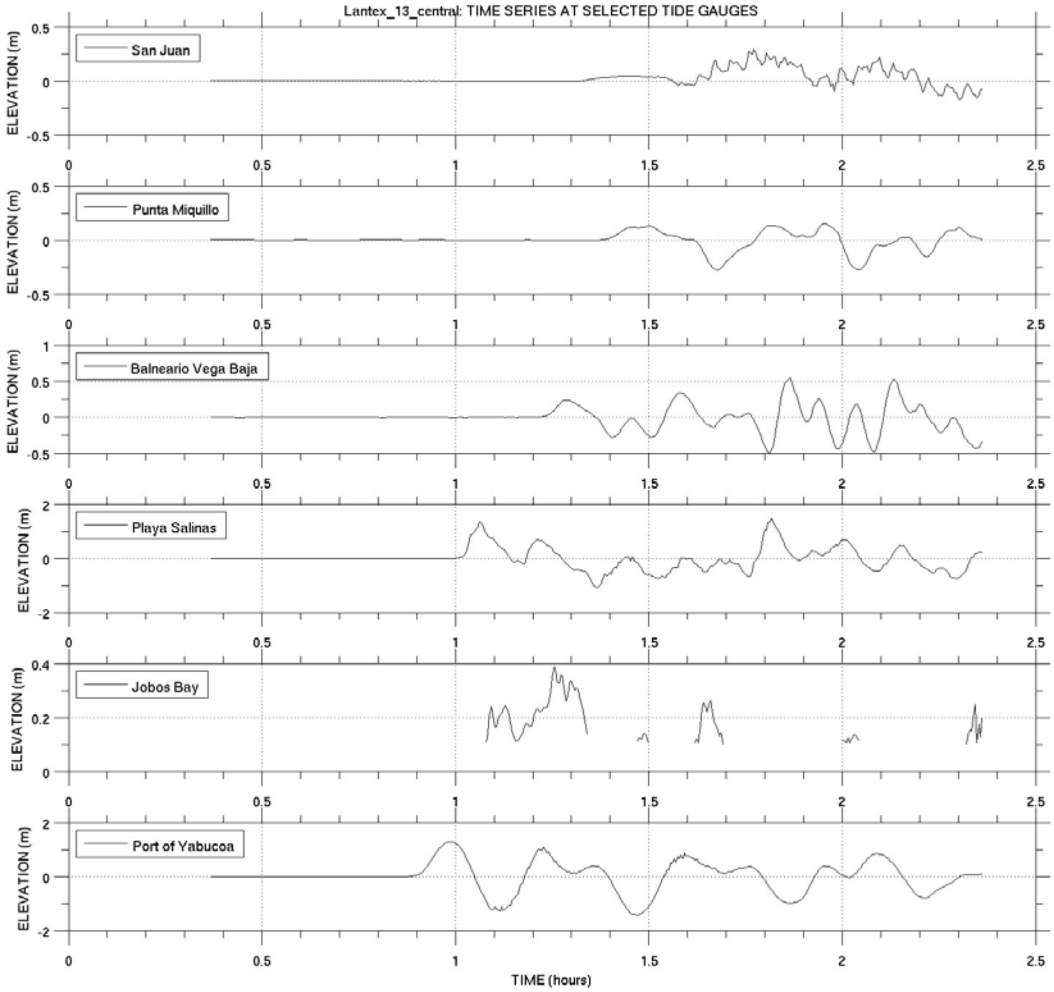


Figure 6 – LANTEX 13 Center inundation grid time series.

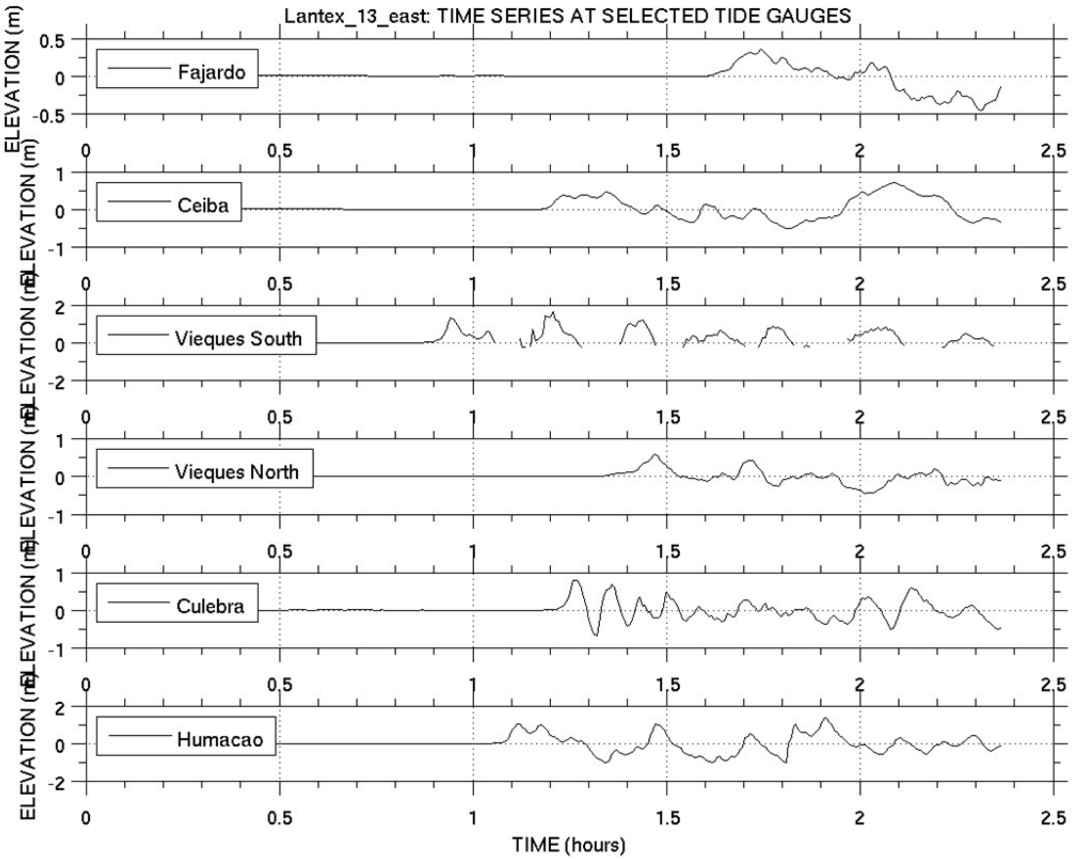


Figure 7 – LANTEX 13 East inundation grid time series.

Dr. Uri ten Brink Scenarios

As part of a European Union sponsored Regional Risk Reduction Initiative (R3I) project, Dr. Uri ten Brink suggested several potential tsunamigenic scenarios to the Government of the British Virgin Islands. These scenarios are shown in Figure 44, and their respective fault parameters are given in Table 1.

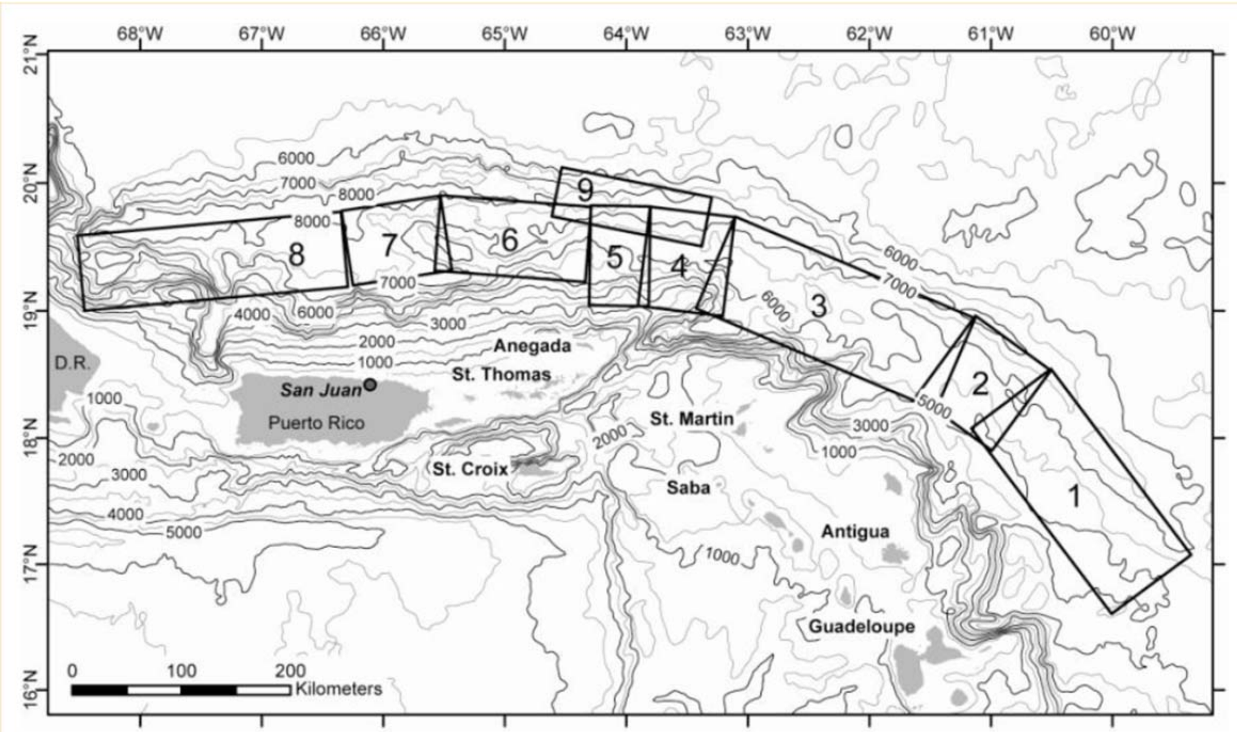


Figure 8 – Uri ten Brink scenarios suggested for the British Virgin Islands as part of the Regional Risk Reduction Initiative.

The table proposes different combinations of activation of fault segments. From this table Dr. Victor Huerfano came out with following combinations shown below, labeled as

- FEQ1
- FEQ1_V2
- FEQ1_V3
- FEQ3
- FEQ1_12
- FEQ1_123
- FEQ1_1234
- FEQ1_23
- FEQ1_234
- FEQ1_2345
- FEQ1_34
- FEQ1_345

- FEQ1_45
- FEQ3_V2

A simulation was made for each of the above 14 scenarios. The adopted nomenclature is based on the segment combinations used for the given scenario. For example, FEQ1_345 implies the activation of segments 3, 4, and 5 of the scenario that Uri ten Brink called FEQ1 (see Table 1 below).

Table 1: Tsunamigenic scenarios suggested by Dr. Uri ten Brink to the Government of the British Virgin Islands

ID	Source	Mw	Length (km)	Width (km)		Strike (°)	Rake (°)	Dip (°)	Slip (m)	Depth (km)
FEQ1	*Source 1* (ten Brink, personal communication)									
	Segment 1	8.7[3]	204	90		143°	90°	15°	8.11	8.5
	Segment 2		81	90		123°	90°	15°	8.11	8.5
	Segment 3		226	90		110°	90°	15°	8.11	8.5
	Segment 4		74	90		97°	90°	15°	8.11	8.5
	Segment 5		52	90		96°	90°	15°	8.11	8.5
FEQ2	*Source 2* (ten Brink, personal communication)									
	Segment 6	8.4	131	68		91°	90°	15°	5.44	9.5
	Segment 7		86	68		82°	90°	15°	5.44	9.5
	Segment 8		229	68		83°	90°	15°	5.44	9.5
FEQ3	*Source 3* (ten Brink, personal communication)									
	Segment 9	8	132	45		100°	-90°	60°	7.06	7.5

Next we go scenario by scenario for ten Brink's scenarios (refer to Table 1 as a reference).

FEQ1: Input parameter file for generation/propagation run.

Segment1: lat: 18.6272182 lon: -60.395771 strike: 143 dip: 15 rake: 90 depth: 8.5 length: 204 width: 90 slip: 8.11	Segment2: lat: 19.024229 lon: -61.0424347 strike: 123 dip: 15 rake: 90 depth: 8.5 length: 81 width: 90 slip: 8.11	Segment3: lat: 19.7198429 lon: -63.07268 strike: 110 dip: 15 rake: 90 depth: 8.5 length: 226 width: 90 slip: 8.11	Segment4: lat: 19.801 lon: -63.7752 strike: 97 dip: 15 rake: 90 depth: 8.5 length: 74 width: 90 slip: 8.11	Segment5: lat: 19.850 lon: -64.270 strike: 96 dip: 15 rake: 90 depth: 8.5 length: 52 width: 90 slip: 8.11

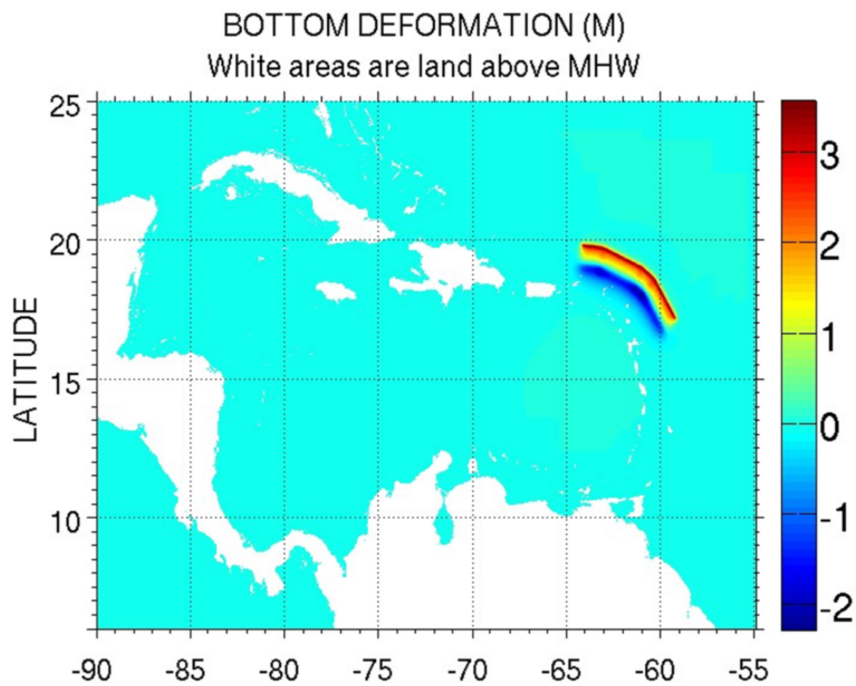


Figure 9 - FEQ1 Bottom deformation.

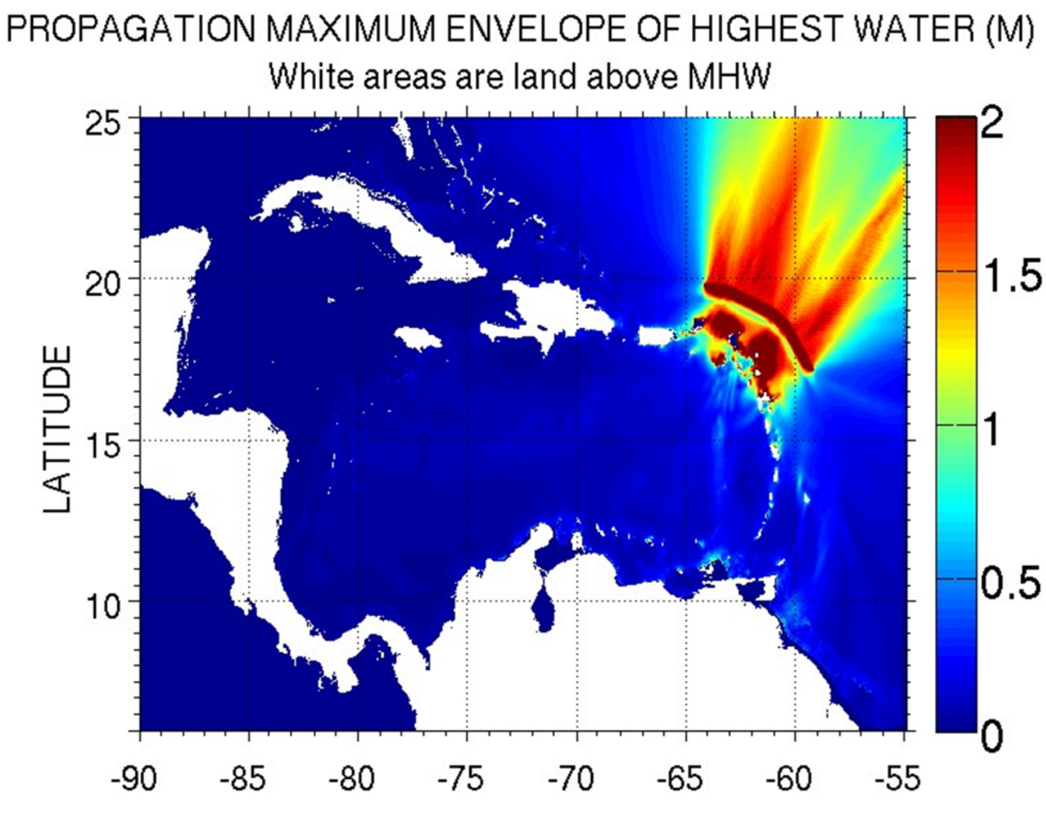


Figure 10 - FEQ1 MEOHW for propagation grid.

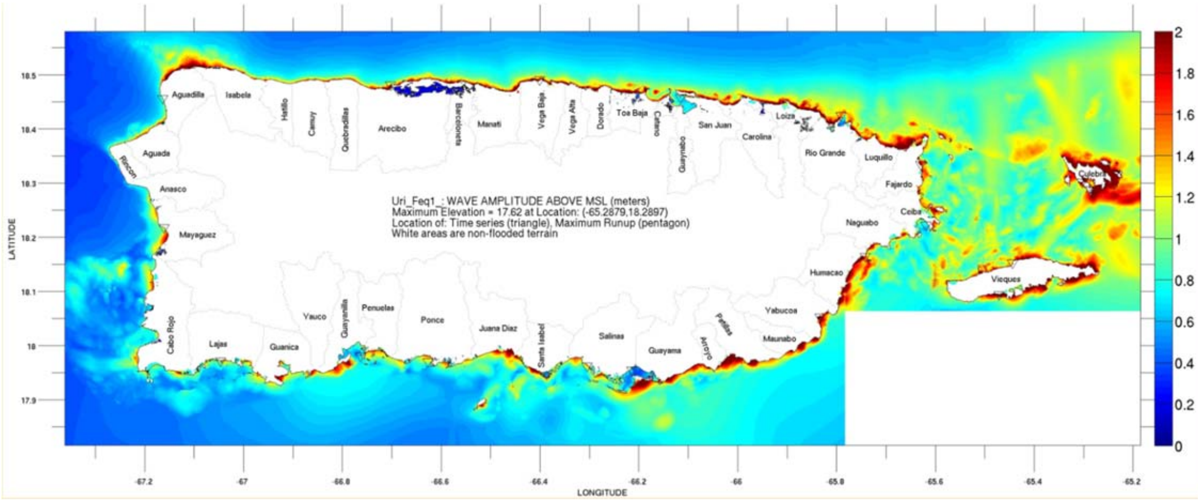


Figure 11 - FEQ1 MEOHW for inundation grids.

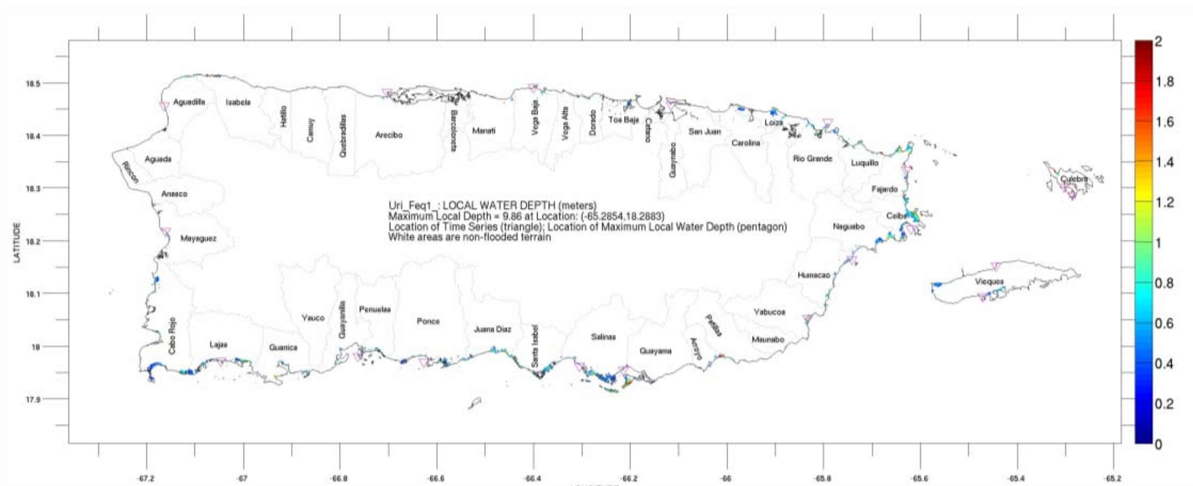


Figure 12 – FEQ1 LWD for inundation grids.

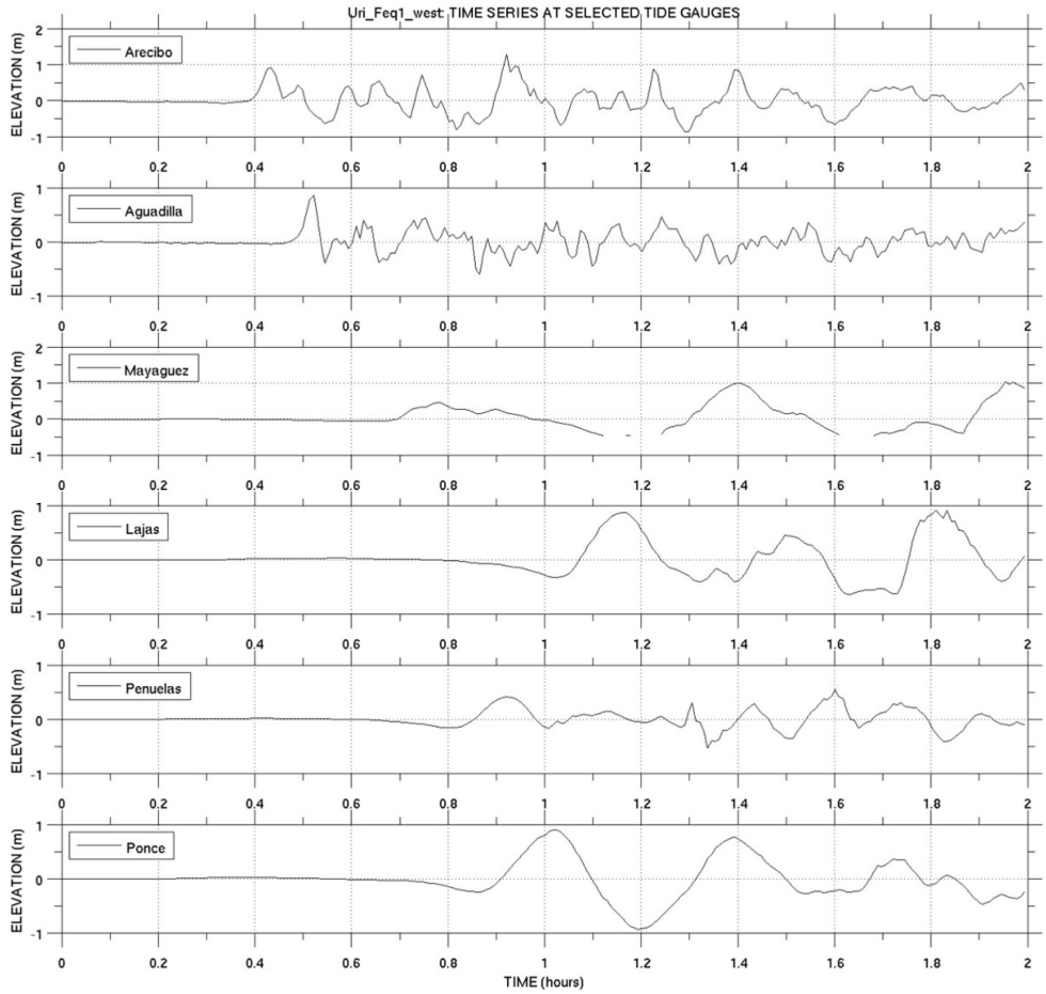


Figure 13 – FEQ1 West inundation grid time series.

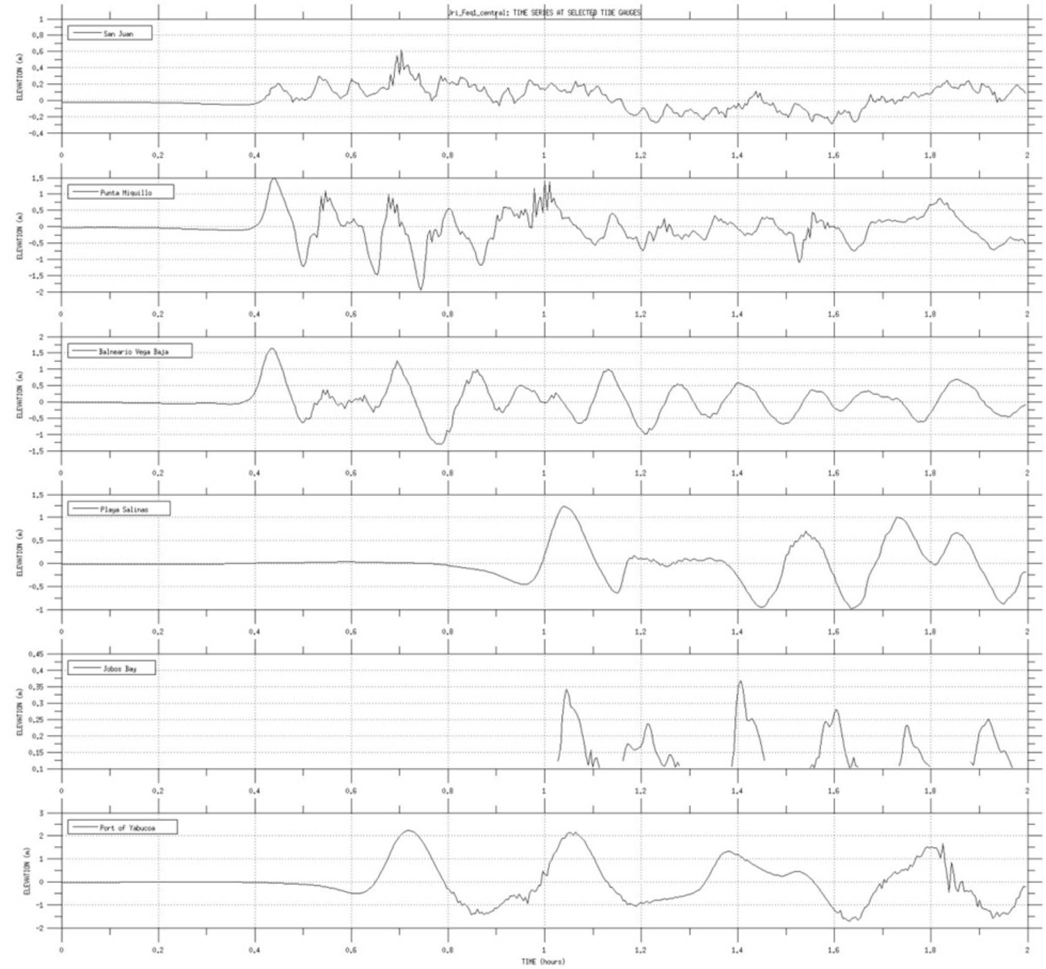


Figure 14 - FEQ1 Center inundation grid time series.

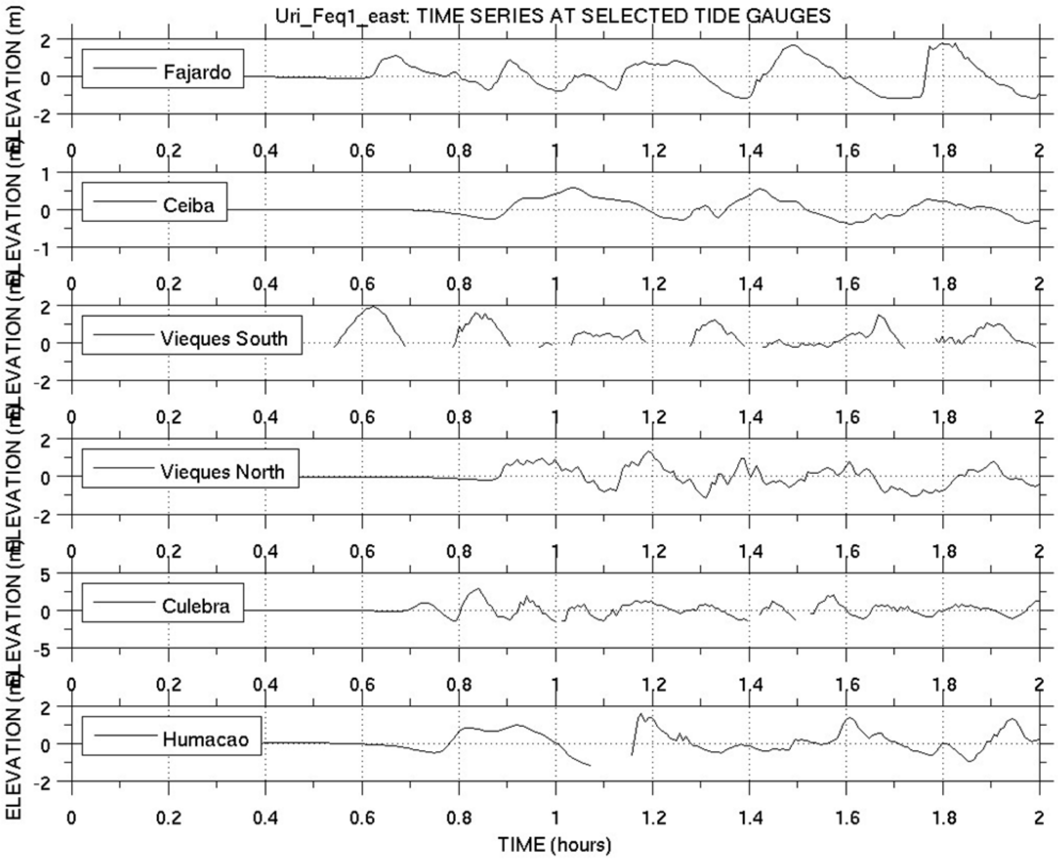


Figure 15 - FEQ1 East inundation grid time series.

FEQ1_V2: Input parameter file for generation/propagation run.

Segment1: lat: 18.6272182 lon: -60.395771 strike: 143 dip: 15 rake: 90 depth: 8.5 length: 204 width: 55 slip: 5	Segment2: lat: 19.024229 lon: -61.0424347 strike: 123 dip: 15 rake: 90 depth: 8.5 length: 81 width: 55 slip: 5	Segment3: lat: 19.7198429 lon: -63.07268 strike: 110 dip: 15 rake: 90 depth: 8.5 length: 226 width: 55 slip: 5	Segment4: lat: 19.801 lon: -63.7752 strike: 97 dip: 15 rake: 90 depth: 8.5 length: 74 width: 55 slip: 5	Segment5: lat: 19.850 lon: -64.270 strike: 96 dip: 15 rake: 90 depth: 8.5 length: 52 width: 55 slip: 5

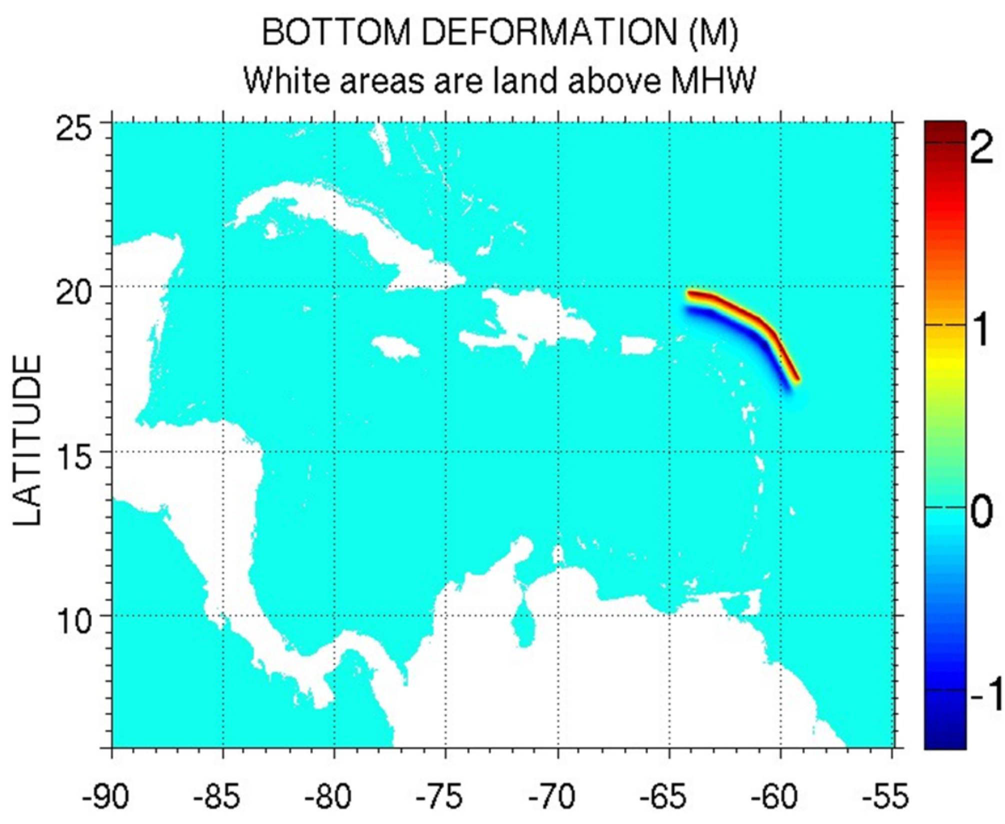


Figure 16 - FEQ1_V2 Bottom deformation.

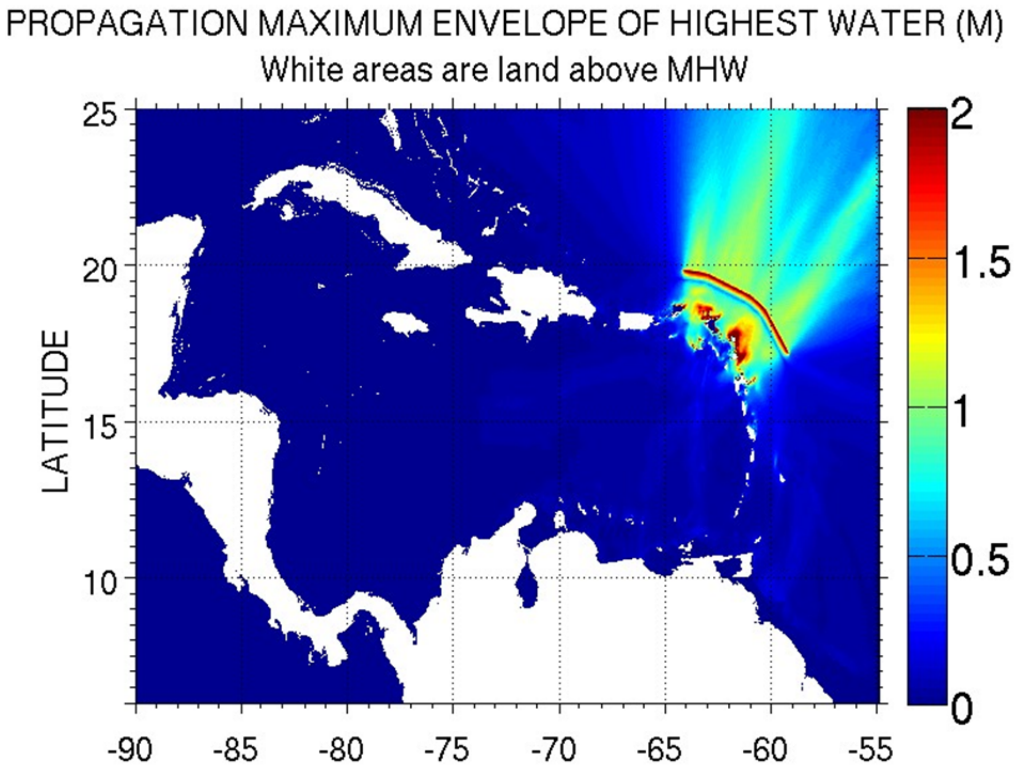


Figure 17 - FEQ1_V2 MEOHW for propagation grid.

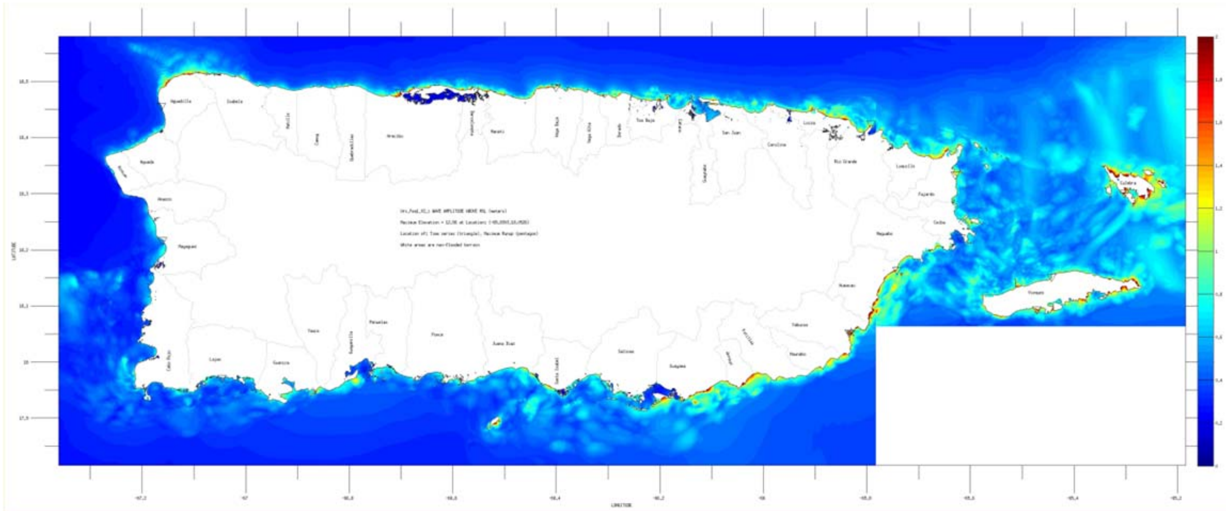


Figure 18 – FEQ1_V2 MEOHW for inundation grids.

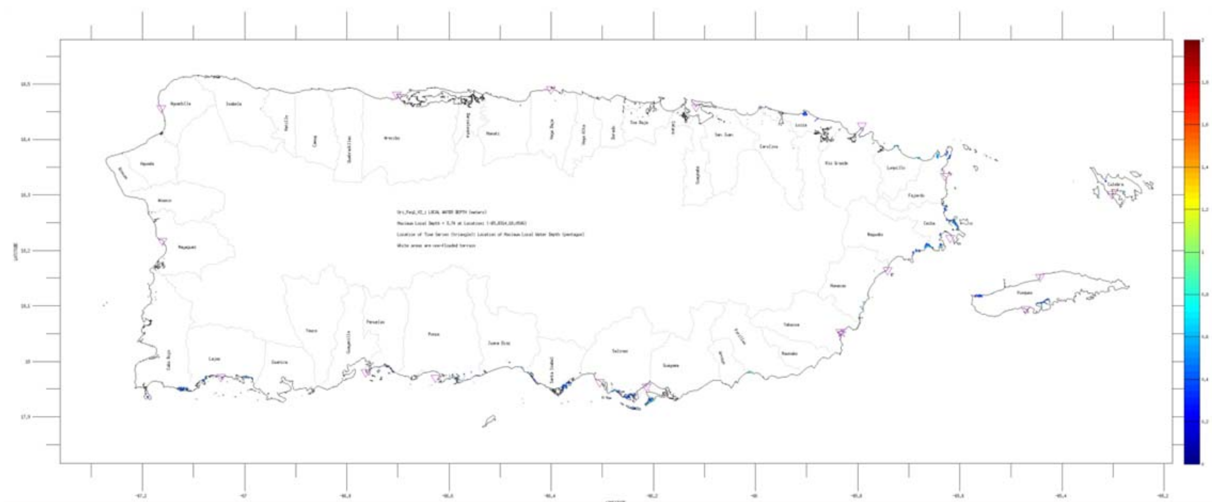


Figure 19 - FEQ1_V2 LWD for inundation grids.

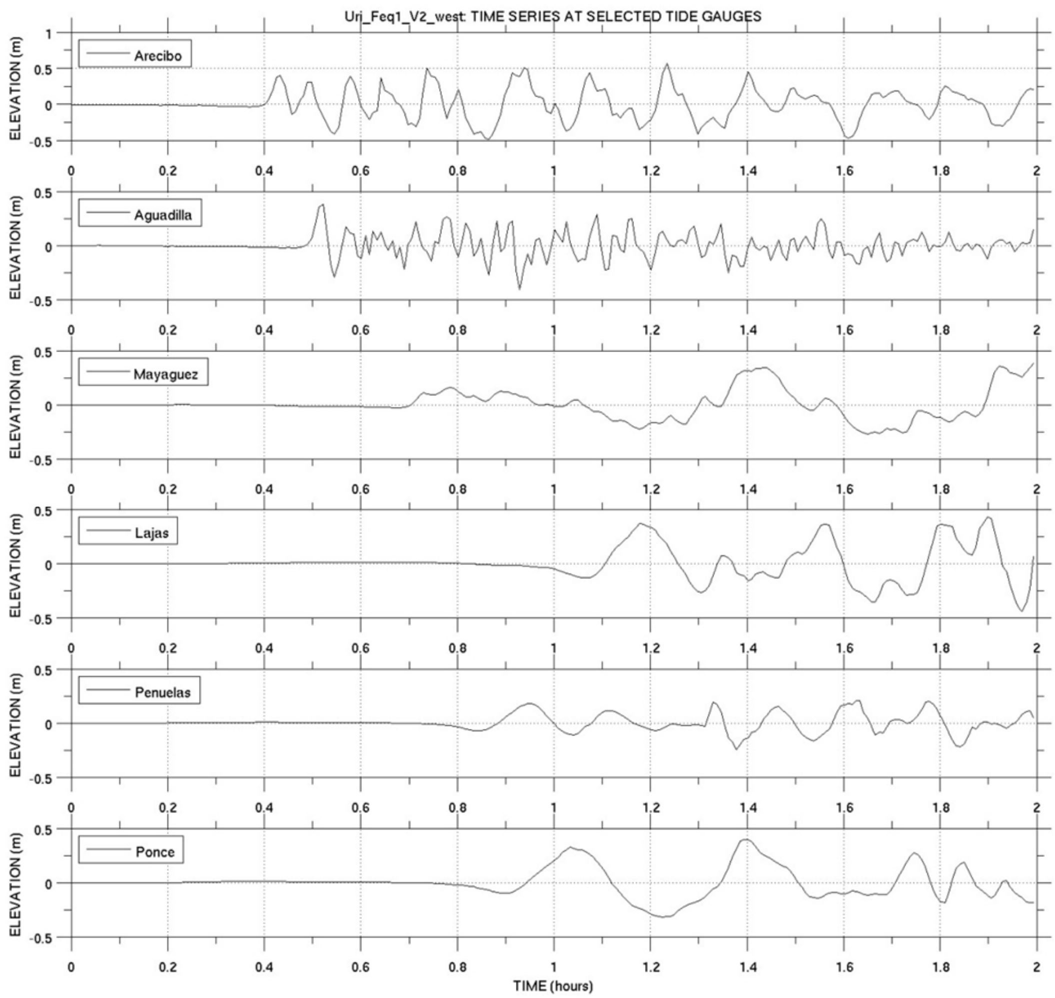


Figure 20 - FEQ1_V2 West inundation grid time series.

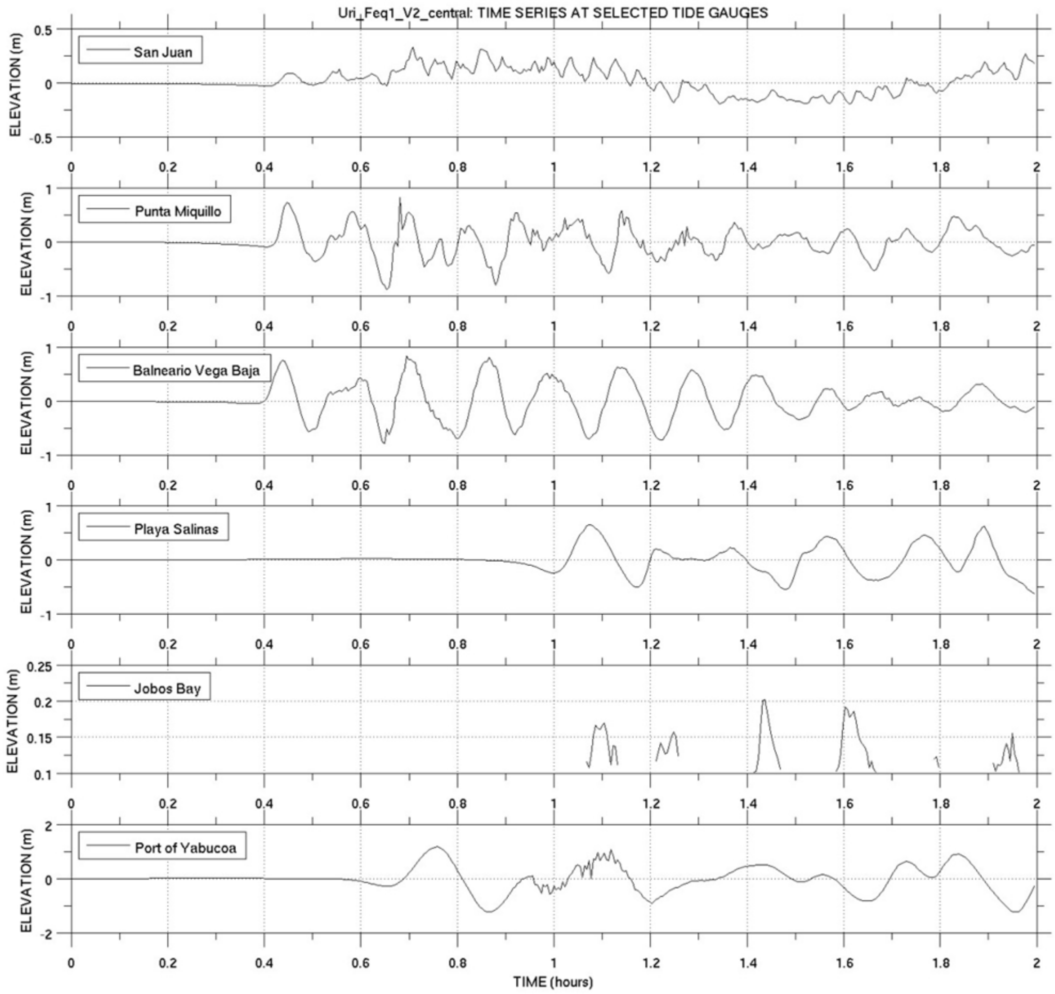


Figure 21 - FEQ1_V2 Center inundation grid time series.

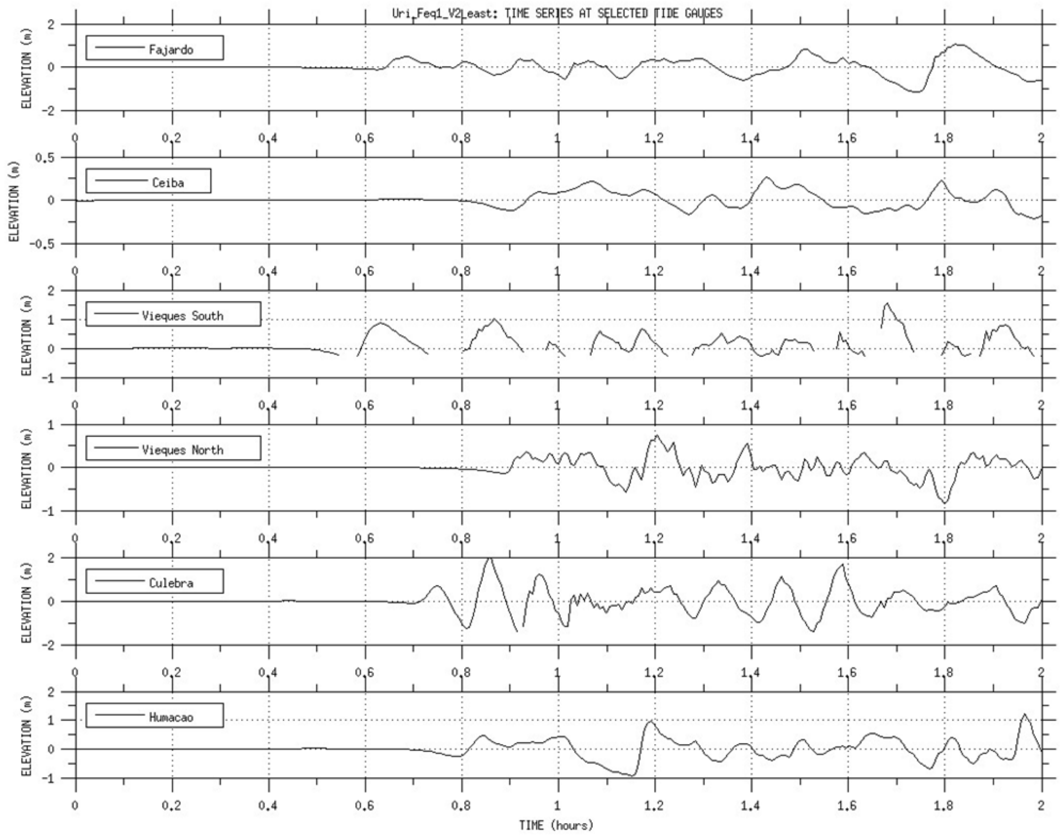


Figure 22 - FEQ1_V2

FEQ1_V3: Input parameter file for generation/propagation run.

Segment1: lat: 18.6272182 lon: -60.395771 strike: 143 dip: 30 rake: 90 depth: 8.5 length: 204 width: 55 slip: 5	Segment2: lat: 19.024229 lon: -61.0424347 strike: 123 dip: 30 rake: 90 depth: 8.5 length: 81 width: 55 slip: 5	Segment3: lat: 19.7198429 lon: -63.07268 strike: 110 dip: 30 rake: 90 depth: 8.5 length: 226 width: 55 slip: 5	Segment4: lat: 19.801 lon: -63.7752 strike: 97 dip: 30 rake: 90 depth: 8.5 length: 74 width: 55 slip: 5	Segment5: lat: 19.850 lon: -64.270 strike: 96 dip: 30 rake: 90 depth: 8.5 length: 52 width: 55 slip: 5

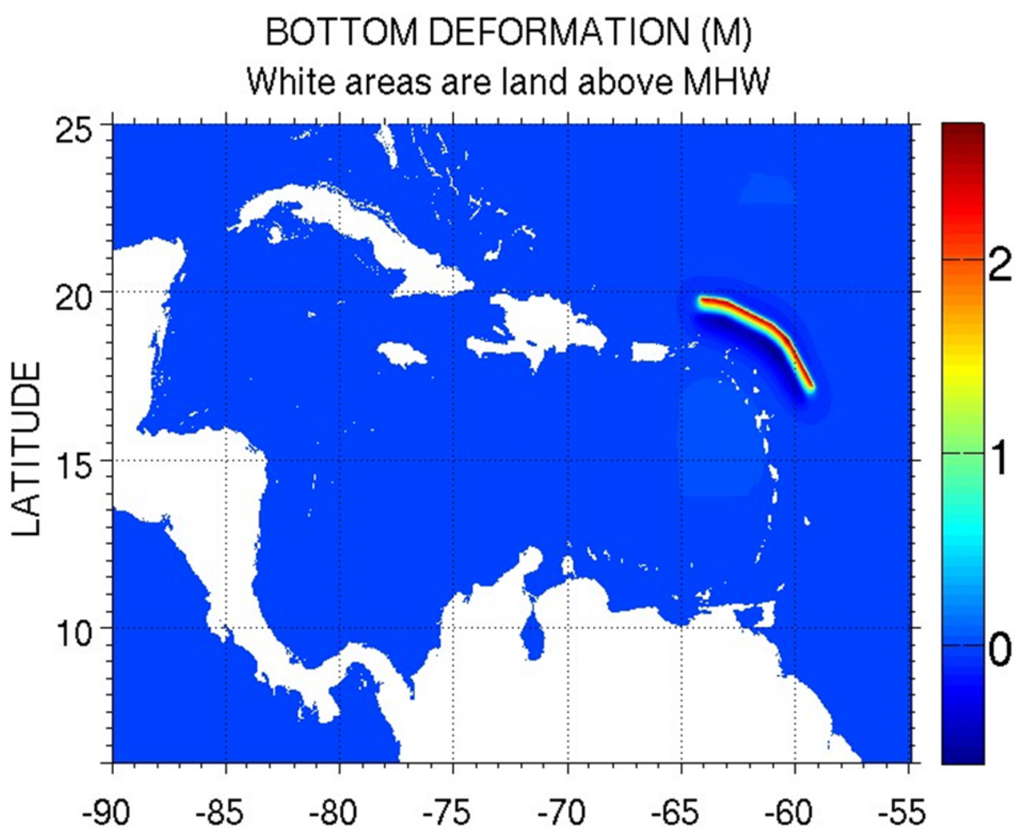


Figure 23 - FEQ1_V3 Bottom deformation.

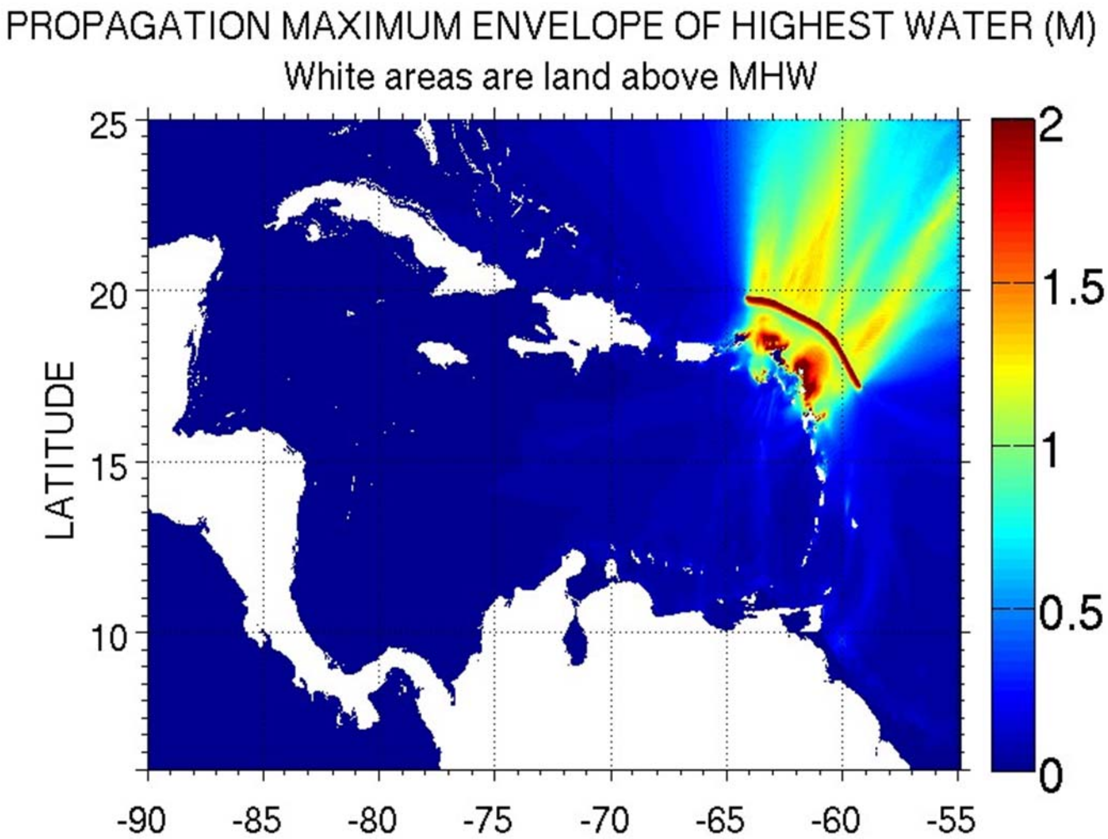


Figure 24 - FEQ1_V3 MEOHW for propagation grid.

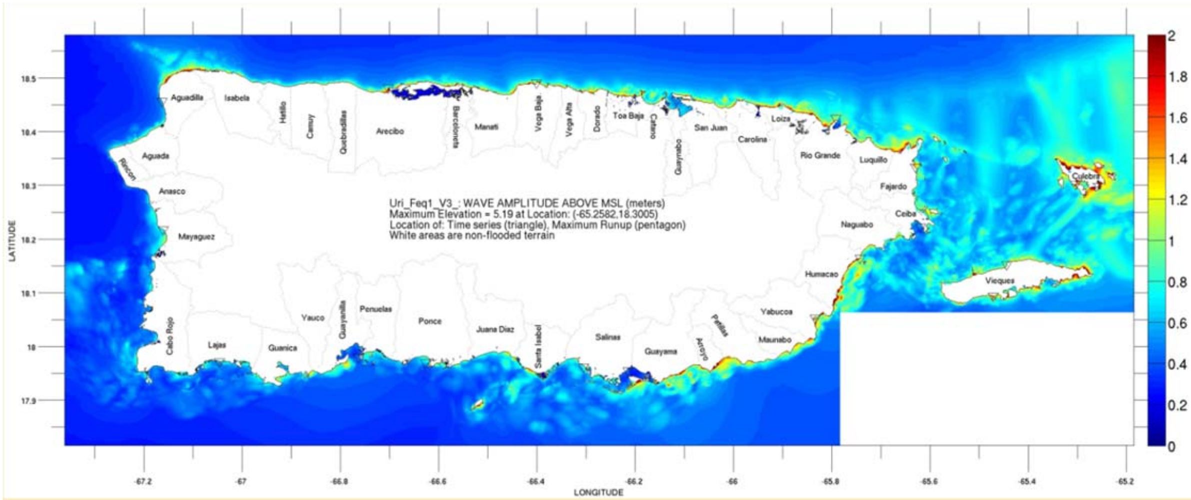


Figure 25 - FEQ1_V3 MEOHW for inundation grids.

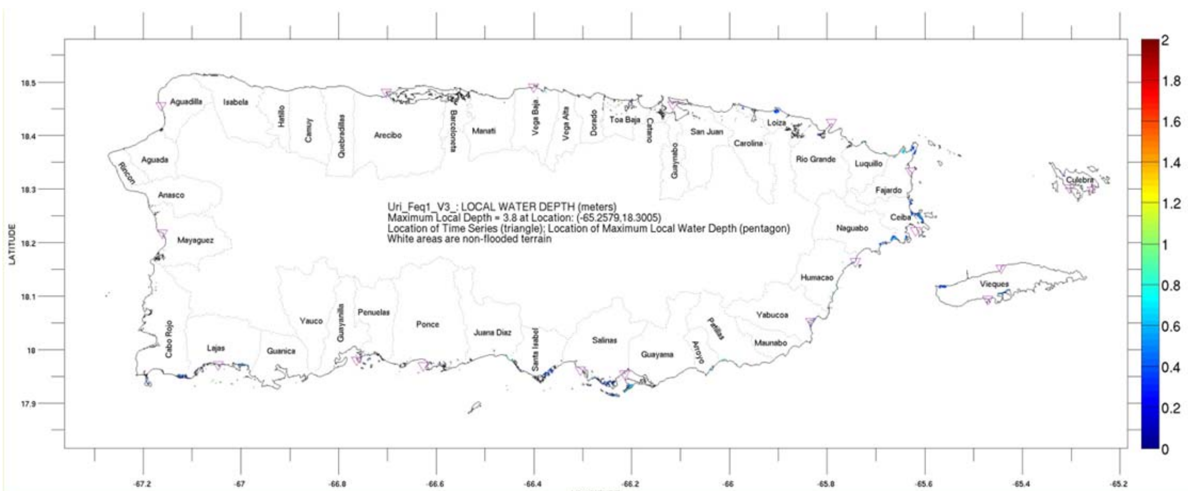


Figure 26 - FEQ1_V3 LWD for inundation grids.

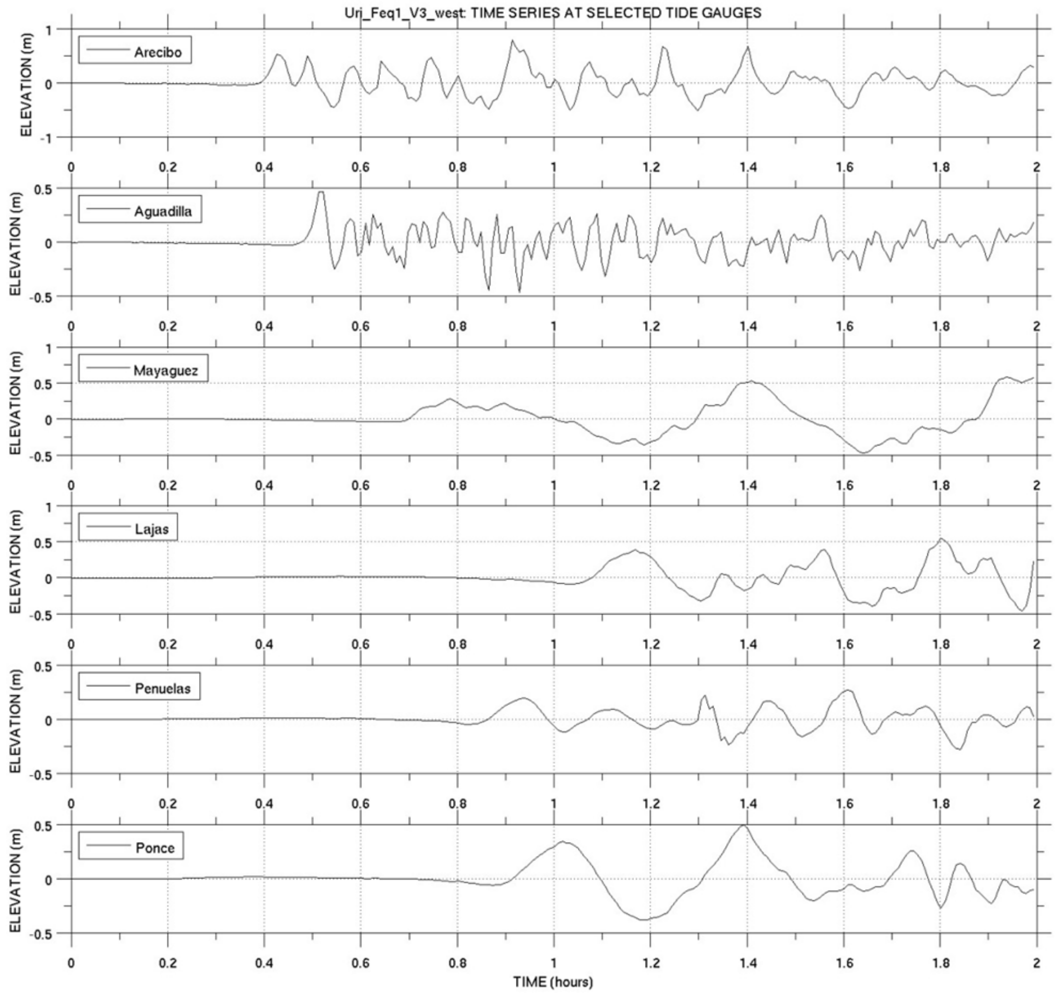


Figure 27 - FEQ1_V3 West inundation grid time series.

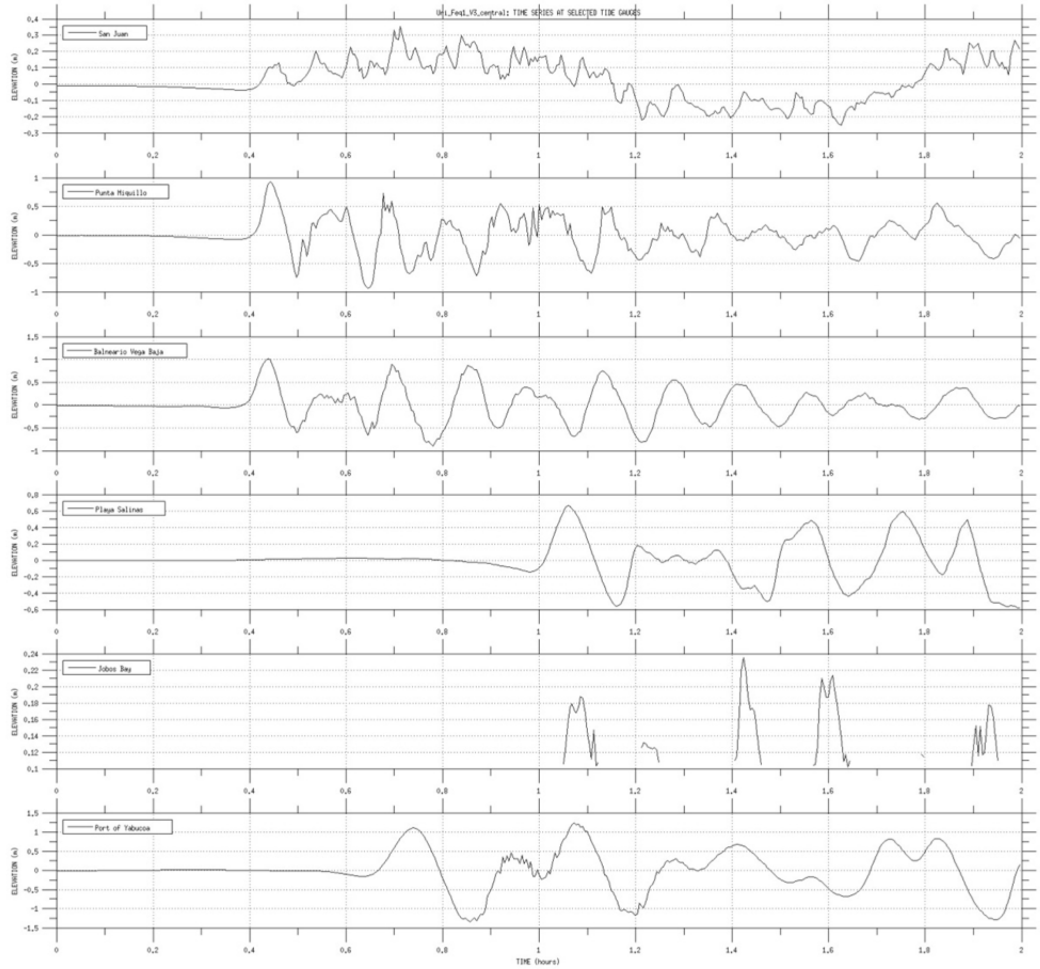


Figure 28 - FEQ1_V3 Center inundation grid time series.

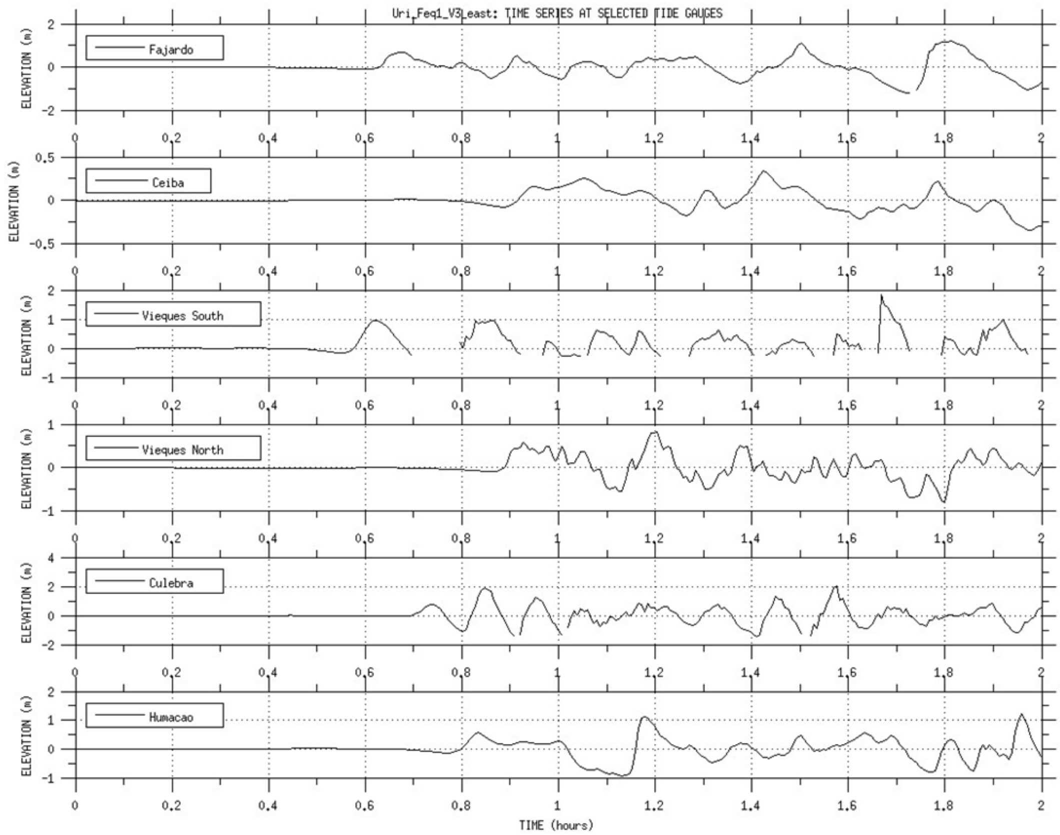


Figure 29 - FEQ1_V3 East inundation grid time series.

FEQ3: Input parameter file for generation/propagation run.

```
Segment9:
lat:   20.14
lon:   -64.51
strike:   100
dip:  60
rake:  -90
depth:  7.5
length:   132
width:  45
slip:  7.06
```

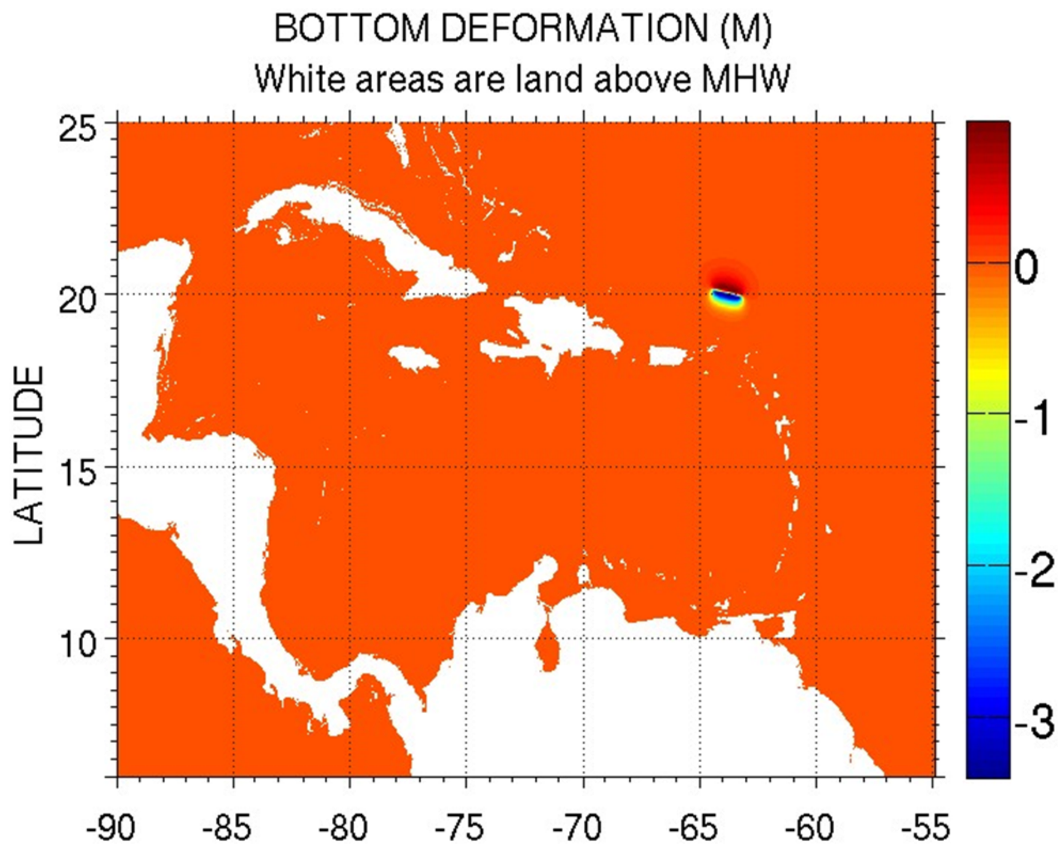


Figure 30 - FEQ3 Bottom deformation.

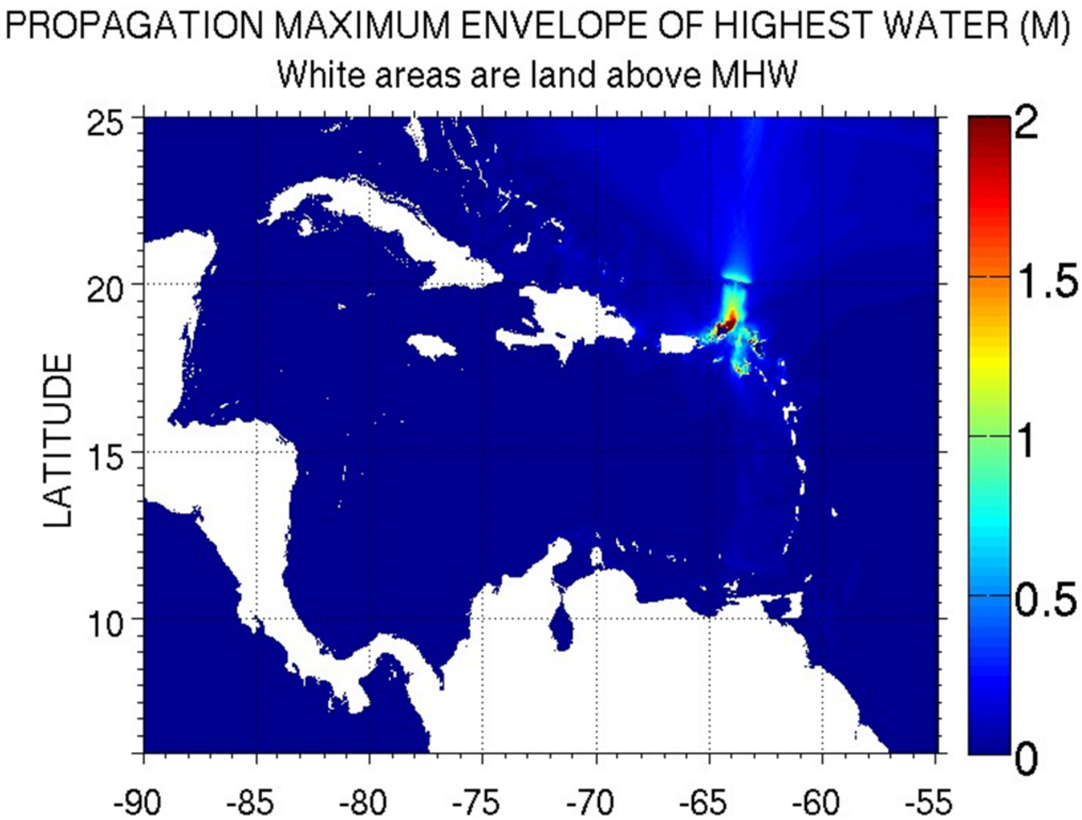


Figure 31 - FEQ3 MEOHW for propagation grid.

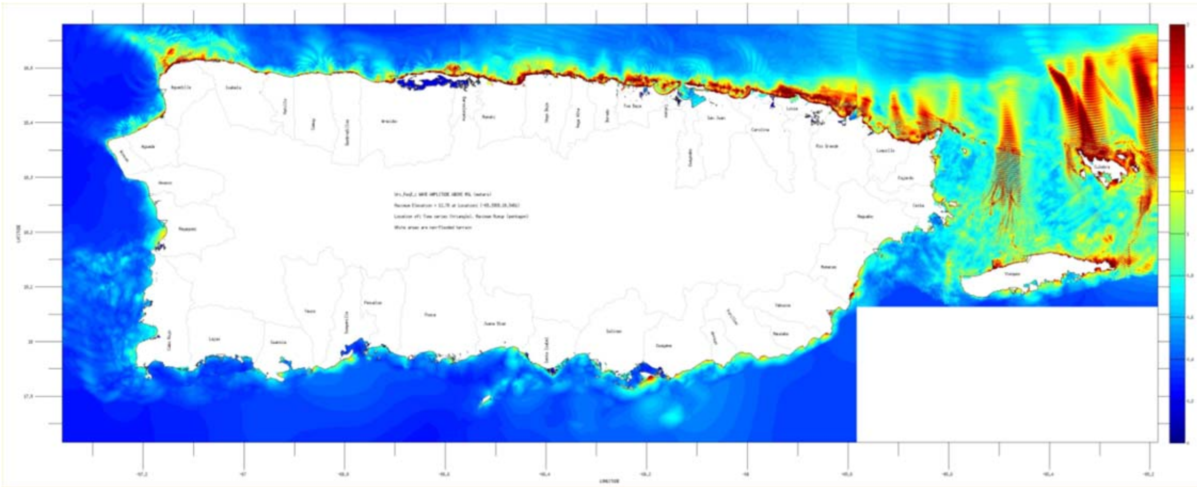


Figure 32 - FEQ3 MEOHW for inundation grids.

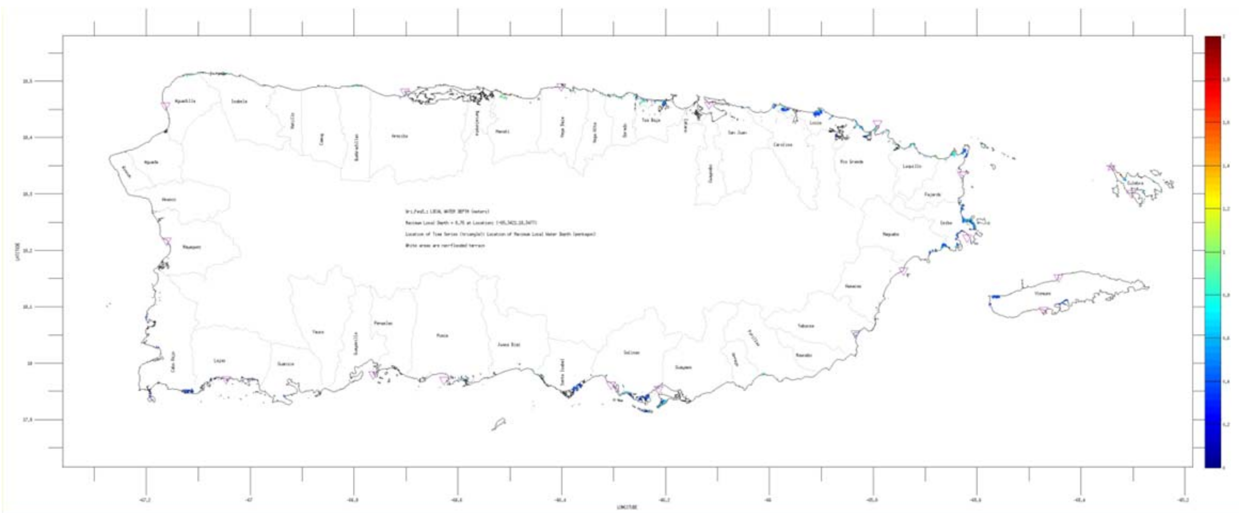


Figure 33 - FEQ3 LWD for inundation grids.

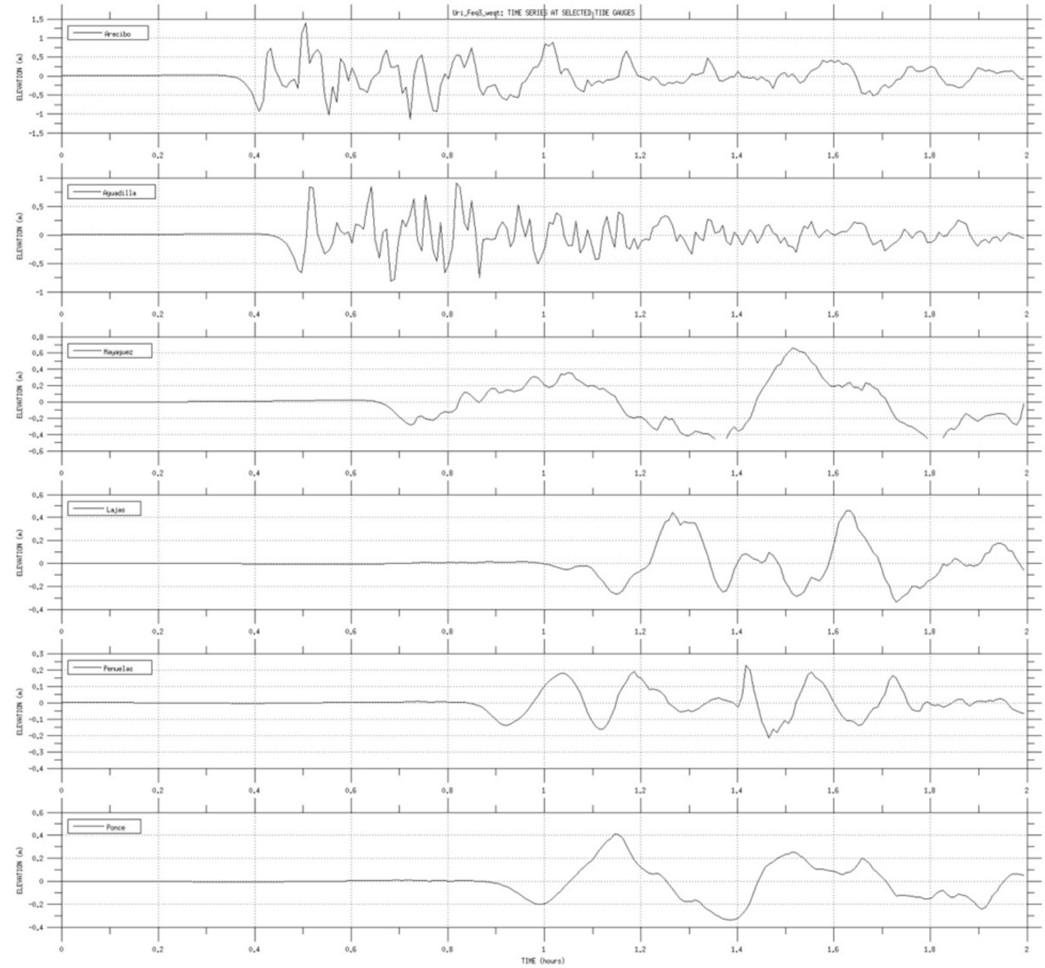


Figure 34 - FEQ3 West inundation grid time series.

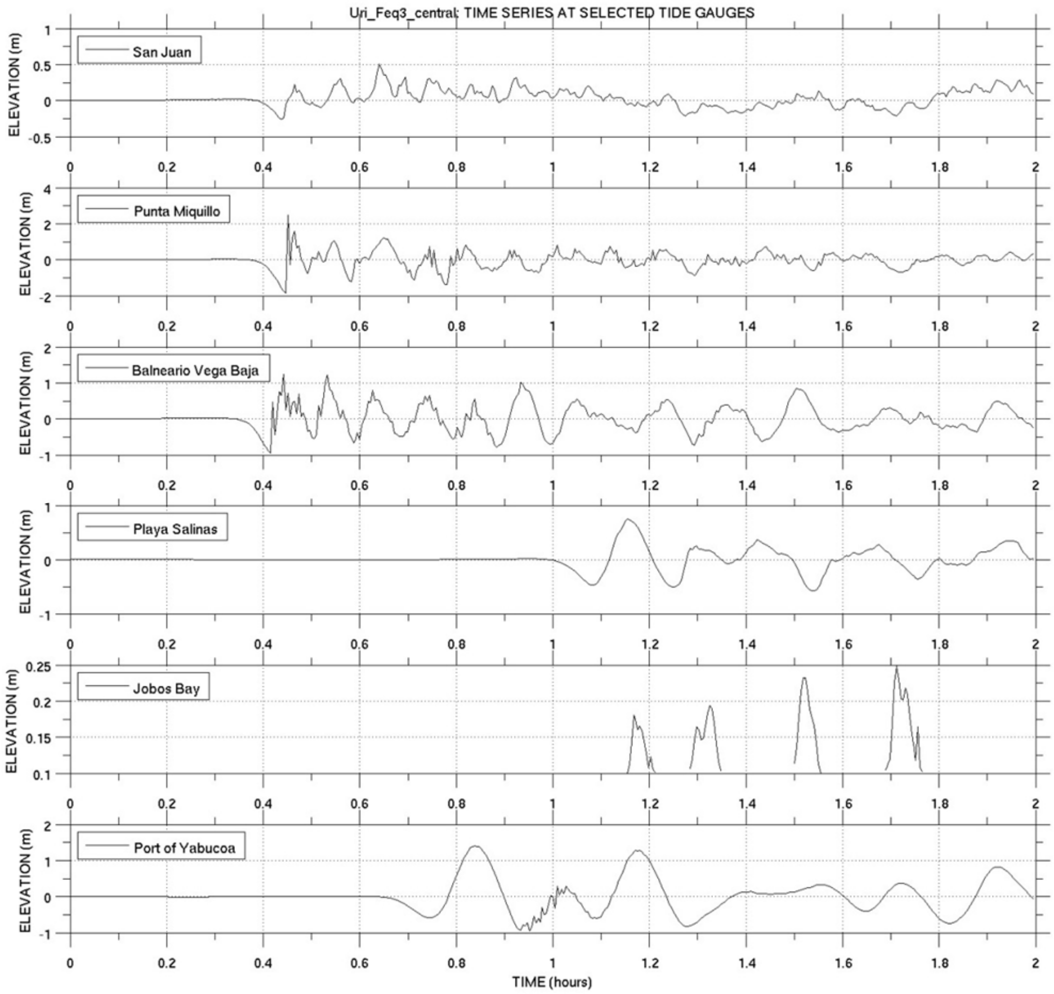


Figure 35 - FEQ3 Center inundation grid time series.

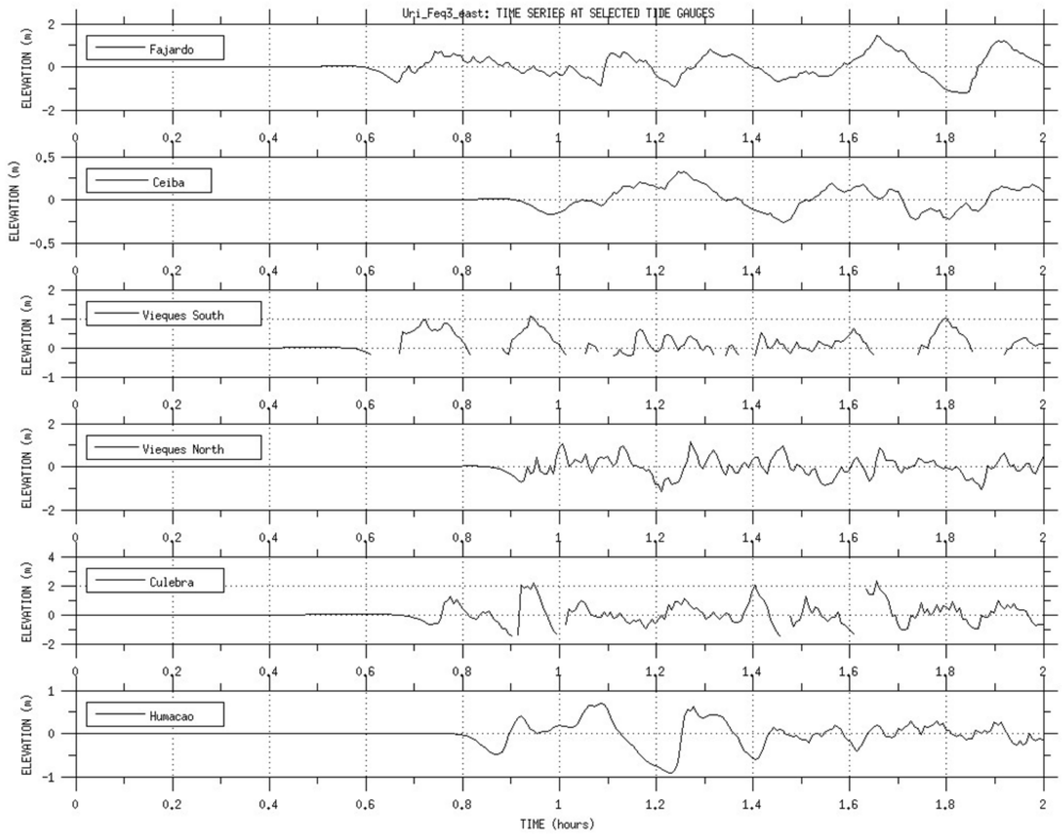


Figure 36 - FEQ3 East inundation grid time series.

FEQ1_12: Input parameter file for generation/propagation run.

Segment1:	Segment2:
lat: 18.6272182 lon: -60.395771 strike: 143 dip: 15 rake: 90 depth: 8.5 length: 204 width: 90 slip: 8.11	lat: 19.024229 lon: -61.0424347 strike: 123 dip: 15 rake: 90 depth: 8.5 length: 81 width: 90 slip: 8.11

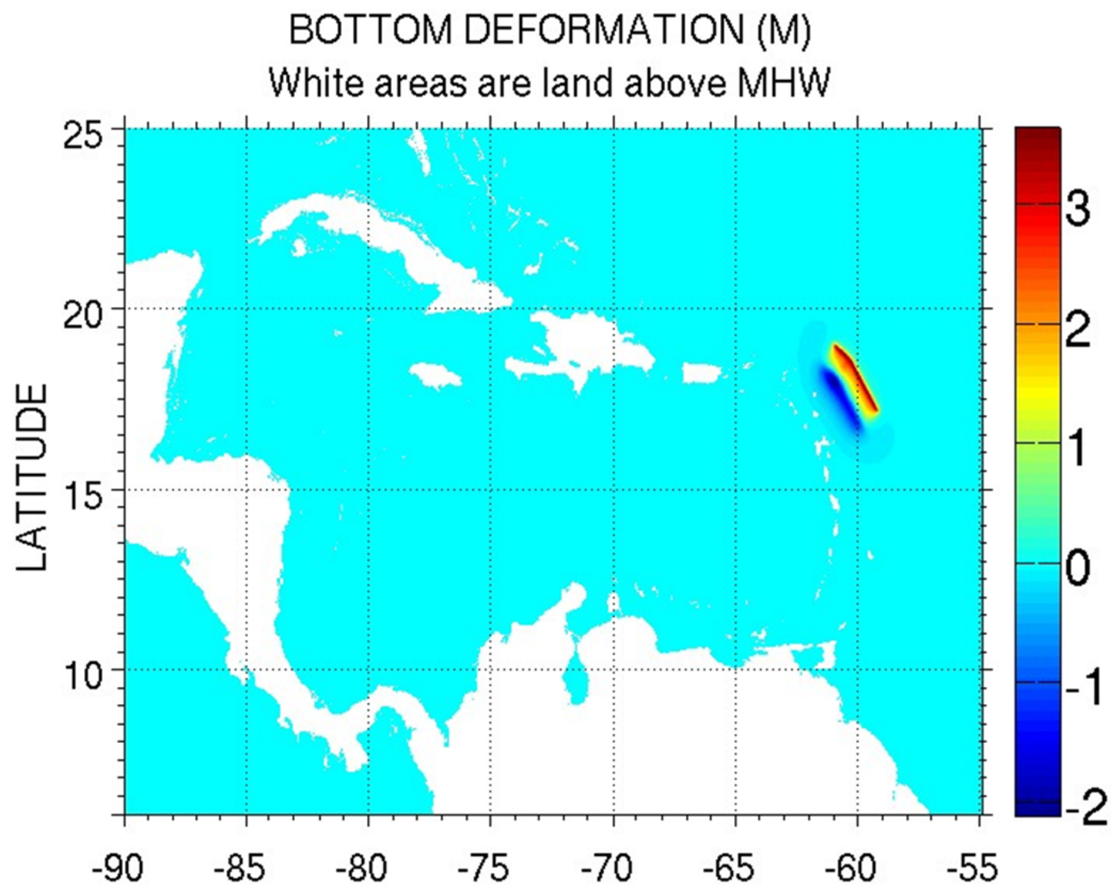


Figure 37 - FEQ1_12 Bottom deformation.

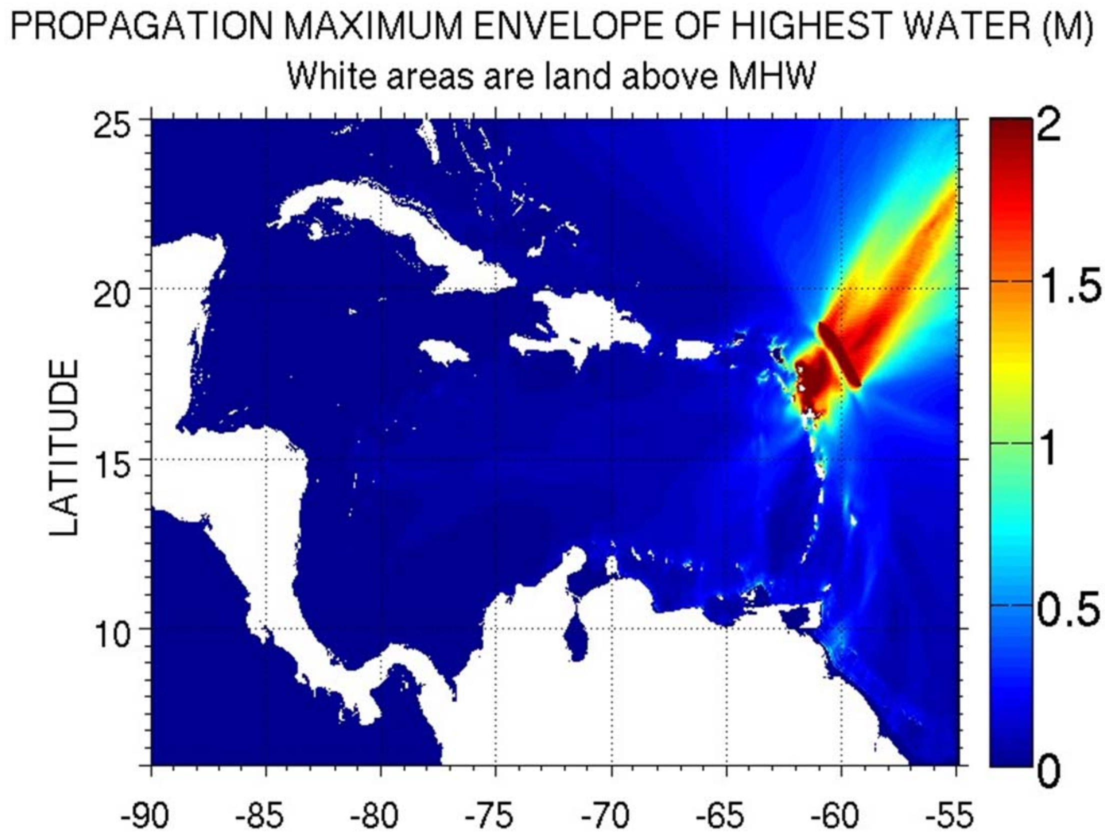


Figure 38 - FEQ1_12 MEOHW for propagation grid.

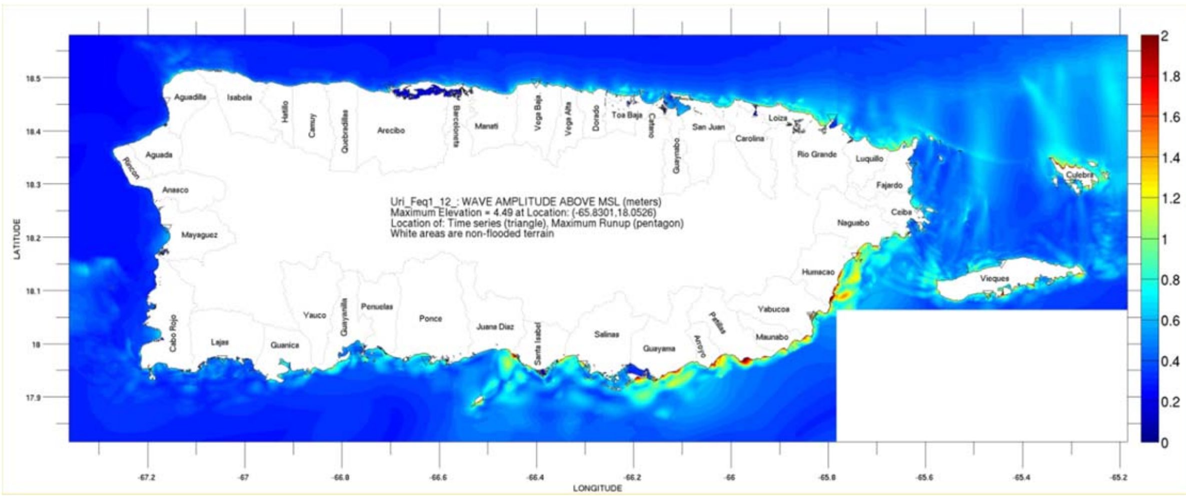


Figure 39 - FEQ1_12 MEOHW for inundation grids.

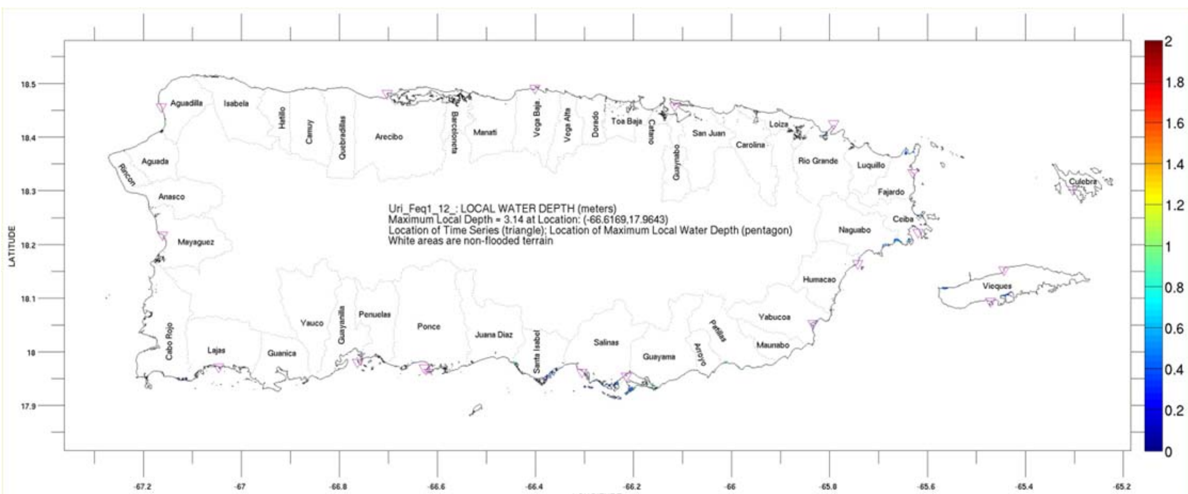


Figure 40 - FEQ1_12 LWD for inundation grids.

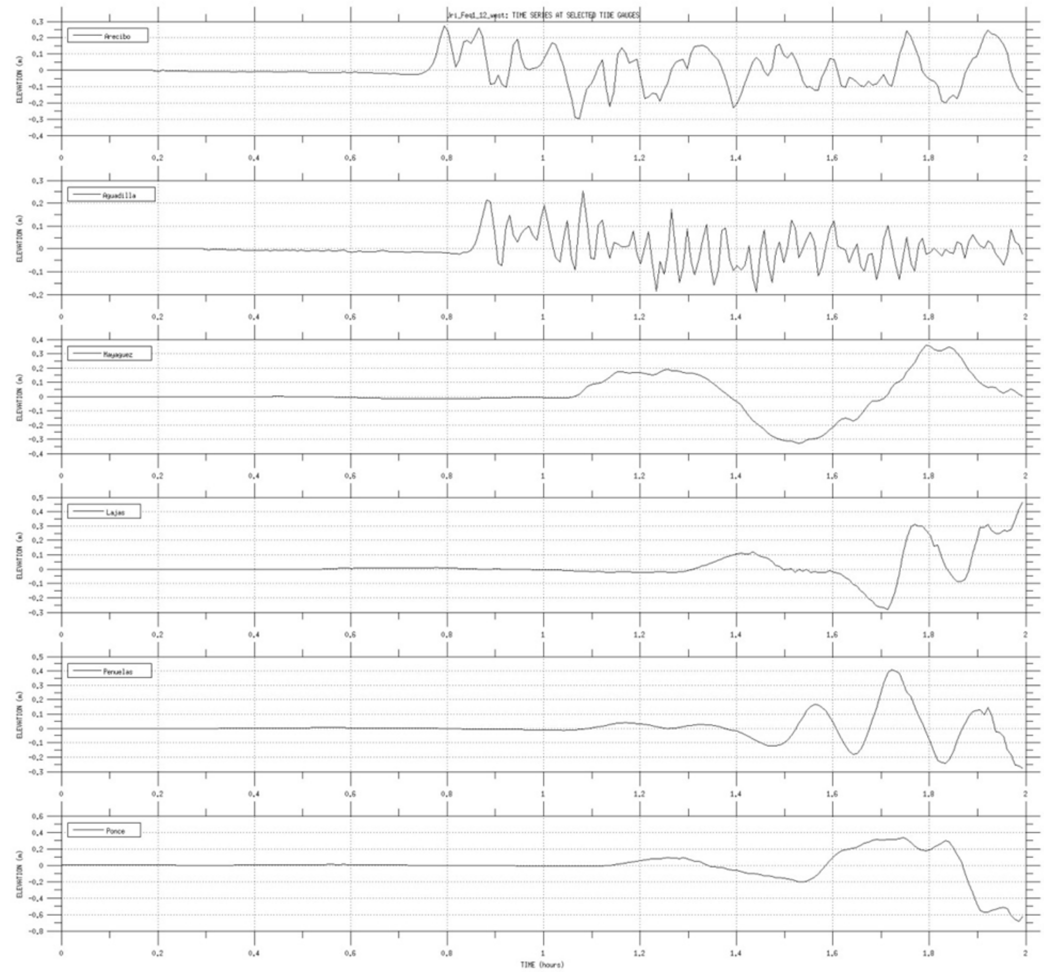


Figure 41 - FEQ1_12 West inundation grid time series.

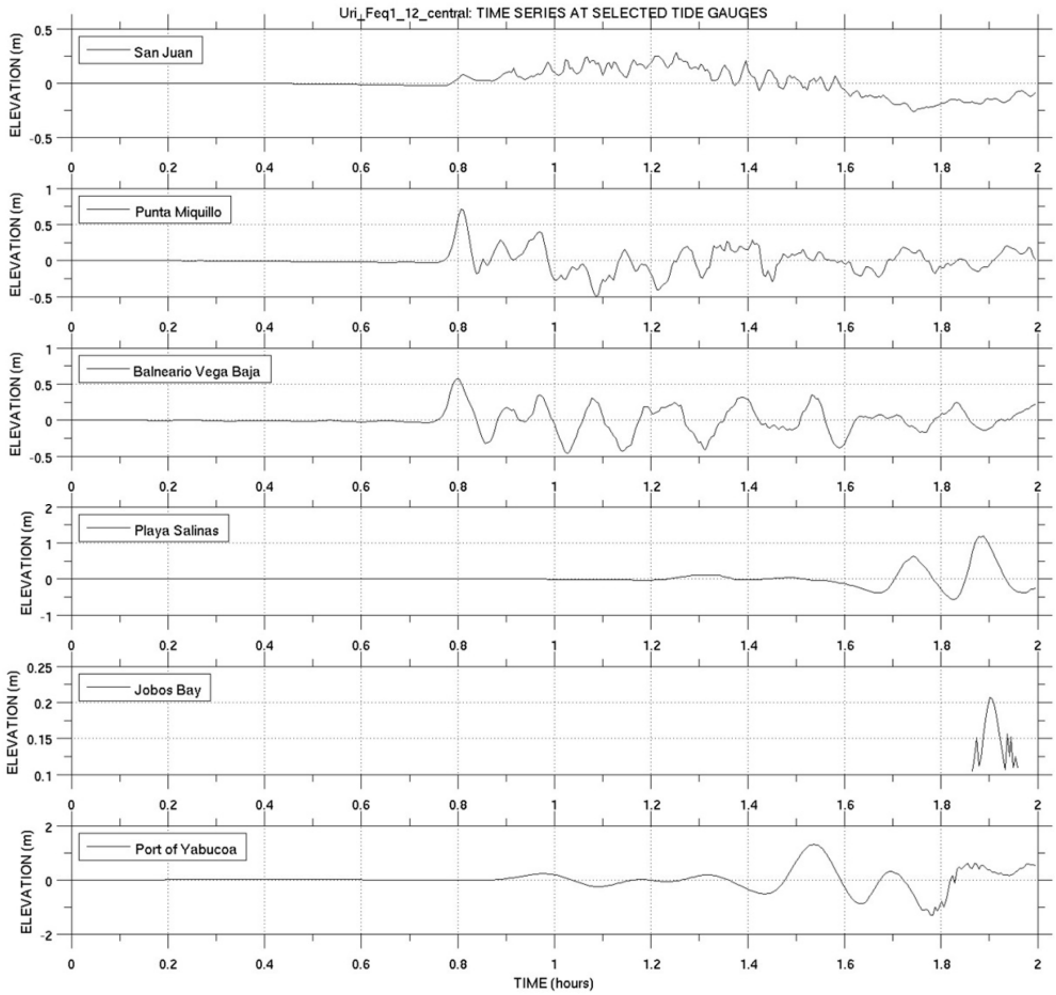


Figure 42 - FEQ1_12 Center inundation grid time series.

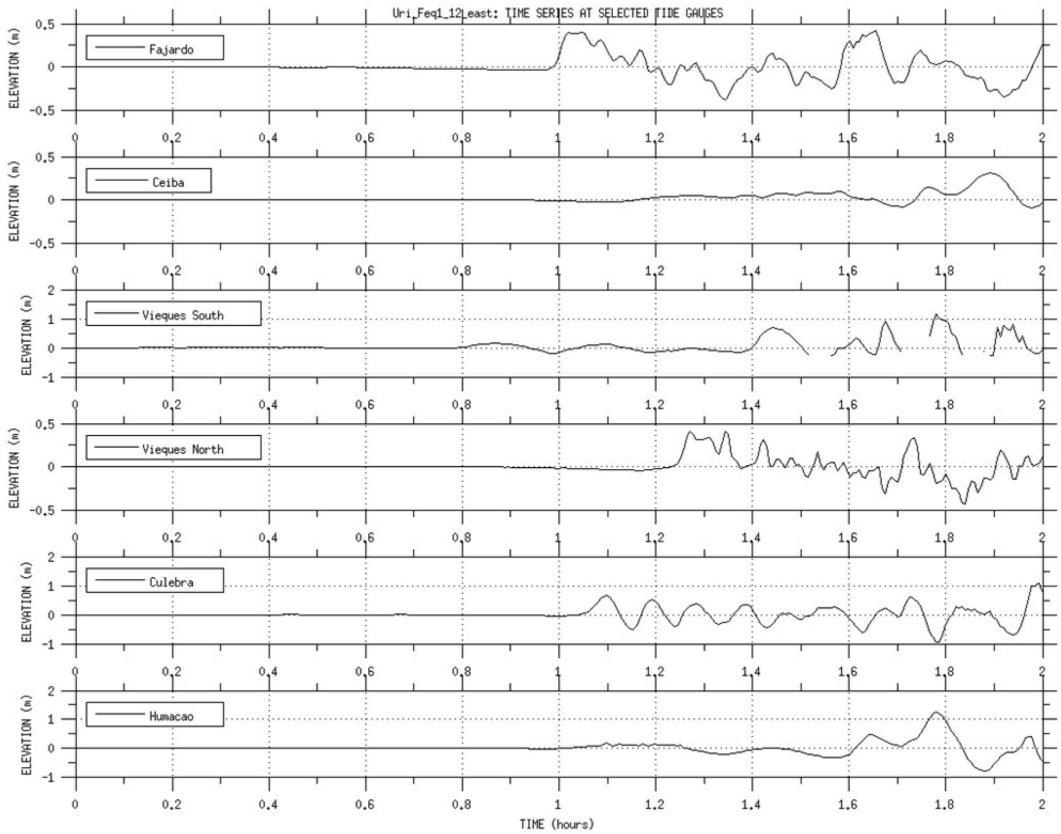


Figure 43 - FEQ1_12 East inundation grid time series.

FEQ1_123: Input parameter file for generation/propagation run

Segment1:	Segment2:	Segment3:
lat: 18.6272182 lon: -60.395771 strike: 143 dip: 15 rake: 90 depth: 8.5 length: 204 width: 90 slip: 8.11	lat: 19.024229 lon: -61.0424347 strike: 123 dip: 15 rake: 90 depth: 8.5 length: 81 width: 90 slip: 8.11	lat: 19.7198429 lon: -63.07268 strike: 110 dip: 15 rake: 90 depth: 8.5 length: 226 width: 90 slip: 8.11

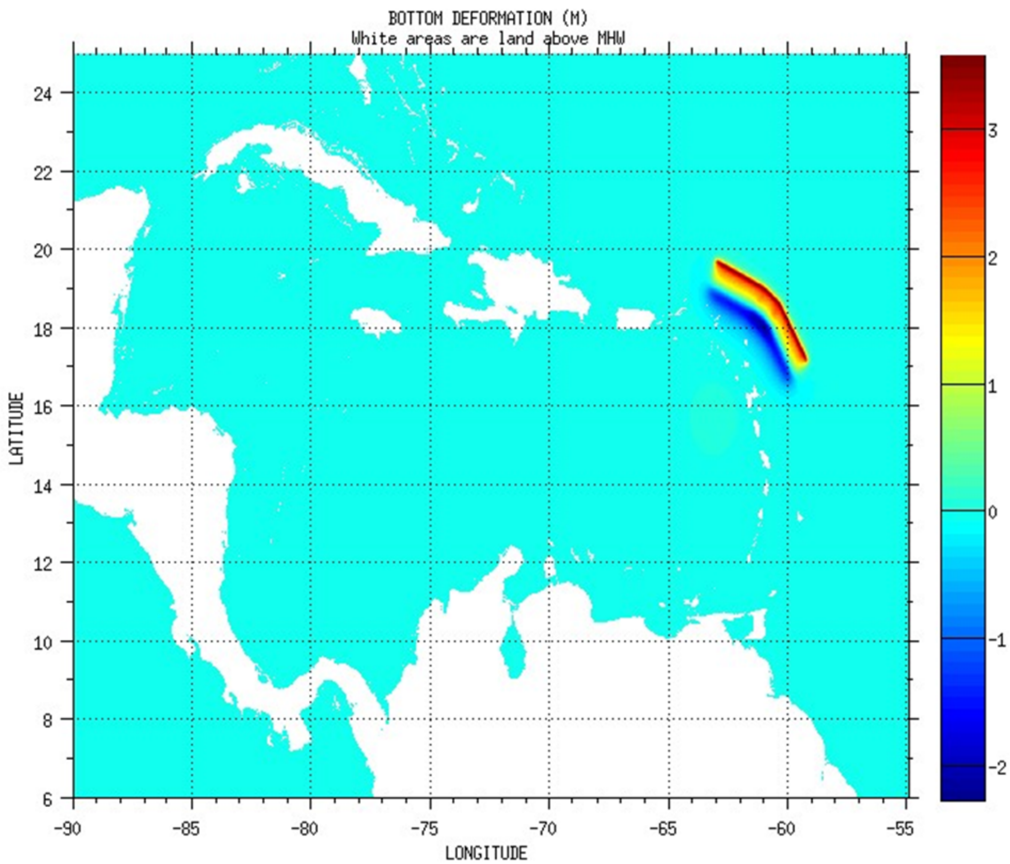


Figure 44 - FEQ1_123 Bottom deformation.

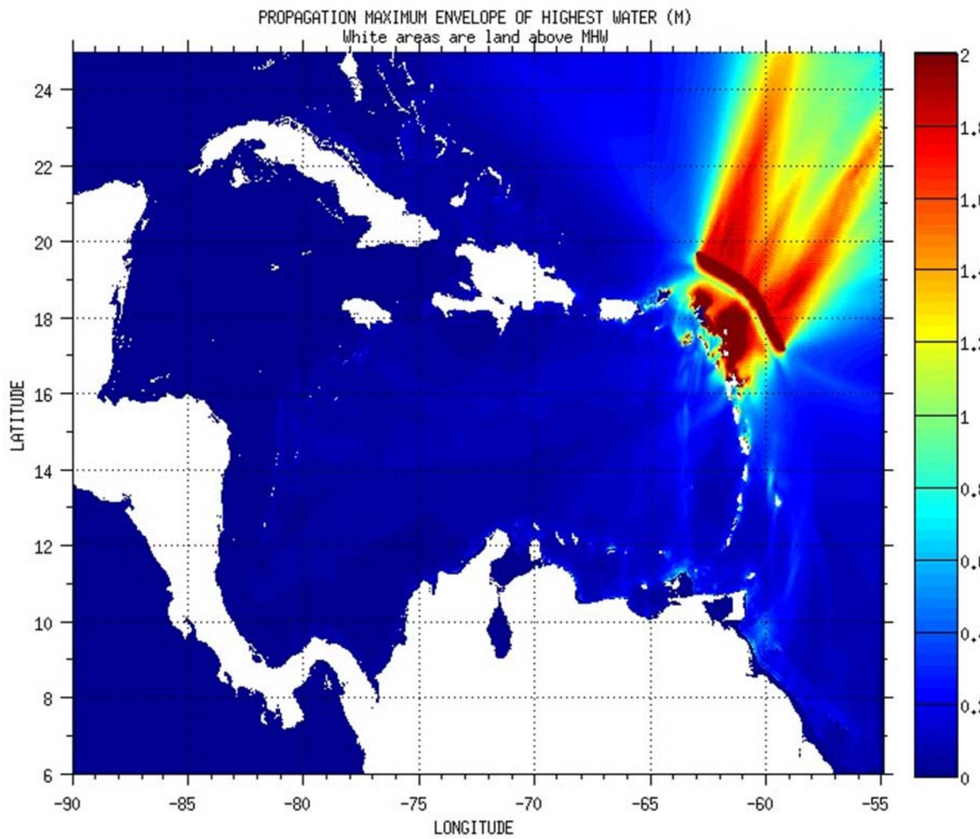


Figure 45 - FEQ1_123 MEOHW for propagation grid.

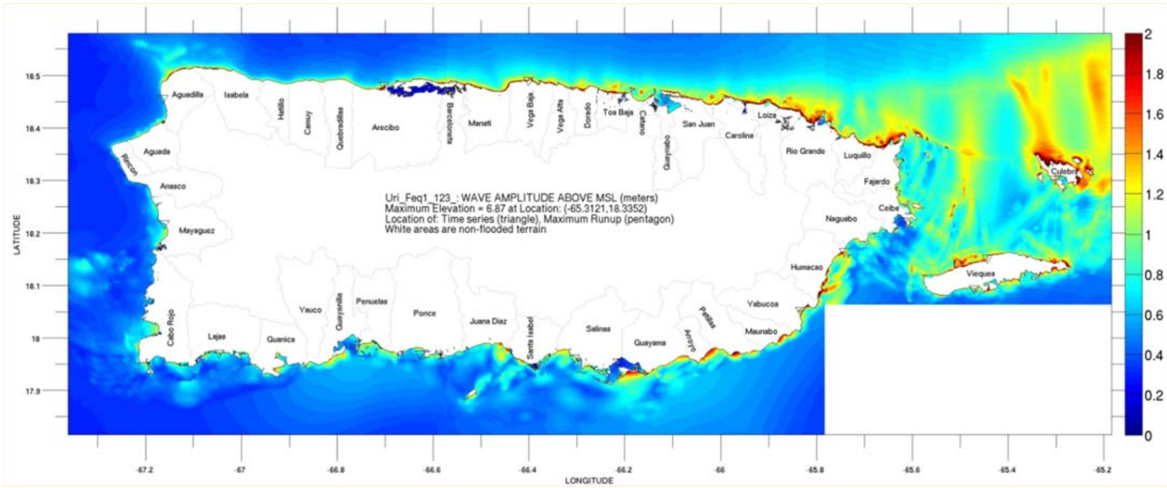


Figure 46 - FEQ1_123 MEOHW for inundation grids.

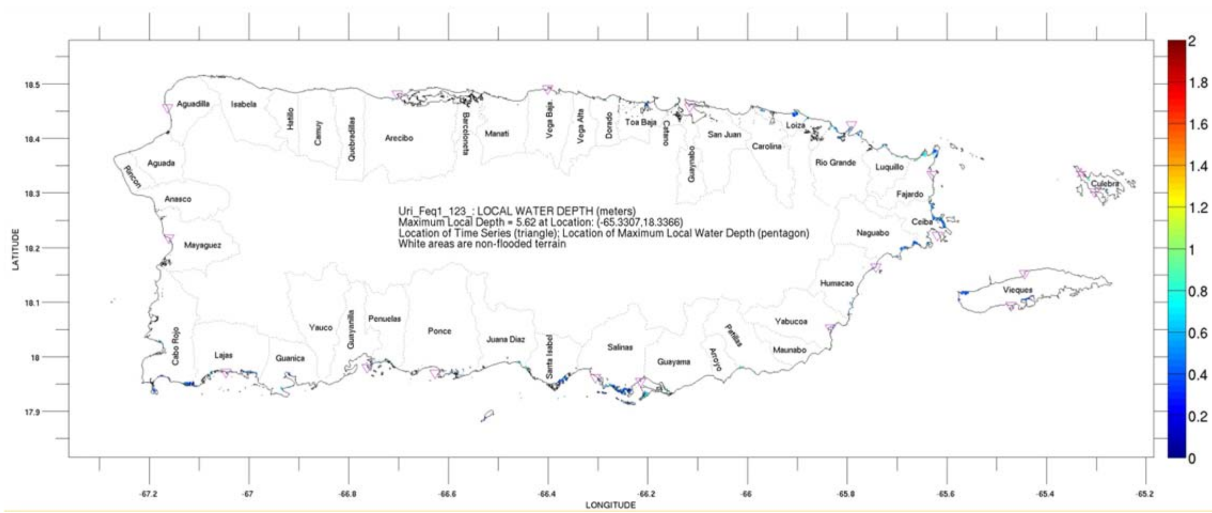


Figure 47 - FEQ1_123 LWD for inundation grids.

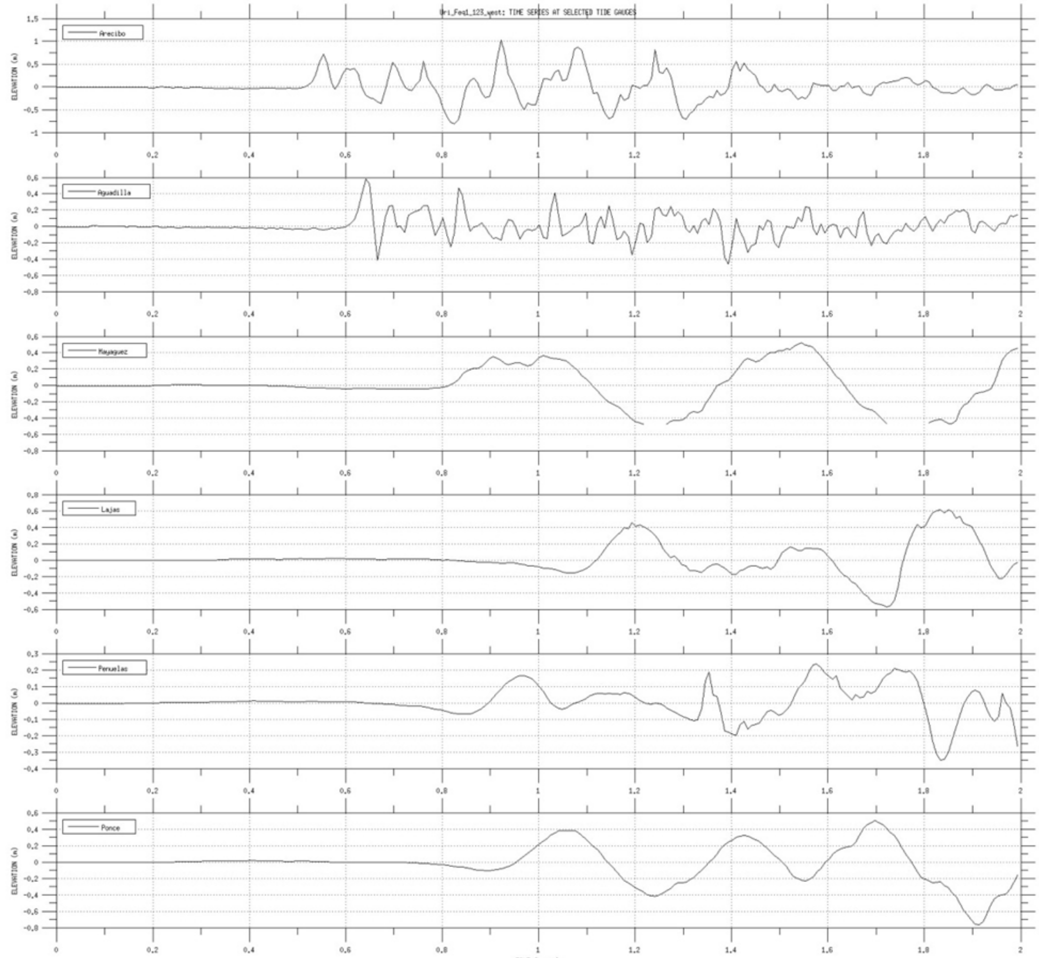


Figure 48 - FEQ1_123 West inundation grid time series.

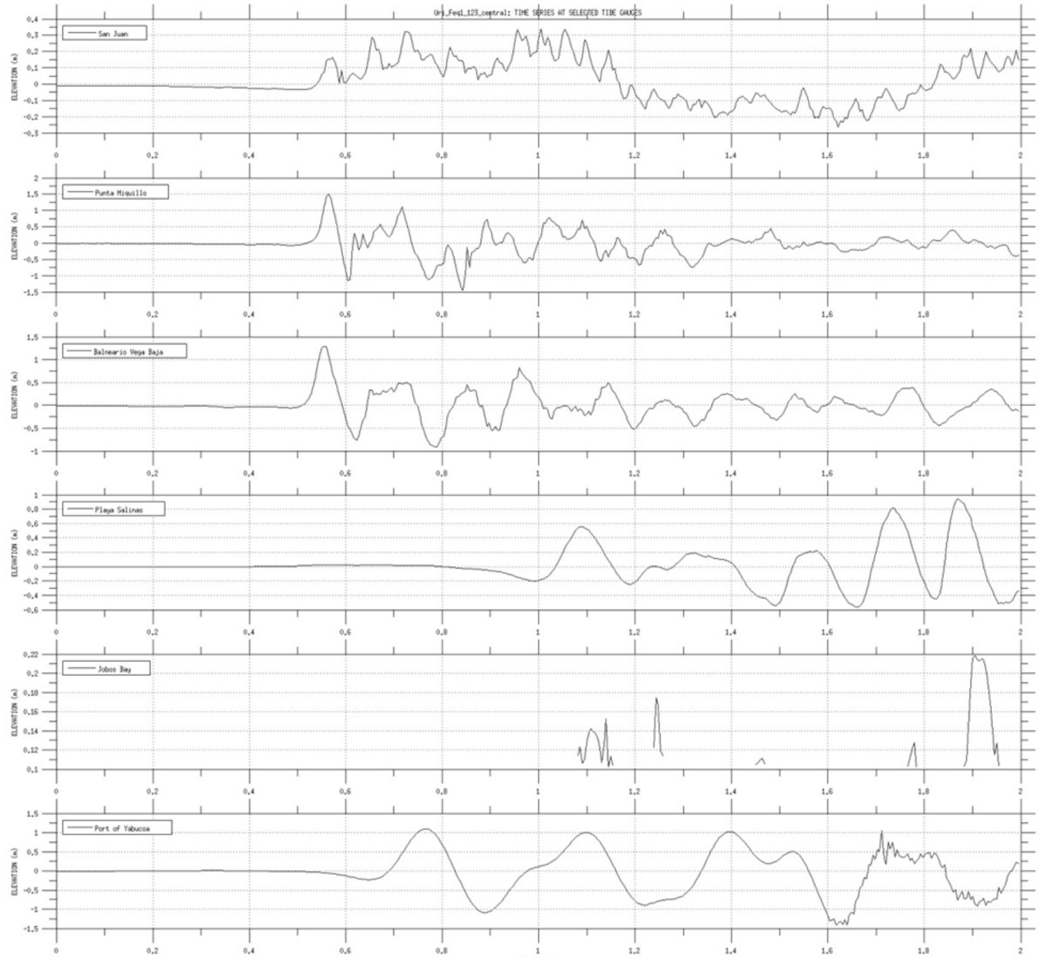


Figure 49 - FEQ1_123 Center inundation grid time series.

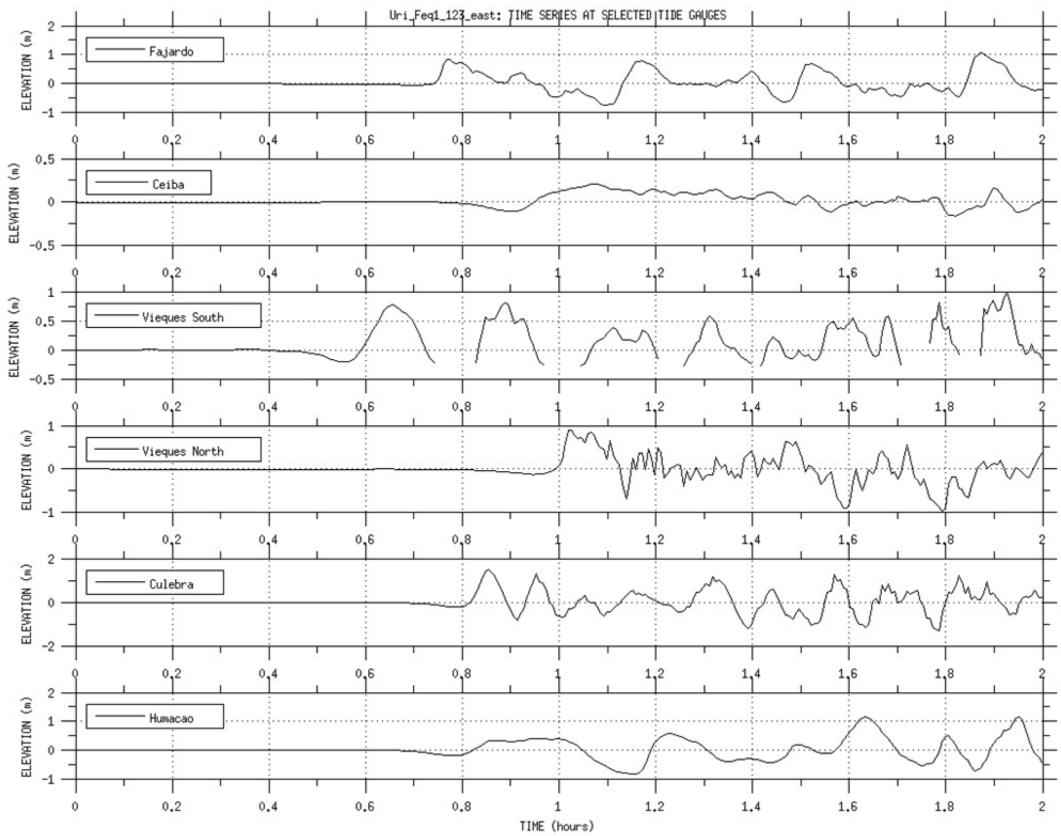


Figure 50 - FEQ1_123 East inundation grid time series.

FEQ1_1234: Input parameter file for generation/propagation run

Segment1:	Segment2:	Segment3:	Segment4:
lat: 18.6272182	lat: 19.024229	lat: 19.7198429	lat: 19.801
lon: -60.395771	lon: -61.0424347	lon: -63.07268	lon: -63.7752
strike: 143	strike: 123	strike: 110	strike: 97
dip: 15	dip: 15	dip: 15	dip: 15
rake: 90	rake: 90	rake: 90	rake: 90
depth: 8.5	depth: 8.5	depth: 8.5	depth: 8.5
length: 204	length: 81	length: 226	length: 74
width: 90	width: 90	width: 90	width: 90
slip: 8.11	slip: 8.11	slip: 8.11	slip: 8.11

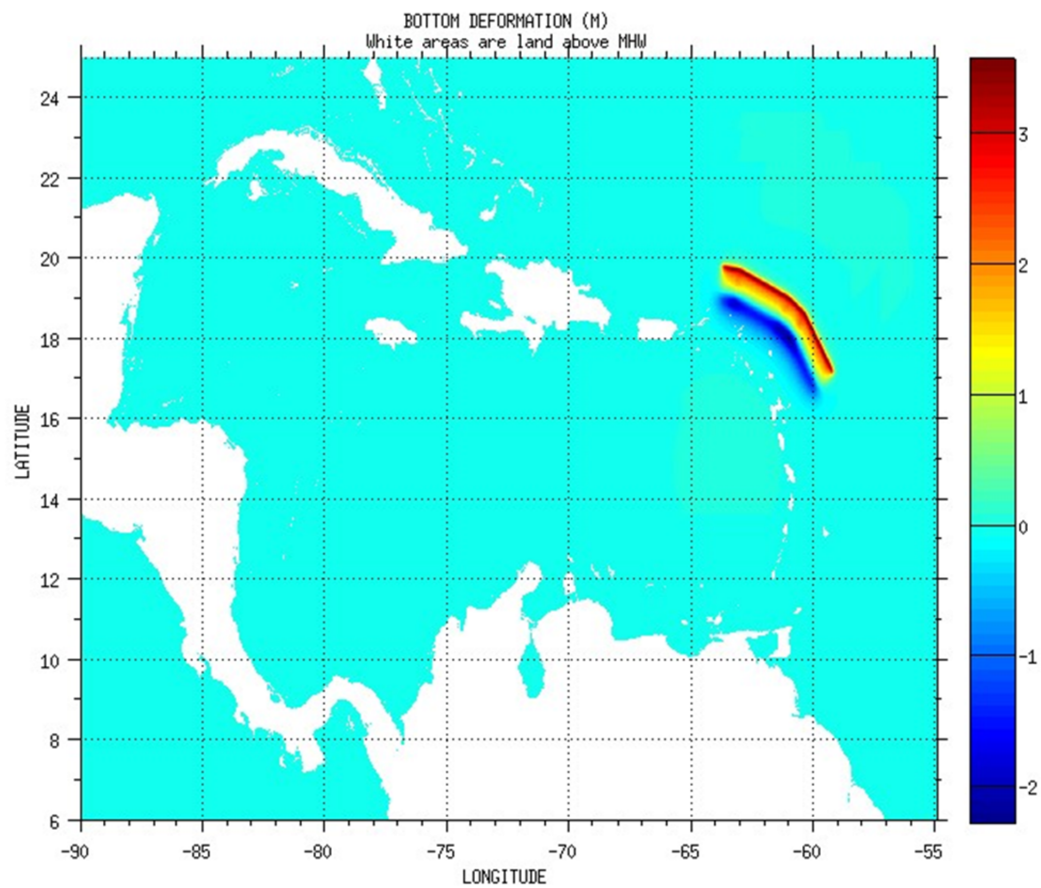


Figure 51 - FEQ1_1234 Bottom deformation.

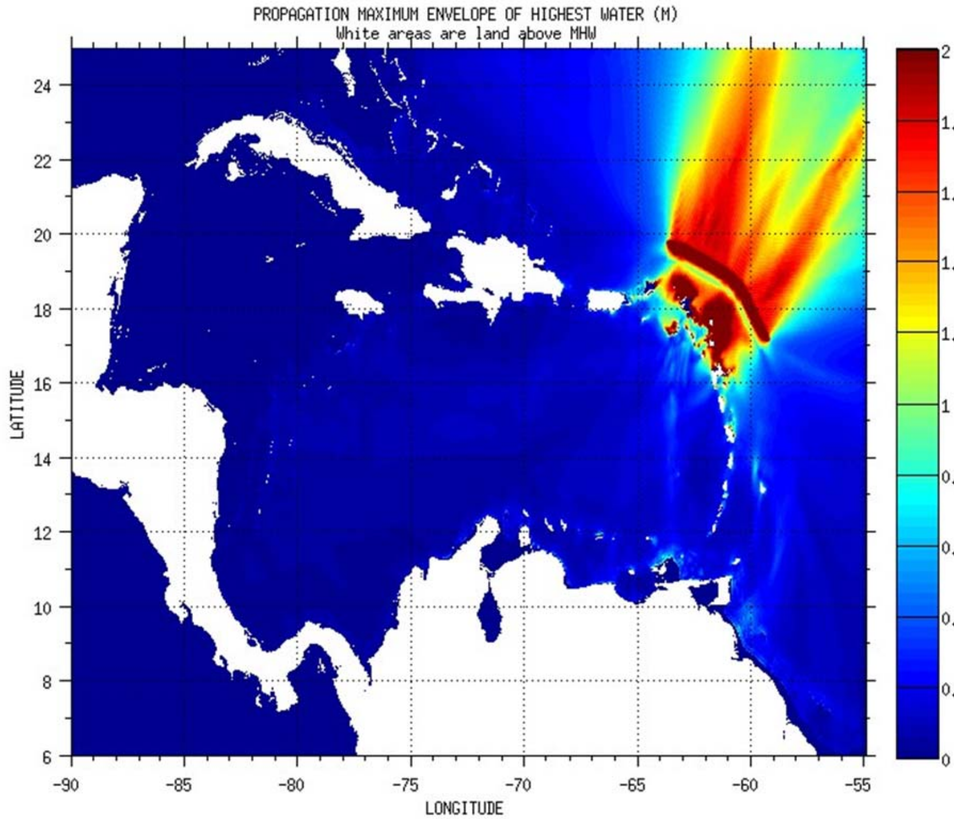


Figure 52 - FEQ1_1234 MEOHW for propagation grid.

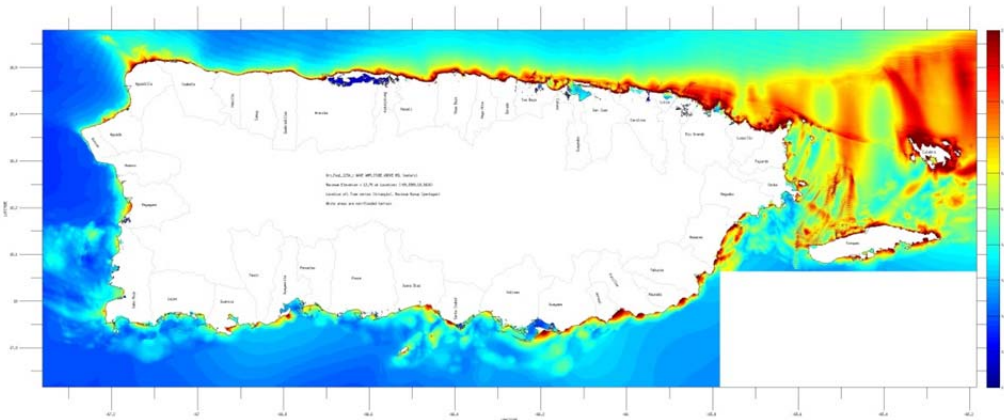


Figure 53 – FEQ1_1234 MEOHW for inundation grids.

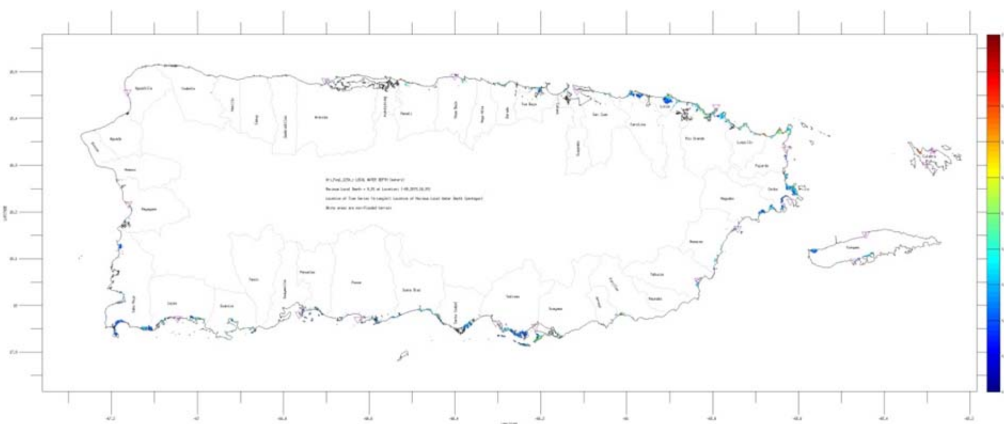


Figure 54 – FEQ1_1234 LWD for inundation grids.

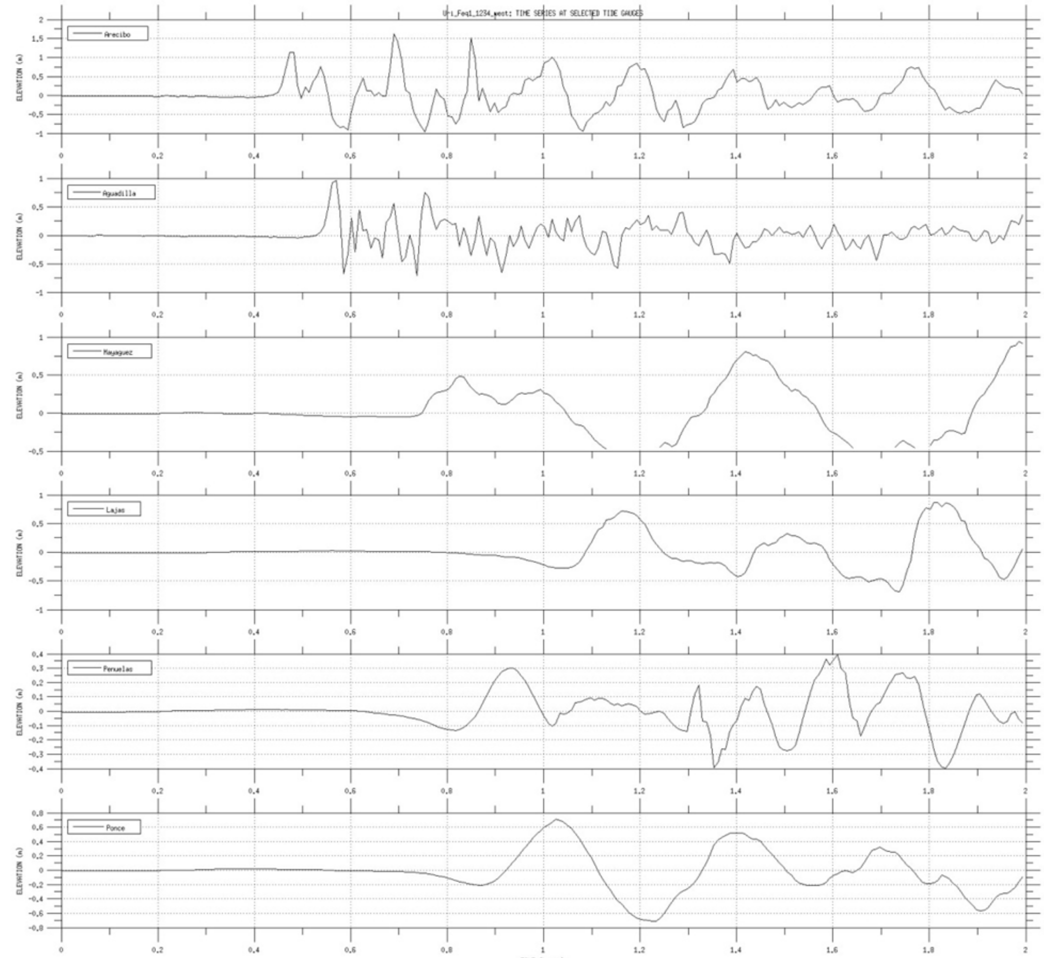


Figure 55 - FEQ1_1234 West inundation grid time series.

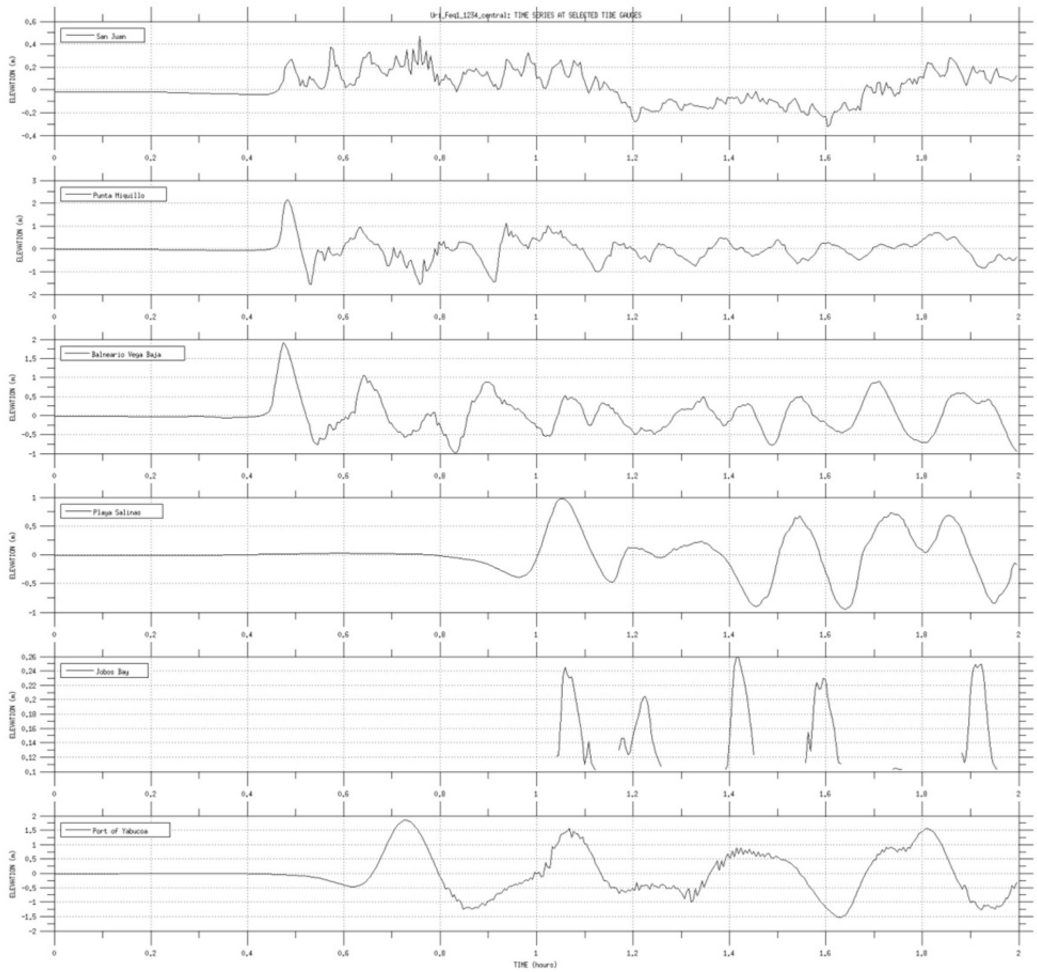


Figure 56 - FEQ1_1234 Center inundation grid time series.

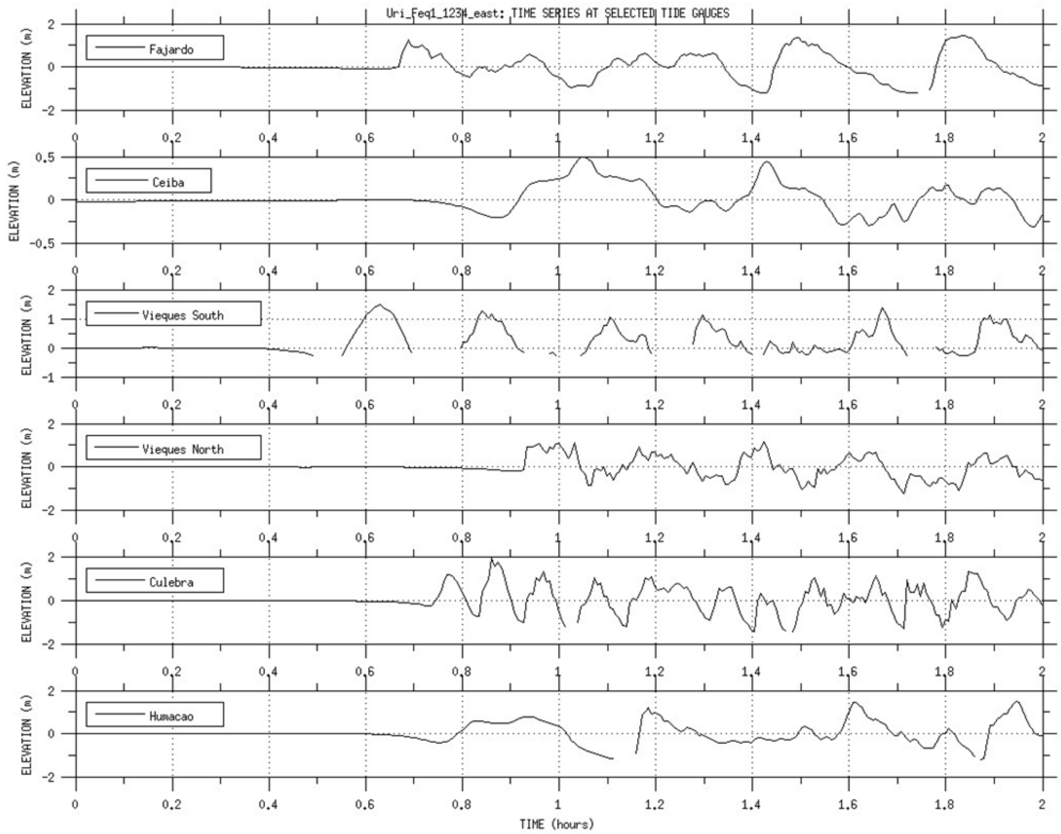


Figure 57 - FEQ1_1234 East inundation grid time series.

FEQ1_23: Input parameter file for generation/propagation run

Segment2: lat: 19.024229 lon: -61.0424347 strike: 123 dip: 15 rake: 90 depth: 8.5 length: 81 width: 90 slip: 8.11	Segment3: lat: 19.7198429 lon: -63.07268 strike: 110 dip: 15 rake: 90 depth: 8.5 length: 226 width: 90 slip: 8.11

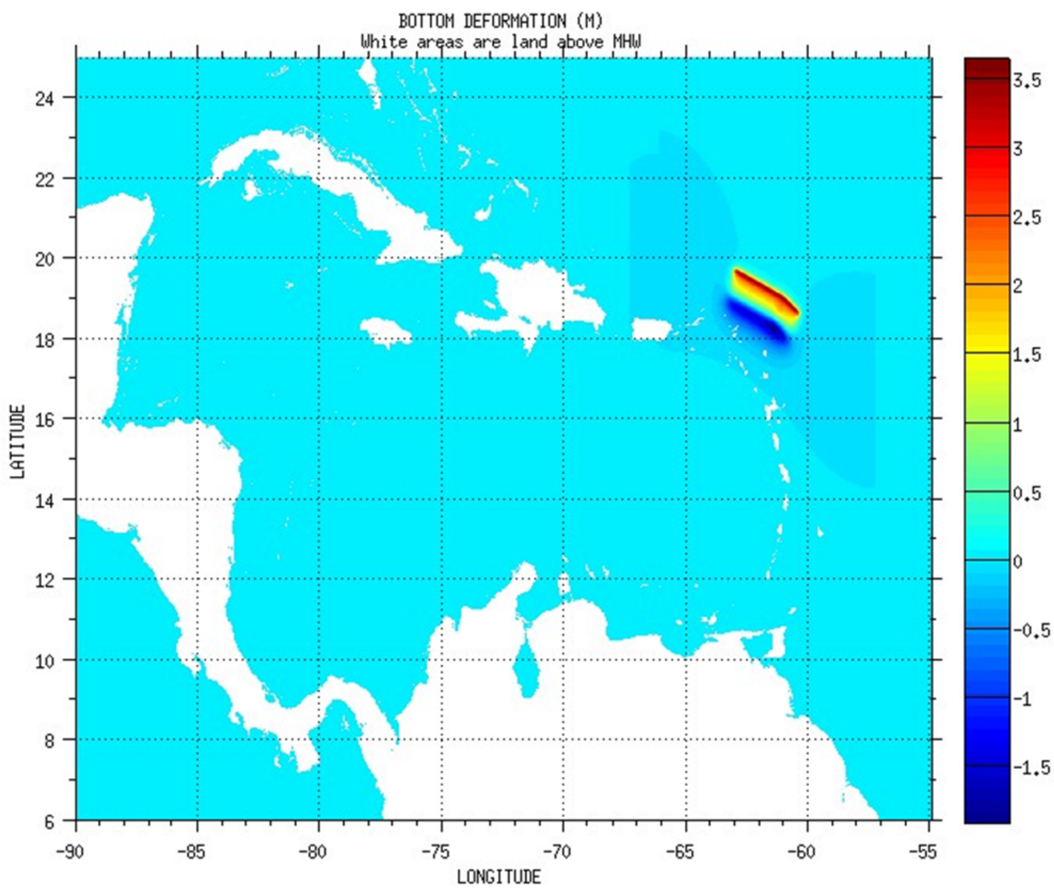


Figure 58 - FEQ1_23 Bottom deformation.

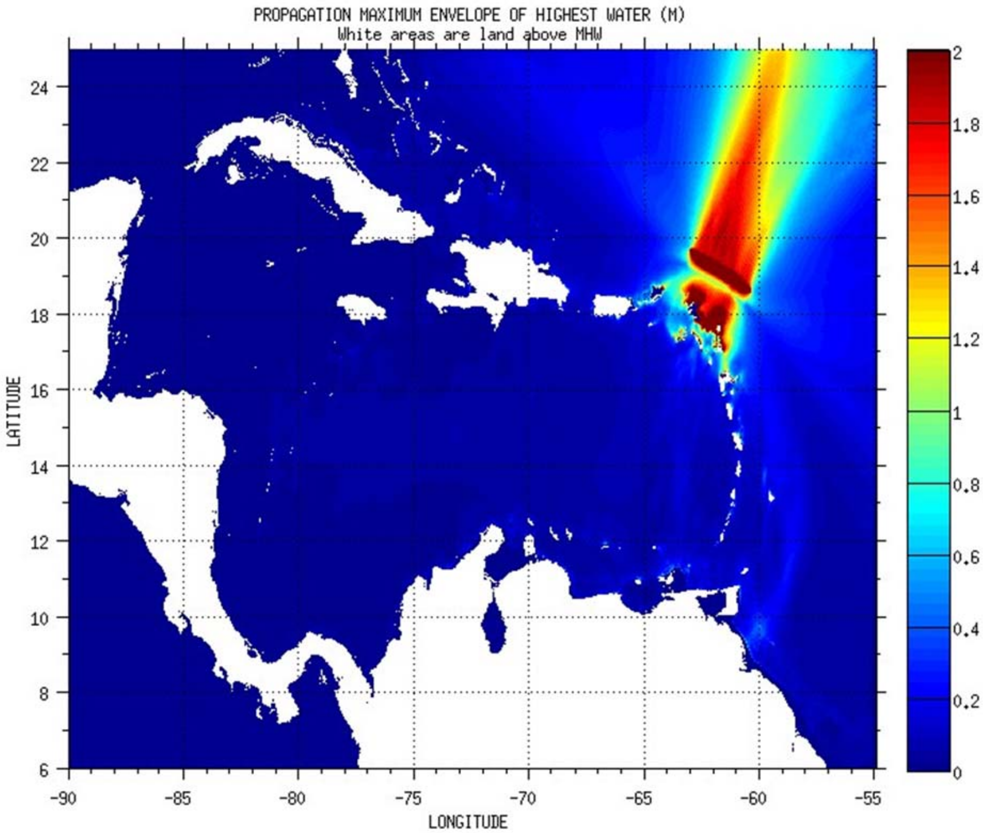


Figure 59 - FEQ1_23 MEOHW for propagation grid.

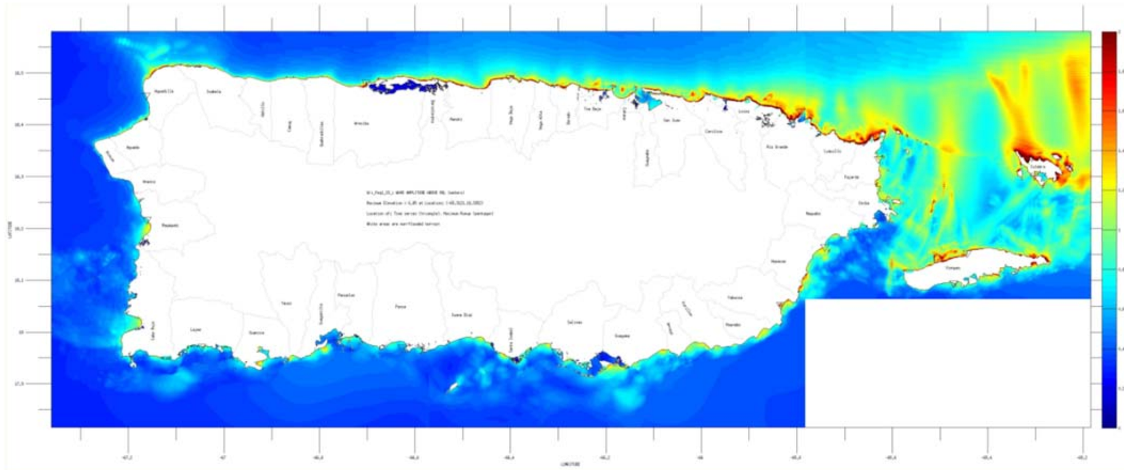


Figure 60 - FEQ1_23 MEOHW for inundation grids.

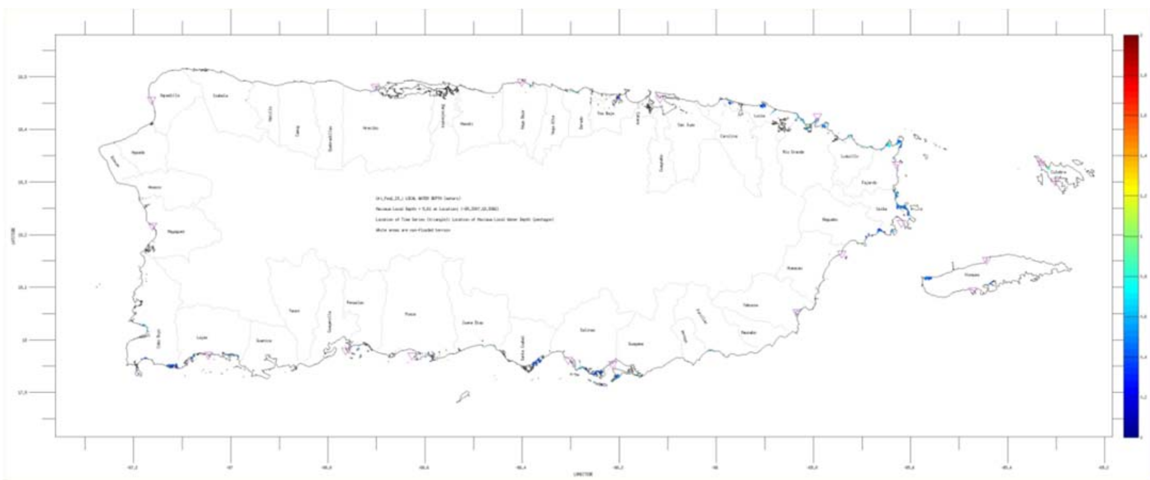


Figure 61- FEQ1_23 LWD for inundation grids.

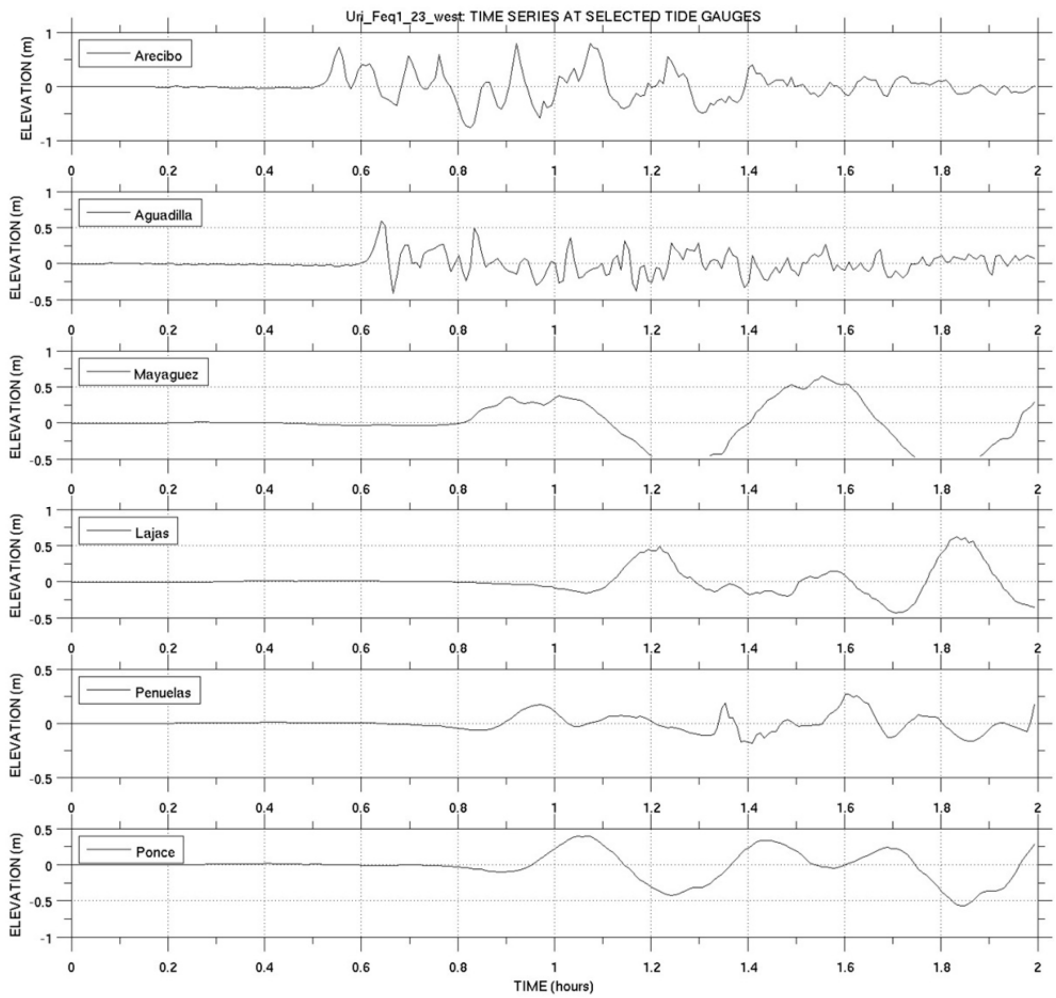


Figure 62 - FEQ1_23 West inundation grid time series.

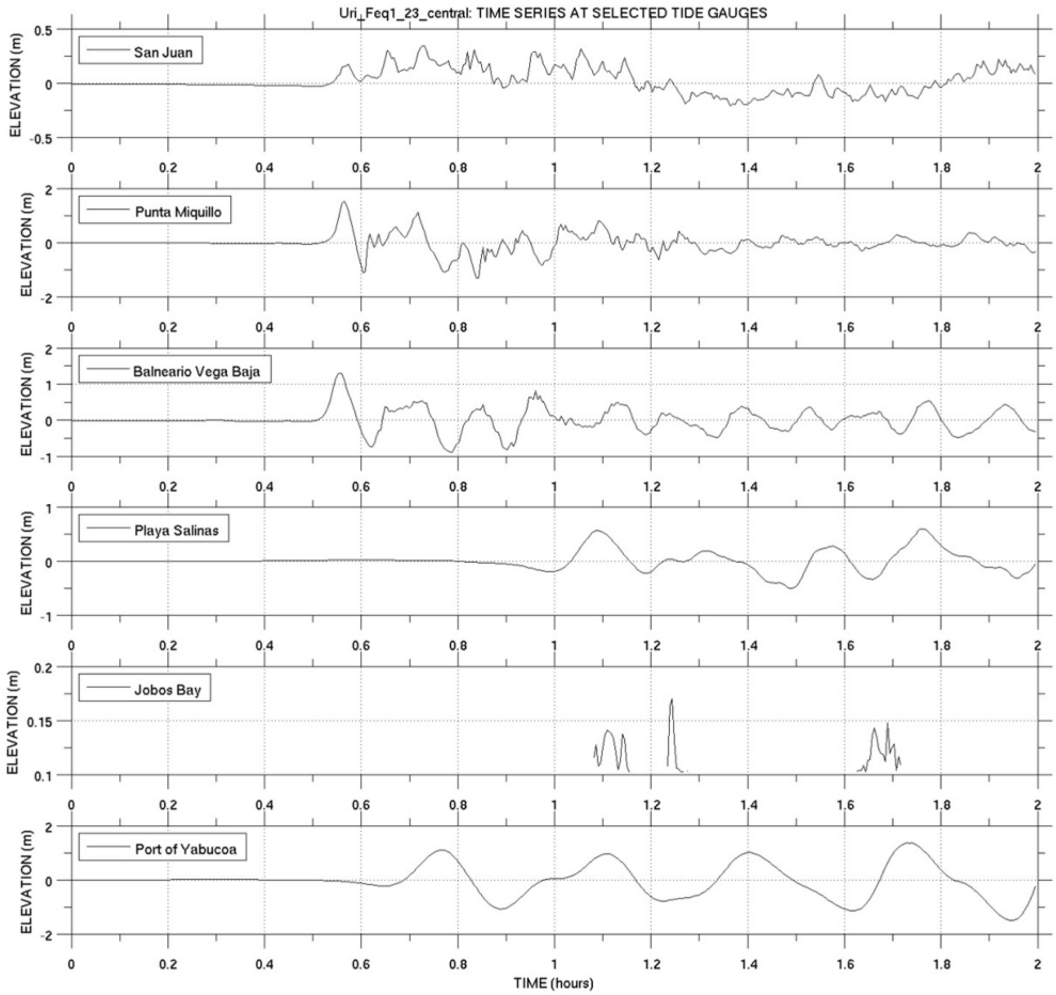


Figure 63 - FEQ1_23 Center inundation grid time series.

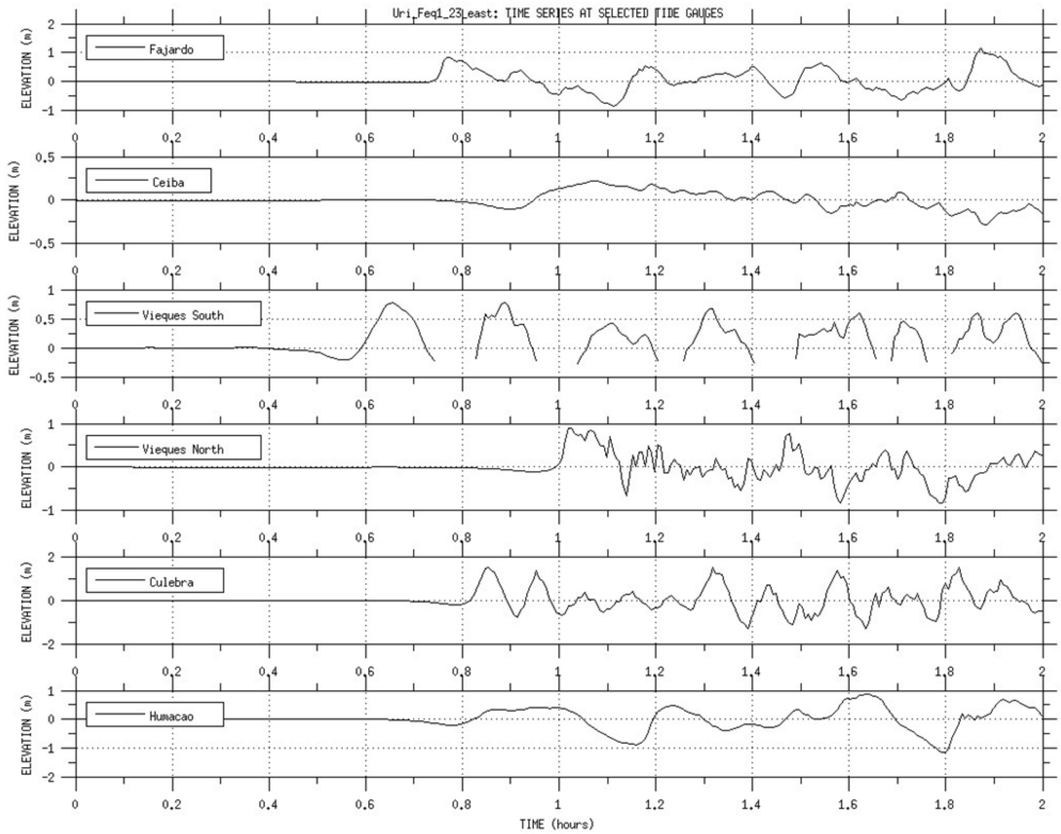


Figure 64 - FEQ1_23 East inundation grid time series.

FEQ1_234: Input parameter file for generation/propagation run

Segment2:	Segment3:	Segment4:
lat: 19.024229	lat: 19.7198429	lat: 19.801
lon: -61.0424347	lon: -63.07268	lon: -63.7752
strike: 123	strike: 110	strike: 97
dip: 15	dip: 15	dip: 15
rake: 90	rake: 90	rake: 90
depth: 8.5	depth: 8.5	depth: 8.5
length: 81	length: 226	length: 74
width: 90	width: 90	width: 90
slip: 8.11	slip: 8.11	slip: 8.11

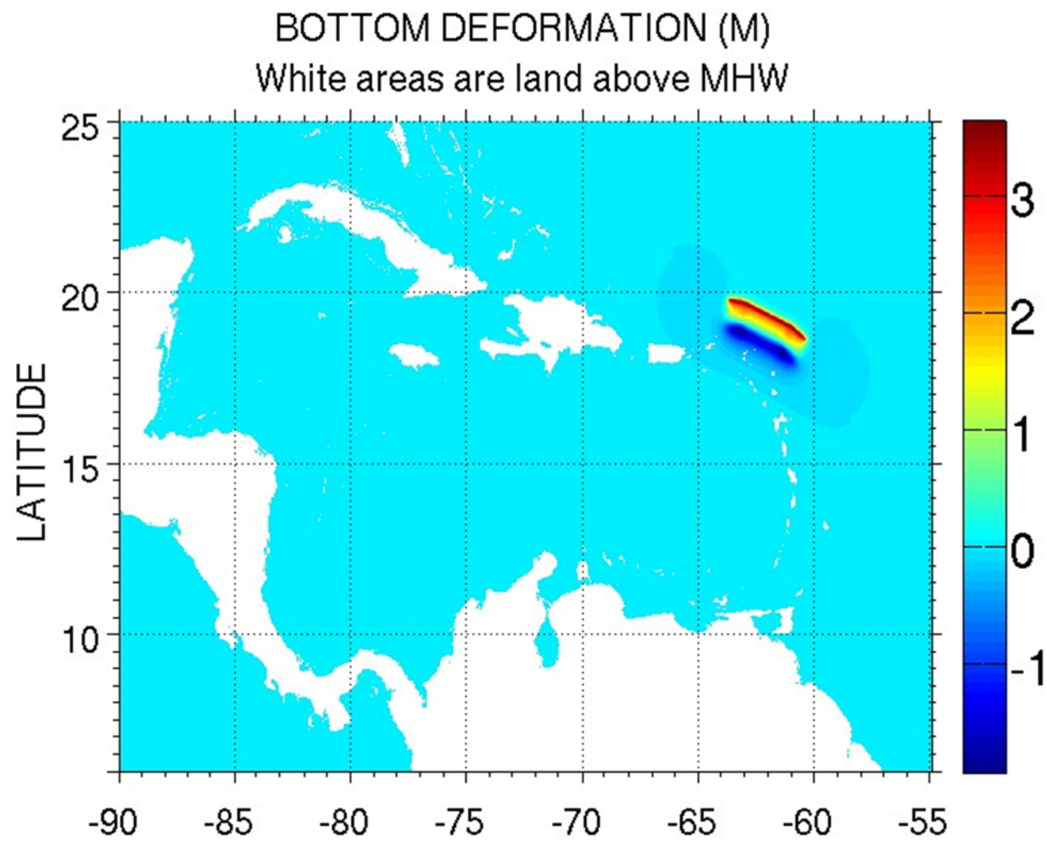


Figure 65 - FEQ1_234 Bottom deformation.

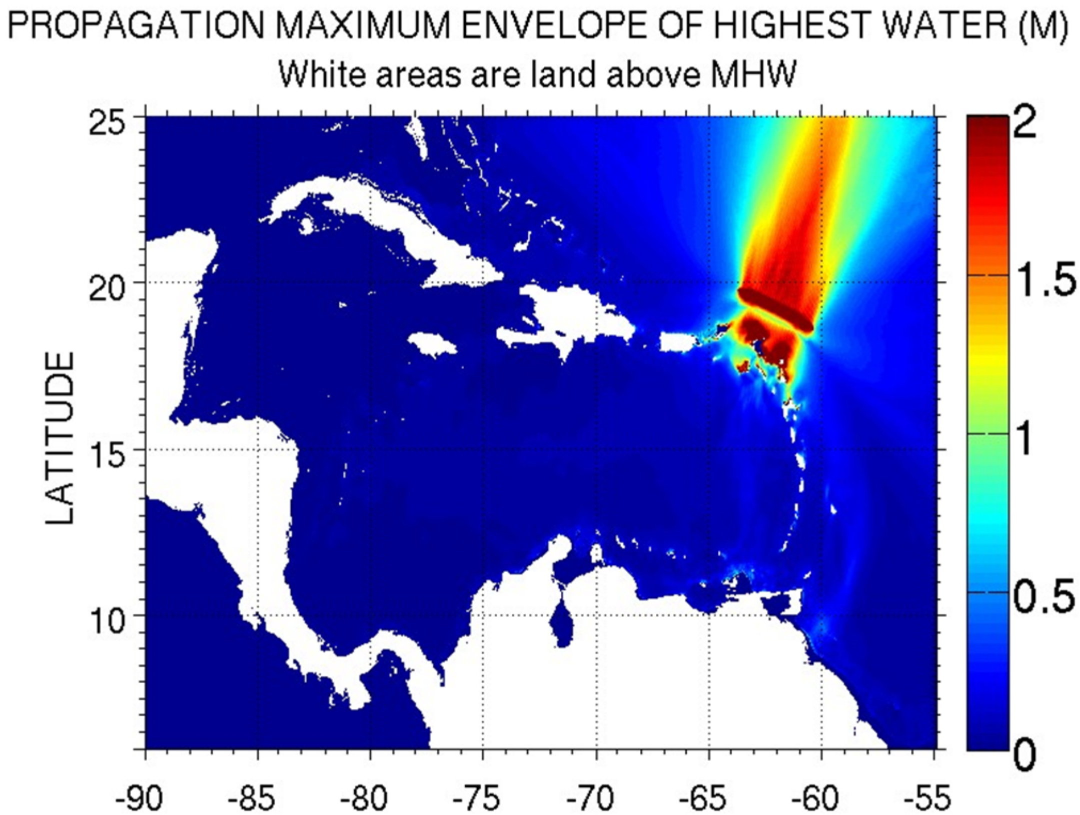


Figure 66 - FEQ1_234 MEOHW for propagation grid.

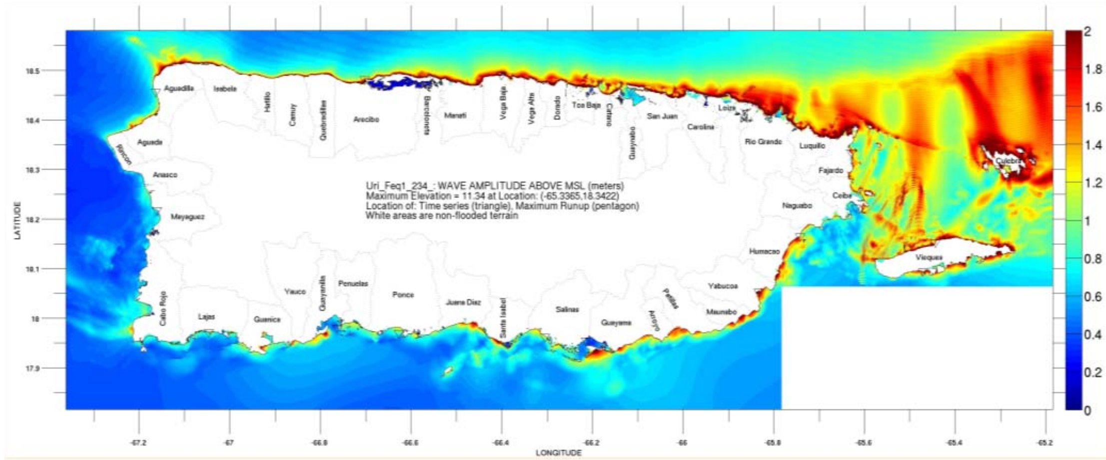


Figure 67 - FEQ1_234 MEOHW for inundation grids.

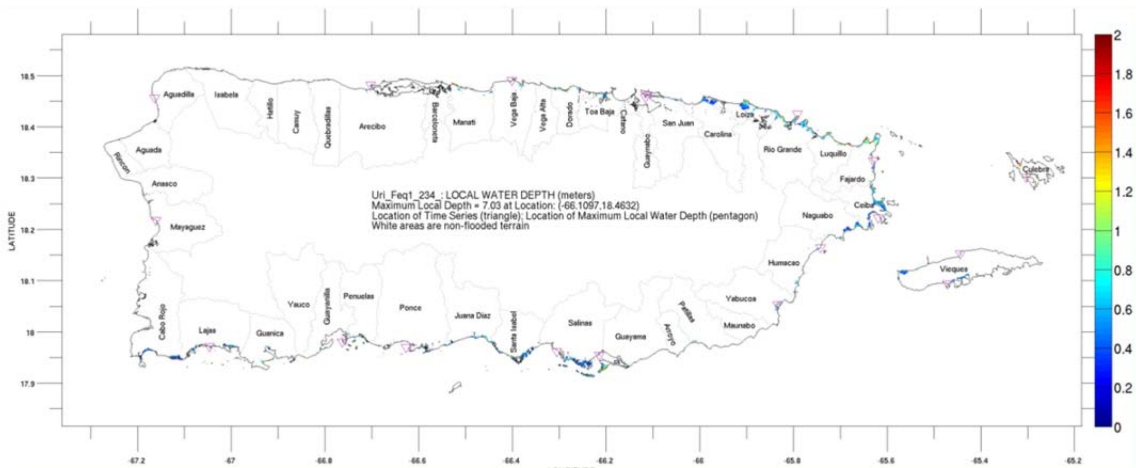


Figure 68 - FEQ1_234 LWD for inundation grids.

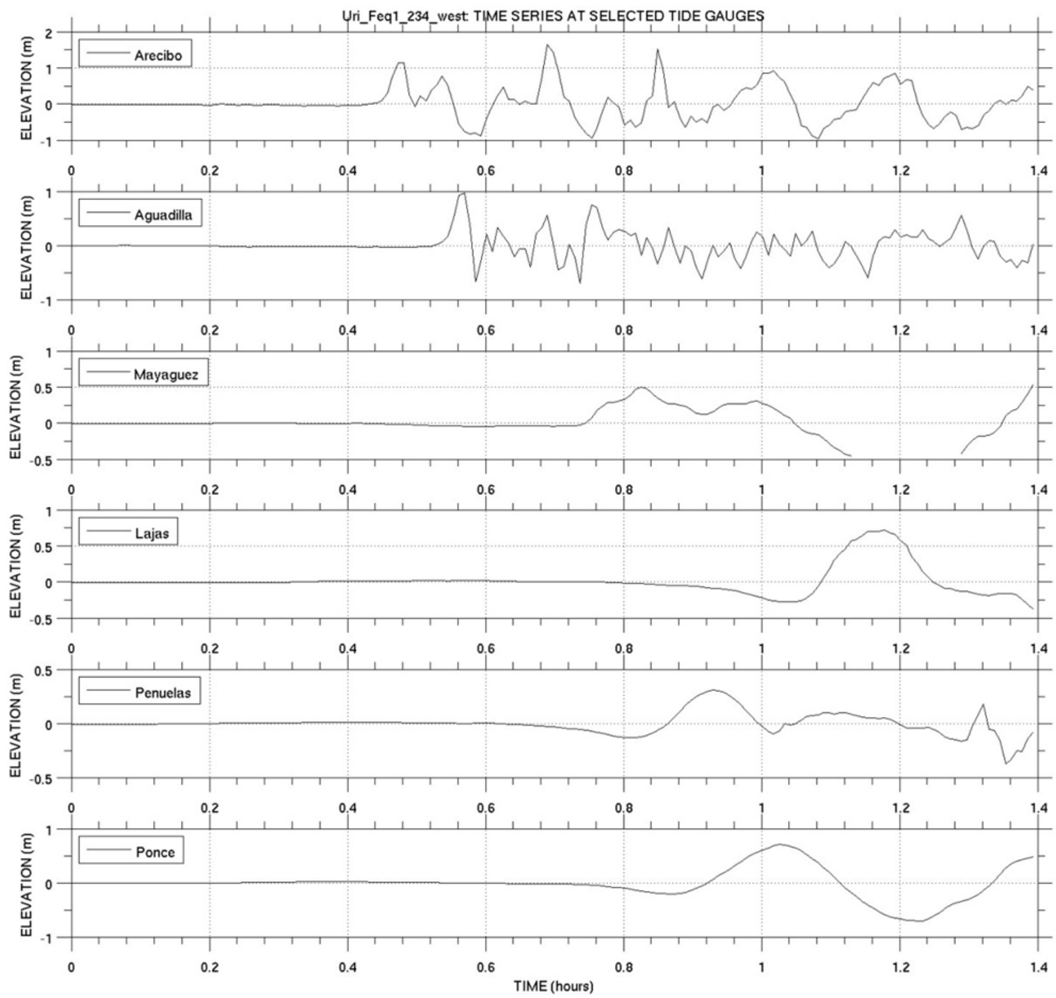


Figure 69 - FEQ1_234 West inundation grid time series.

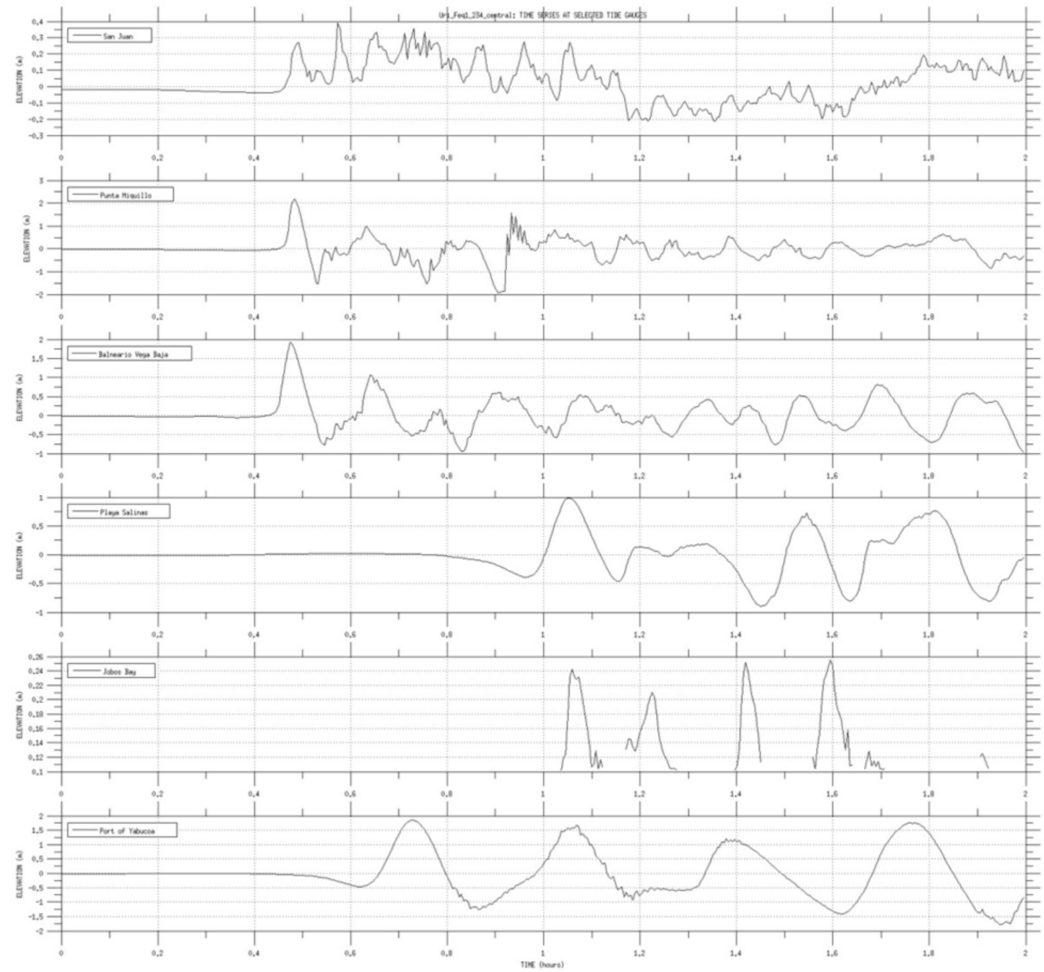


Figure 70 - FEQ1_234 Center inundation grid time series.

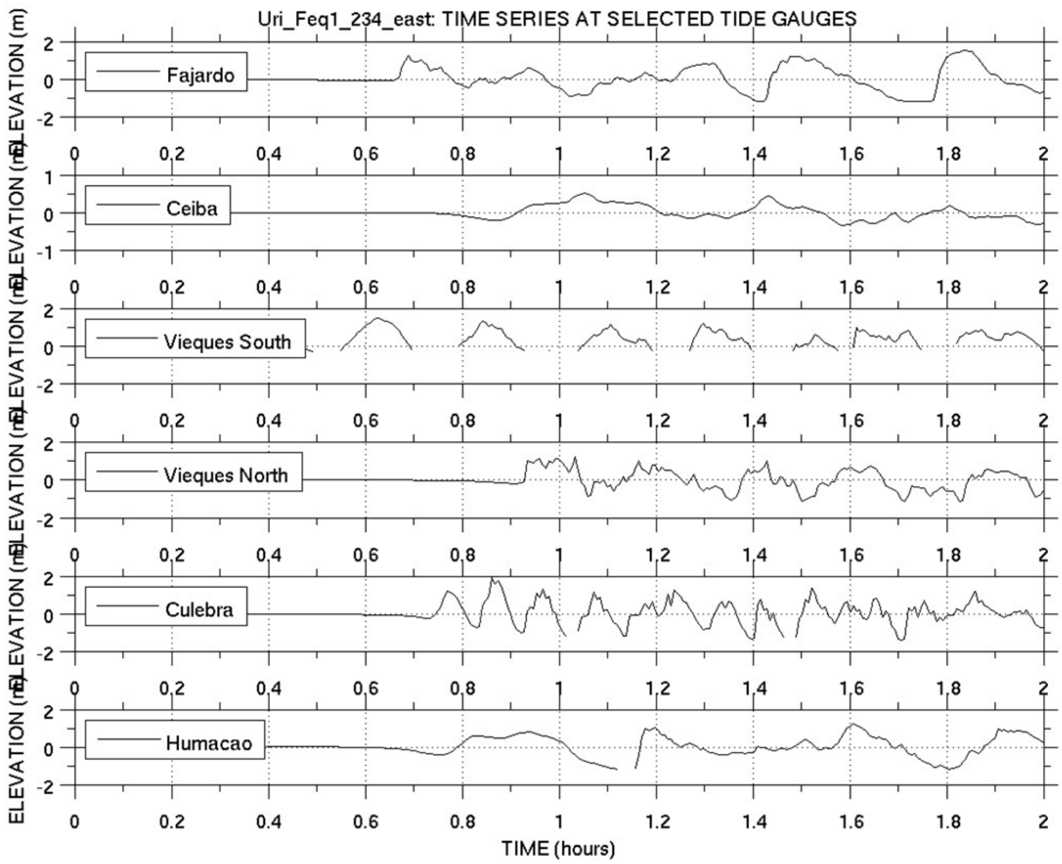


Figure 71 - FEQ1_234 East inundation grid time series.

FEQ1_2345: Input parameter file for generation/propagation run.

Segment2:	Segment3:	Segment4:	Segment5:
lat: 19.024229	lat: 19.7198429	lat: 19.801	lat: 19.850
lon: -61.0424347	lon: -63.07268	lon: -63.7752	lon: -64.270
strike: 123	strike: 110	strike: 97	strike: 96
dip: 15	dip: 15	dip: 15	dip: 15
rake: 90	rake: 90	rake: 90	rake: 90
depth: 8.5	depth: 8.5	depth: 8.5	depth: 8.5
length: 81	length: 226	length: 74	length: 52
width: 90	width: 90	width: 90	width: 90
slip: 8.11	slip: 8.11	slip: 8.11	slip: 8.11

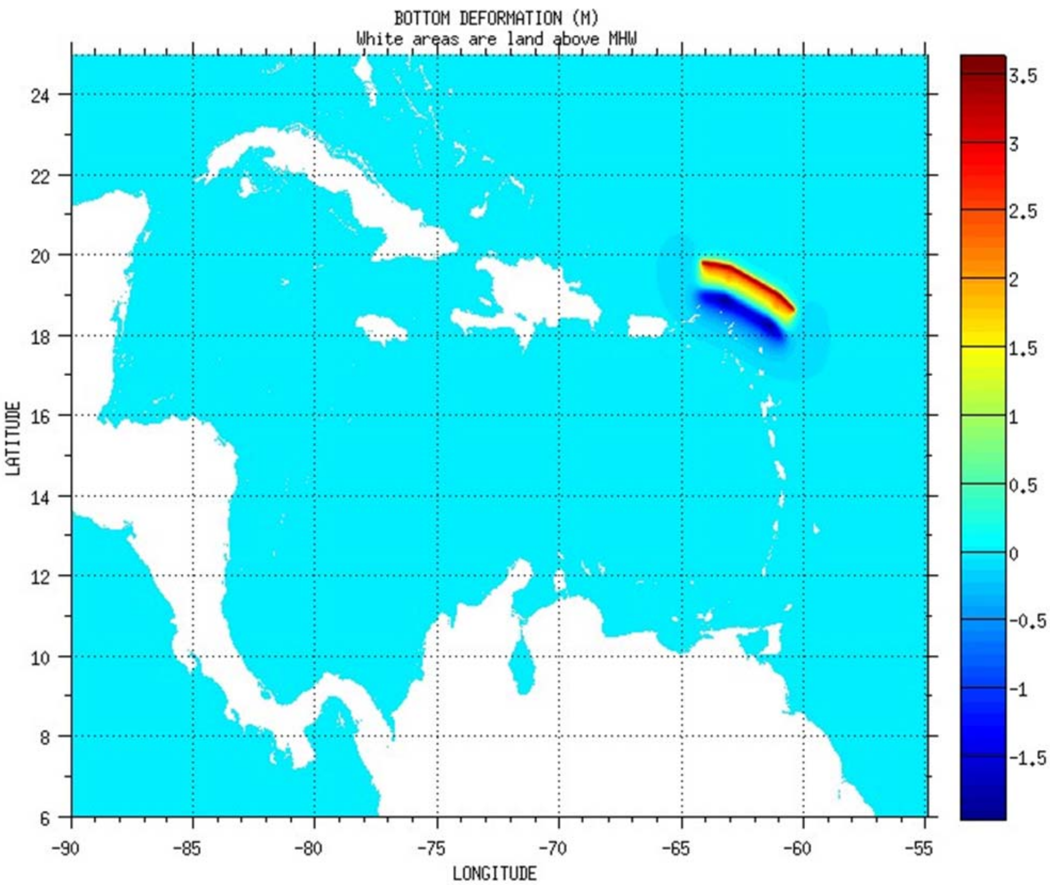


Figure 72 - FEQ1_2345 Bottom deformation.

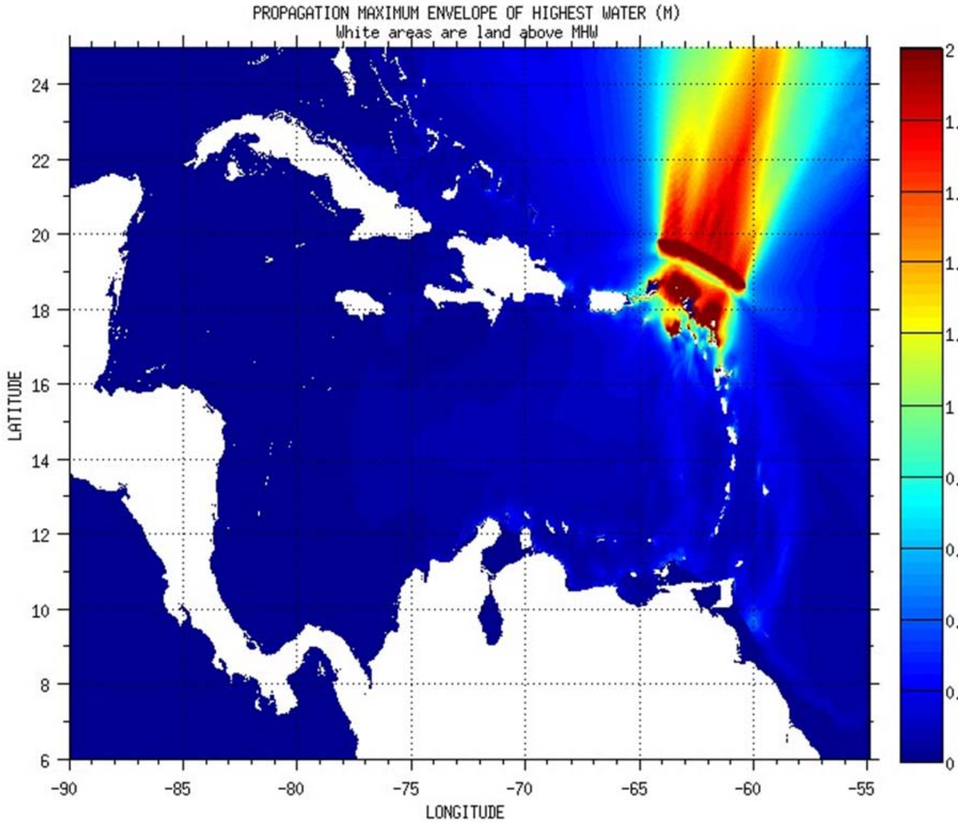


Figure 73 - FEQ1_2345 MEOHW for propagation grid.

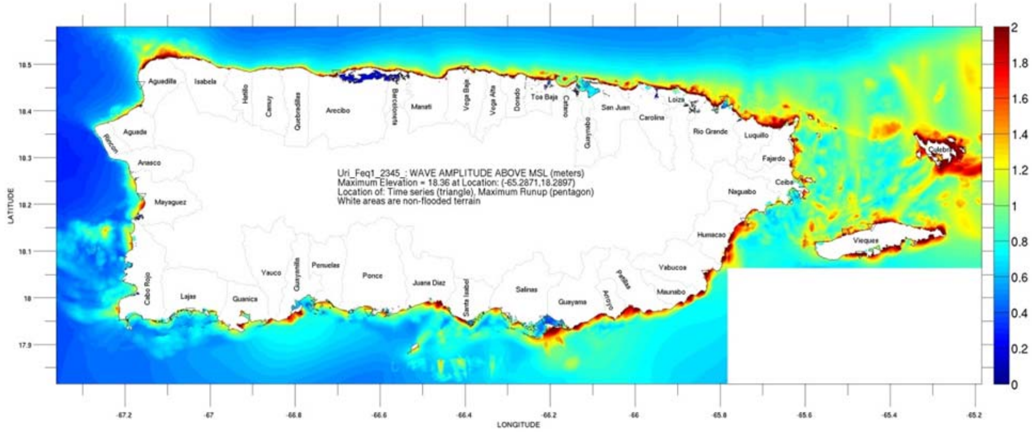


Figure 74 – FEQ1_2345 MEOHW for inundation grids.

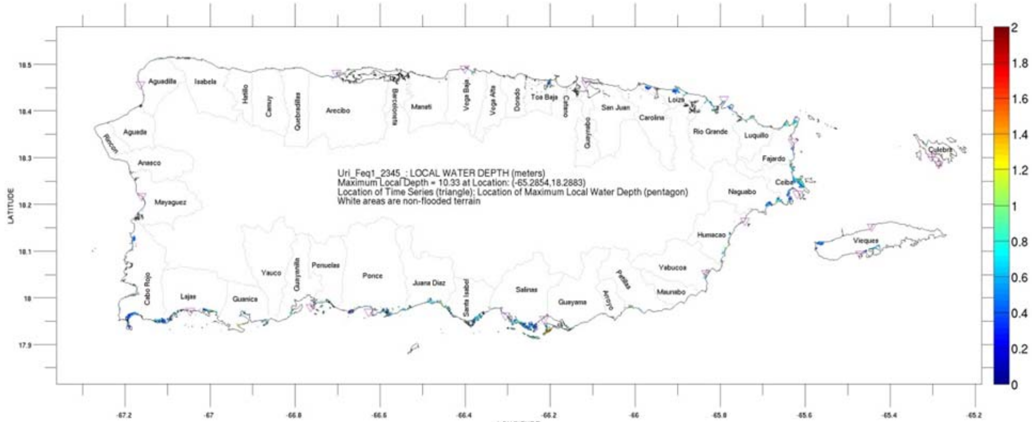


Figure 75 – FEQ1_2345 LWD for inundation grids.

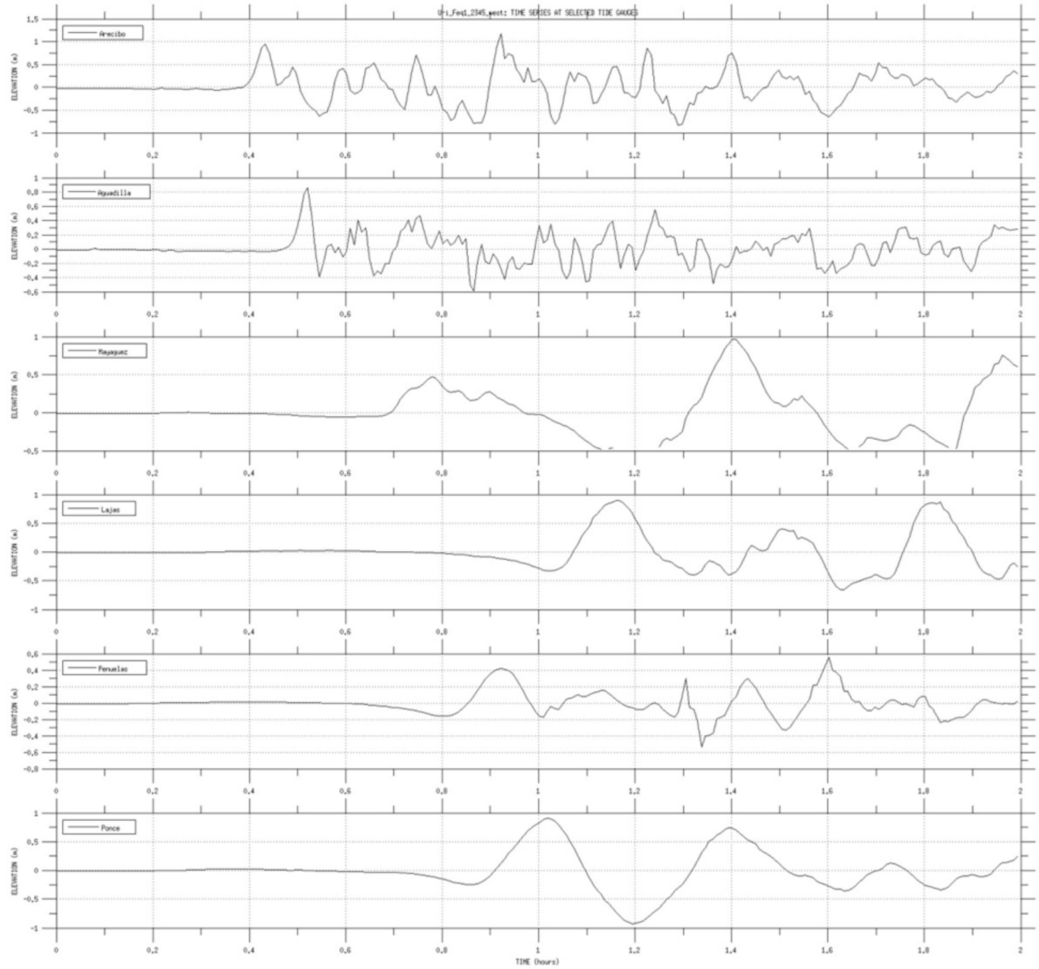


Figure 76 - FEQ1_2345 West inundation grid time series.

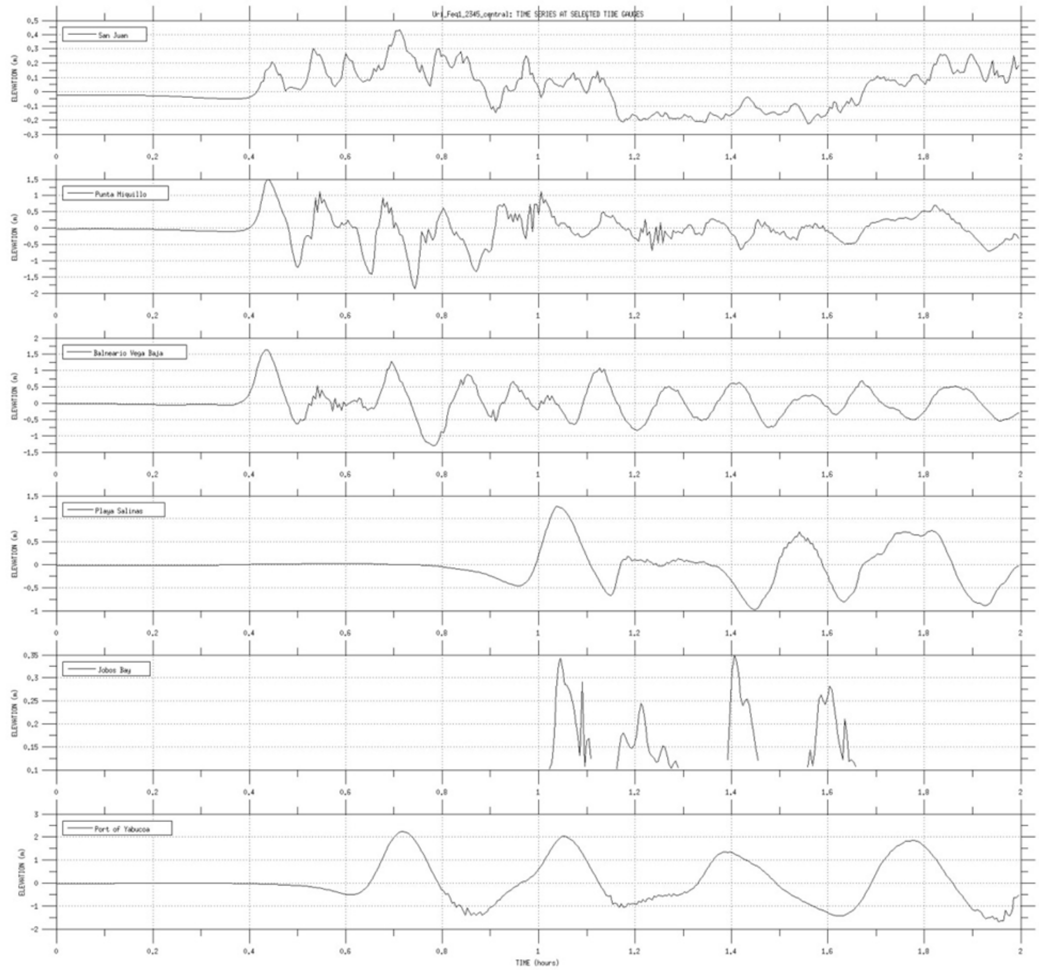


Figure 77 - FEQ1_2345 Center inundation grid time series.

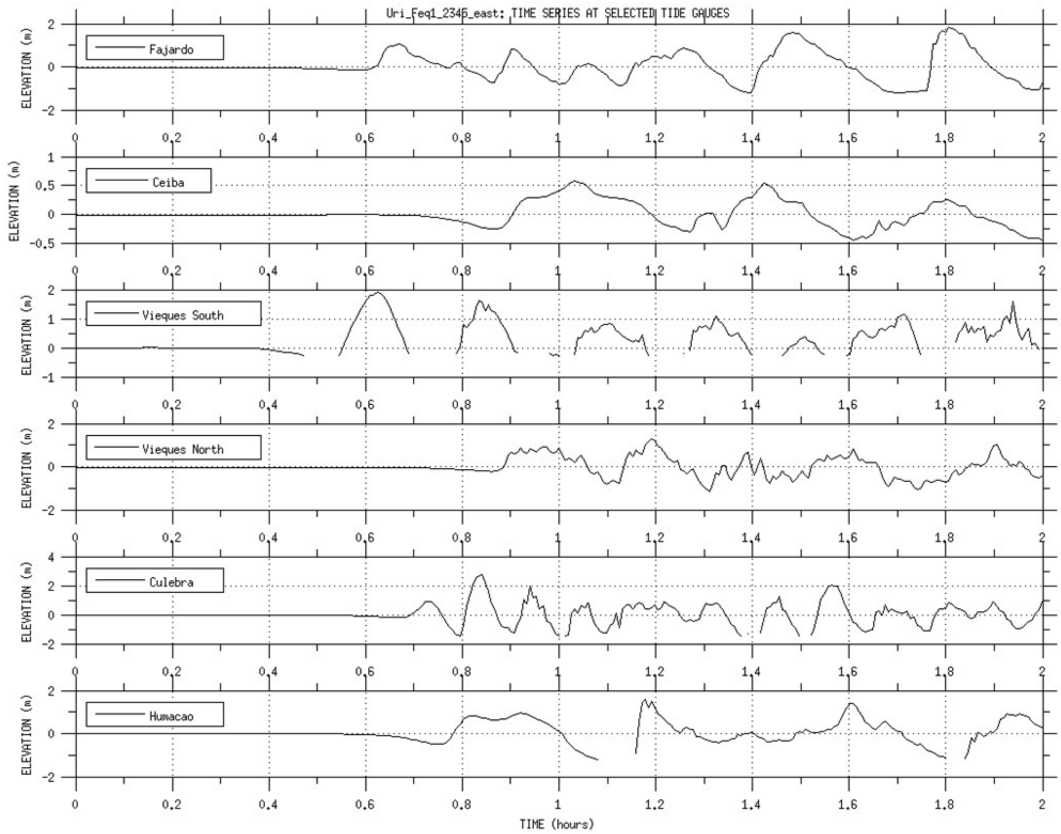


Figure 78 - FEQ1_2345 East inundation grid time series.

FEQ1_34: Input parameter file for generation/propagation run.

Segment3:	Segment4:
lat: 19.7198429 lon: -63.07268 strike: 110 dip: 15 rake: 90 depth: 8.5 length: 226 width: 90 slip: 8.11	lat: 19.801 lon: -63.7752 strike: 97 dip: 15 rake: 90 depth: 8.5 length: 74 width: 90 slip: 8.11

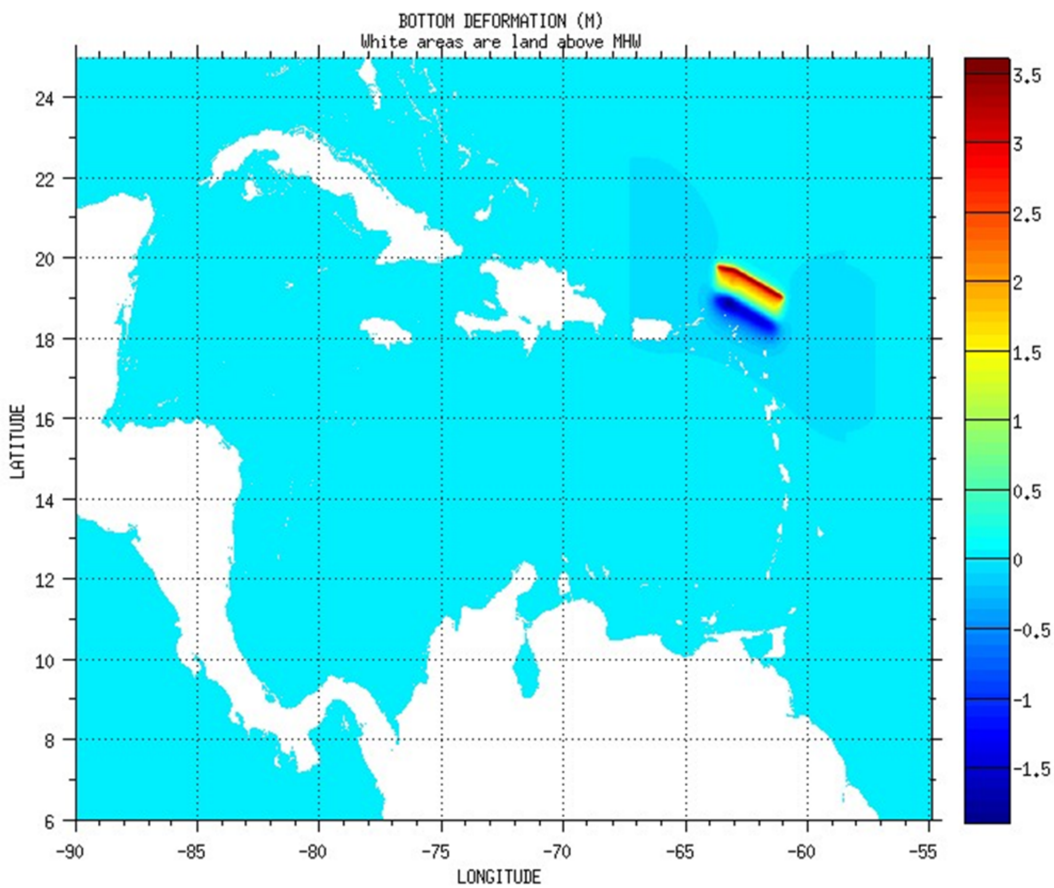


Figure 79 - FEQ1_34 Bottom deformation.

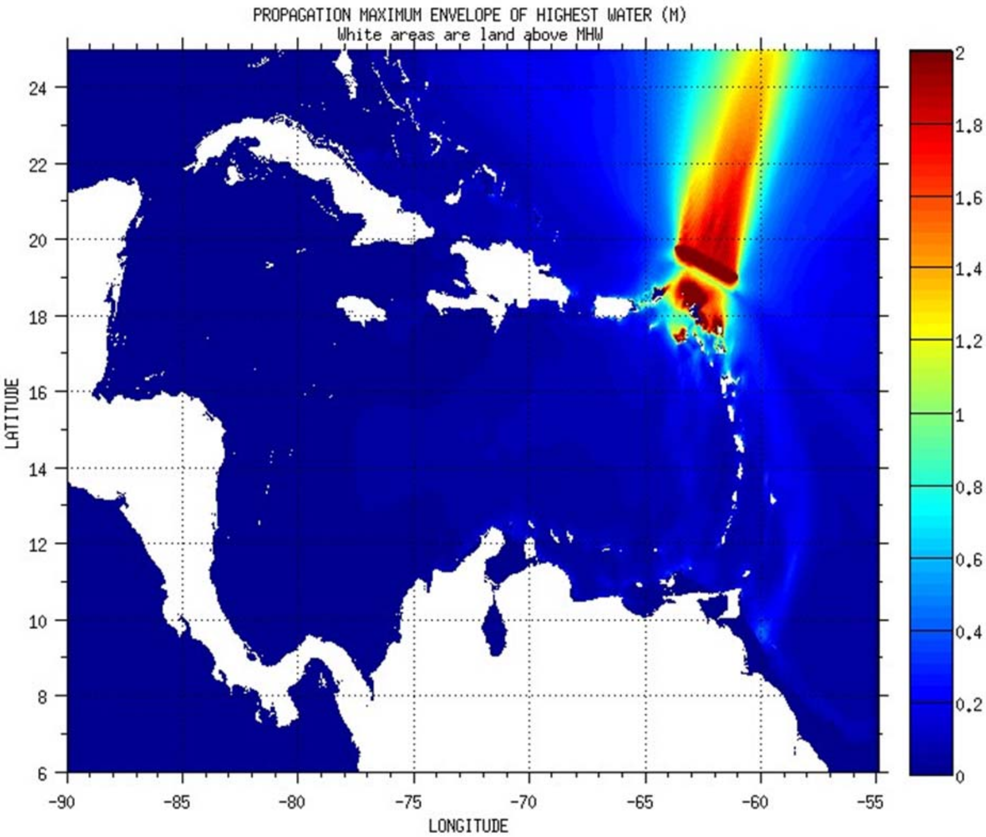


Figure 80 - FEQ1_34 MEOHW for propagation grid.

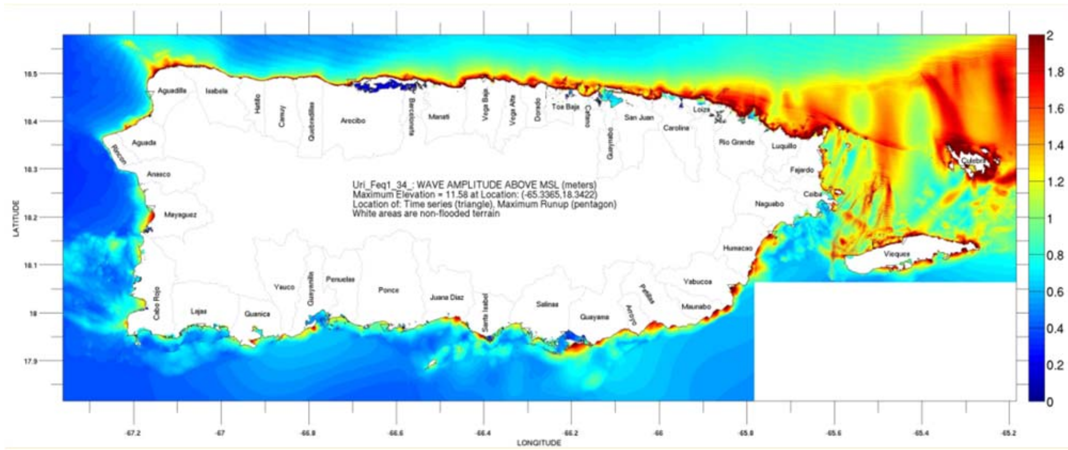


Figure 81 – FEQ1_34 MEOHW for inundation grids.

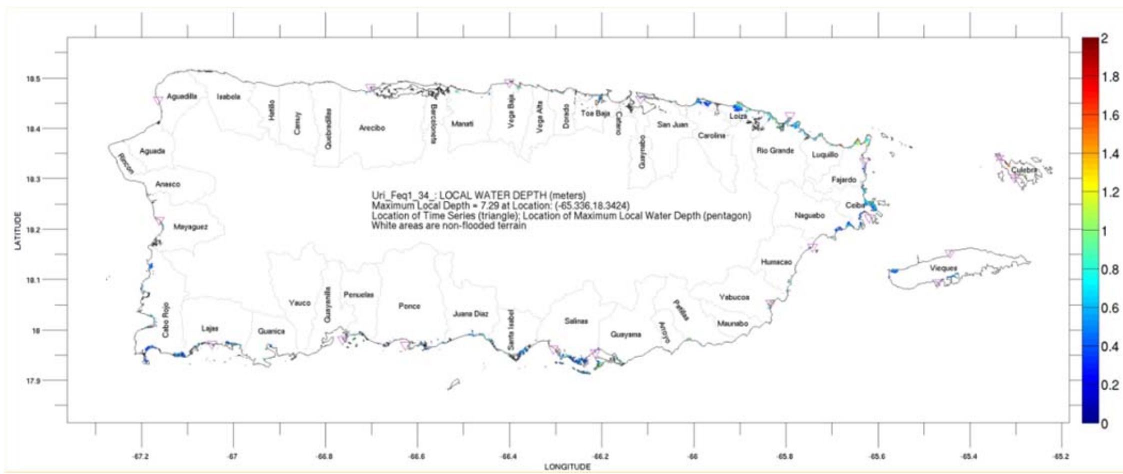


Figure 82 – FEQ1_34 LWD for inundation grids.

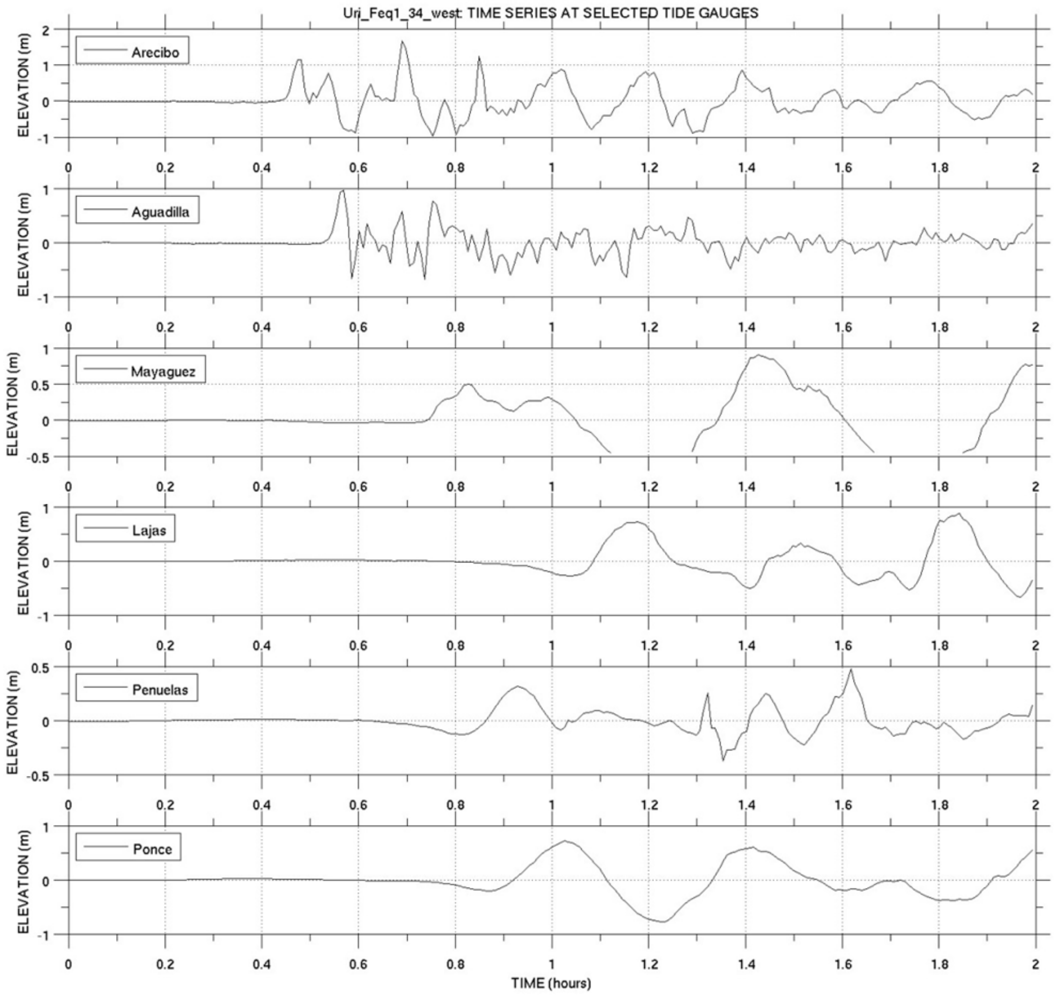


Figure 83 - FEQ1_34 West inundation grid time series.

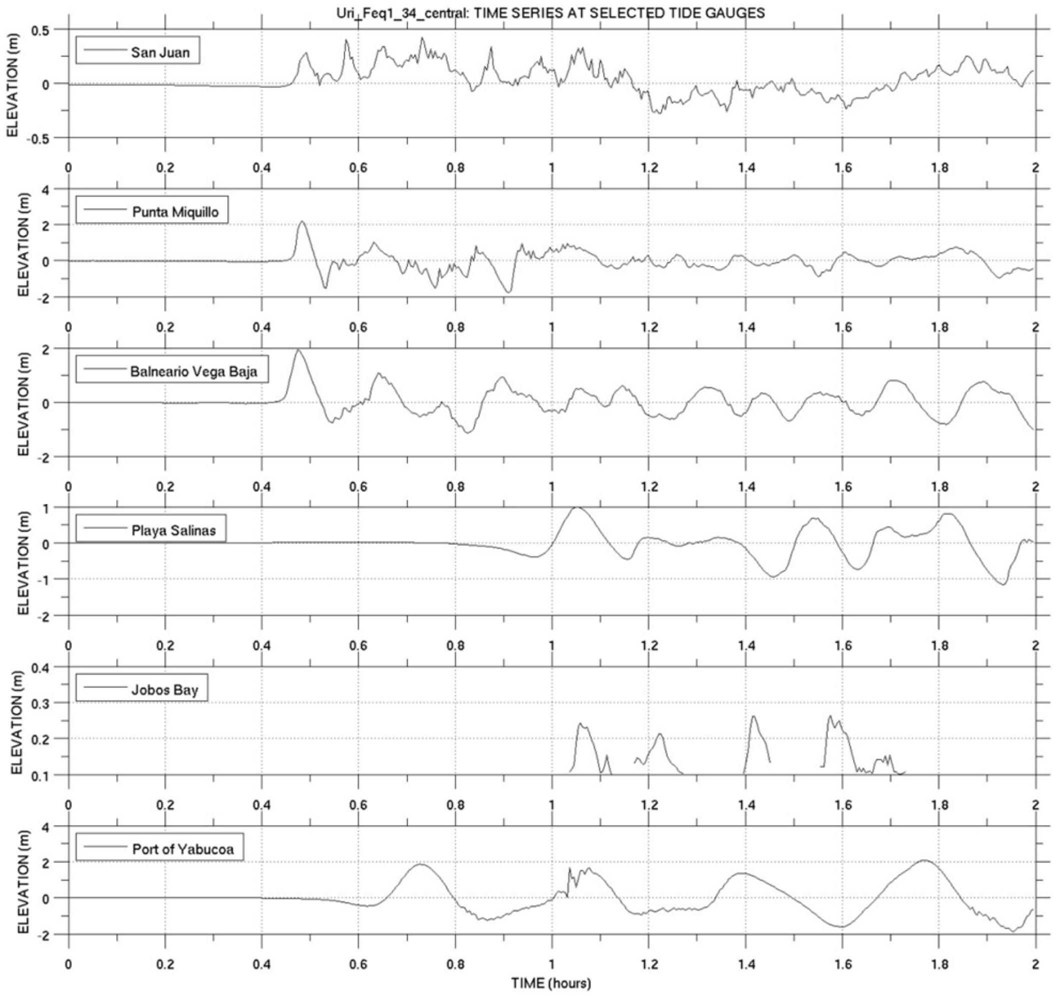


Figure 84 - FEQ1_34 Center inundation grid time series.

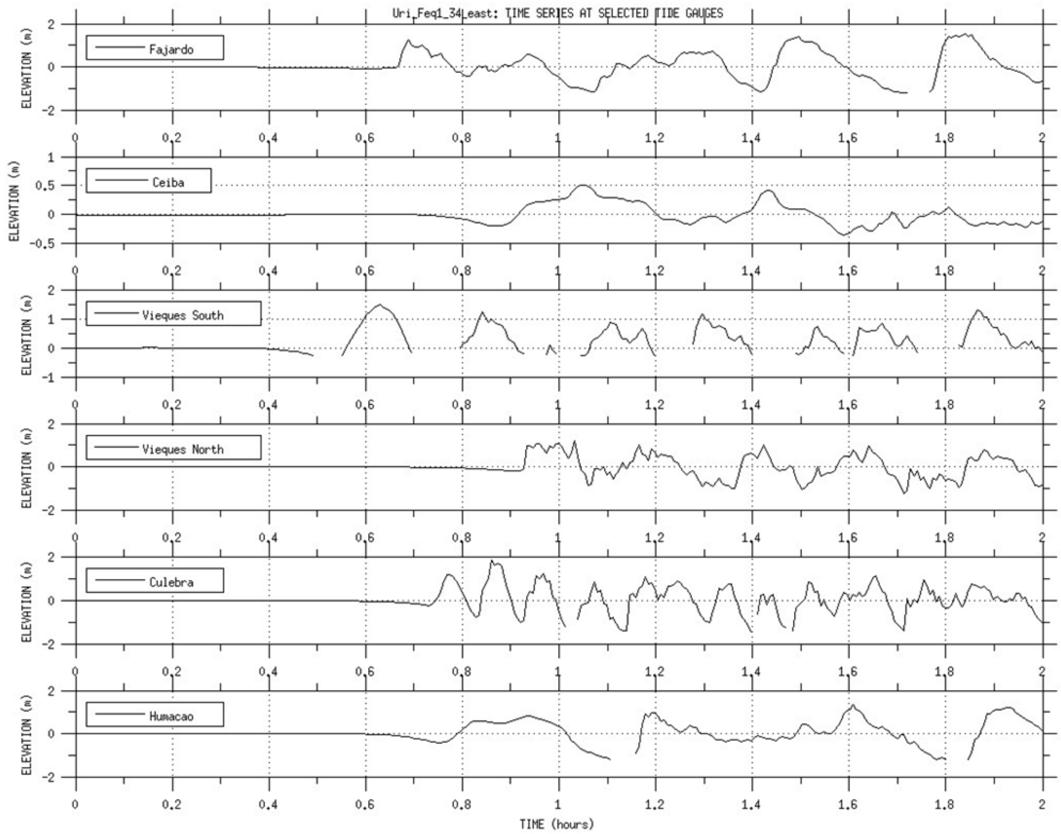


Figure 85 - FEQ1_34 East inundation grid time series.

FEQ1_345: Input parameter file for generation/propagation run.

Segment3: lat: 19.7198429 lon: -63.07268 strike: 110 dip: 15 rake: 90 depth: 8.5 length: 226 width: 90 slip: 8.11	Segment4: lat: 19.801 lon: -63.7752 strike: 97 dip: 15 rake: 90 depth: 8.5 length: 74 width: 90 slip: 8.11	Segment5: lat: 19.850 lon: -64.270 strike: 96 dip: 15 rake: 90 depth: 8.5 length: 52 width: 90 slip: 8.11

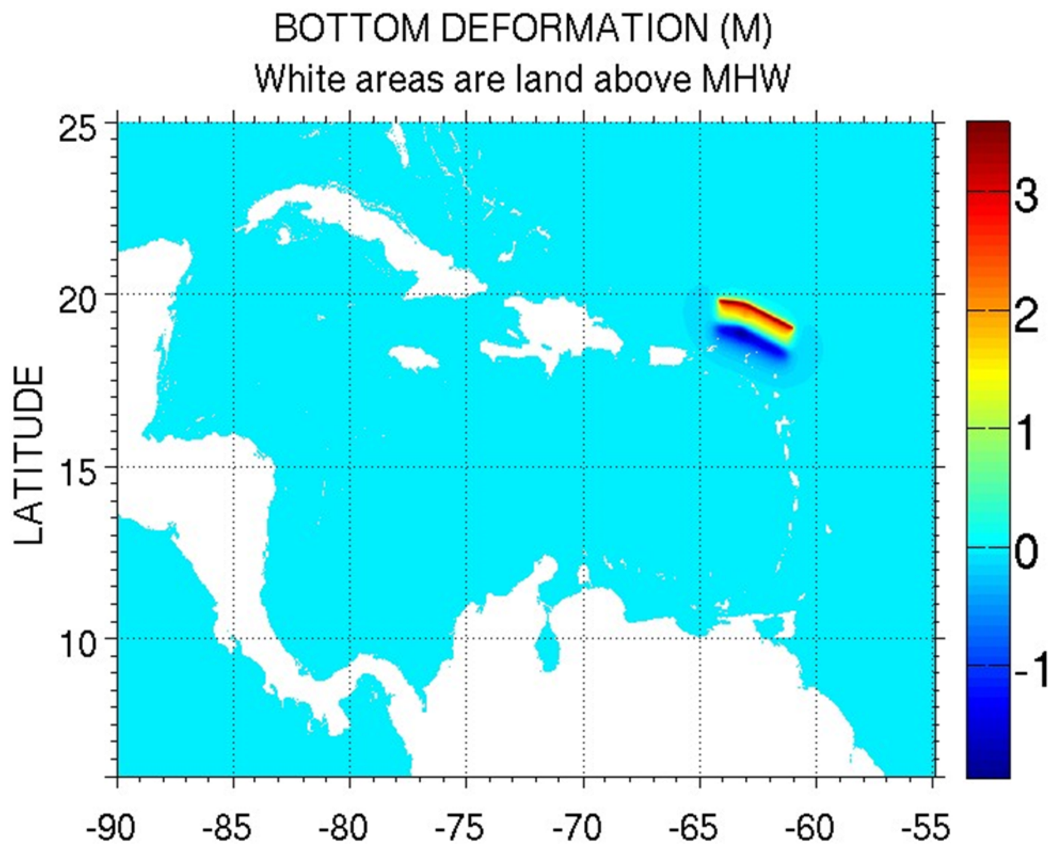


Figure 86 - FEQ1_345 Bottom deformation.

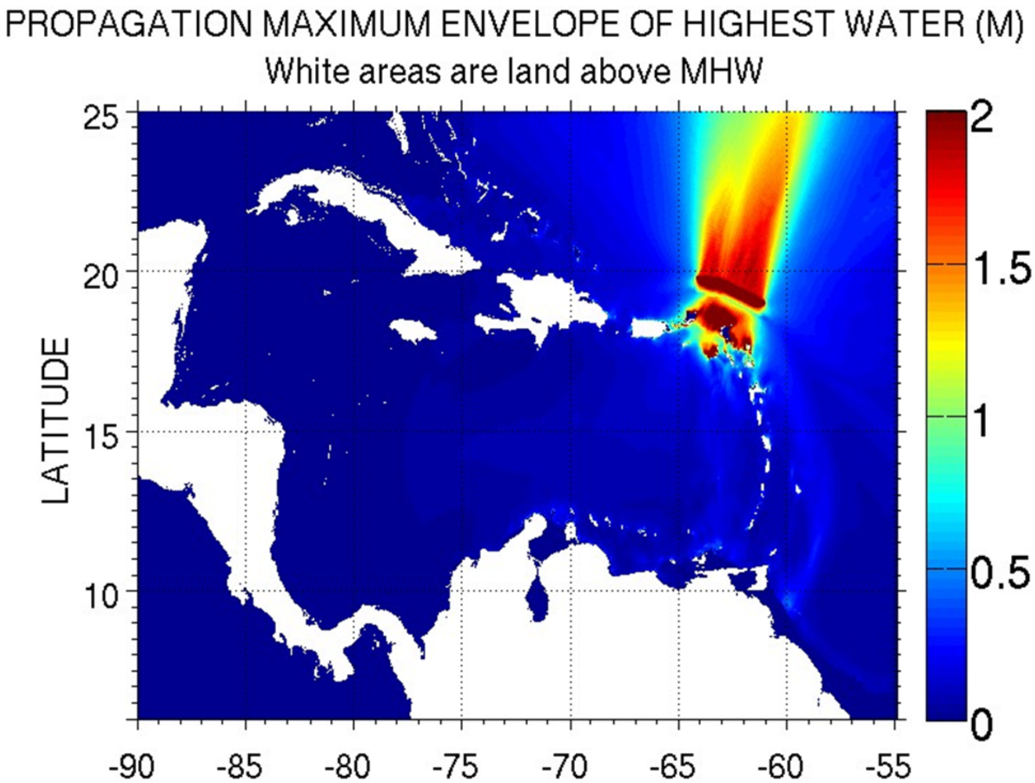


Figure 87 – FEQ1_345 MEOHW for propagation grid.

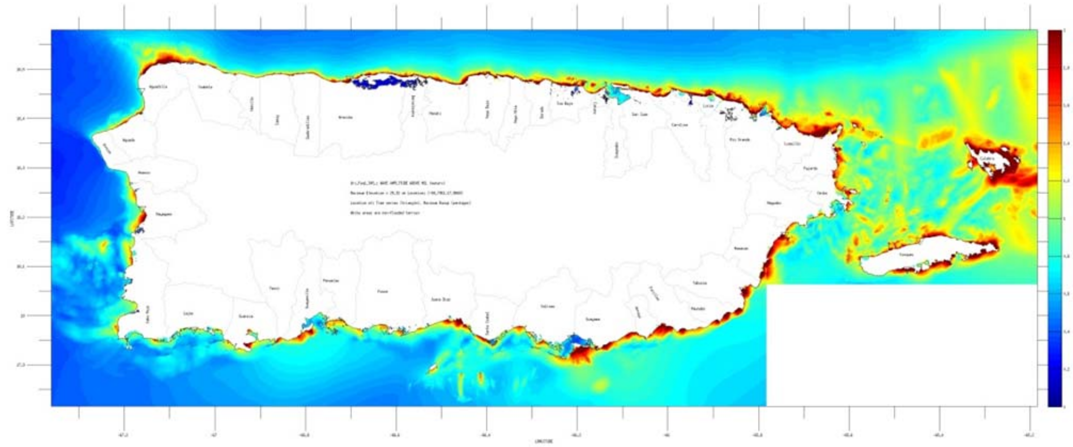


Figure 88 – FEQ1_345 MEOHW for inundation grids.

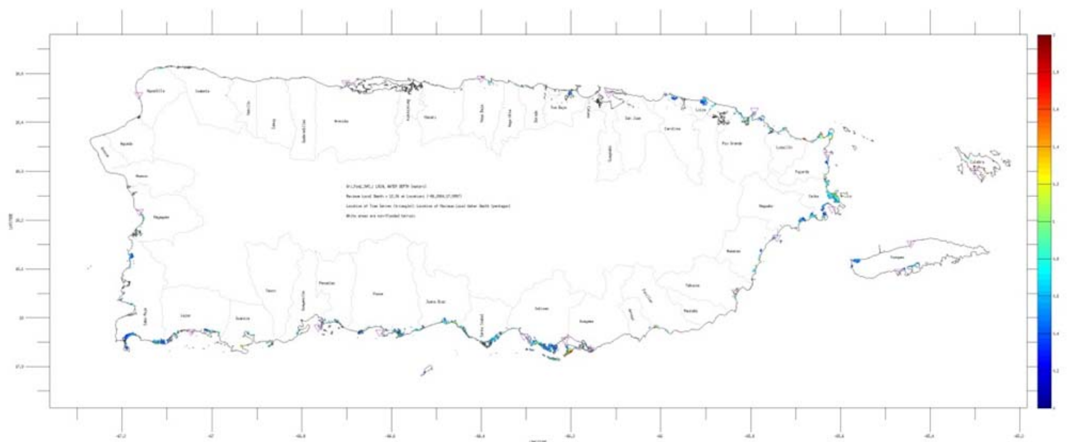


Figure 89 – FEQ1_345 LWD for inundation grids.

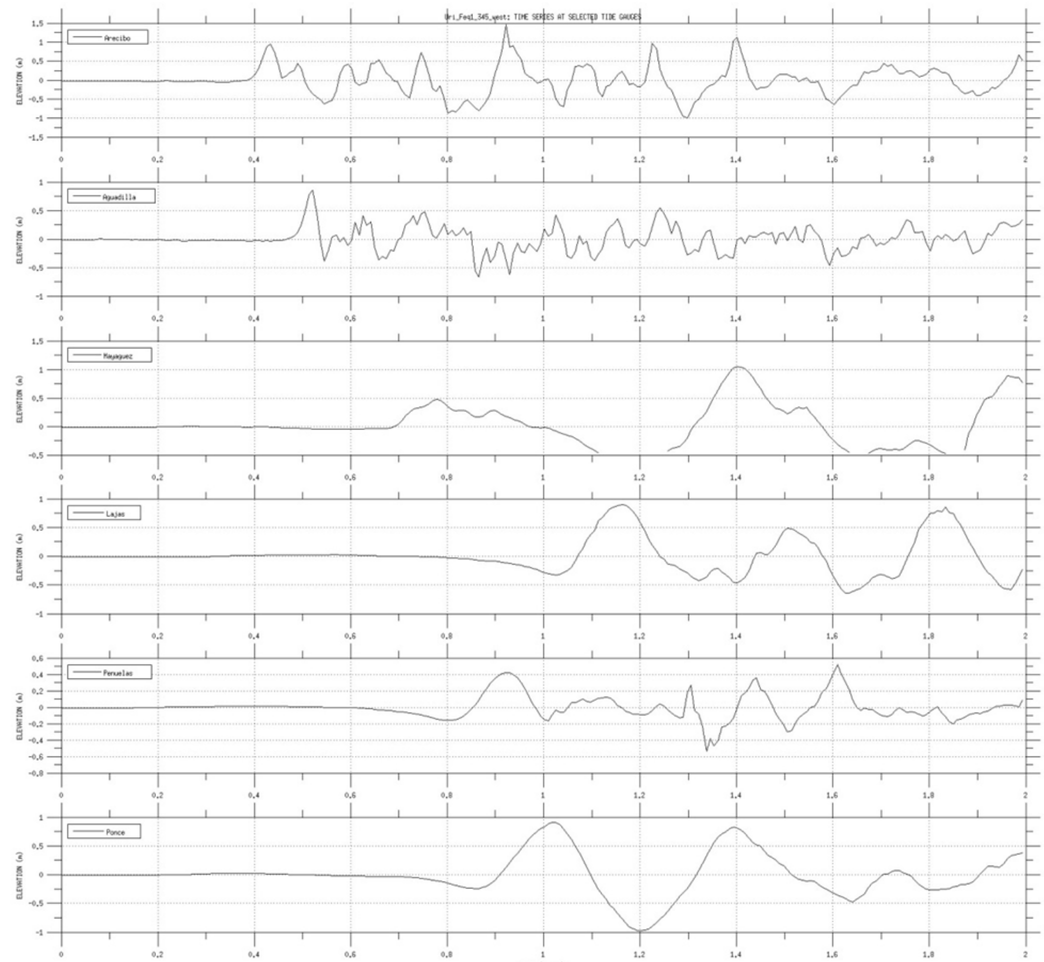


Figure 90 - FEQ1_345 West inundation grid time series.

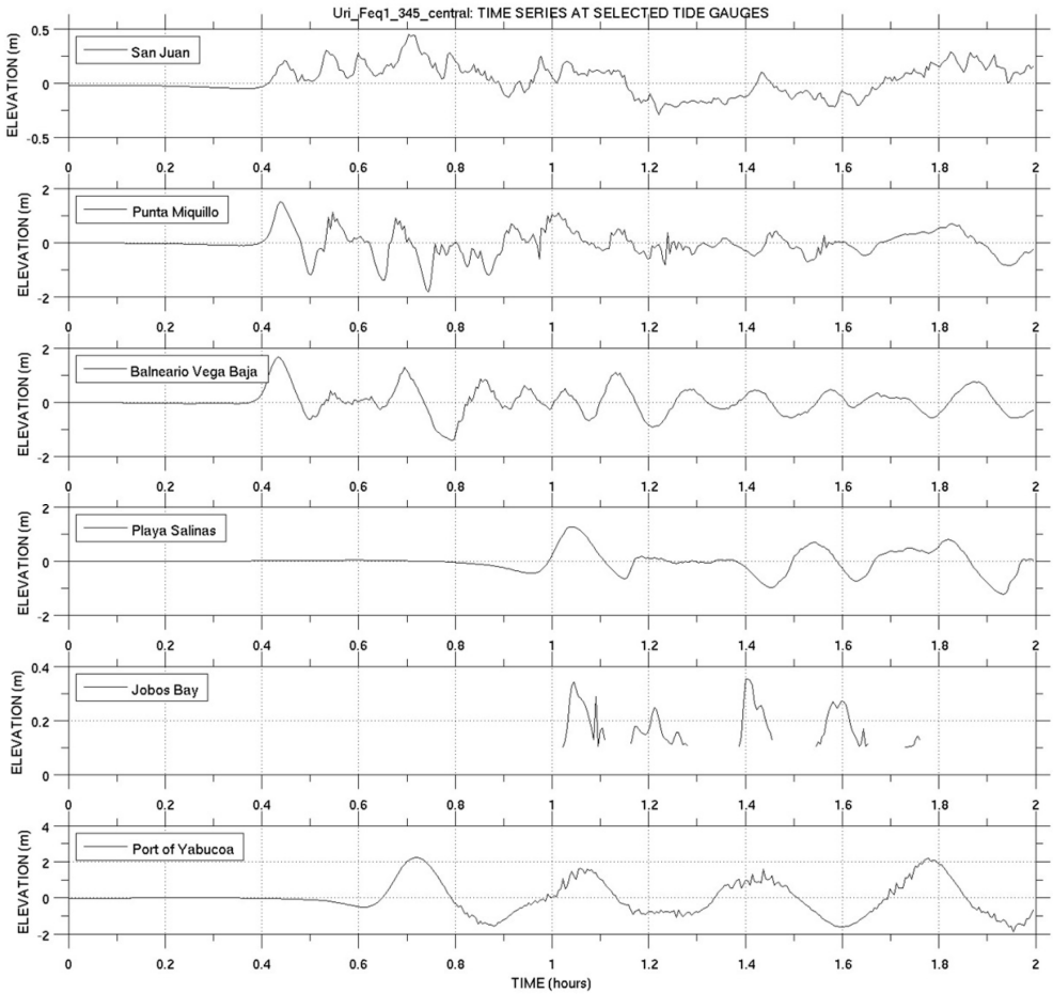


Figure 91 - FEQ1_345 Center inundation grid time series.

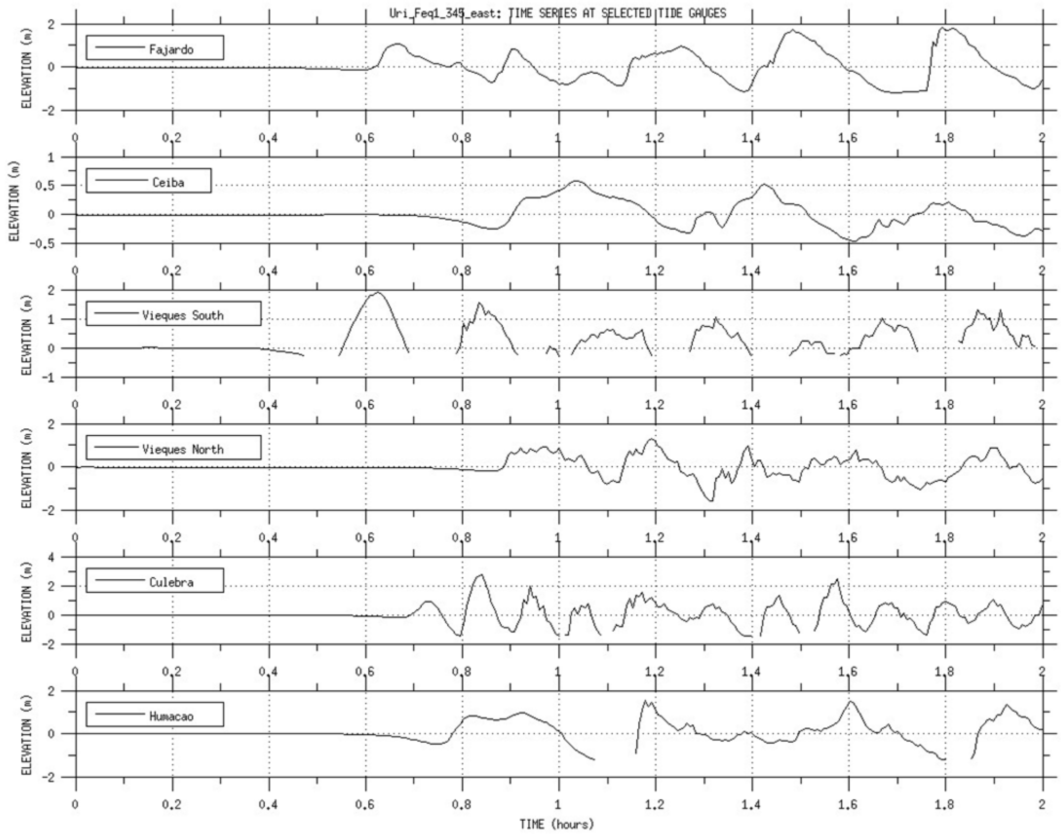


Figure 92 - FEQ1_345 East inundation grid time series.

FEQ1_45: Input parameter file for generation/propagation run.

Segment4:	Segment5:
lat: 19.801	lat: 19.850
lon: -63.7752	lon: -64.270
strike: 97	strike: 96
dip: 15	dip: 15
rake: 90	rake: 90
depth: 8.5	depth: 8.5
length: 74	length: 52
width: 90	width: 90
slip: 8.11	slip: 8.11

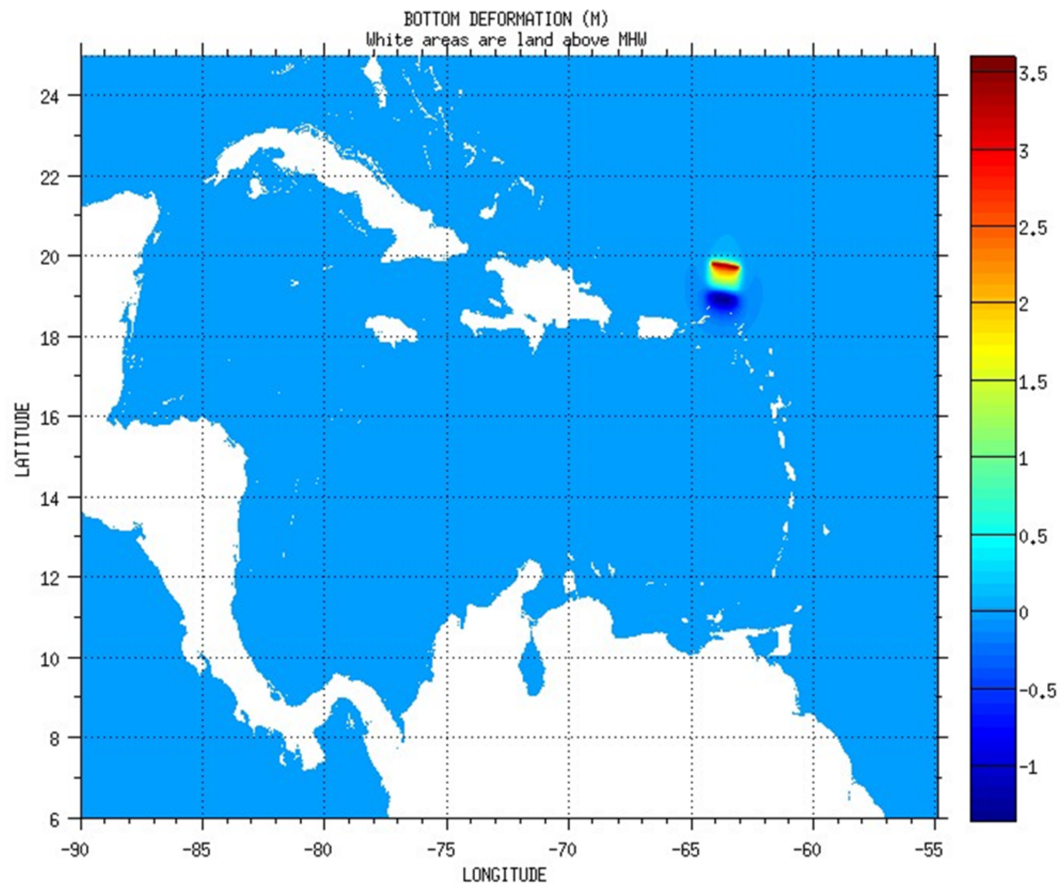


Figure 93 - FEQ1_45 Bottom deformation.

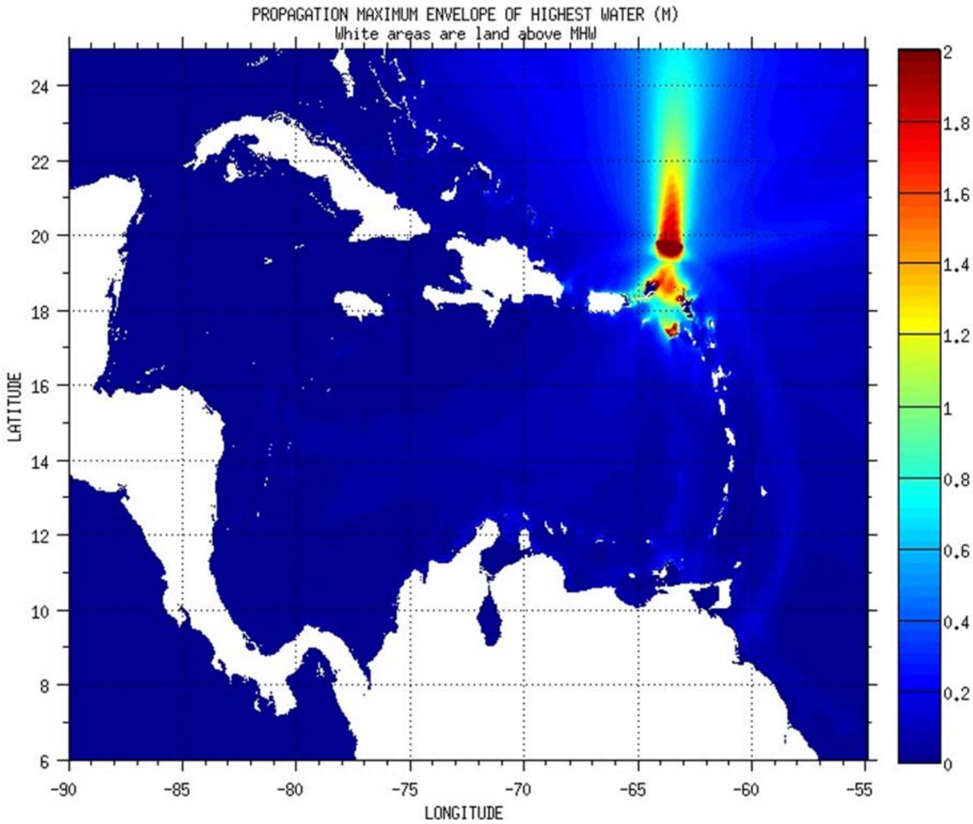


Figure 94 - FEQ1_45 MEOHW for propagation grid.

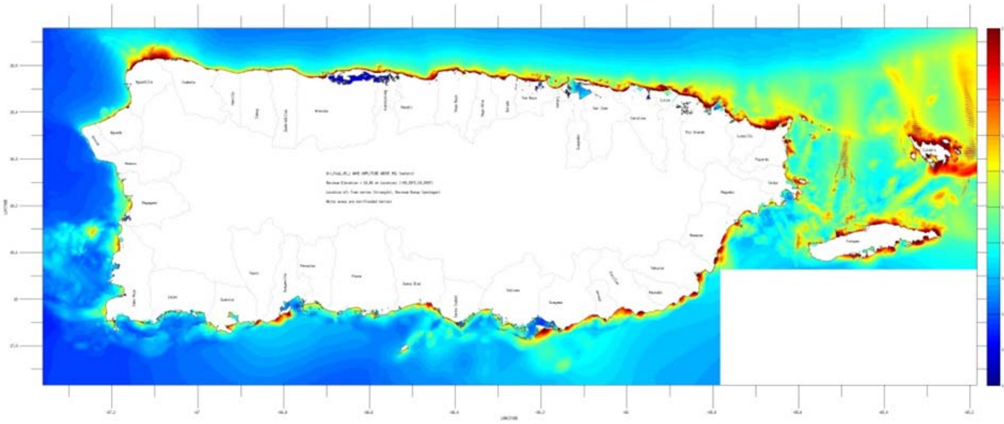


Figure 95 – FEQ1_45 MEOHW for inundation grids.

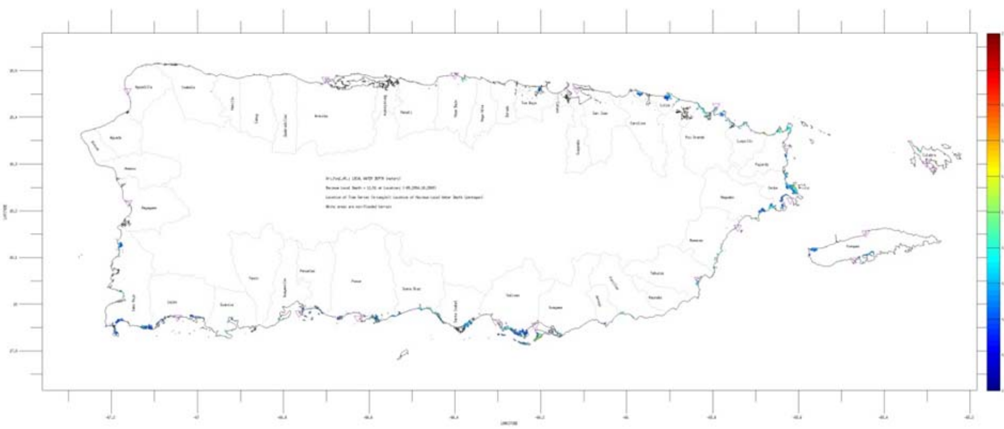


Figure 96 – FEQ1_45 LWD for inundation grids.

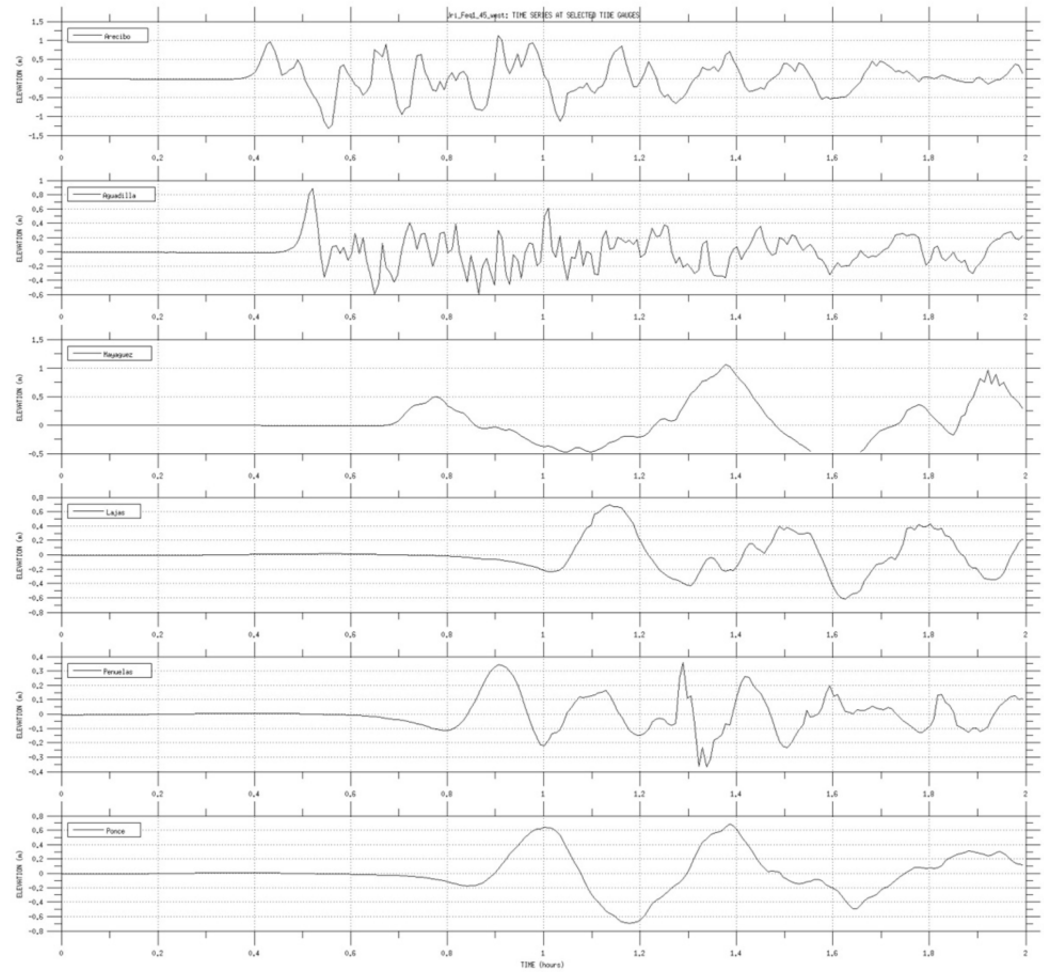


Figure 97 – FEQ1_45 West inundation grid time series.

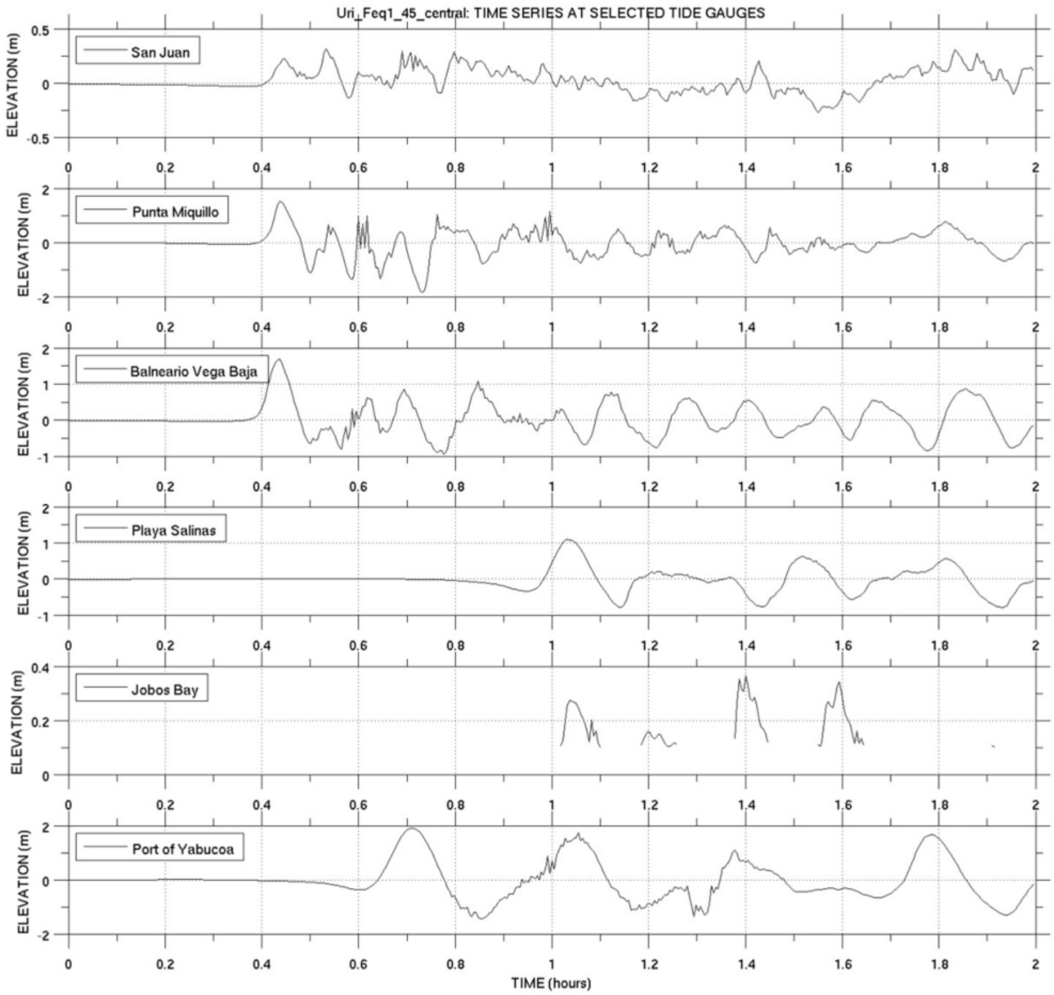


Figure 98 - FEQ1_45 Center inundation grid time series.

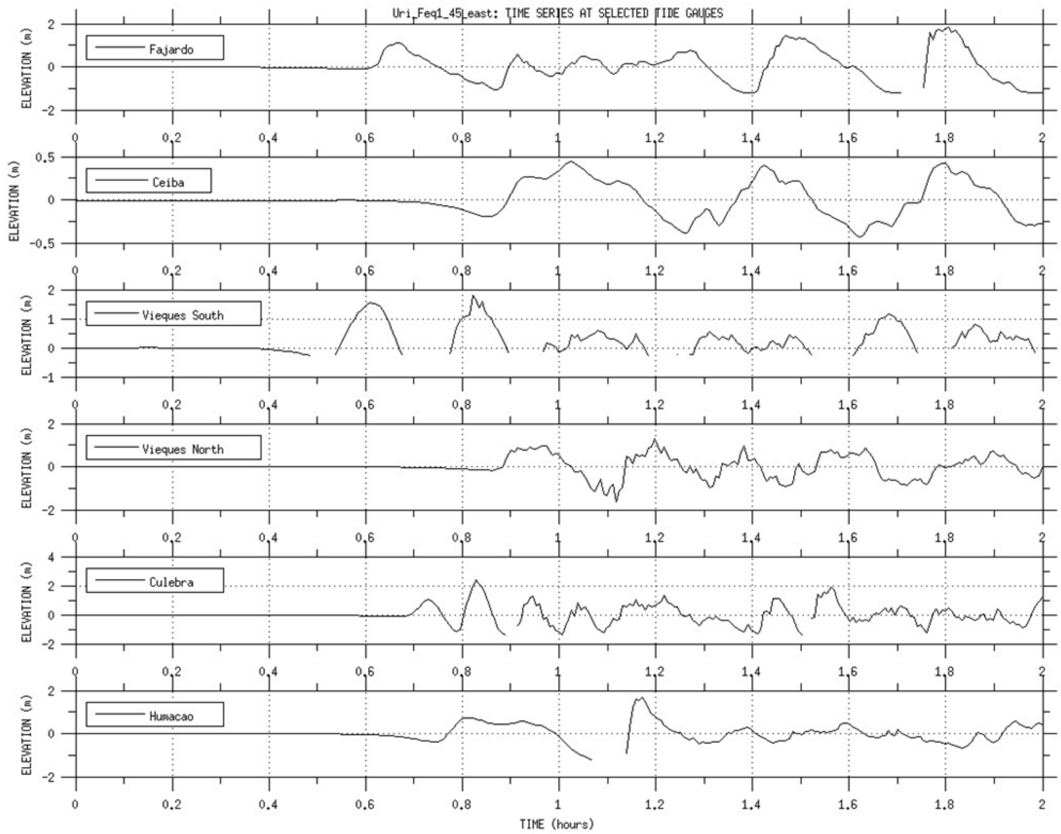


Figure 99 - FEQ1_45 East inundation grid time series.

FEQ3_V2: Input parameter file for generation/propagation run.

```
Segment9:
lat:   20.14
lon:   -64.51
strike:   100
dip:  60
rake:  -90
depth:  7.5
length:   132
width:  54
slip:  3.25
```

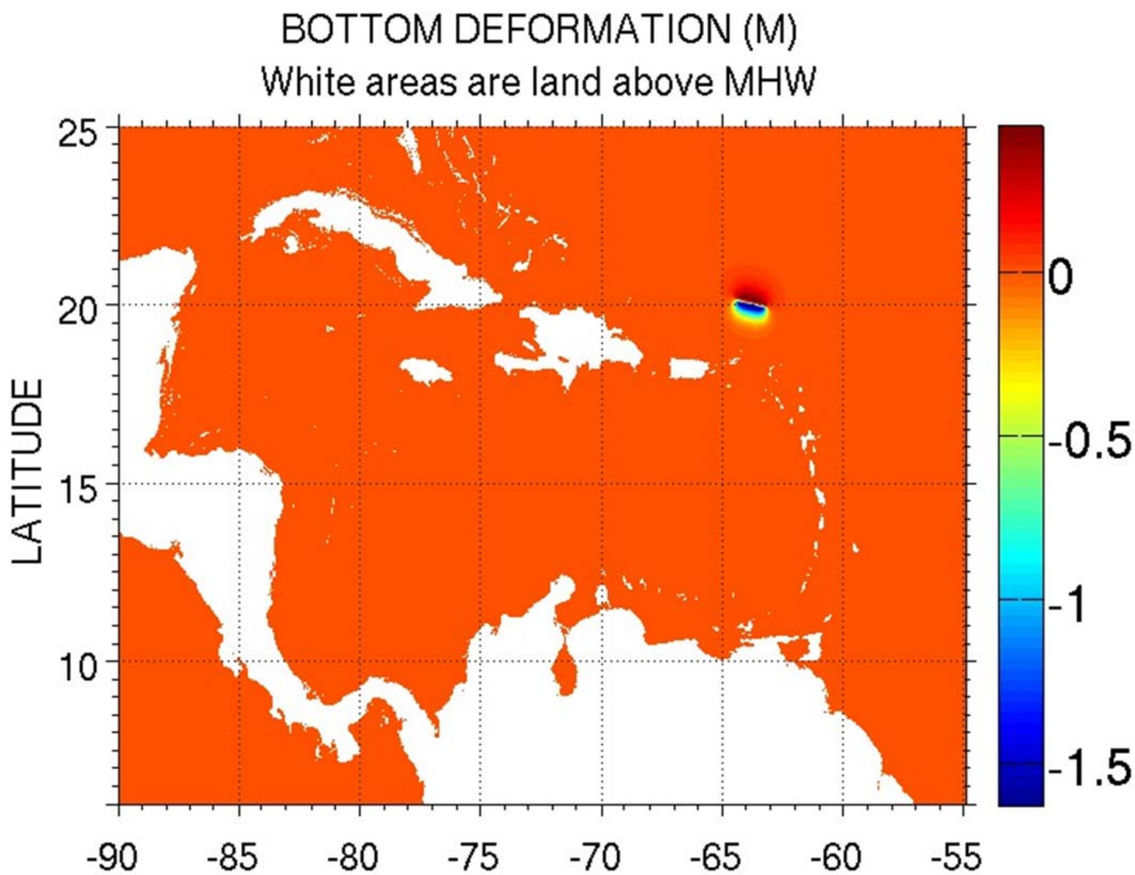


Figure 100 - FEQ3_V2 Bottom deformation.

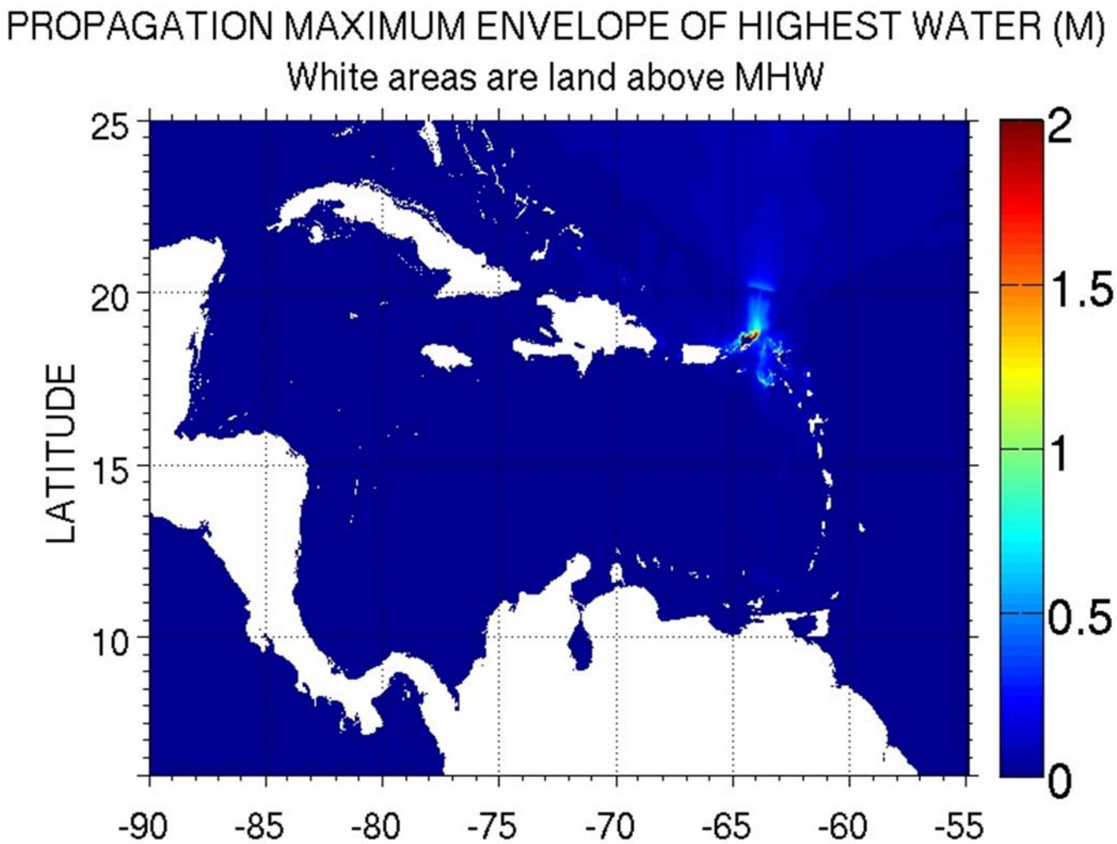


Figure 101 - FEQ3_V2 MEOHW for propagation grid.

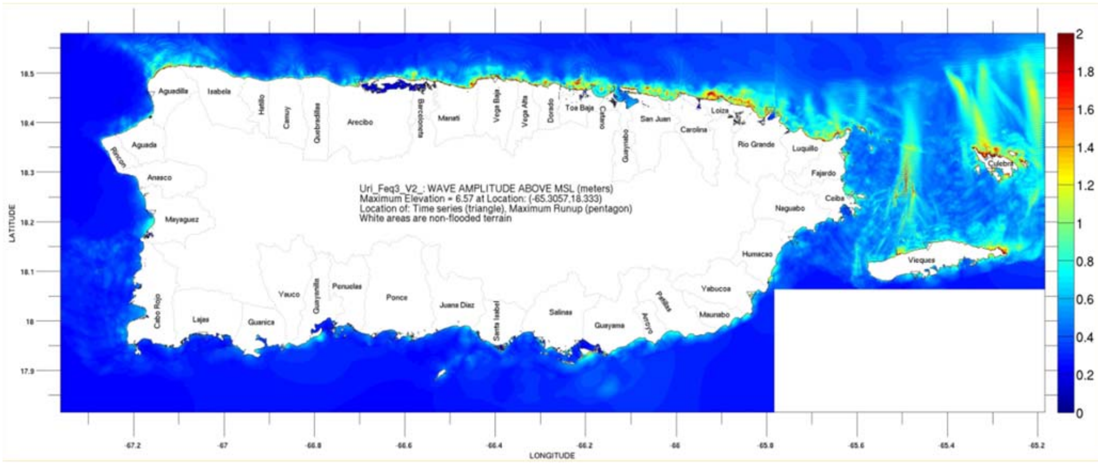


Figure 102 - FEQ3_V2 MEOHW for inundation grids.

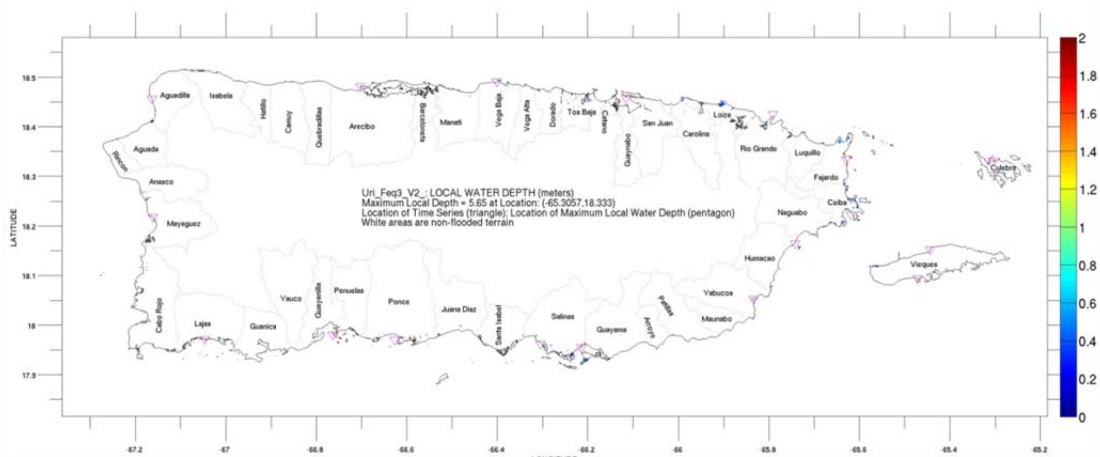


Figure 103 - FEQ3_V2 LWD for inundation grids.

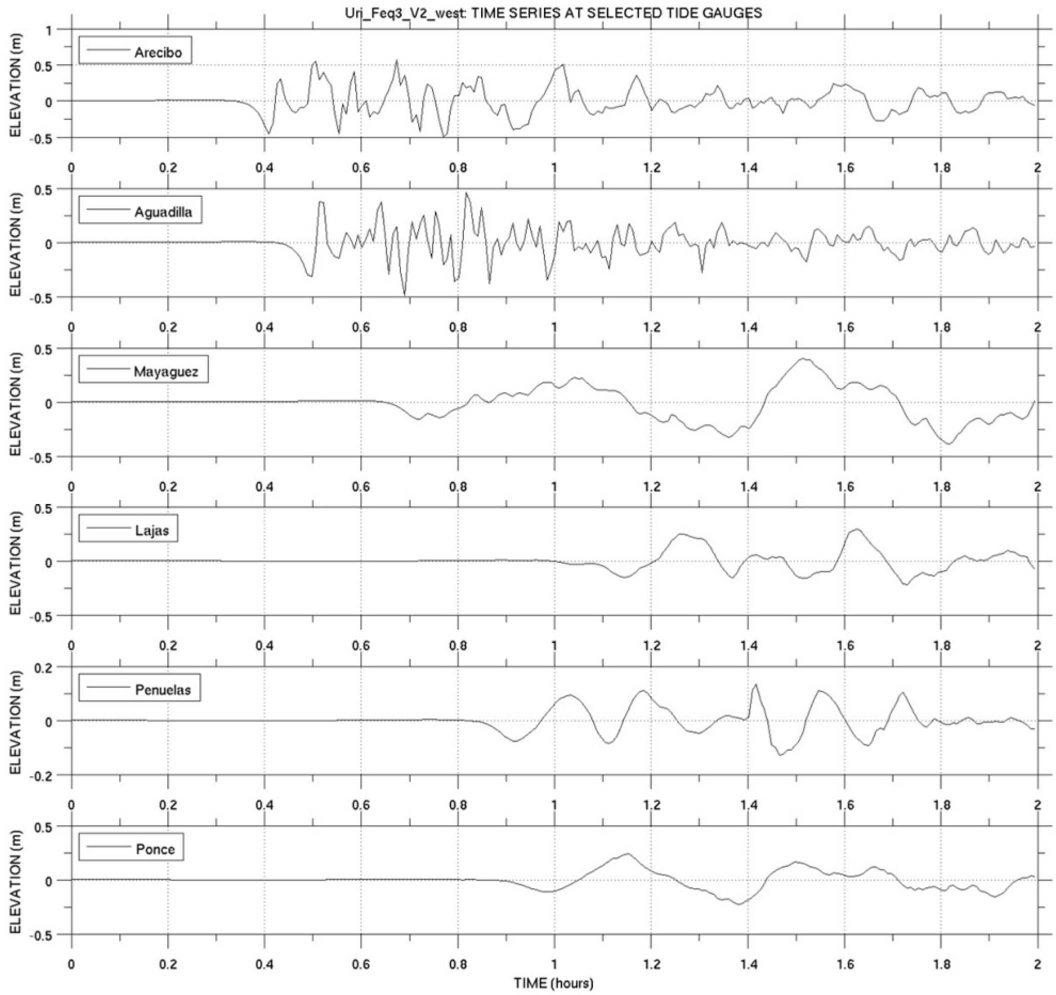


Figure 104 - FEQ3_V2 West inundation grid time series.

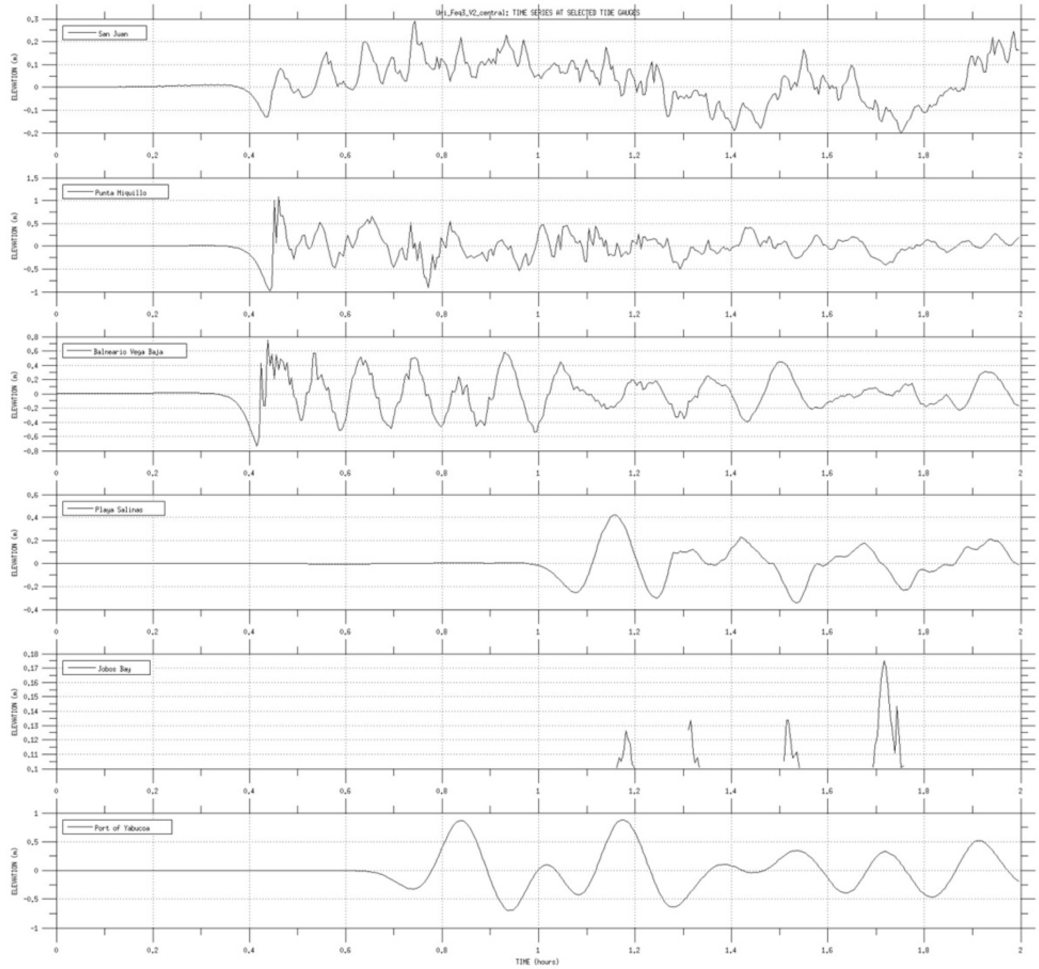


Figure 105 - FEQ3_V2 Center inundation grid time series.

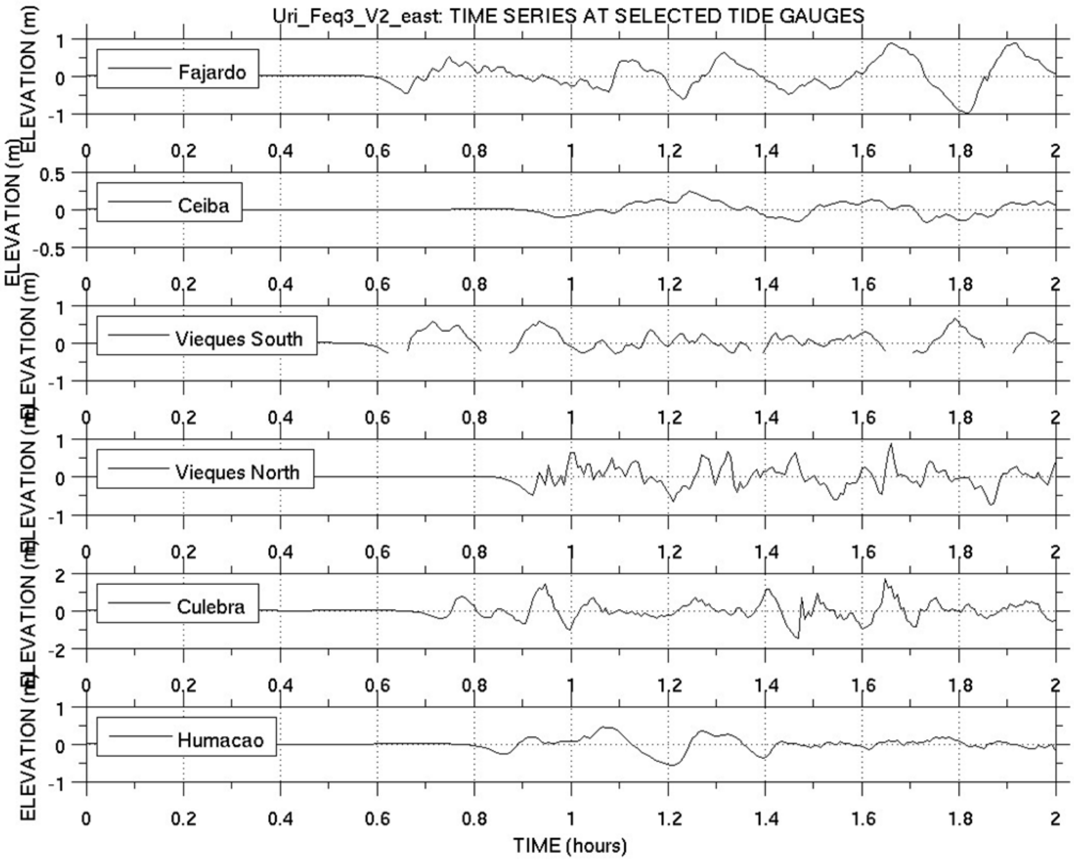


Figure 106 - FEQ3_V2 East inundation grid time series.

ADDITIONAL FAULTS

Dr. Victor Huerfano added additional faults, shown in Figure 88 as the segments B1-B2-B3-B4. The corresponding fault parameters, and results, are

Figure 107 – Location of additional regional faults supplied by Dr. Victor Huerfano.

B1 [segment (B1 to B2)]: Input parameter file for generation/propagation run.

'Longitude: -61.59733
'Latitude: 17.98005
Length (km): 105.8
Width (km): 20.
DIP (deg): 60.
RAKE (deg): 90.0
STRIKE (deg): 136.
SLIP (m): 2.2
DEPTH (km): 10.

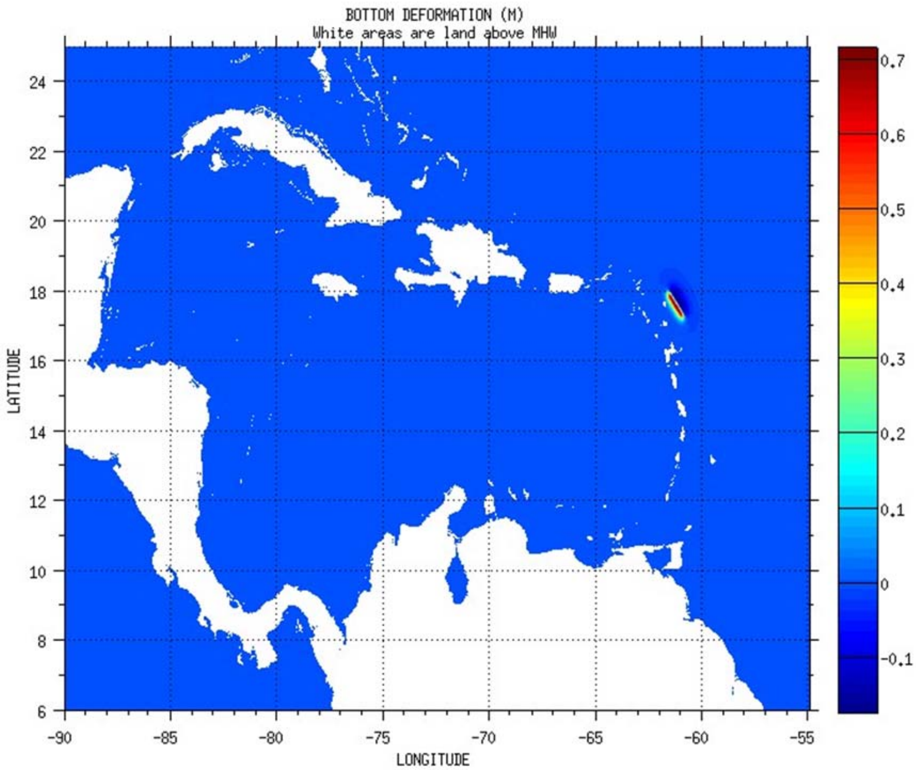


Figure 108 - B1 [segment (B1 to B2)] Bottom deformation.

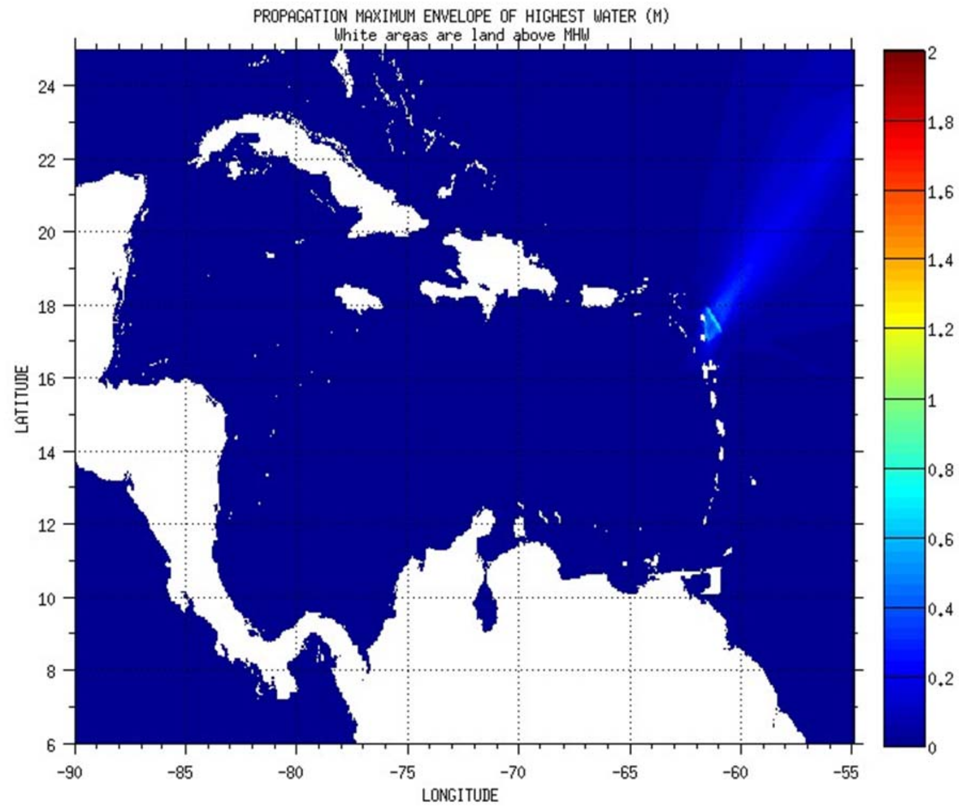


Figure 109 - B1 [segment (B1 to B2)] MEOHW for propagation grid.

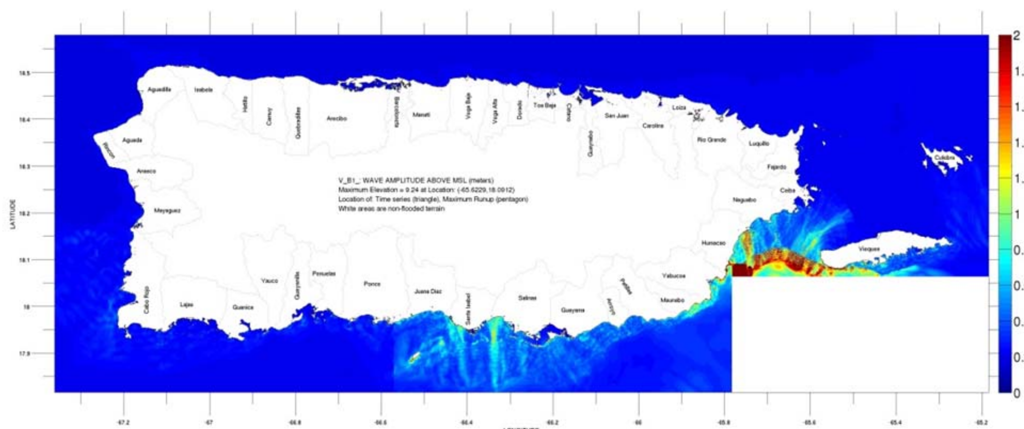


Figure 110 - B1 [segment (B1 to B2)] MEOHW for inundation grids.

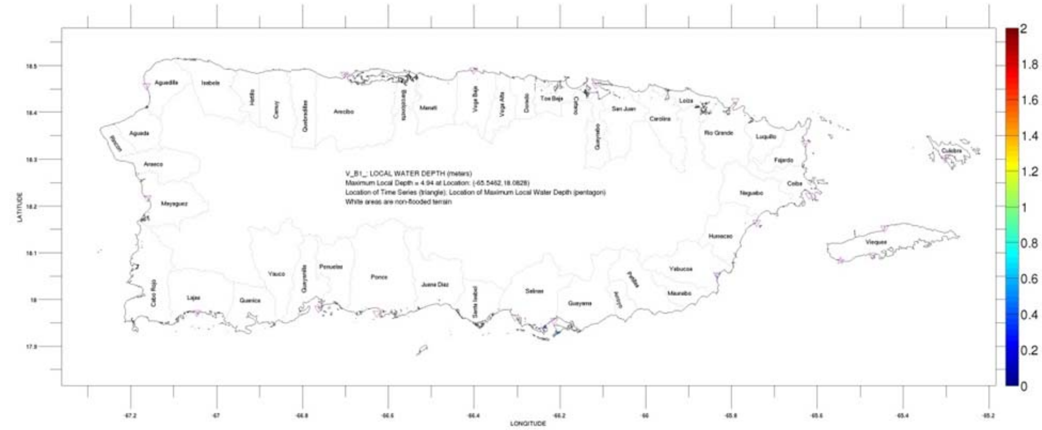


Figure 111 - B1 [segment (B1 to B2)] LWD for inundation grids.

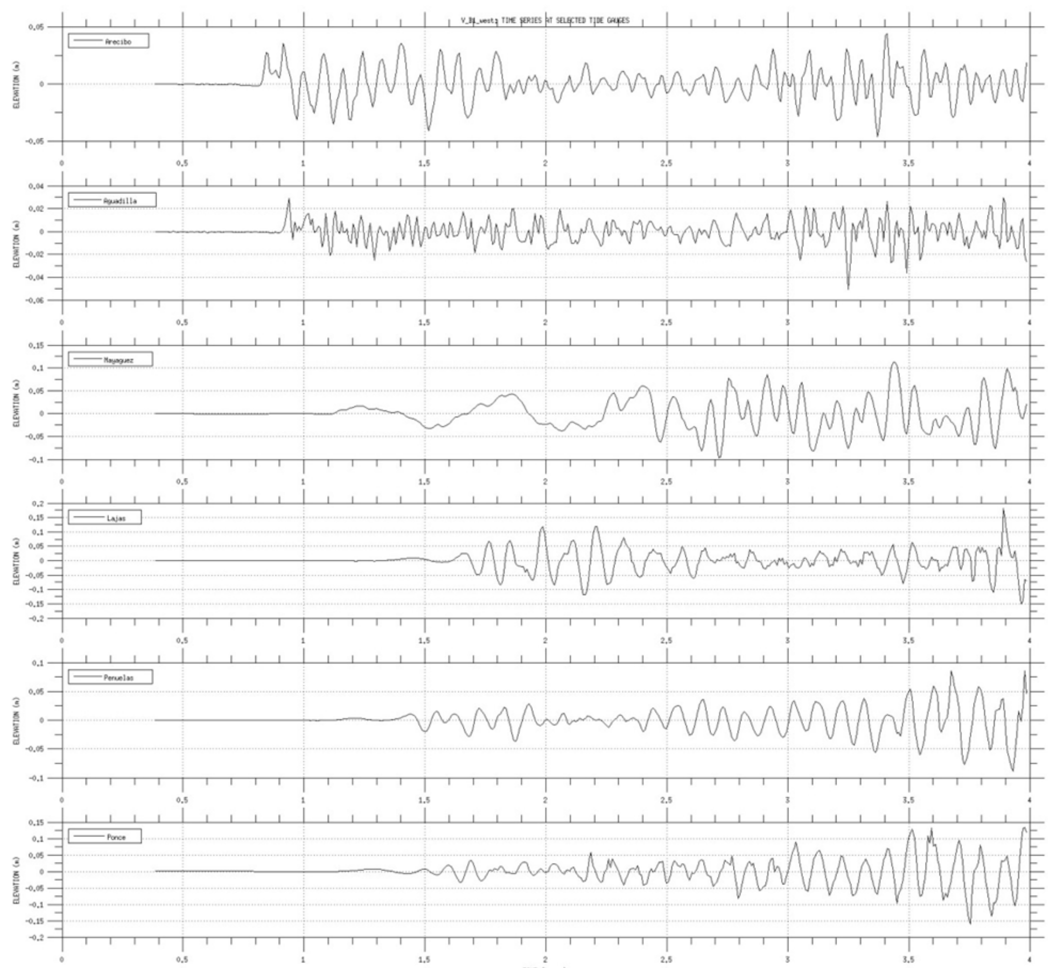


Figure 112 - B1 (segment B1 to B2): West inundation grid time series.

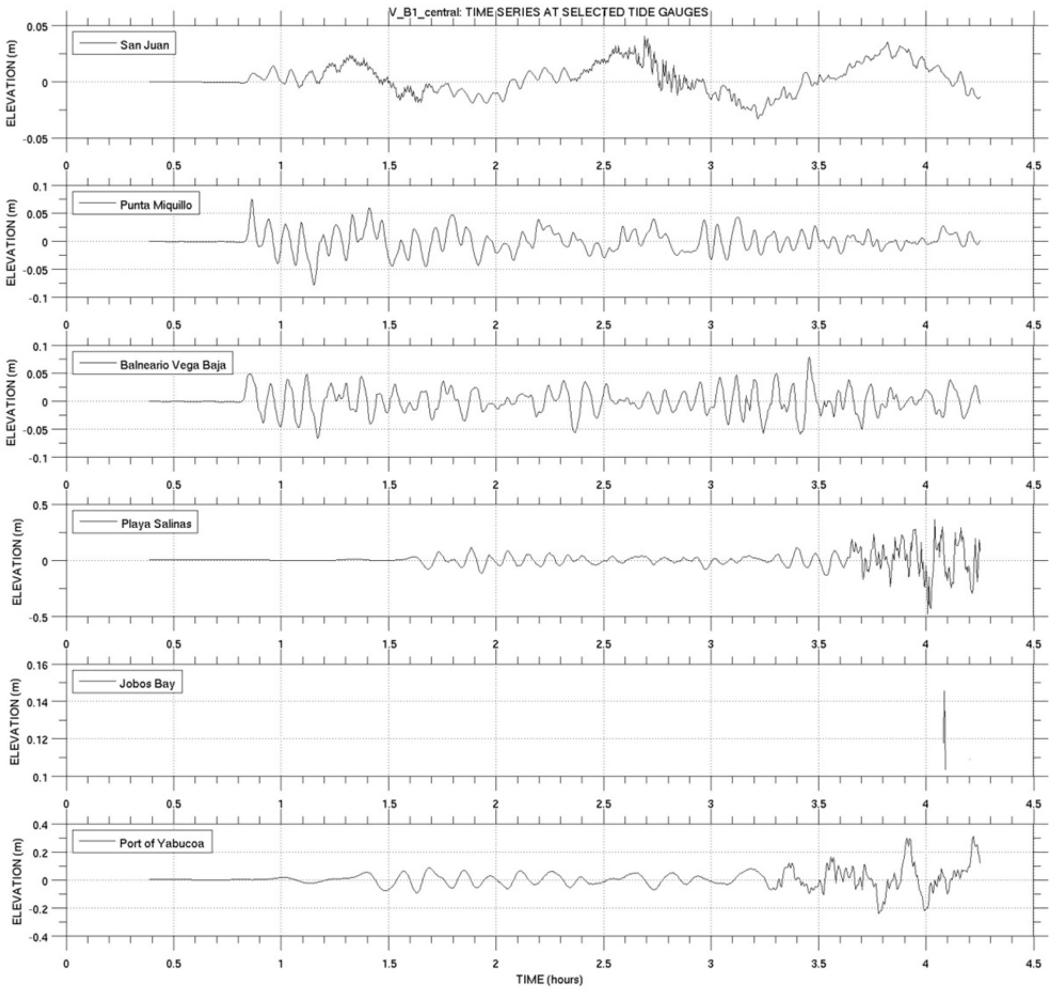


Figure 113 - B1 (segment B1 to B2): Center inundation grid time series.

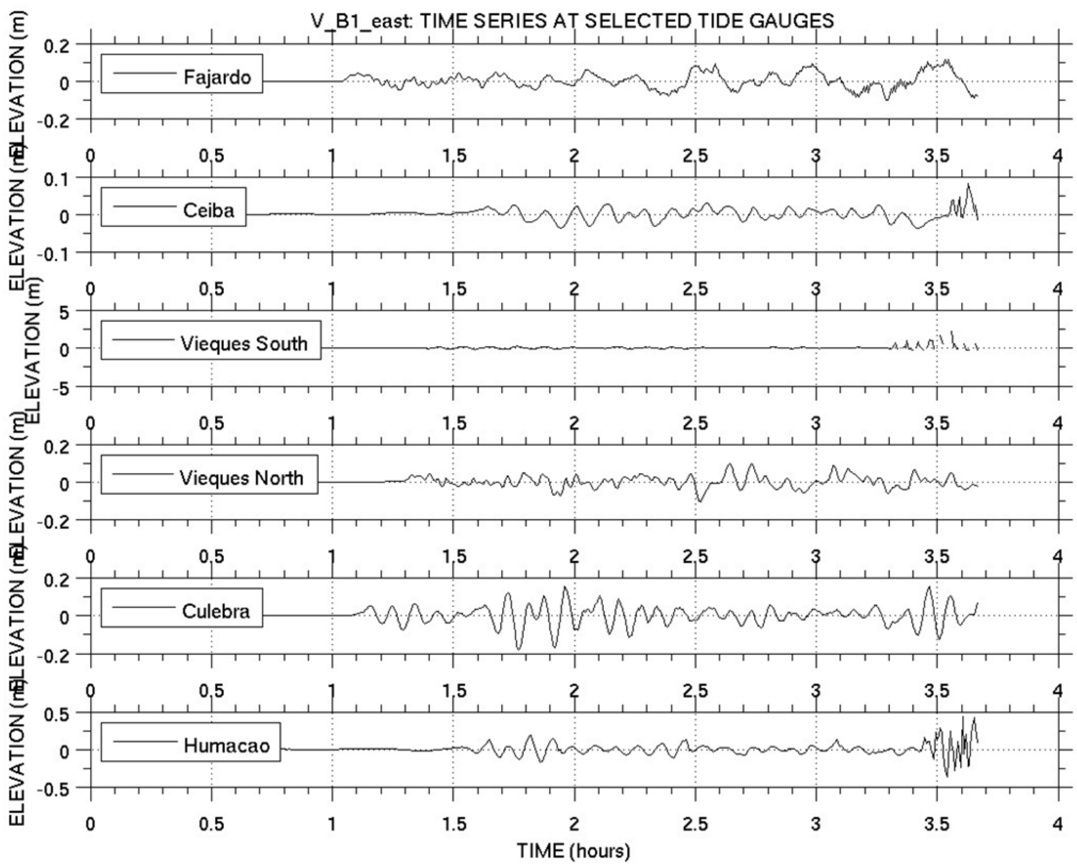


Figure 114 - East inundation grid time series.

B1-B2 [segments (B1 to B2) + (B2 to B3)]: Input parameter file for generation/propagation run.

```
######################## SEGMENT 1 ####################################################
Longitude:  -61.59733
Latitude:  17.98005
Length (km):  105.8
Width (km):  40.
DIP (deg ): 60.
RAKE (deg):   90.0
STRIKE (deg):  136.
SLIP (m):   3.
DEPTH (km):   10.
######################## SEGMENT 2 ####################################################
Longitude: -60.93607
Latitude: 17.29519
Length (km):  97.
Width (km):  40.
DIP (deg):  60.
RAKE (deg):   90.0
STRIKE (deg): 155.
SLIP (m}: 3.
DEPTH (km):  10.
```

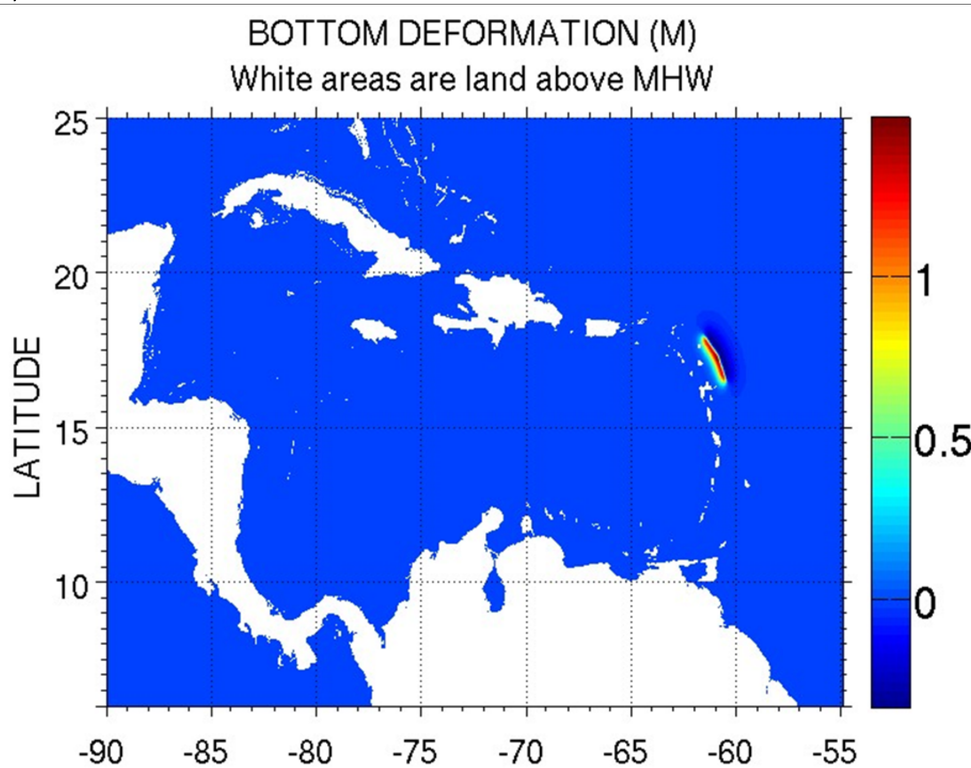


Figure 115 - Bottom deformation.

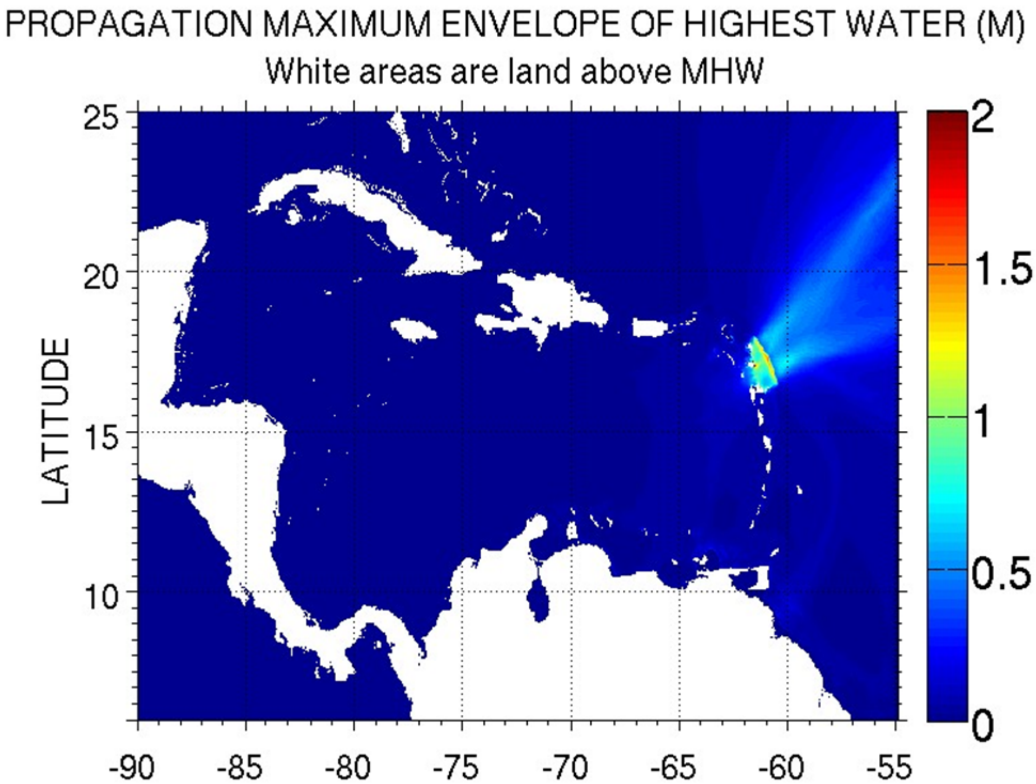


Figure 116- B1-B2 [segments (B1 to B2) + (B2 to B3)] MEOHW for propagation grid.

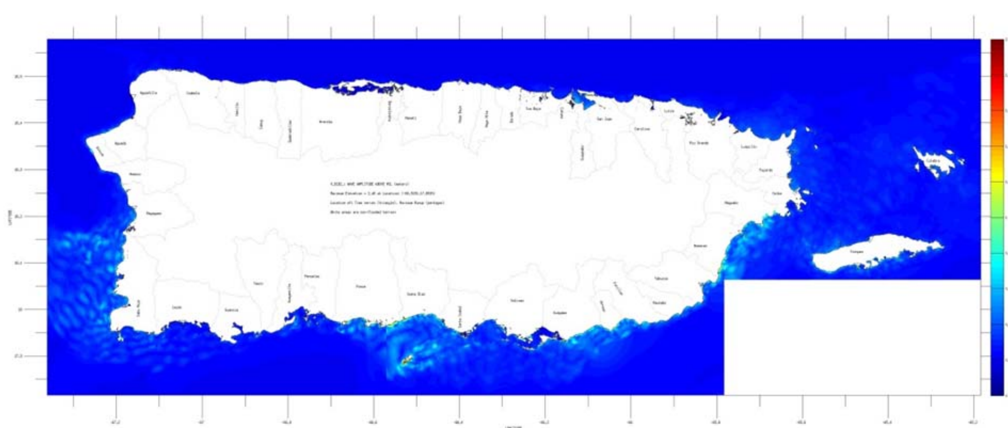


Figure 117 – B1-B2 [segments (B1 to B2) + (B2 to B3)] LWD for inundation grids.

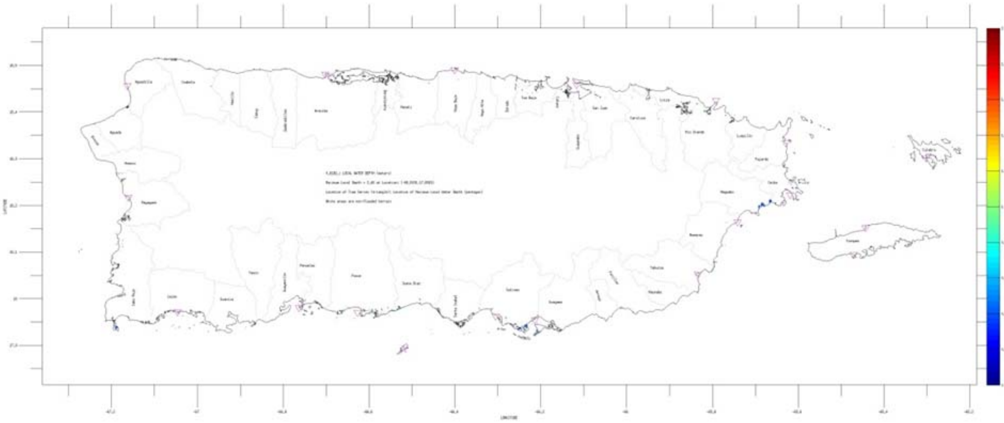


Figure 118 - B1-B2 [segments (B1 to B2) + (B2 to B3)] MEOHW for inundation grids.

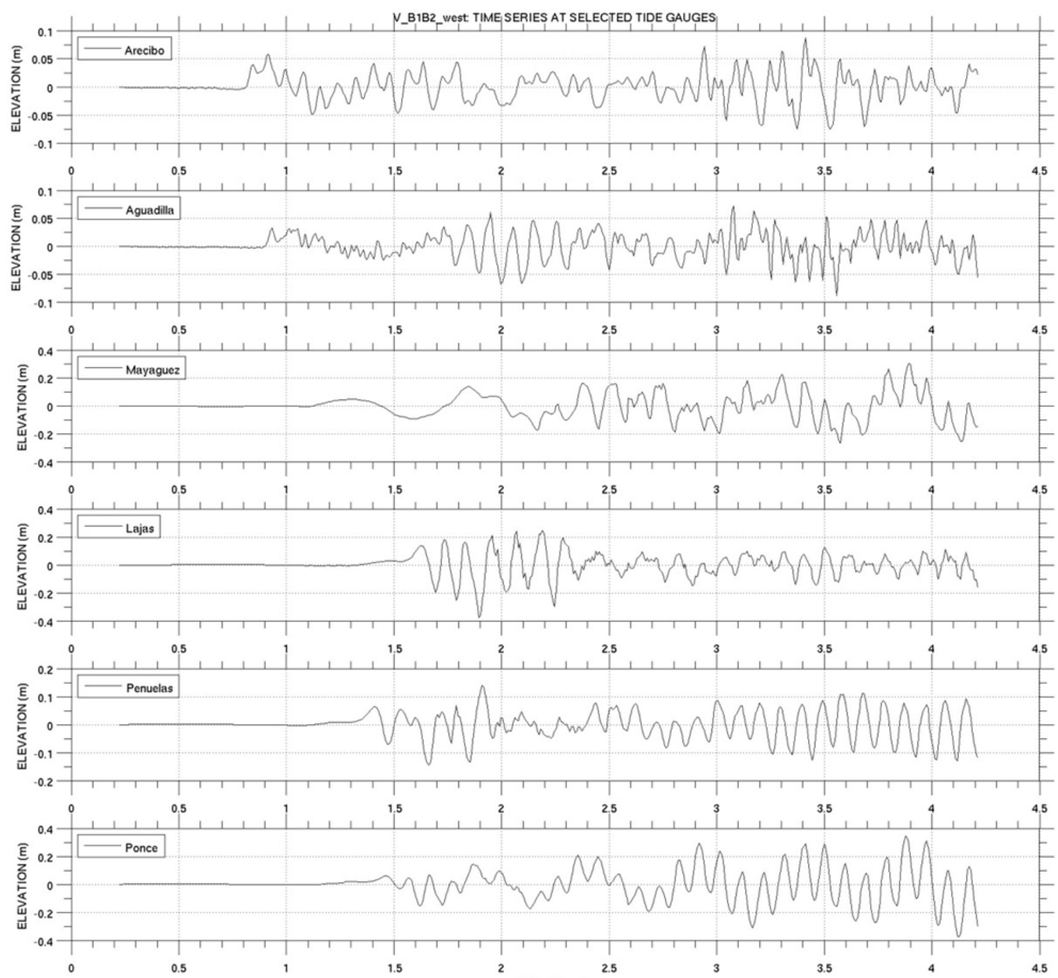


Figure 119 - B1 (segment B1 to B2): West inundation grid time series.

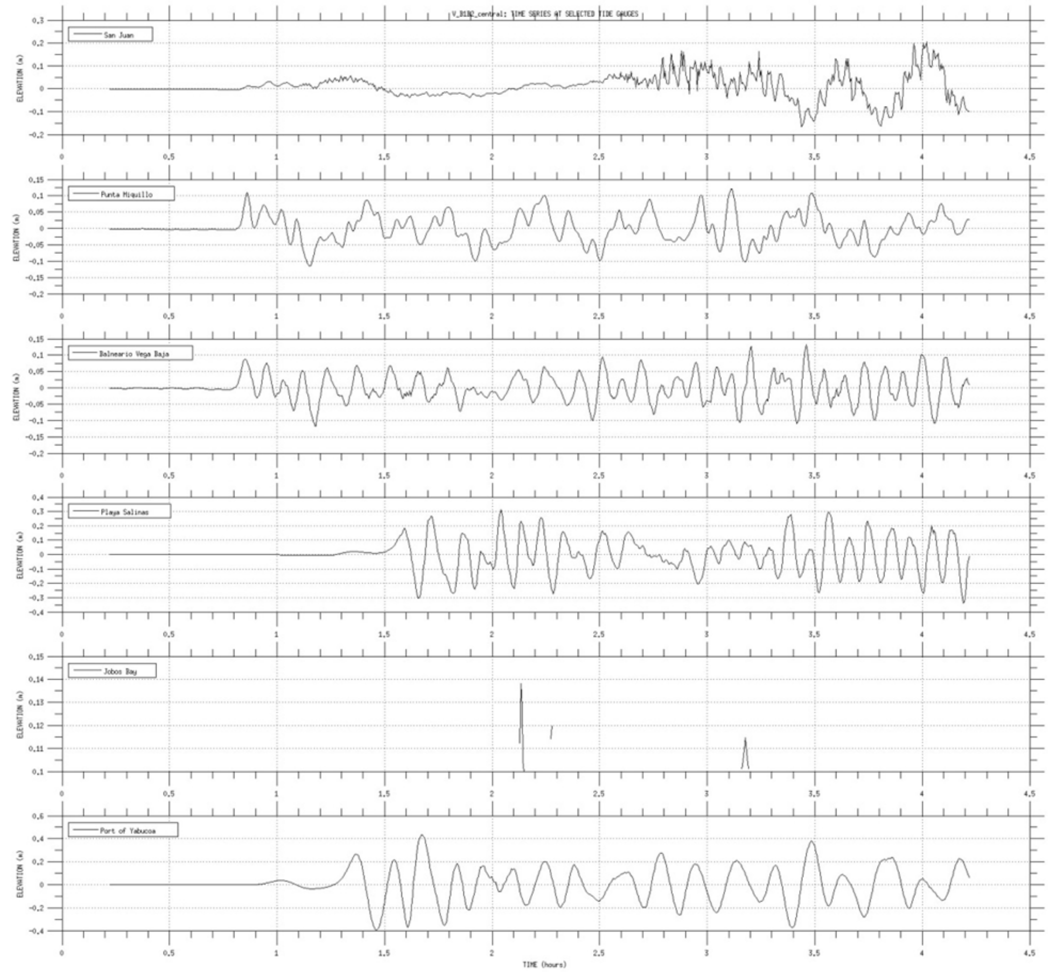


Figure 120 - B1 (segment B1 to B2): Center inundation grid time series.

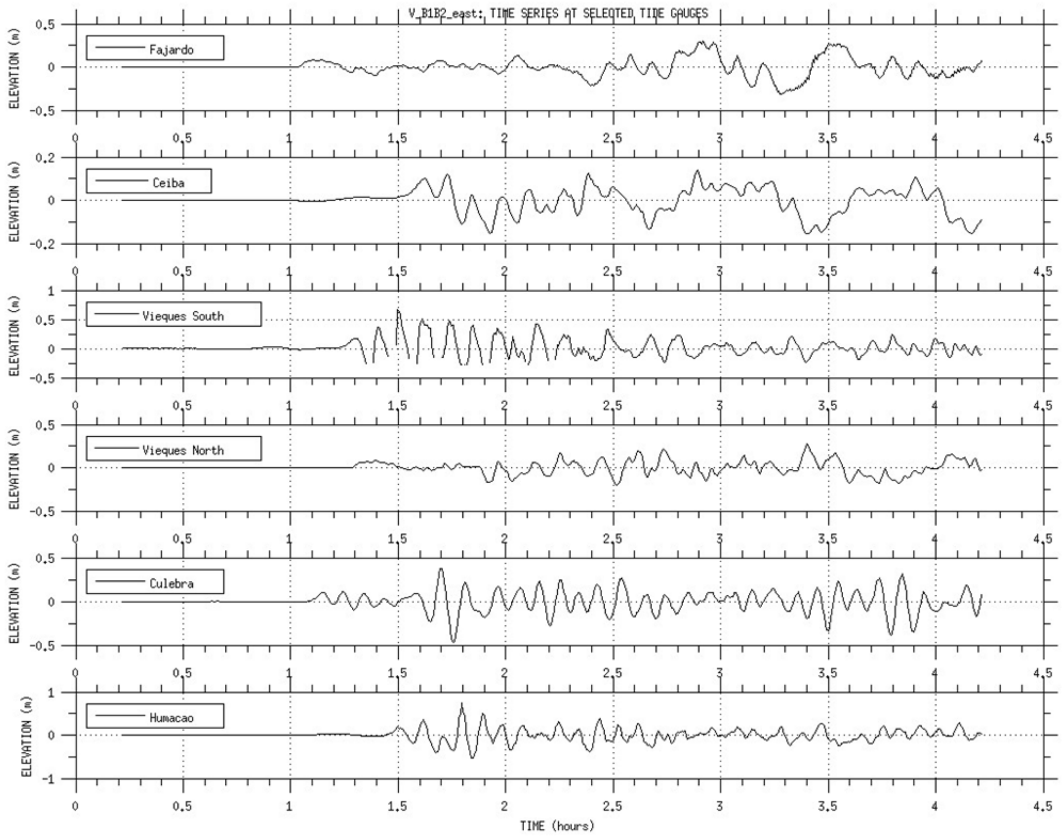


Figure 121 - - B1 (segment B1 to B2): East inundation grid time series.

B1-B2-B3 [segments (B1 to B2) + (B2 to B3) + (B3 to B4)]: Input parameter file for generation/propagation run.

```
####################### SEGMENT 1 ################################################
Longitude: -61.59733
Latitude: 17.98005
Length (km): 105.8
Width (km): 65.
DIP (deg): 60.
RAKE (deg): 90.0
STRIKE (deg): 136.
SLIP (m): 5.
DEPTH (km): 10.
####################### SEGMENT 2 ################################################
Longitude: -60.93607
Latitude: 17.29519
Length (km): 97.
Width (km): 65.
DIP (deg): 60.
RAKE (deg): 90.0
STRIKE (deg): 155.
SLIP (m): 5.
DEPTH (km): 10.
####################### SEGMENT 3 ################################################
Longitude: -60.56574
Latitude: 16.50455
Length (km): 124.1
Width (km): 65.
DIP (deg): 60.
RAKE (deg): 90.0
STRIKE (deg): 164.5
SLIP (m): 5.
DEPTH (km): 10.
```

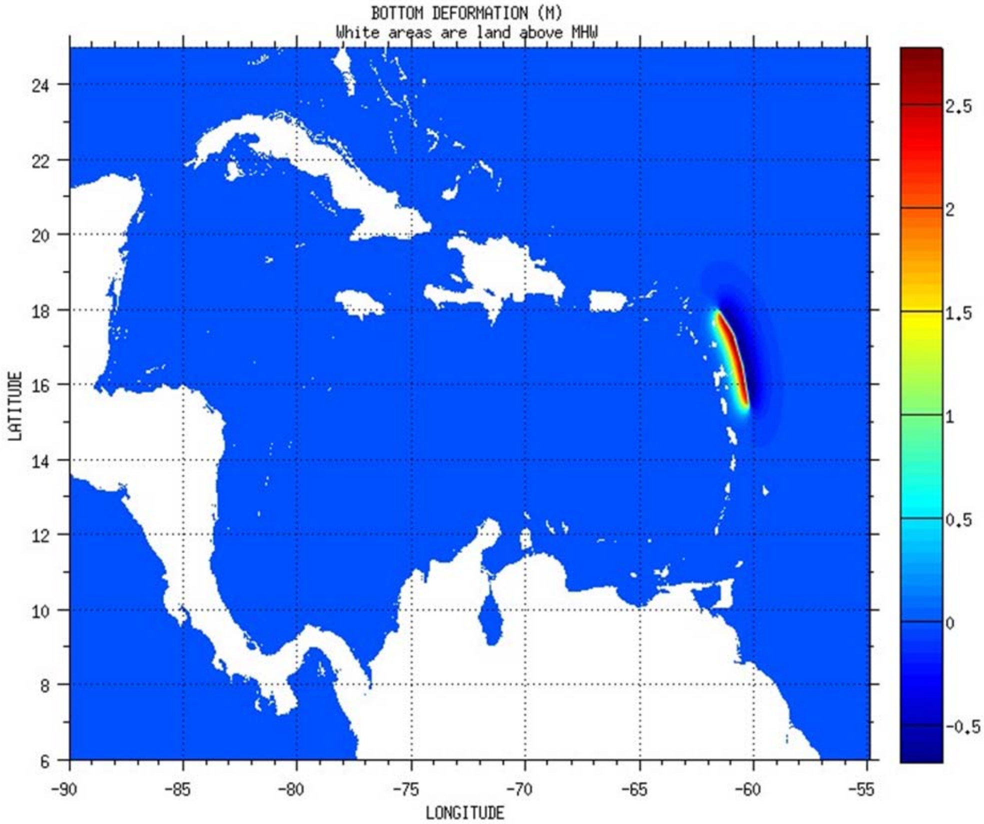


Figure 122 - B1-B2-B3 [segments (B1 to B2) + (B2 to B3) + (B3 to B4)] Bottom deformation.

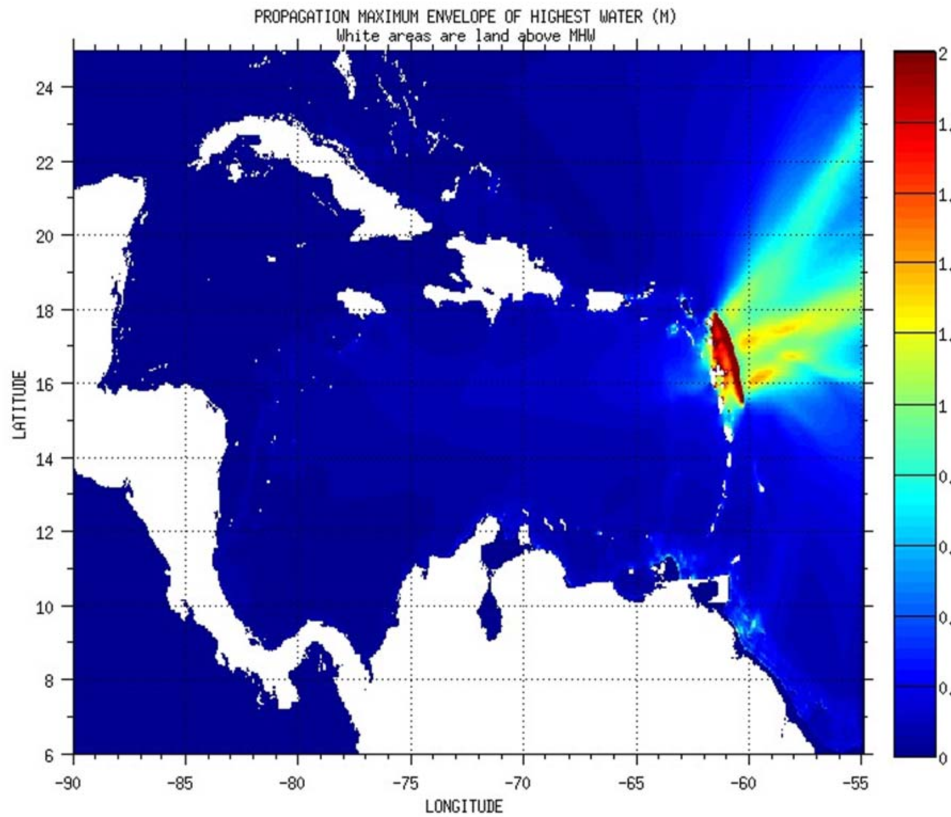


Figure 123 - B1-B2-B3 [segments (B1 to B2) + (B2 to B3) + (B3 to B4)] MEOHW for propagation grid.

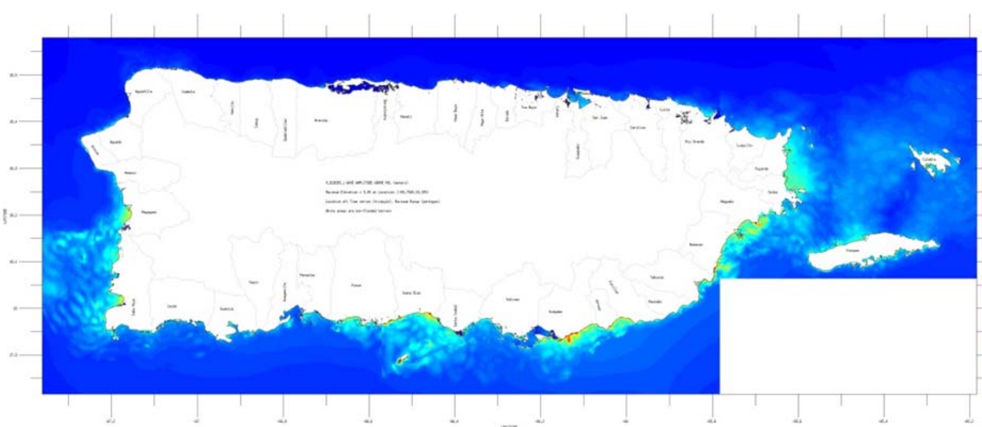


Figure 124 - B1-B2-B3 [segments (B1 to B2) + (B2 to B3) + (B3 to B4)] MEOHW for inundation grids.

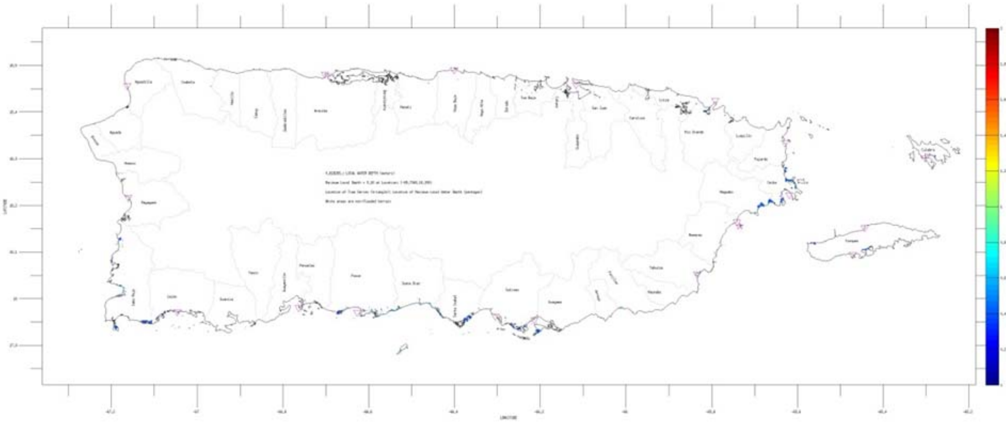


Figure 125 - B1-B2-B3 [segments (B1 to B2) + (B2 to B3) + (B3 to B4)] LWD for inundation grids.

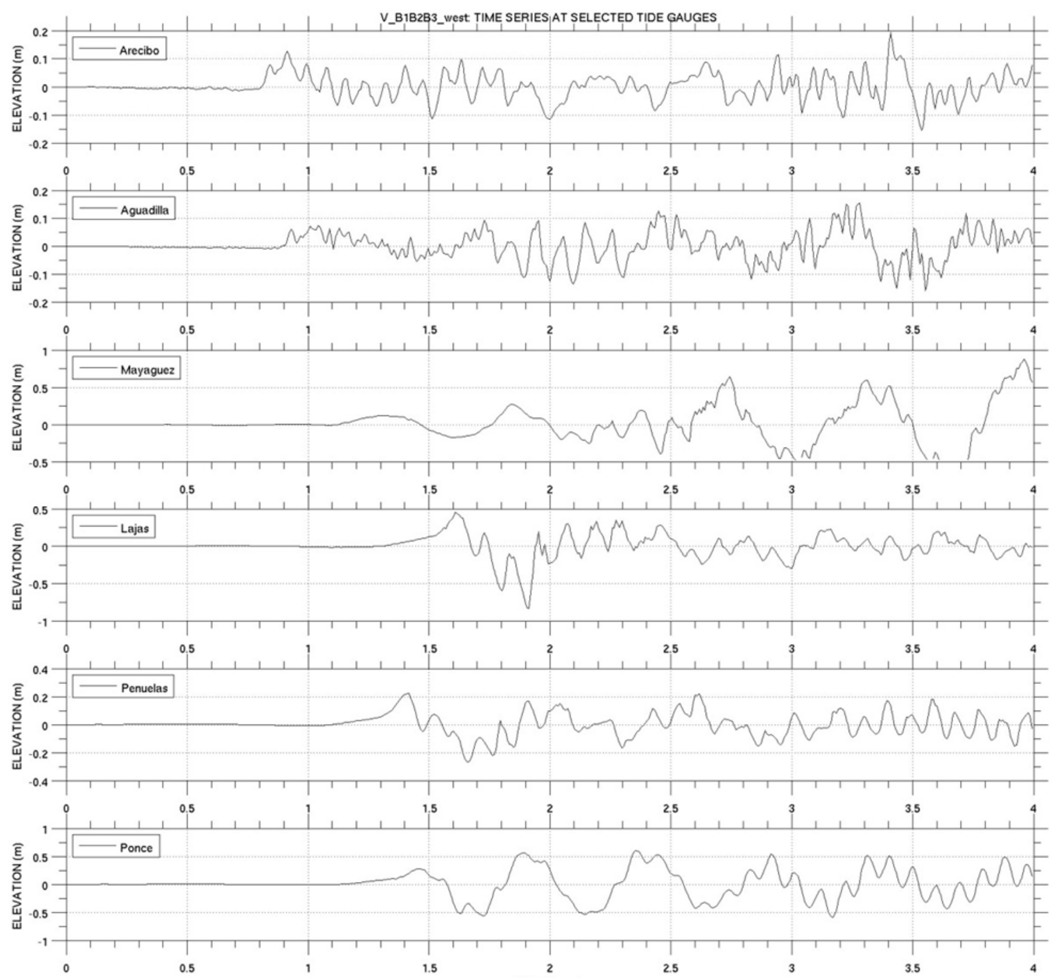


Figure 126 - B1 (segment B1 to B2): West inundation grid time series.

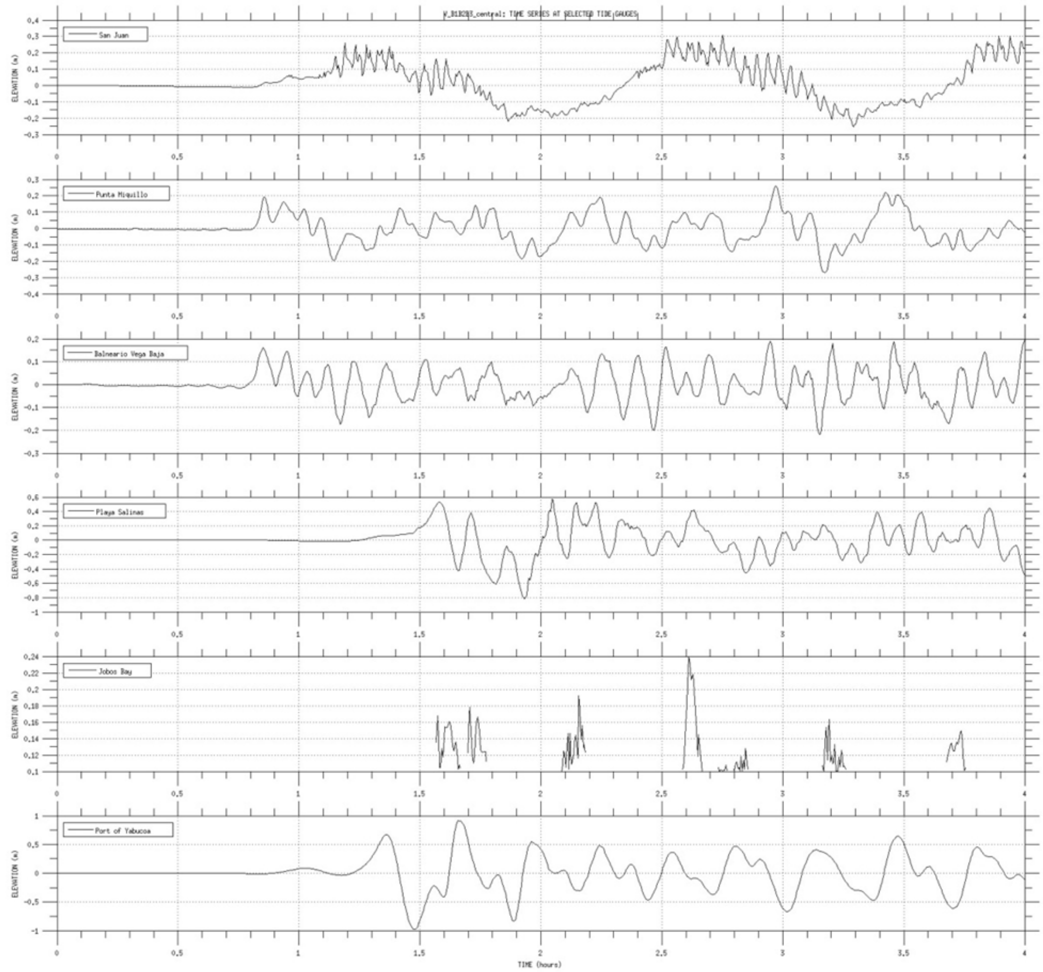


Figure 127 - B1 (segment B1 to B2): Center inundation grid time series.

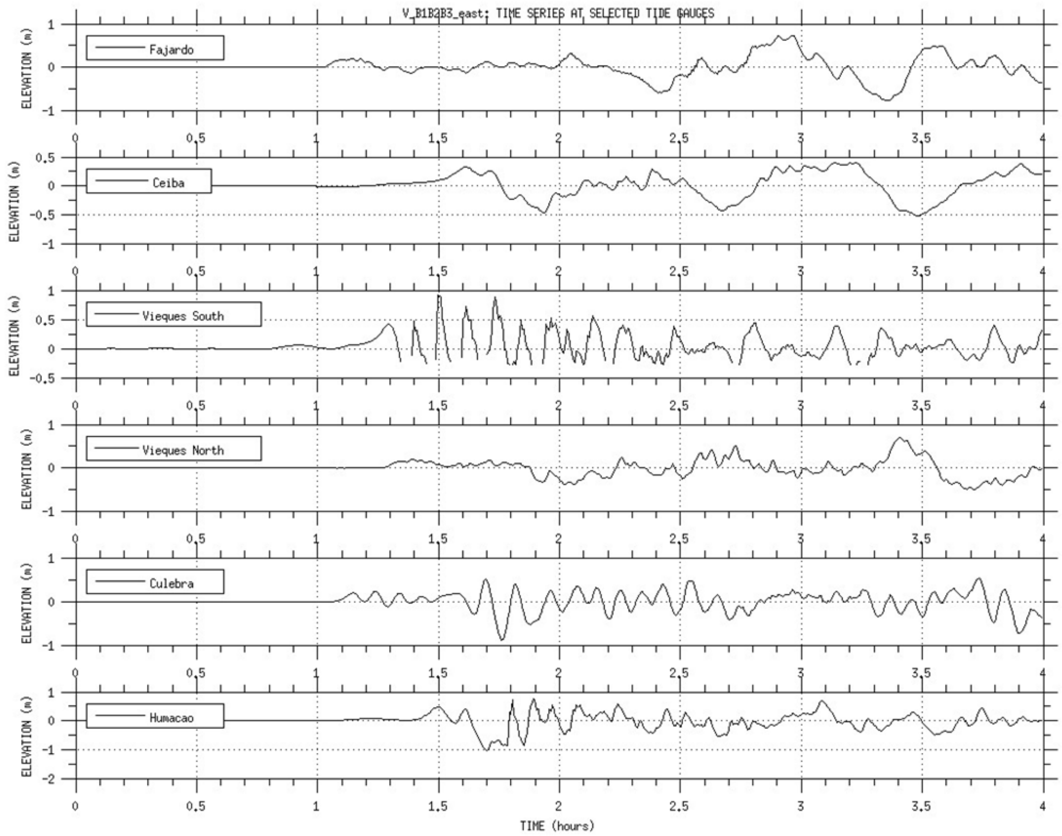


Figure 128 – B1-B2-B3 [segments (B1 to B2) + (B2 to B3) + (B3 to B4)]: East inundation grid time series.

B2 [segment (B2 to B3)]: Input parameter file for generation/propagation run.

```
######################### SEGMENT 1 ######################################################
Longitude:   -60.93607
Latitude:  17.29519
Length (km): 97.
Width (km): 20.
DIP (deg): 60.
RAKE (deg): 90.0
STRIKE (deg): 155.
SLIP (m): 2.
DEPTH (km): 10.
```

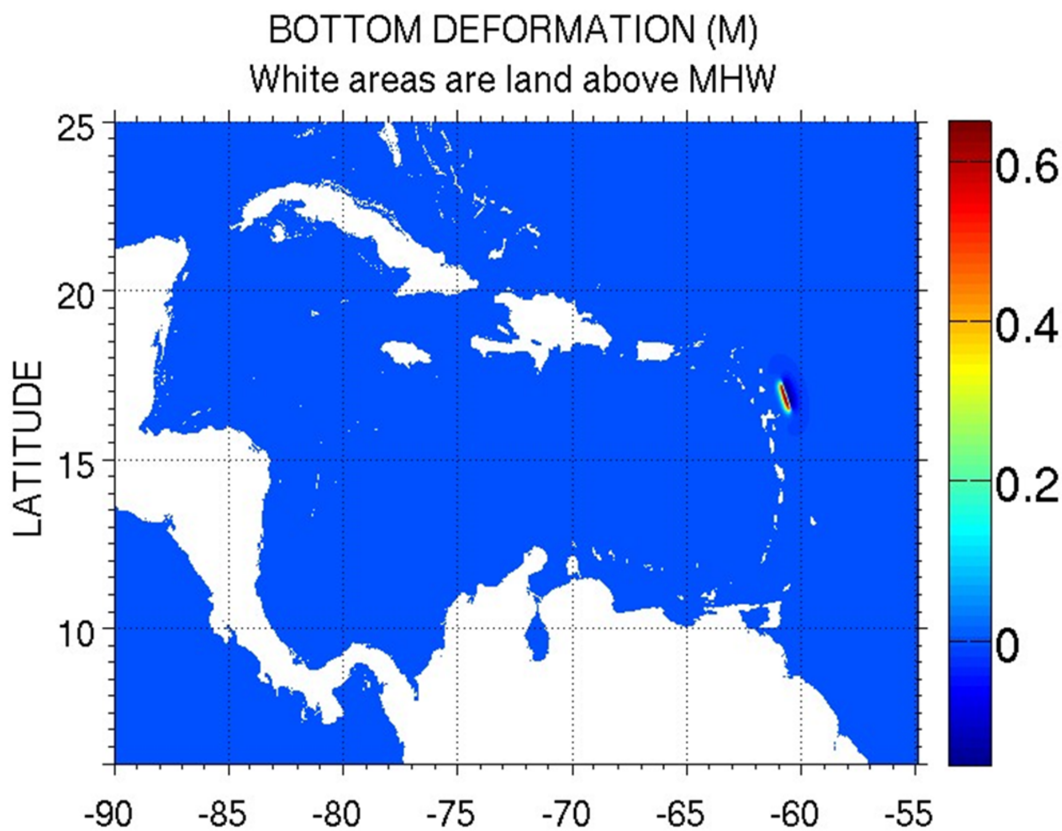


Figure 129 - B2 [segment (B2 to B3)] Bottom deformation.

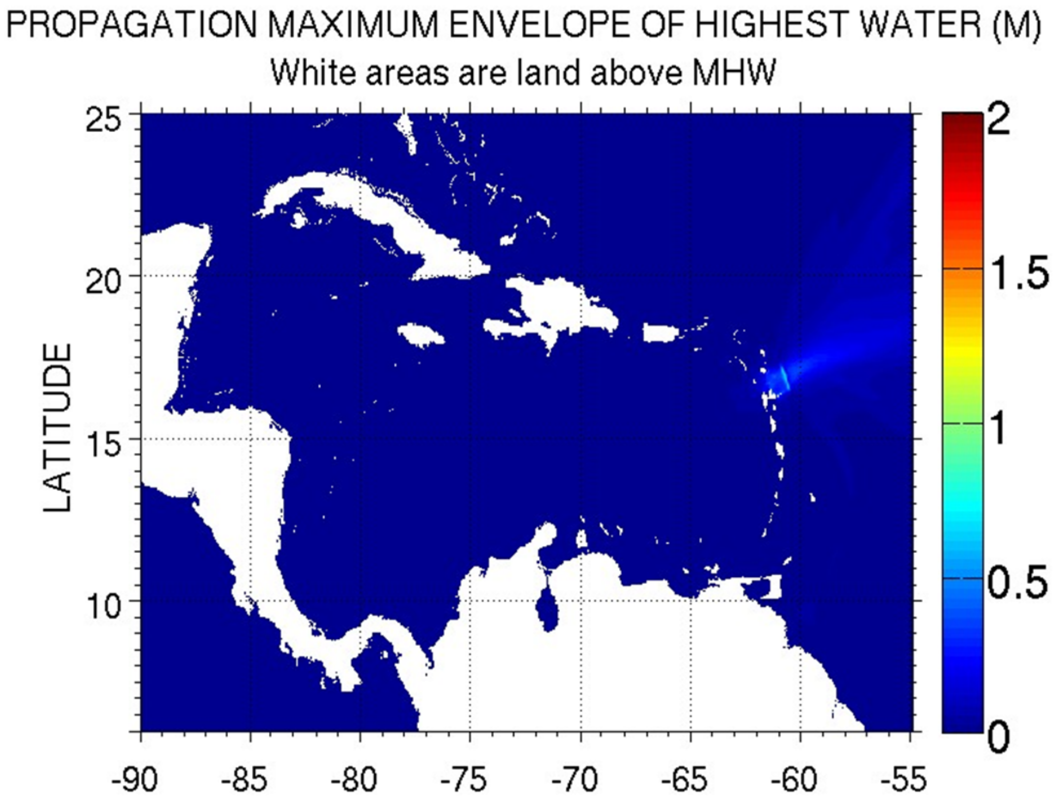


Figure 130 – B2 [segment (B2 to B3)] MEOHW for propagation grid.

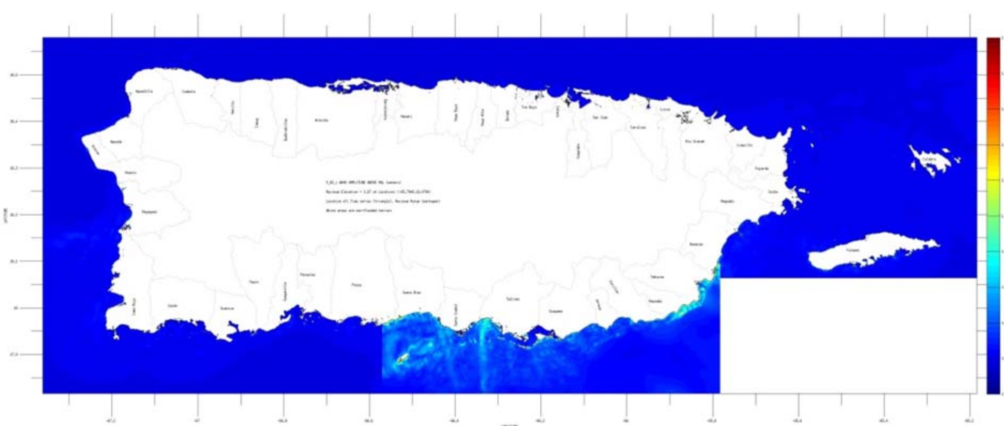


Figure 131 – B2 [segment (B2 to B3)] MEOHW for propagation grid.

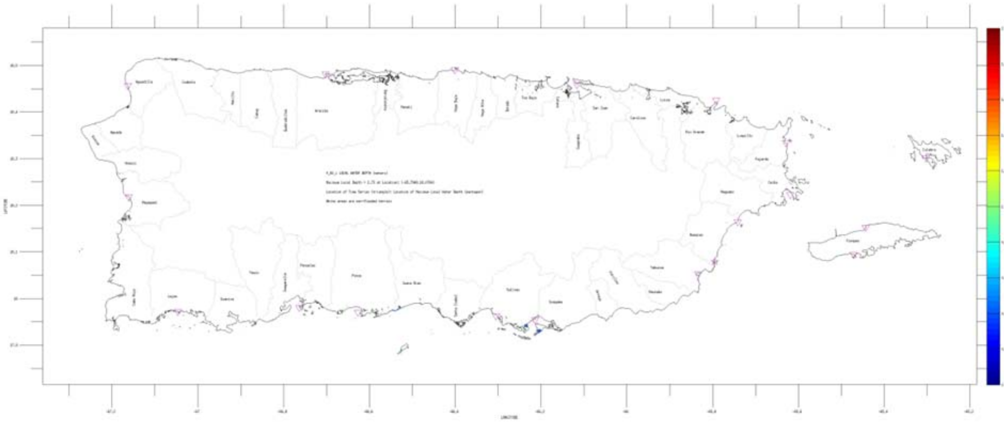


Figure 132– B2 [segment (B2 to B3)] LWD for propagation grid.

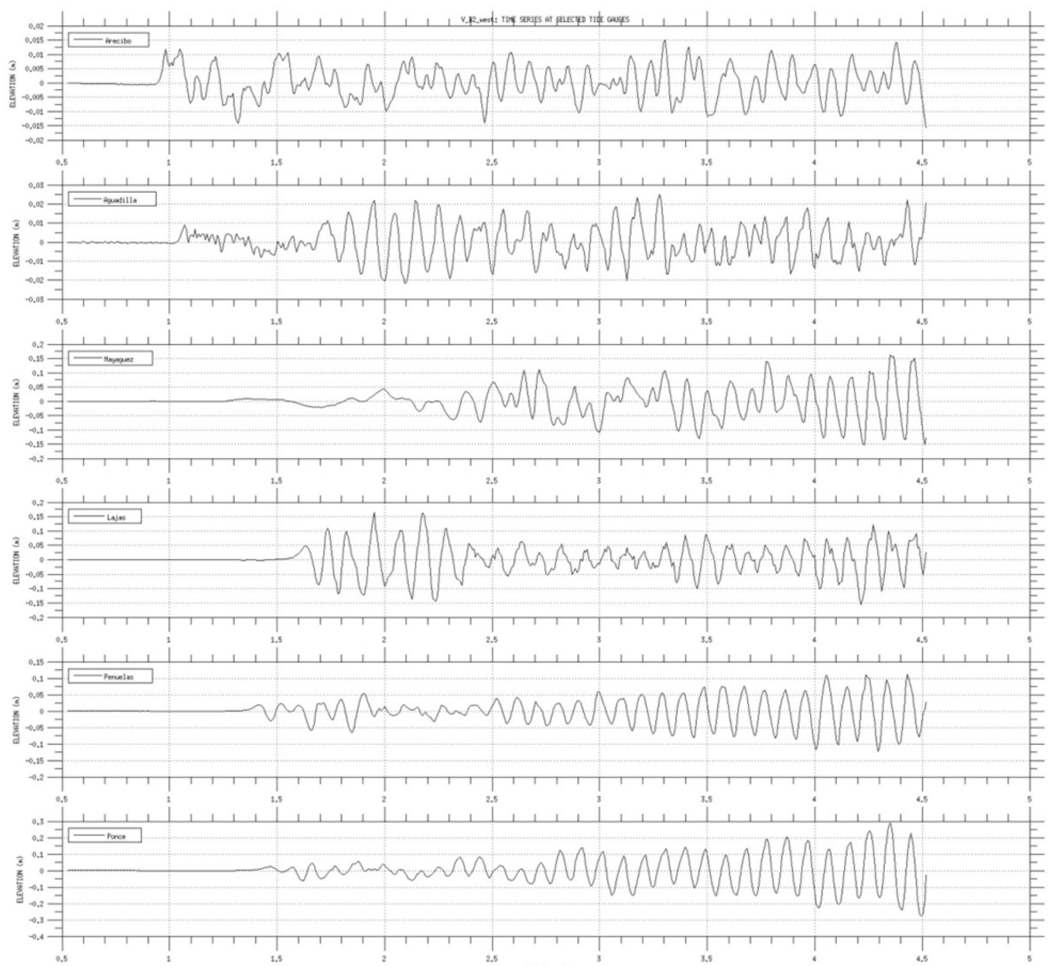


Figure 133 – B2 (segment B2 to B3): West inundation grid time series.

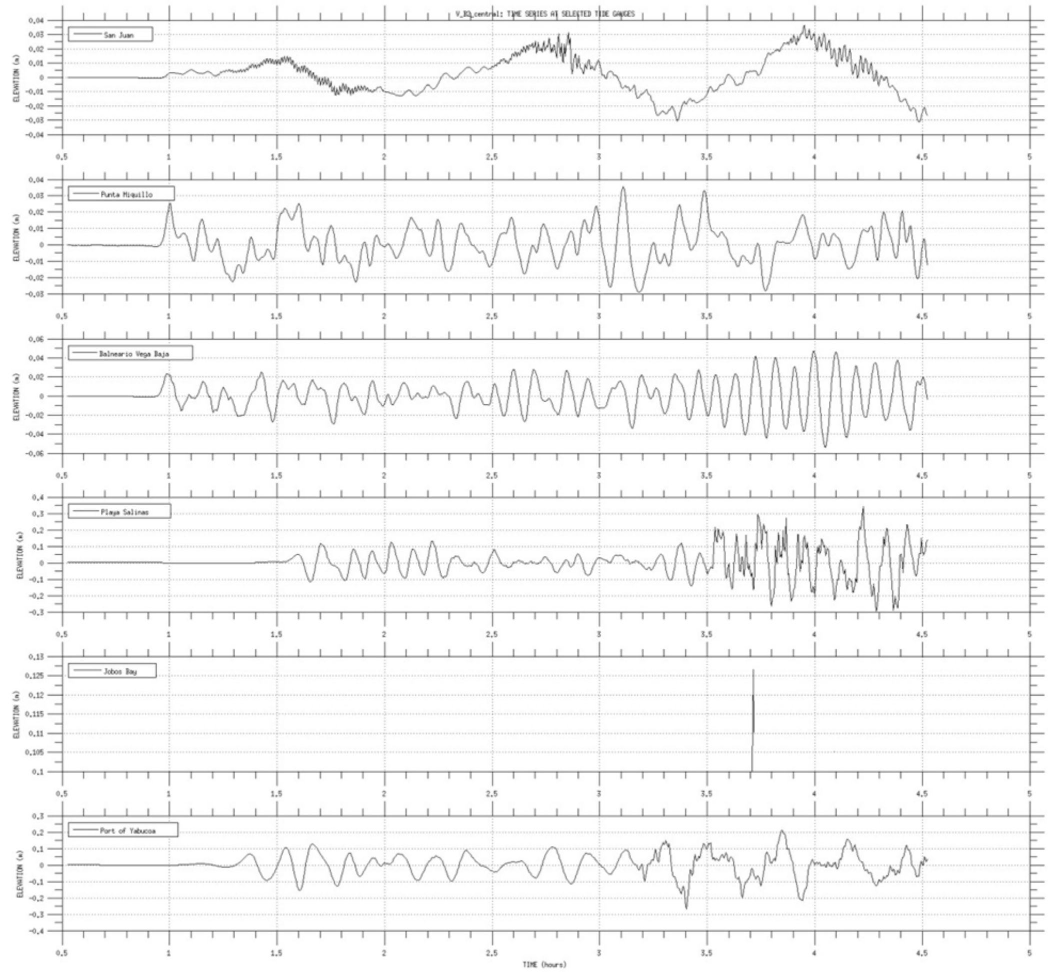


Figure 134 – B2 (segment B2 to B3): Center inundation grid time series.

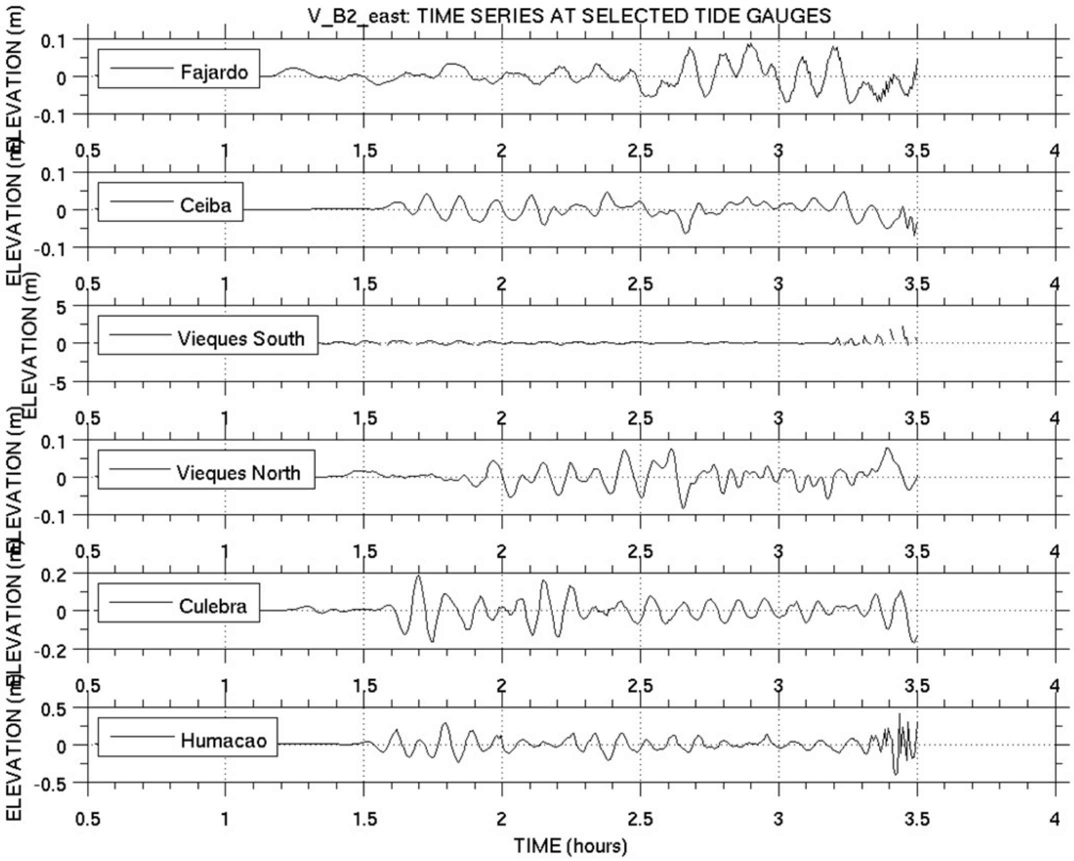


Figure 135 – B2-B3 [segments (B2 to B3) + (B3 to B4)] East inundation grid time series.

B2-B3 [segments (B2 to B3) + (B3 to B4)]: Input parameter file for generation/propagation run.

```
######################## SEGMENT 1 ####################################################
Longitude: -60.93607
Latitude: 17.29519
Length (km): 97.
Width (km): 40.
DIP (deg): 60.
RAKE (deg): 90.0
STRIKE (deg): 155.
SLIP (m): 3.
DEPTH (km): 10.
######################## SEGMENT 2 ####################################################
Longitude: -60.56574
Latitude: 16.50455
Length (km): 124.1
Width (km): 40.
DIP (deg): 60.
RAKE (deg): 90.0
STRIKE (deg): 164.5
SLIP (m): 3.
DEPTH (km): 10.
```

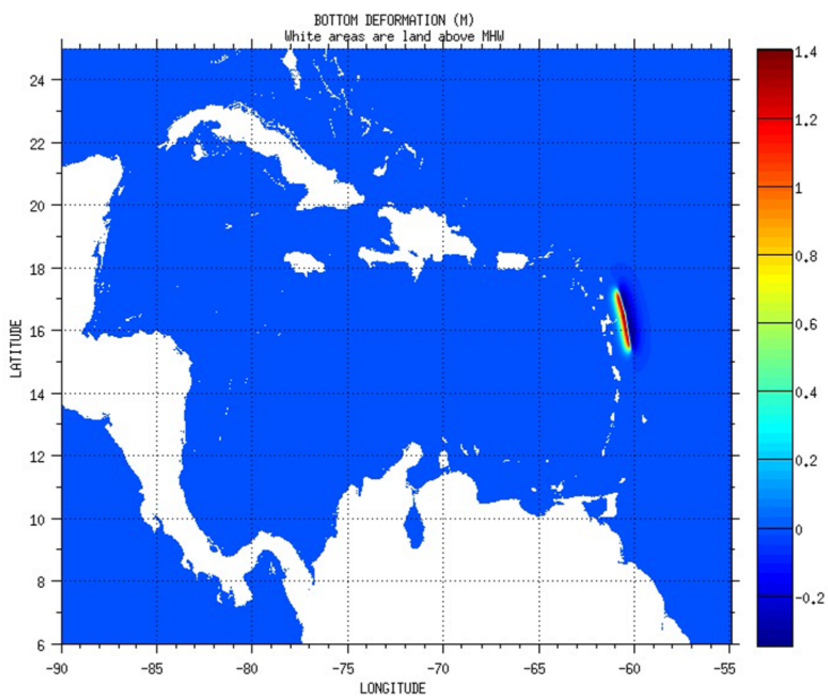


Figure 136- B2-B3 [segments (B2 to B3) + (B3 to B4)] Bottom deformation.

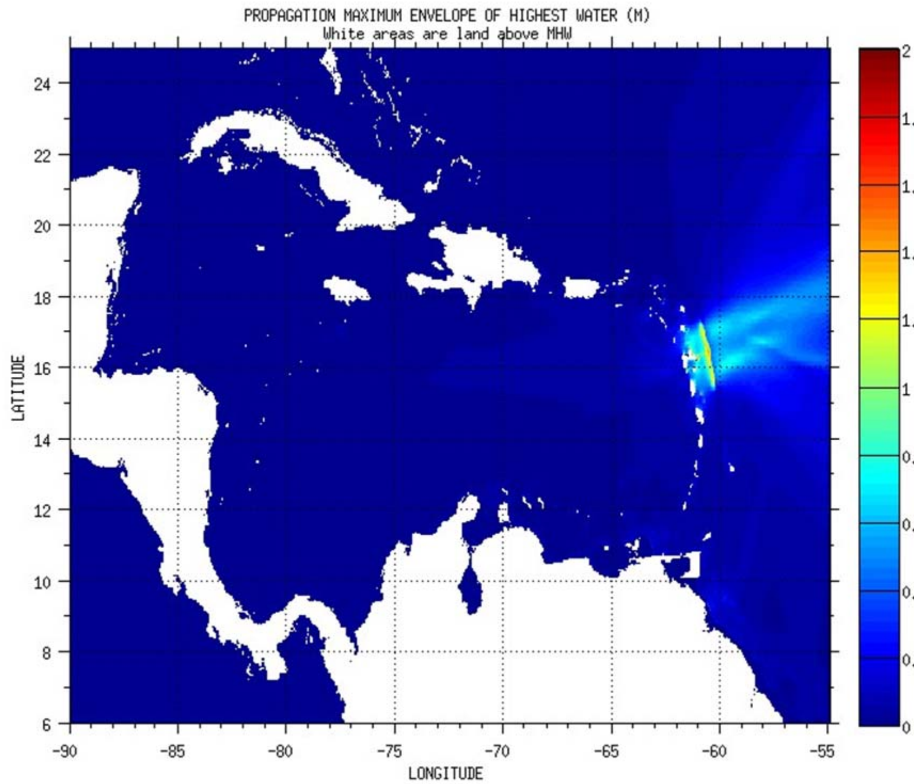


Figure 137 – B2-B3 [segments (B2 to B3) + (B3 to B4)] MEOHW for propagation grid.

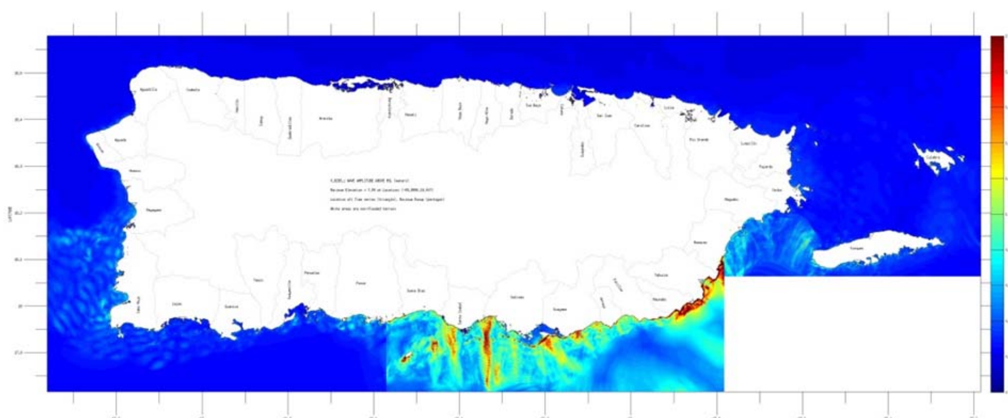


Figure 138 – B2-B3 [segments (B2 to B3) + (B3 to B4)] MEOHW for inundation grids.

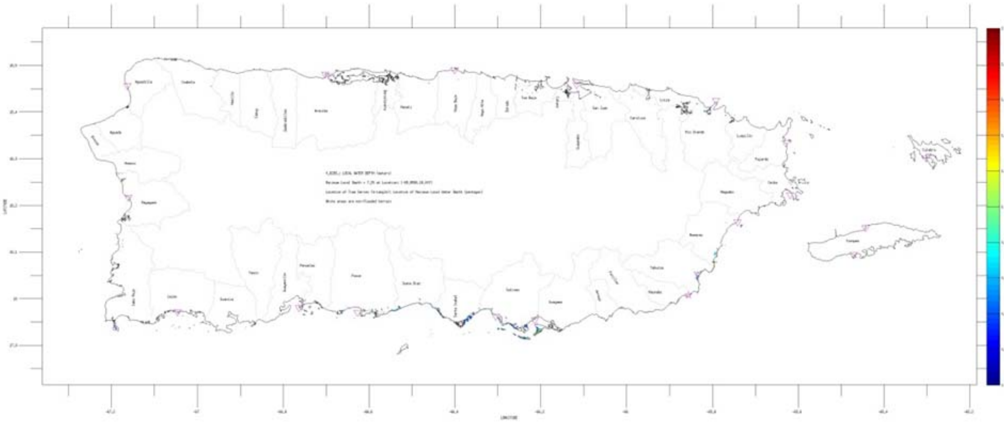


Figure 139 – B2-B3 [segments (B2 to B3) + (B3 to B4)] MEOHW for inundation grids.

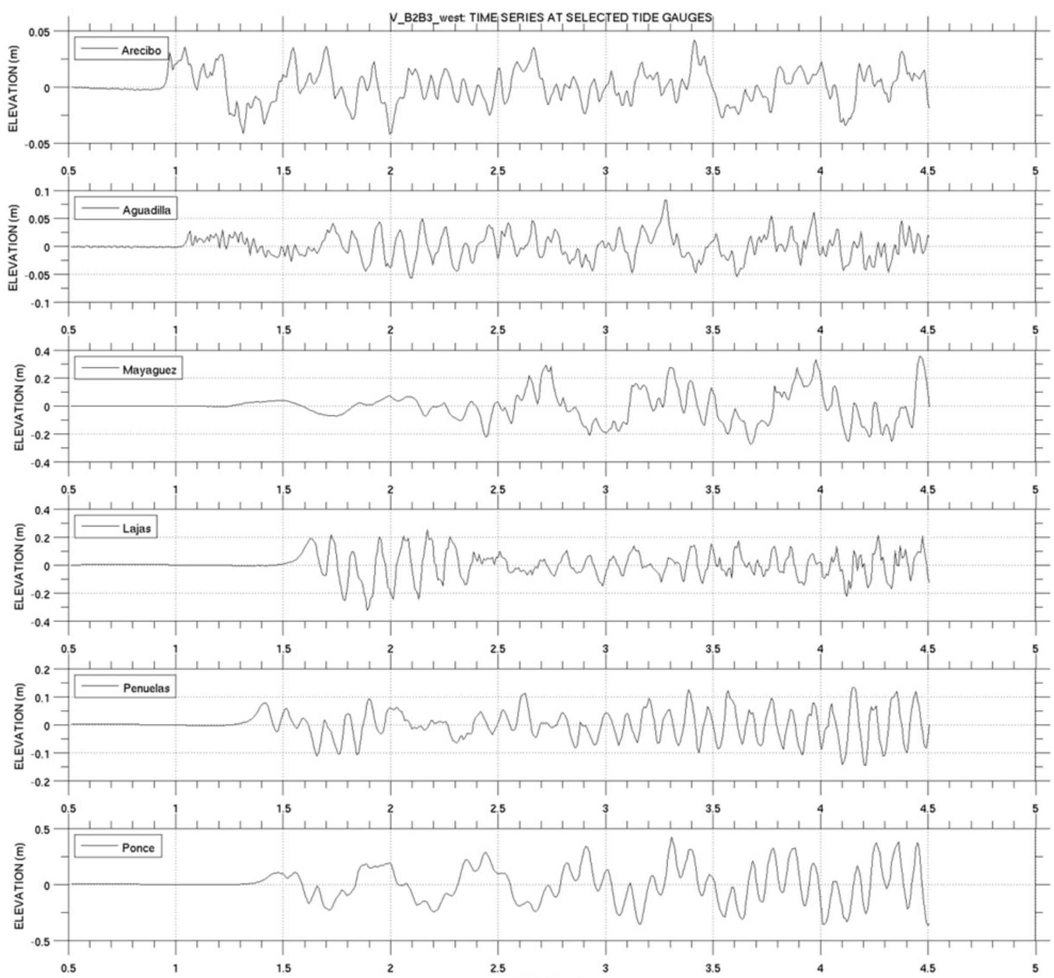


Figure 140 – B2-B3 (segments B2 to B3 + B3 to B4): West inundation grid time series.

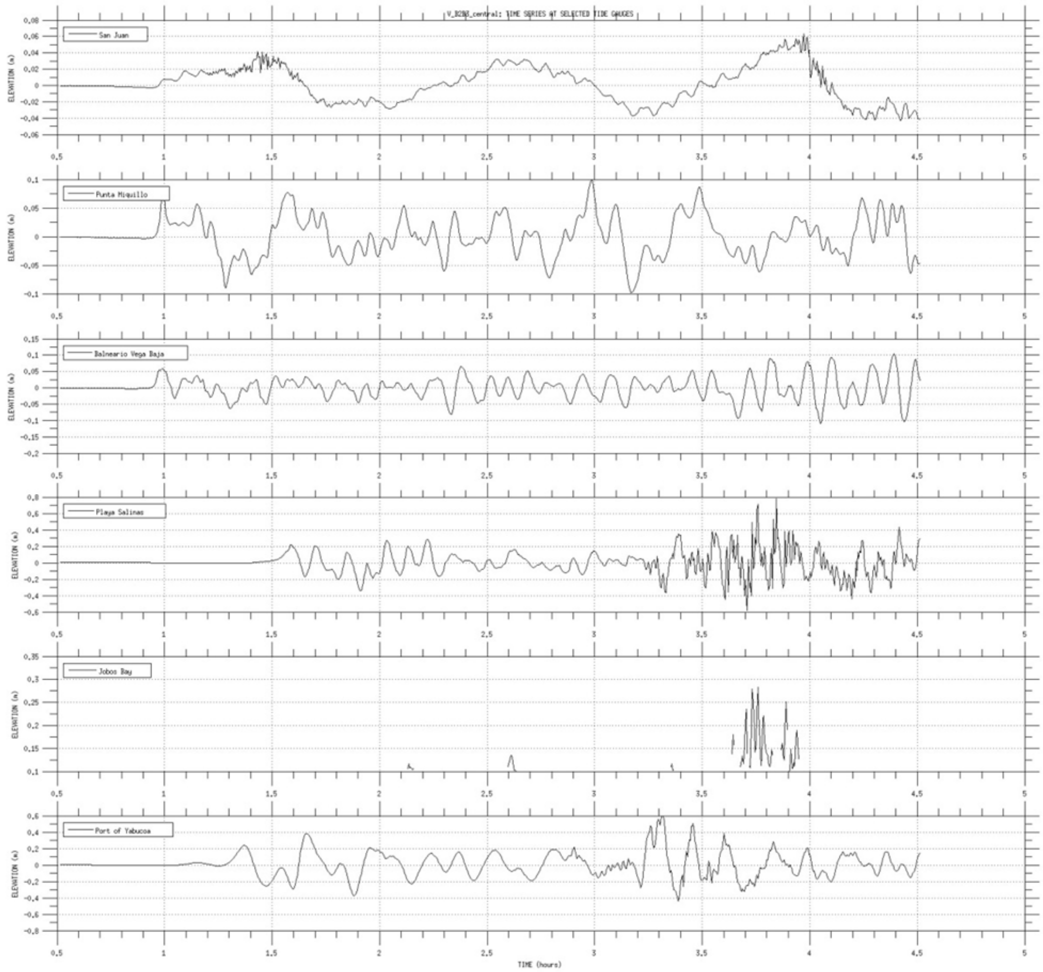


Figure 141 – B2-B3 (segments B2 to B3 + B3 to B4): Center inundation grid time series.

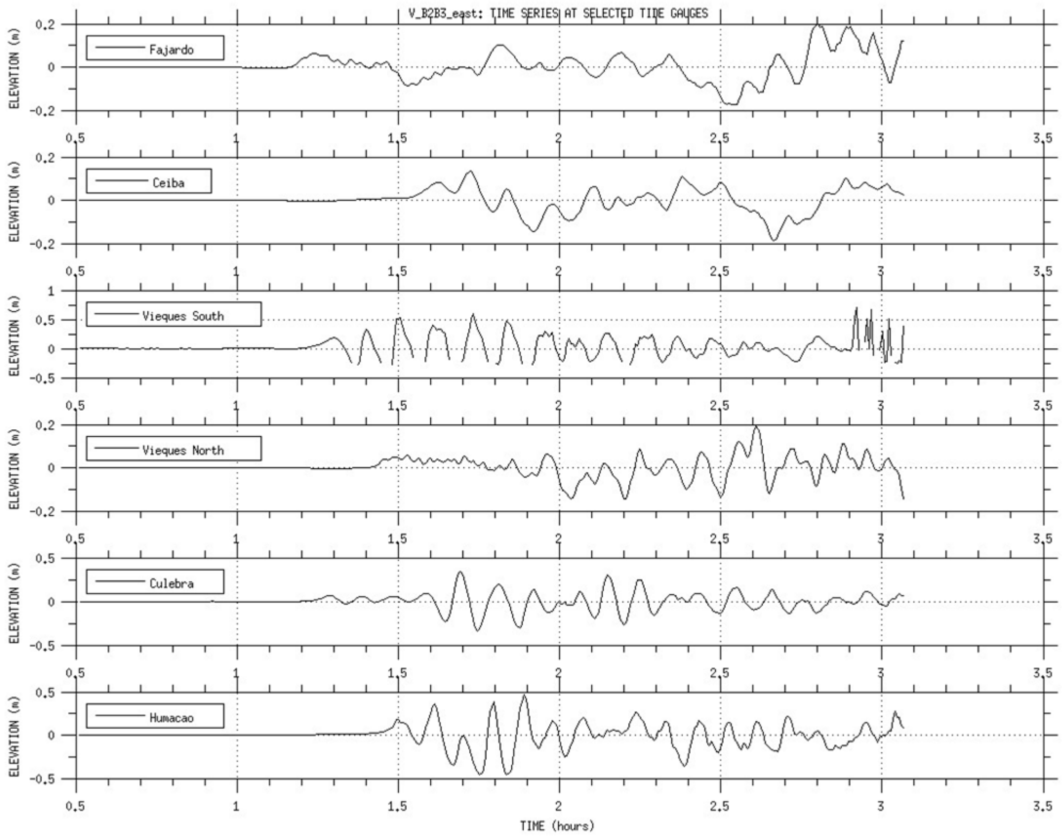


Figure 142 – B2-B3 [segments (B2 to B3) + (B3 to B4)] East inundation grid time series.

B3 [segment (B3 to B4)]: Input parameter file for generation/propagation run.

```
######################## SEGMENT 1 ####################################################
Longitude:  -60.56574
Latitude:  16.50455
Length (km):  124.1
Width (km):  20.
DIP (deg):  60.
RAKE (deg):  90.0
STRIKE (deg): 164.5
SLIP (m):  2.25
DEPTH (km):  10.
```

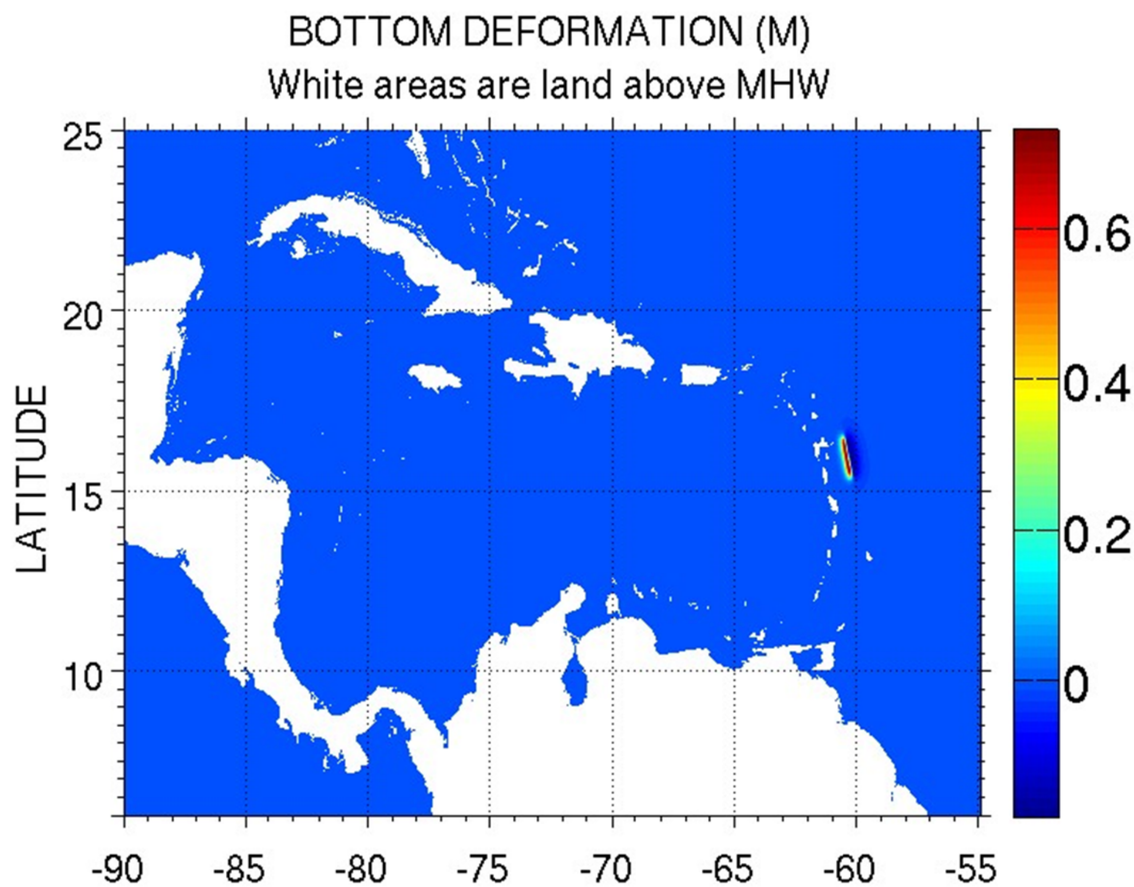


Figure 143- B3 [segment (B3 to B4)] Bottom deformation.

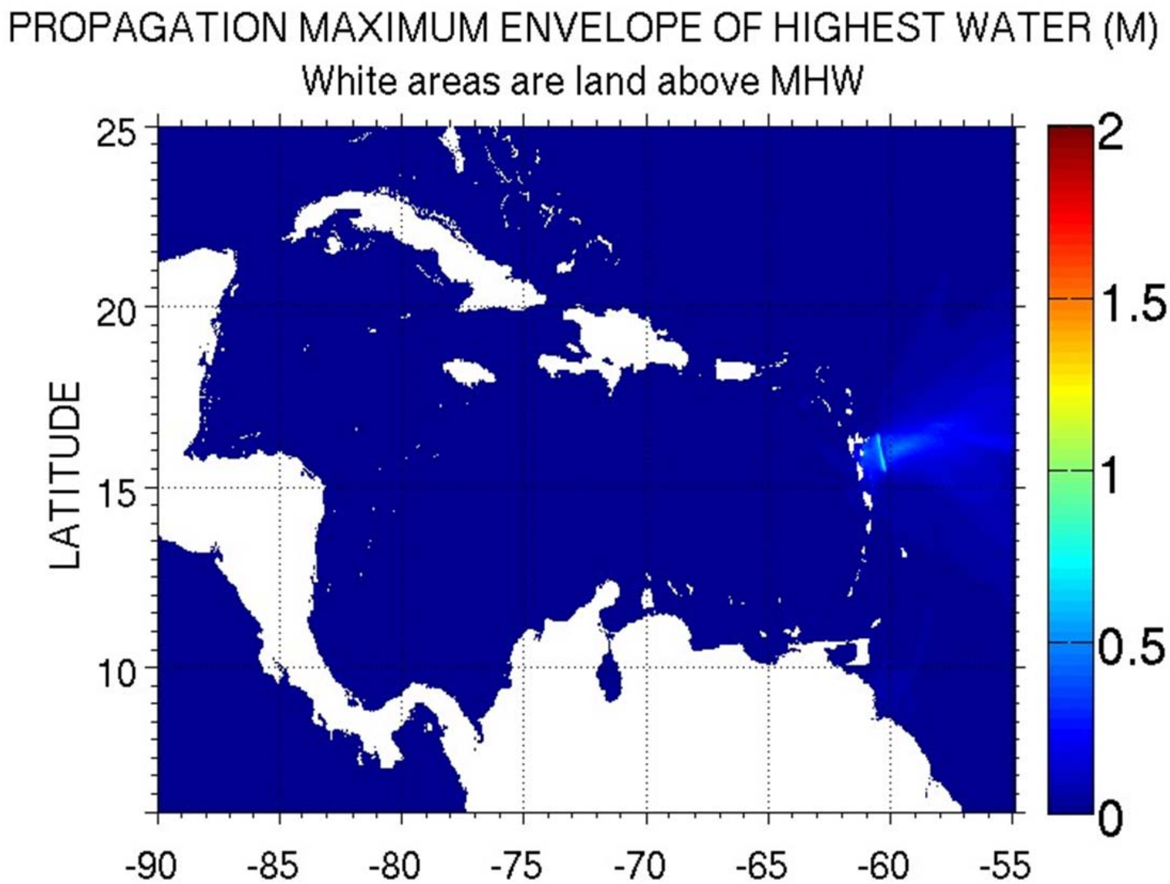


Figure 144 – B3 [segment (B3 to B4)] MEOHW for propagation grid.

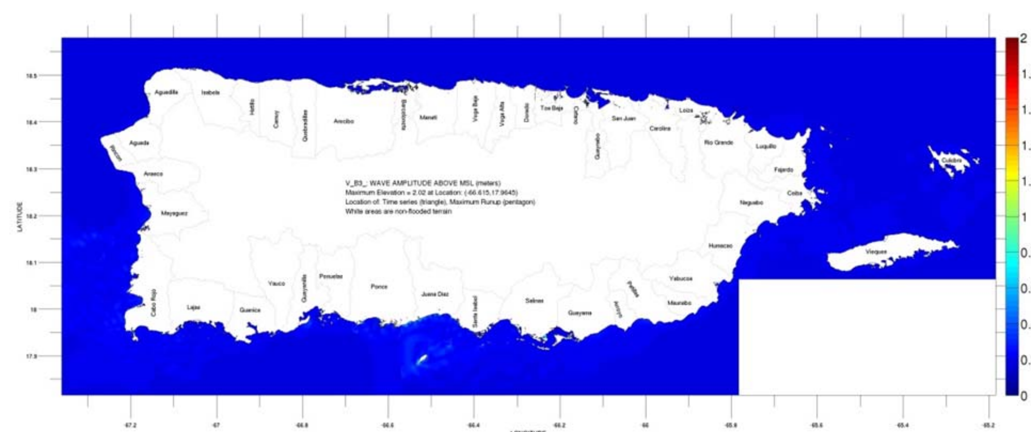


Figure 145 – B3 [segment (B3 to B4)] MEOHW for inundation grids.

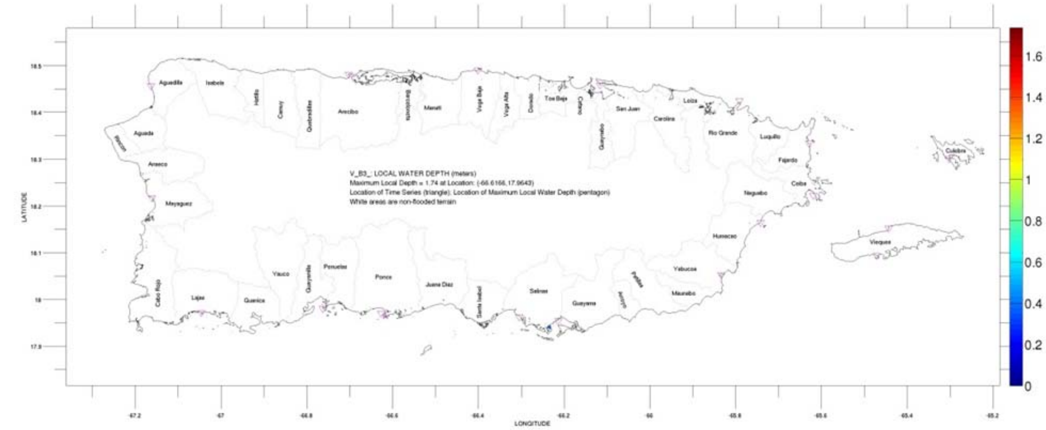


Figure 146 – B3 [segment (B3 to B4)] LWD for inundation grids.

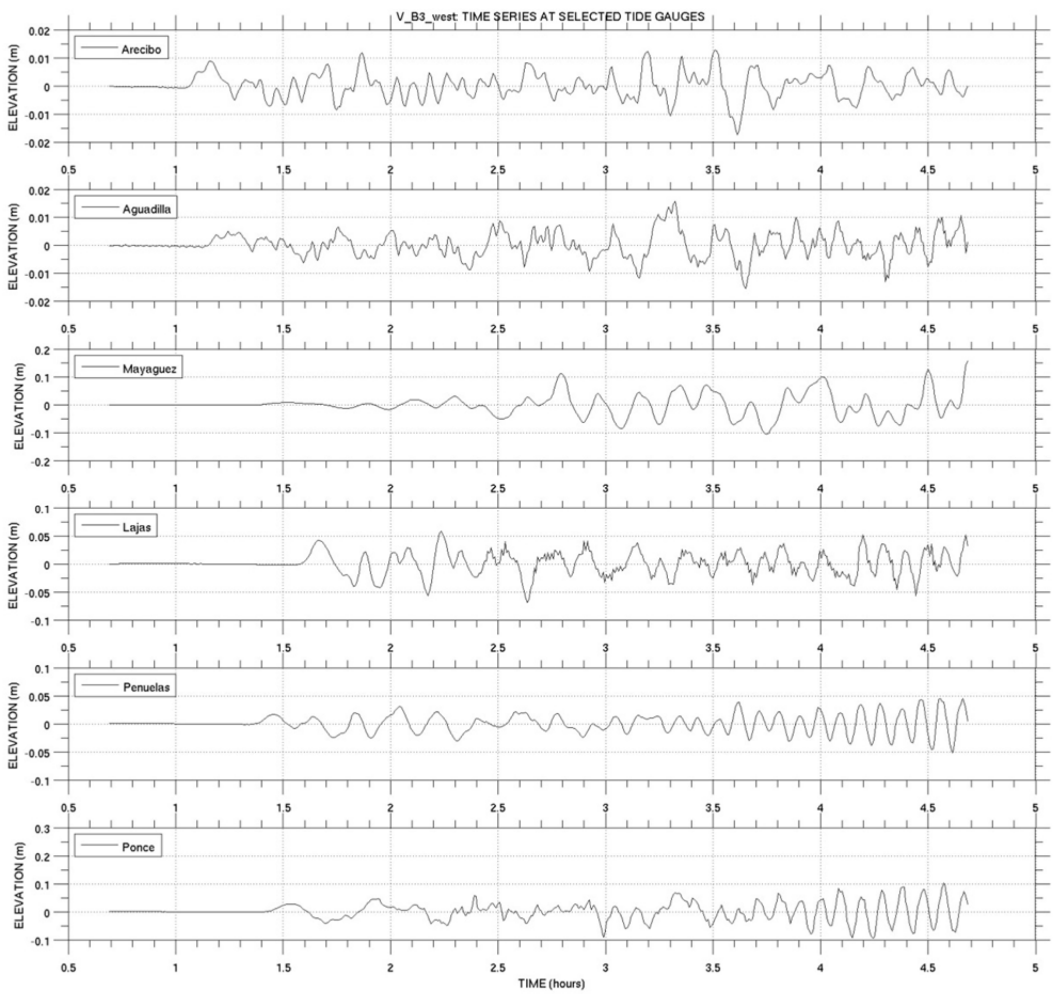


Figure 147 – B3 (segment B3 to B4): West inundation grid time series.

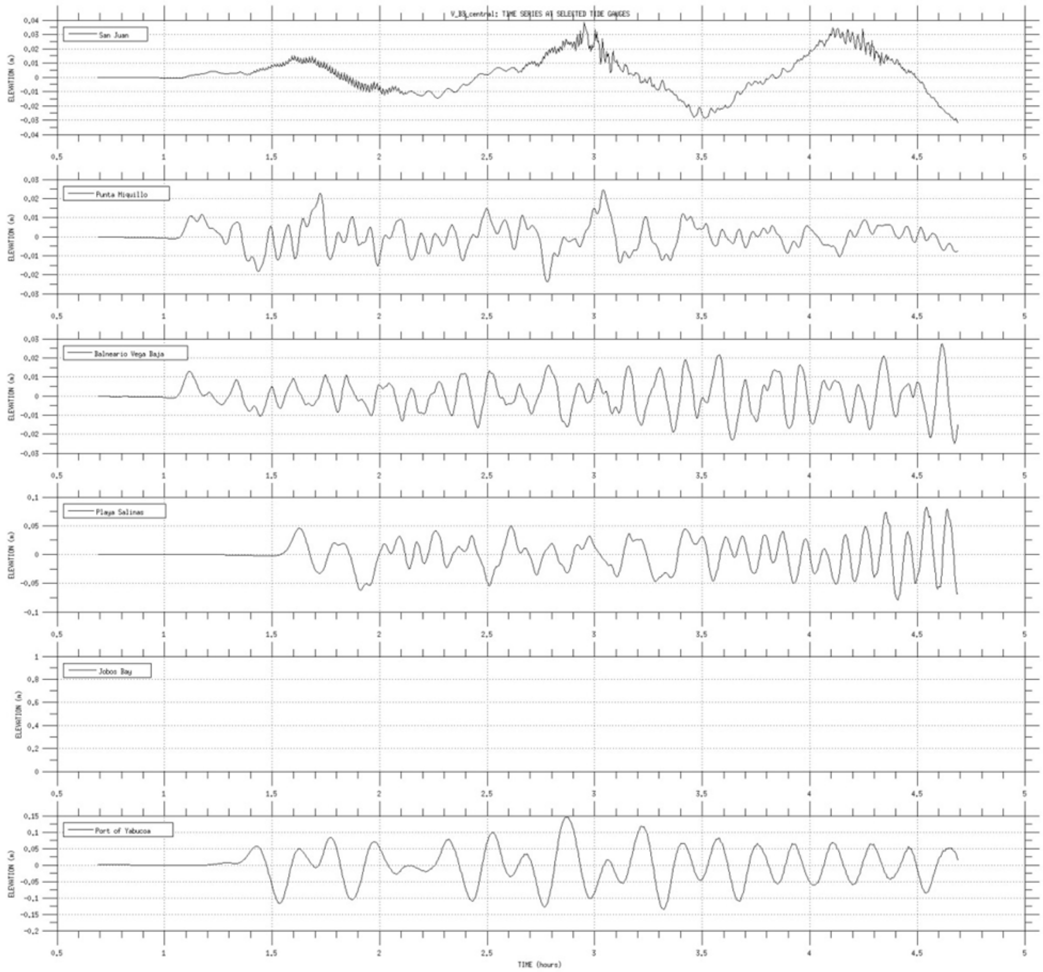


Figure 148 - B3 (segment B3 to B4): Central inundation grid time series.

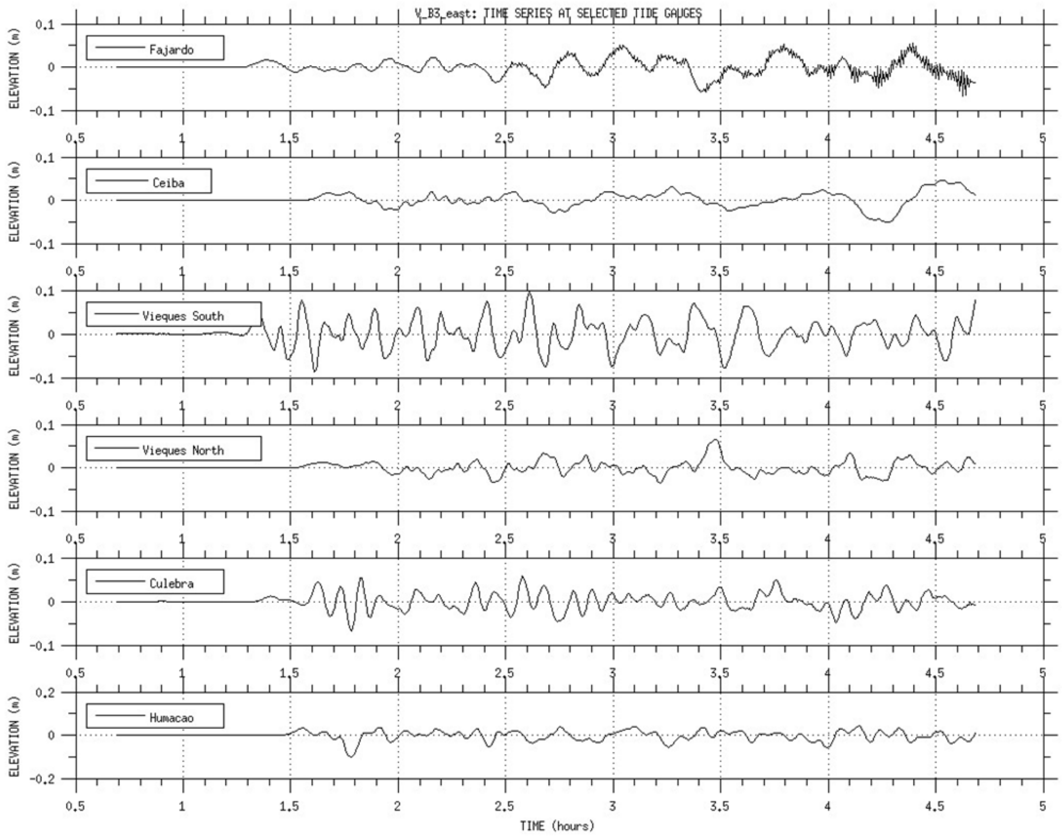


Figure 149 - B3 [segment (B3 to B4)] East inundation grid time series.

MAXIMUM OF THE MAXIMUMS (MOM) FOR REGIONAL EVENTS

We will now show the Maximum of the Maximums (MOM), in which all of the above results (the individual MEOHW's) are processed in order to get the MOM.

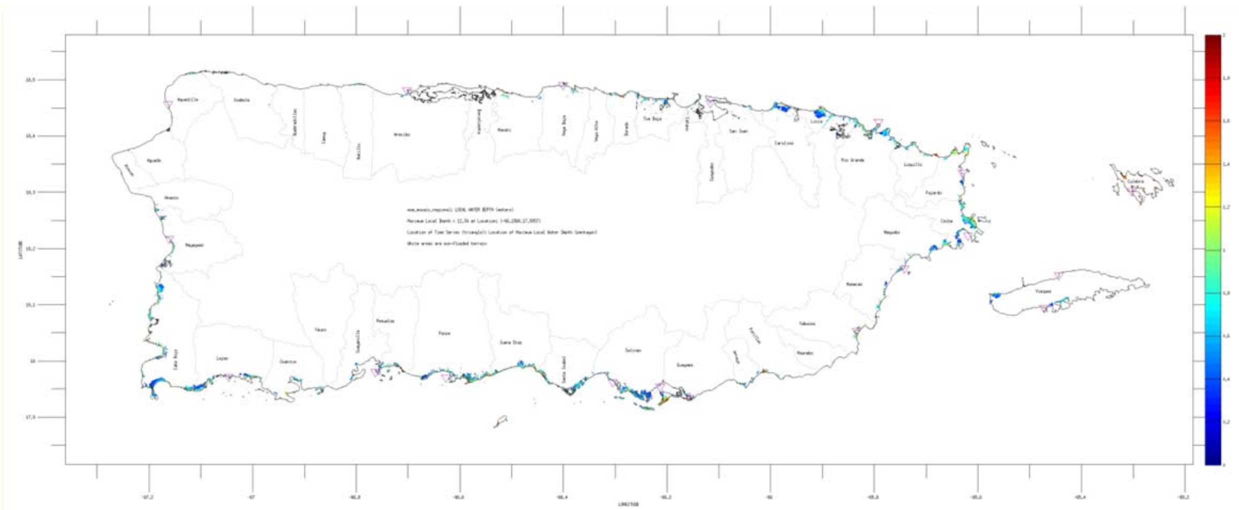


Figure 150 – Maximum of the Maximums (MOM) for all of the regional scenarios.

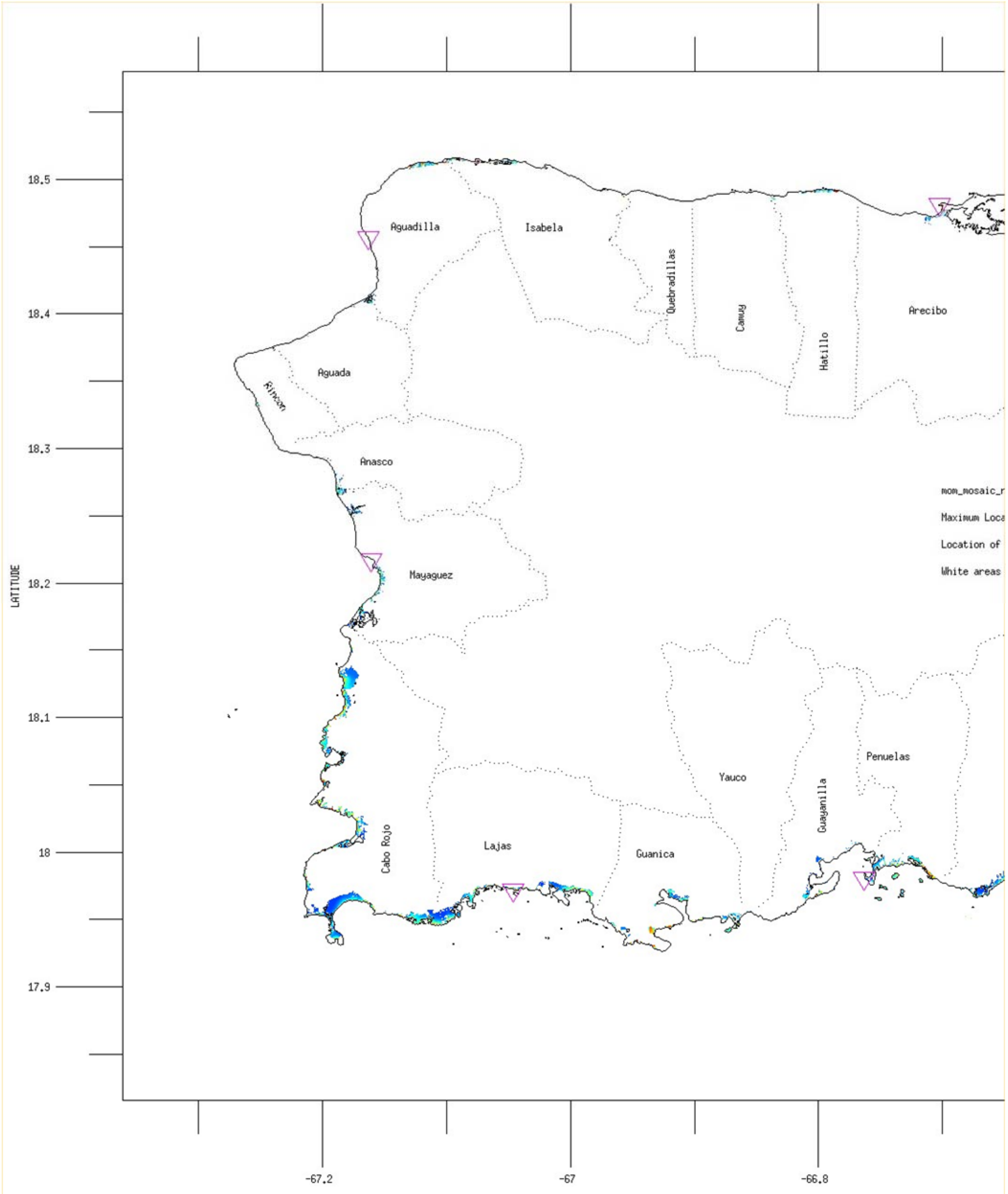
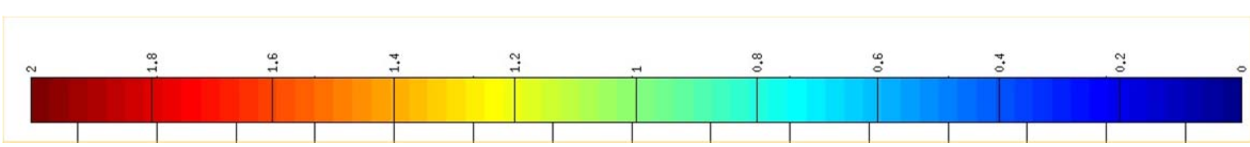


Figure 151 – MOM for the west part of the island. Regional scenarios.

Figure 152 – MOM for the central part of the island. Regional scenarios.



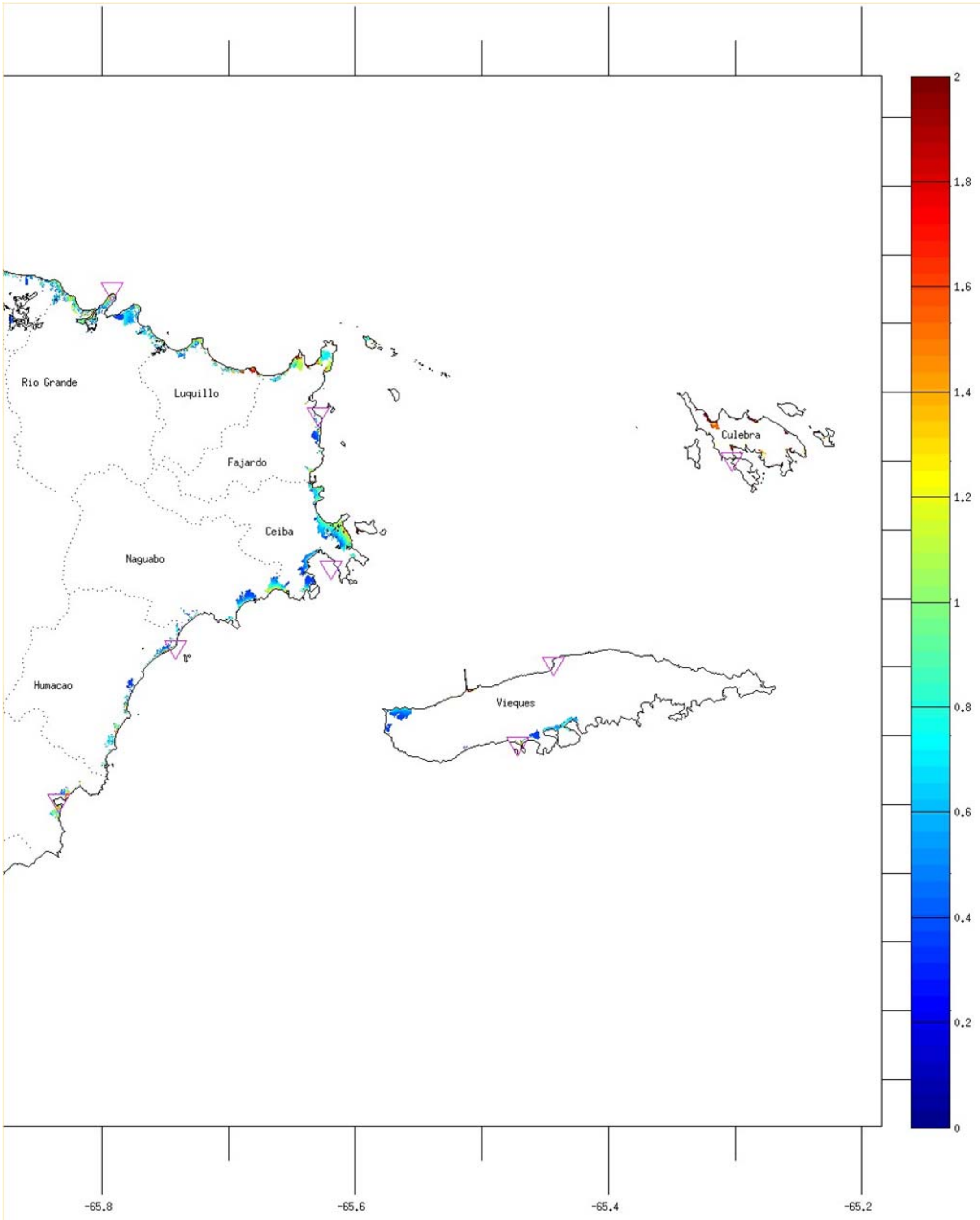


Figure 153 - MOM for the east part of the island. Regional scenarios.

COMPARISON WITH FLOODING FROM LOCAL SOURCES

Finally, we will compare the extent of flooding from local versus regional sources. This is shown in Figure 225. It can be seen that, with one exception, the regional flooding lies inside the local flooding. The exception is at a location at the entrance to Ensenada Honda in Culebra (see Figure 226).

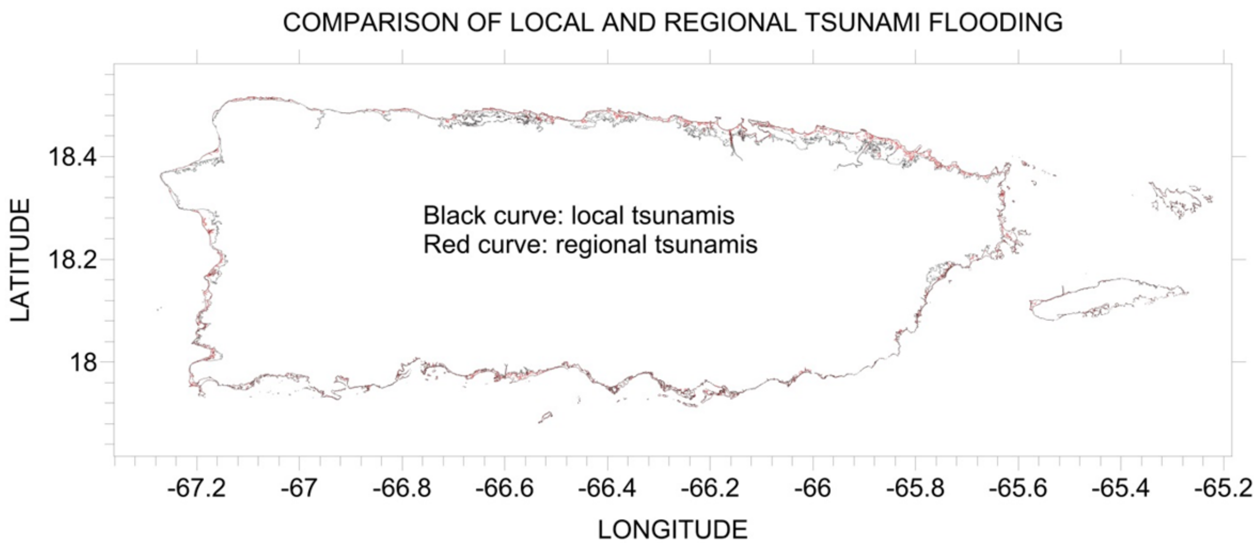


Figure 154 – Comparison of tsunami flooding from MOM's of local and regional tsunamis.

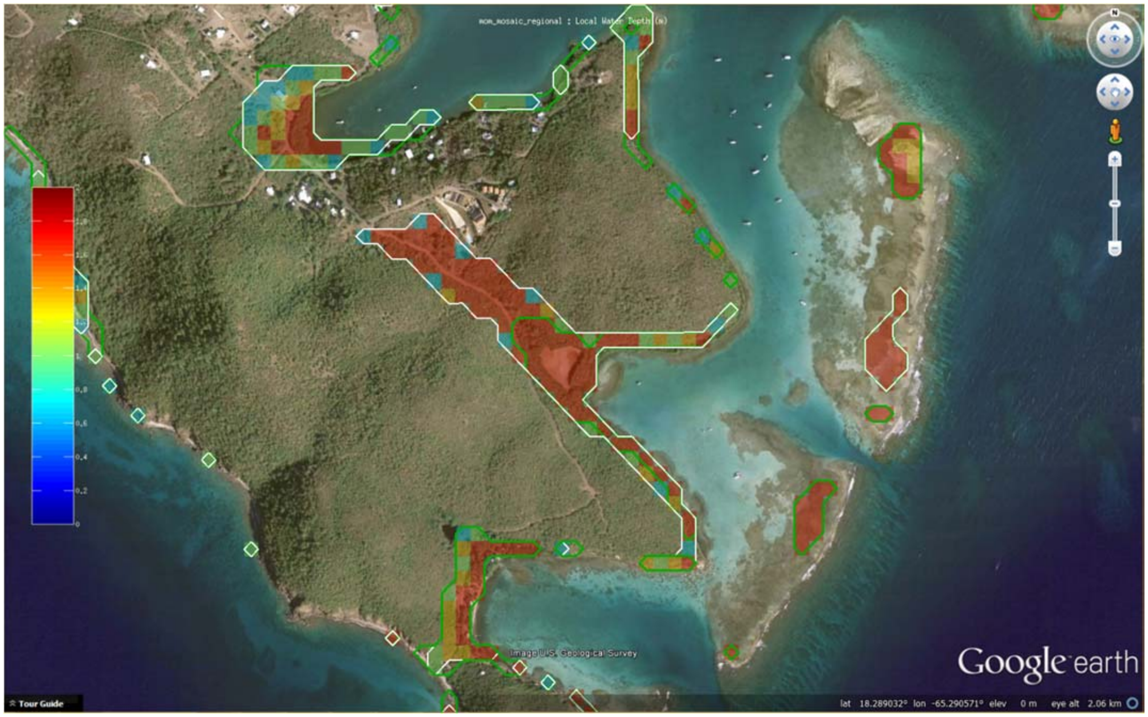


Figure 155 – The figure shows the only location where the flooding from regional sources (white curve) extended further inland than the flooding from local sources (green curve). The painted areas are from the kmz for the regional sources.

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