Tsunami Mapping Projects, GOM
ACCOMPLISHMENTS

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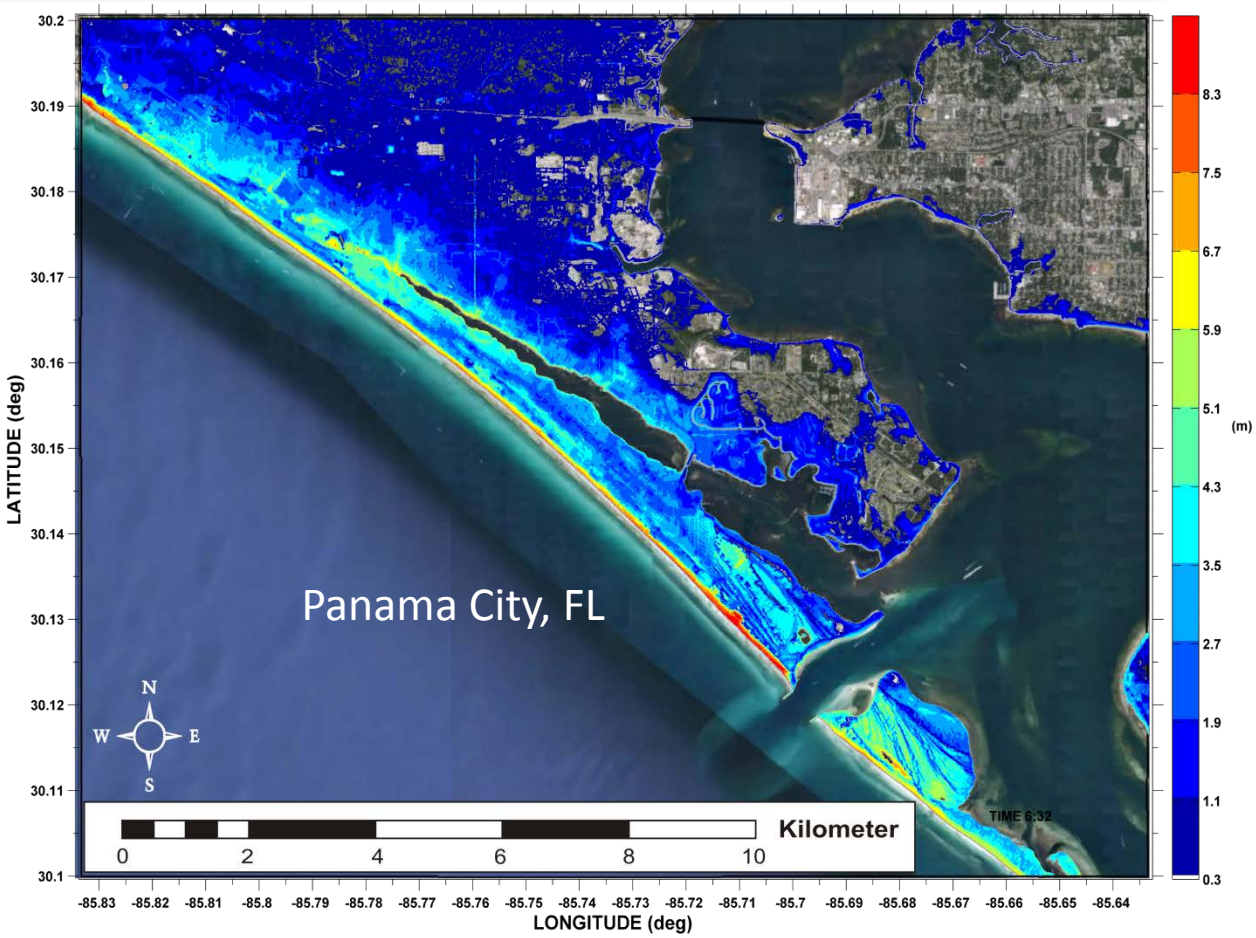
Amy Godsey



Portland, OR, 2015

Tsunami Mapping Projects, GOM
ACCOMPLISHMENTS

What are the concerns for the GOM?

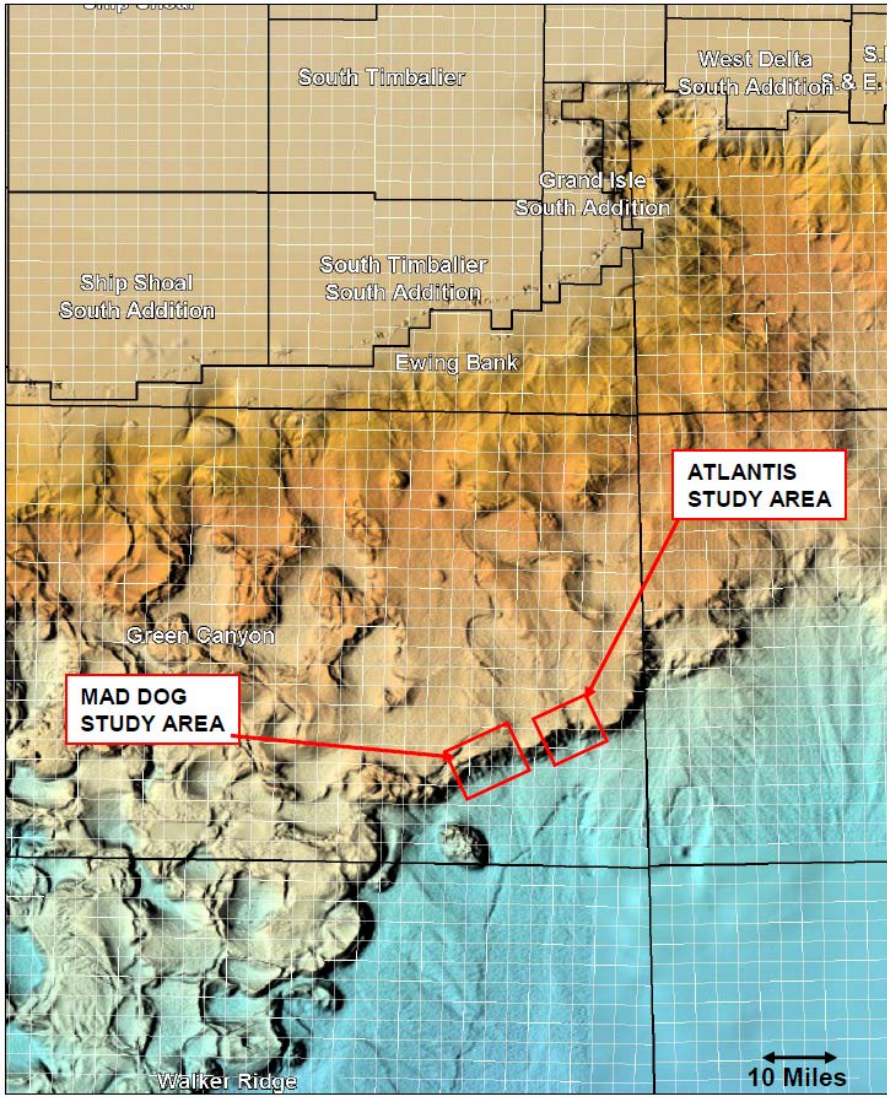


Fig.1: Gulf of Mexico Seafloor Rendering Showing Location of the Mad Dog and Atlantis Study Areas, Southern Green Canyon Area.

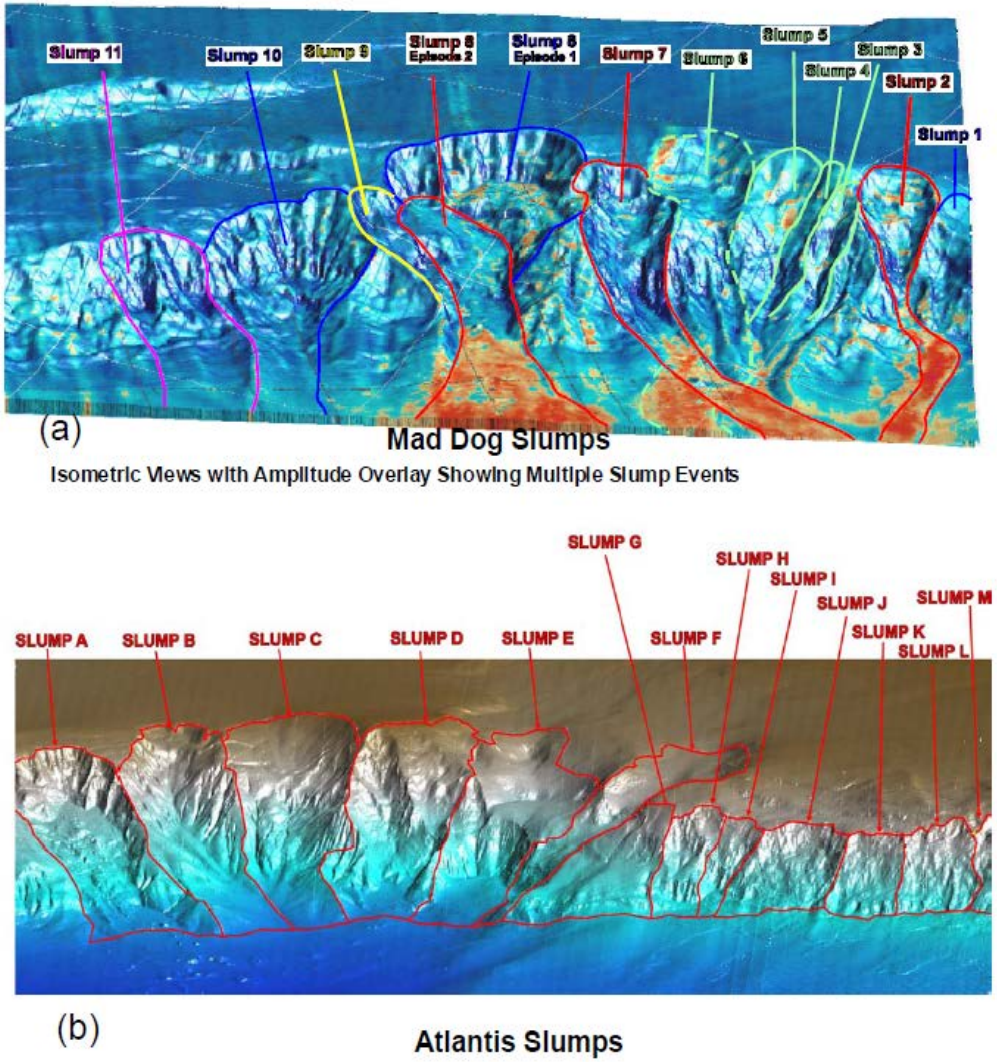
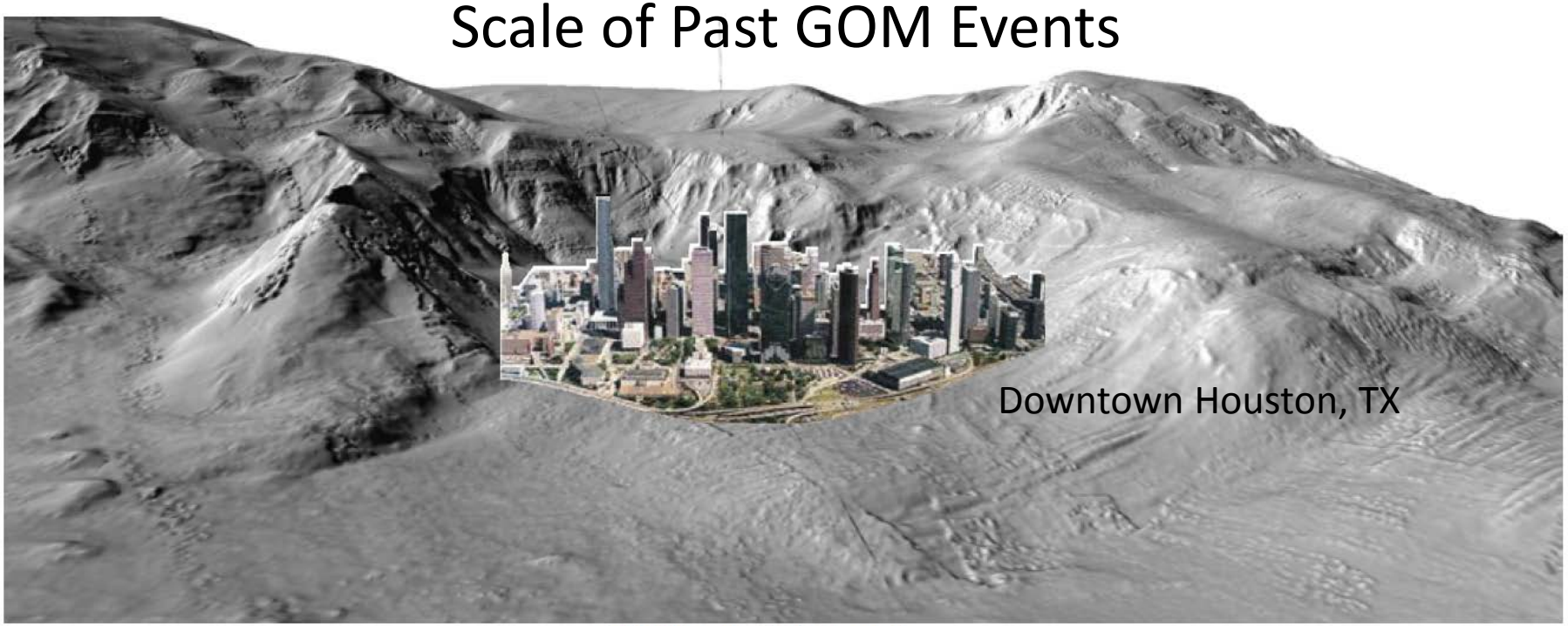
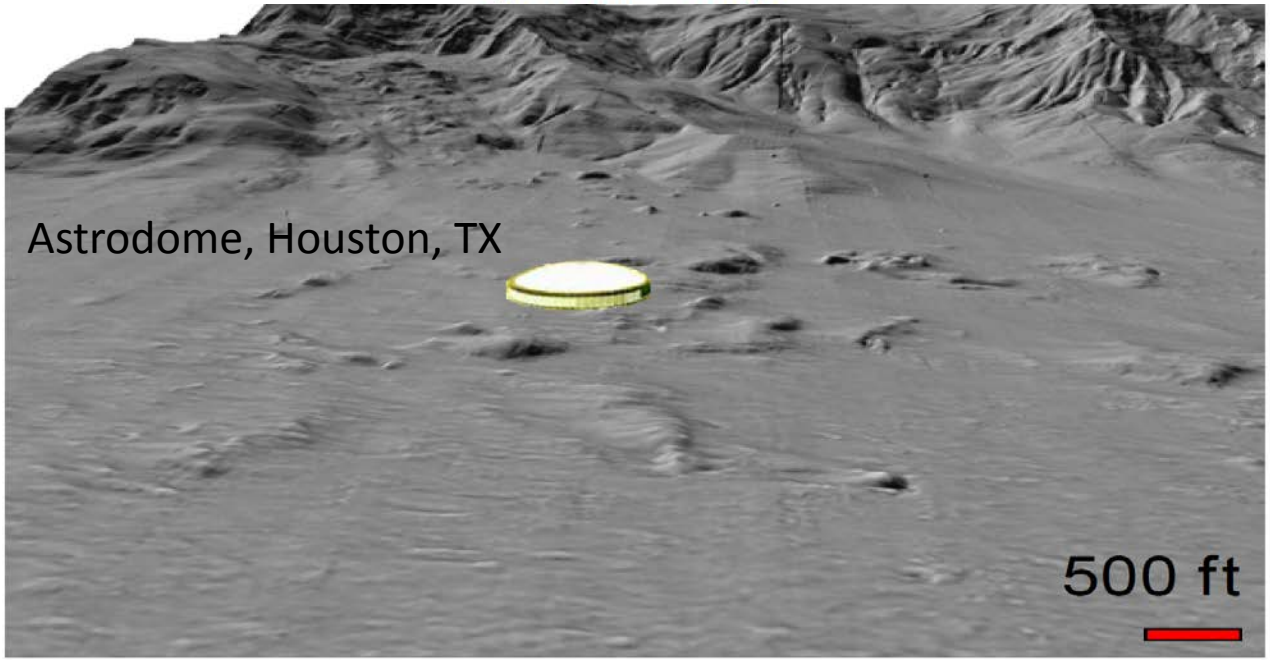


Fig.2: Isometric View and Nomenclature of Identified Slumps in the Mad Dog and Atlantis Study Areas.

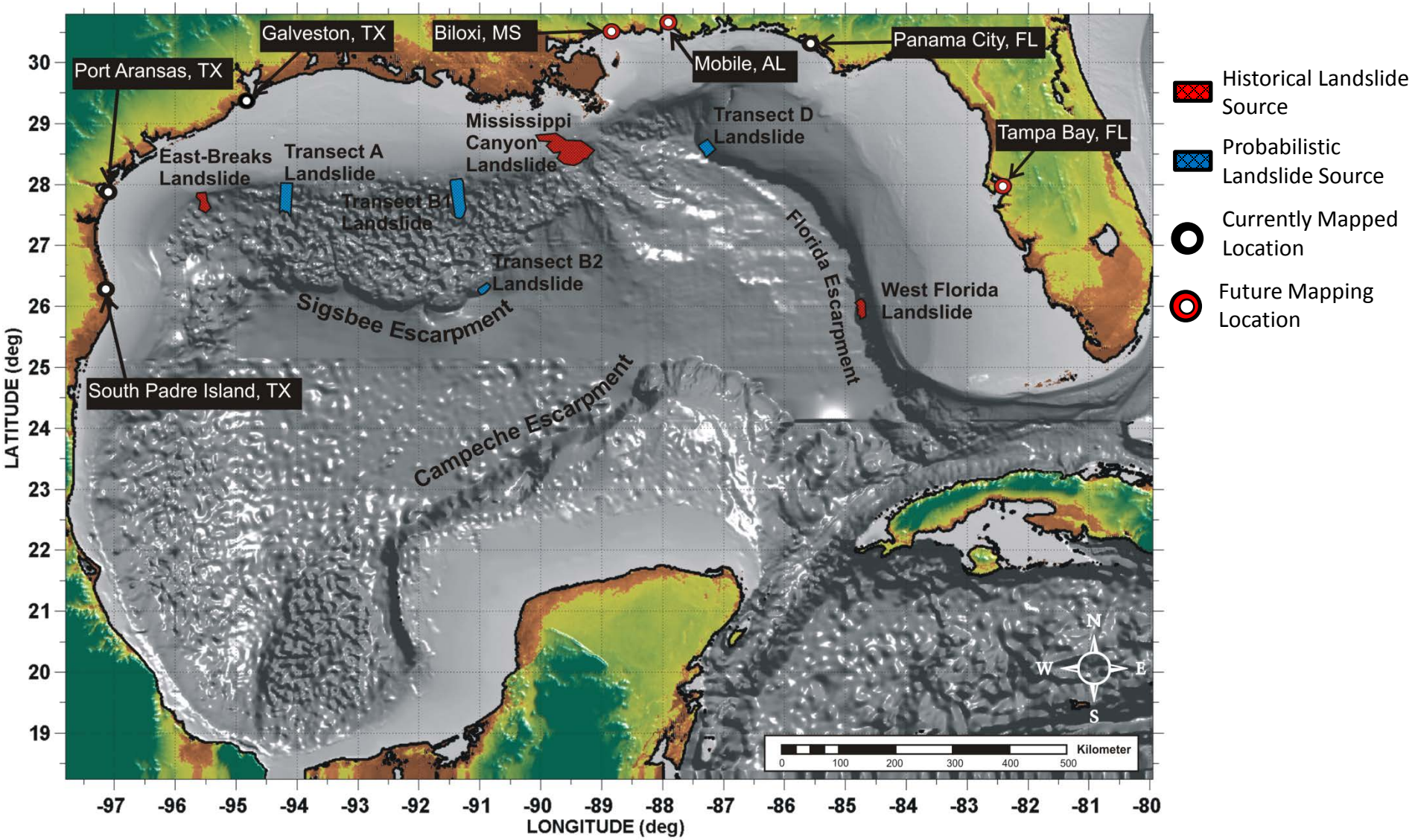
Scale of Past GOM Events



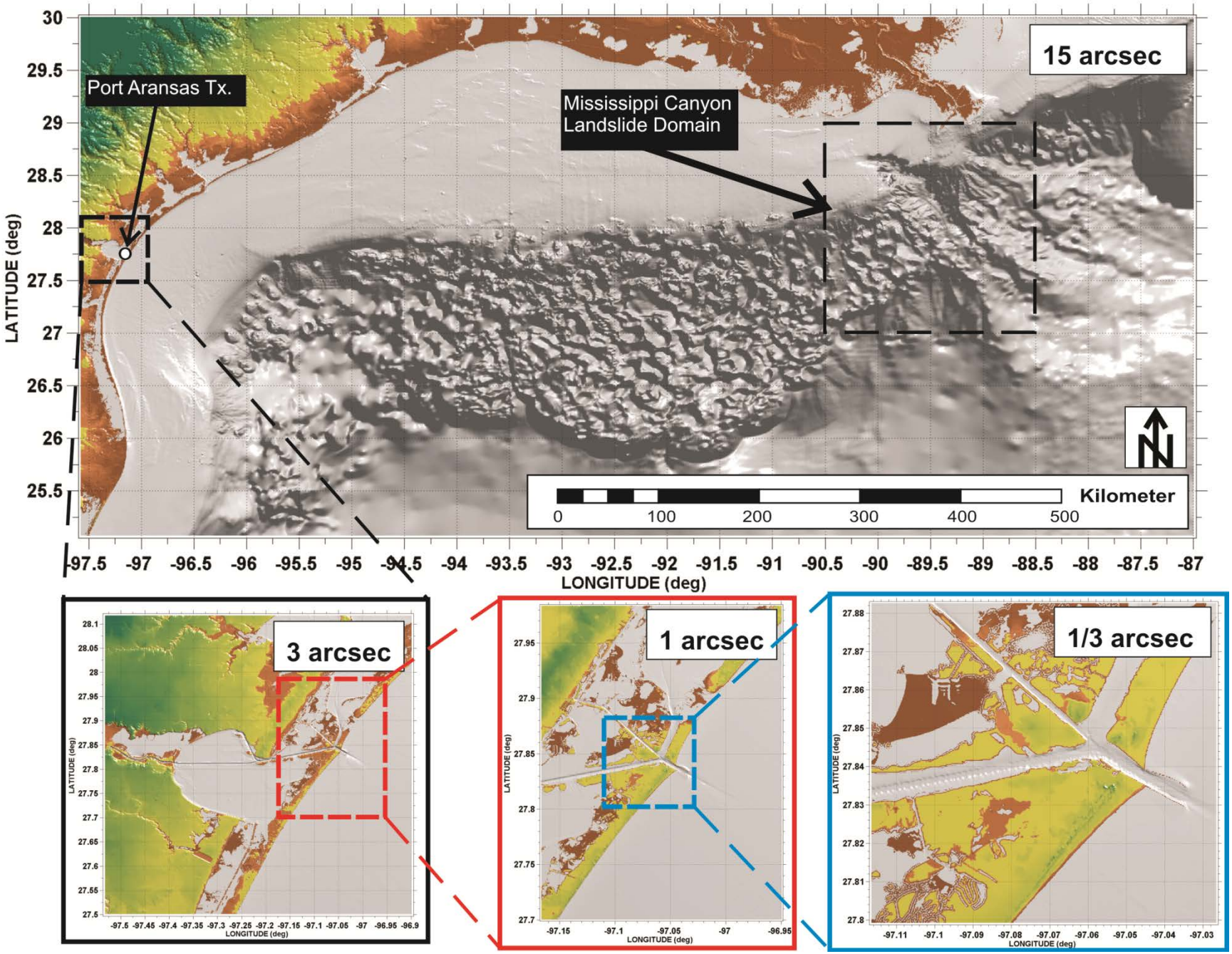
b) Atlantis "Slump E"



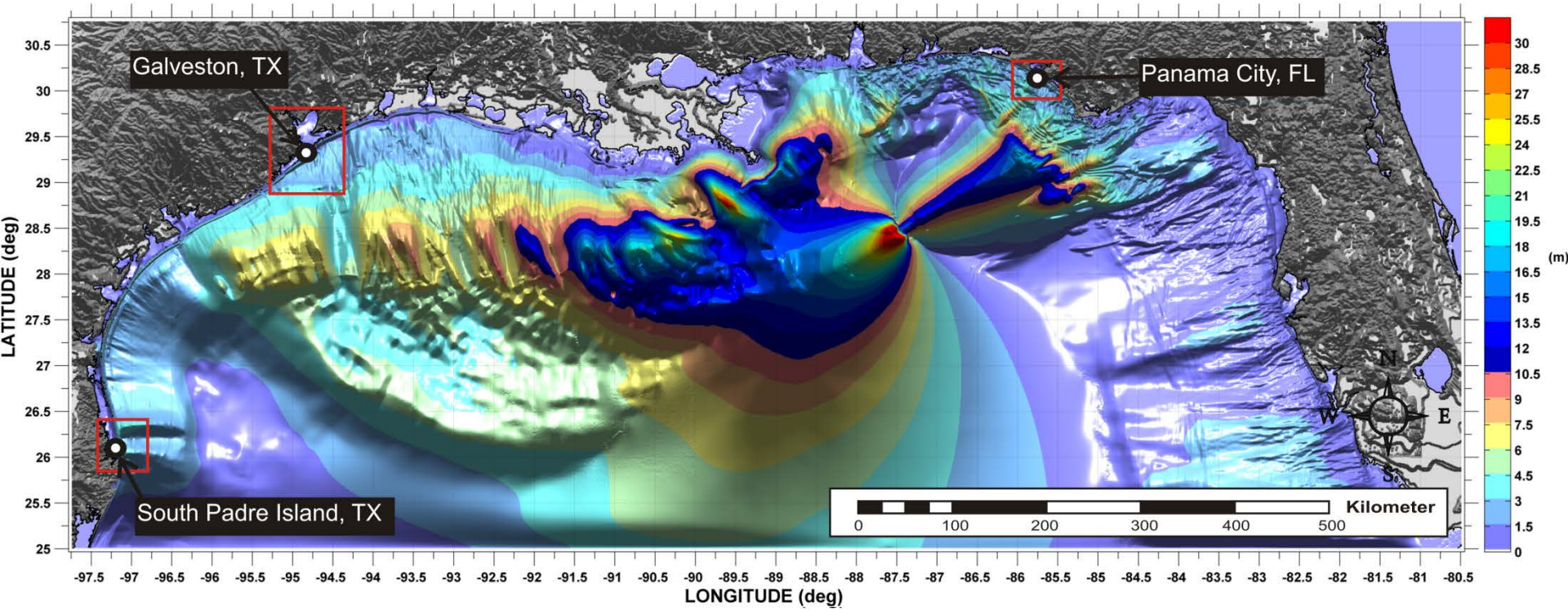
Landslide Sources and Coastal Locations for Inundation Mapping



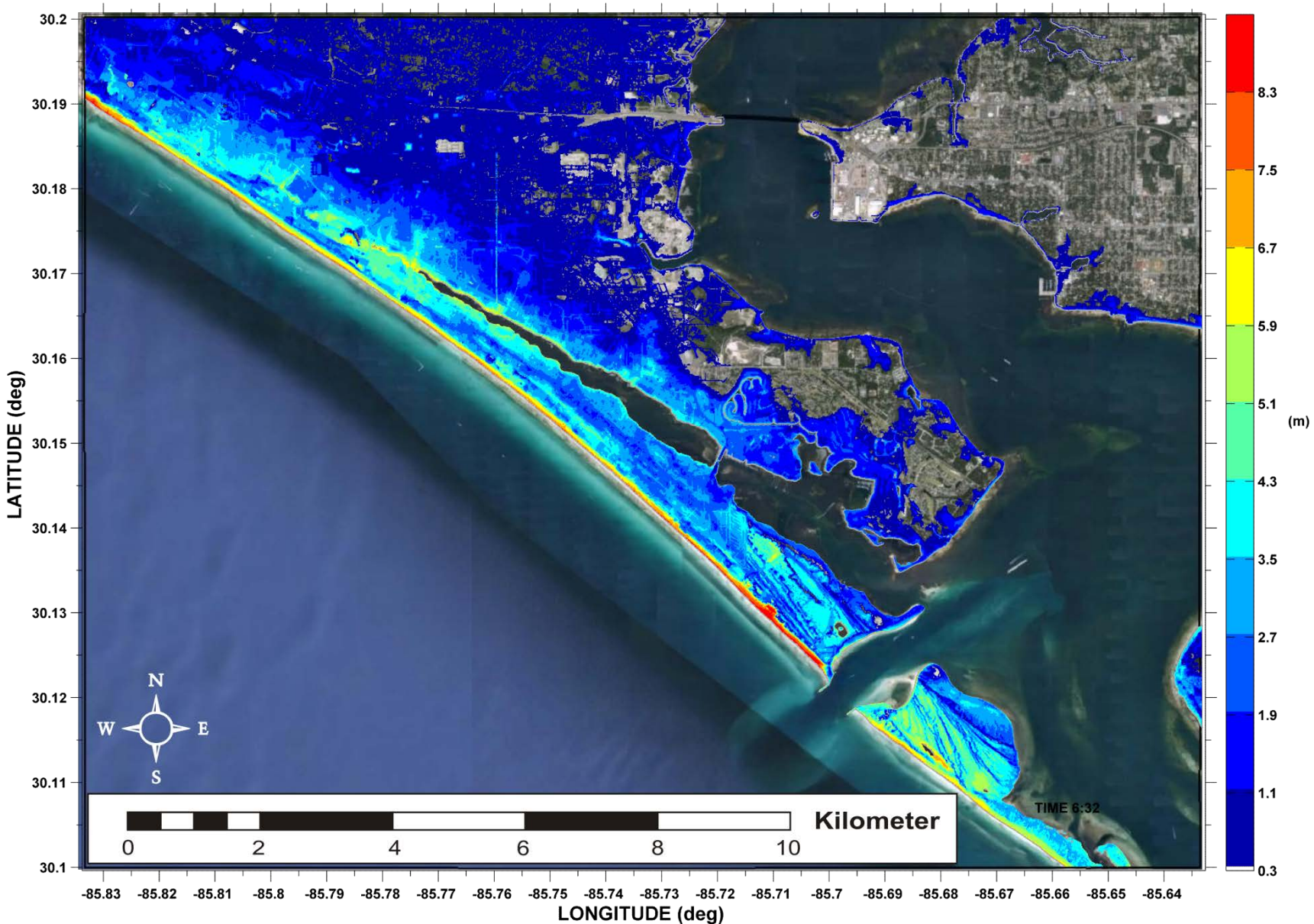
Generation (TSUNAMI3D), Propagation and Runup (NEOWAVE)



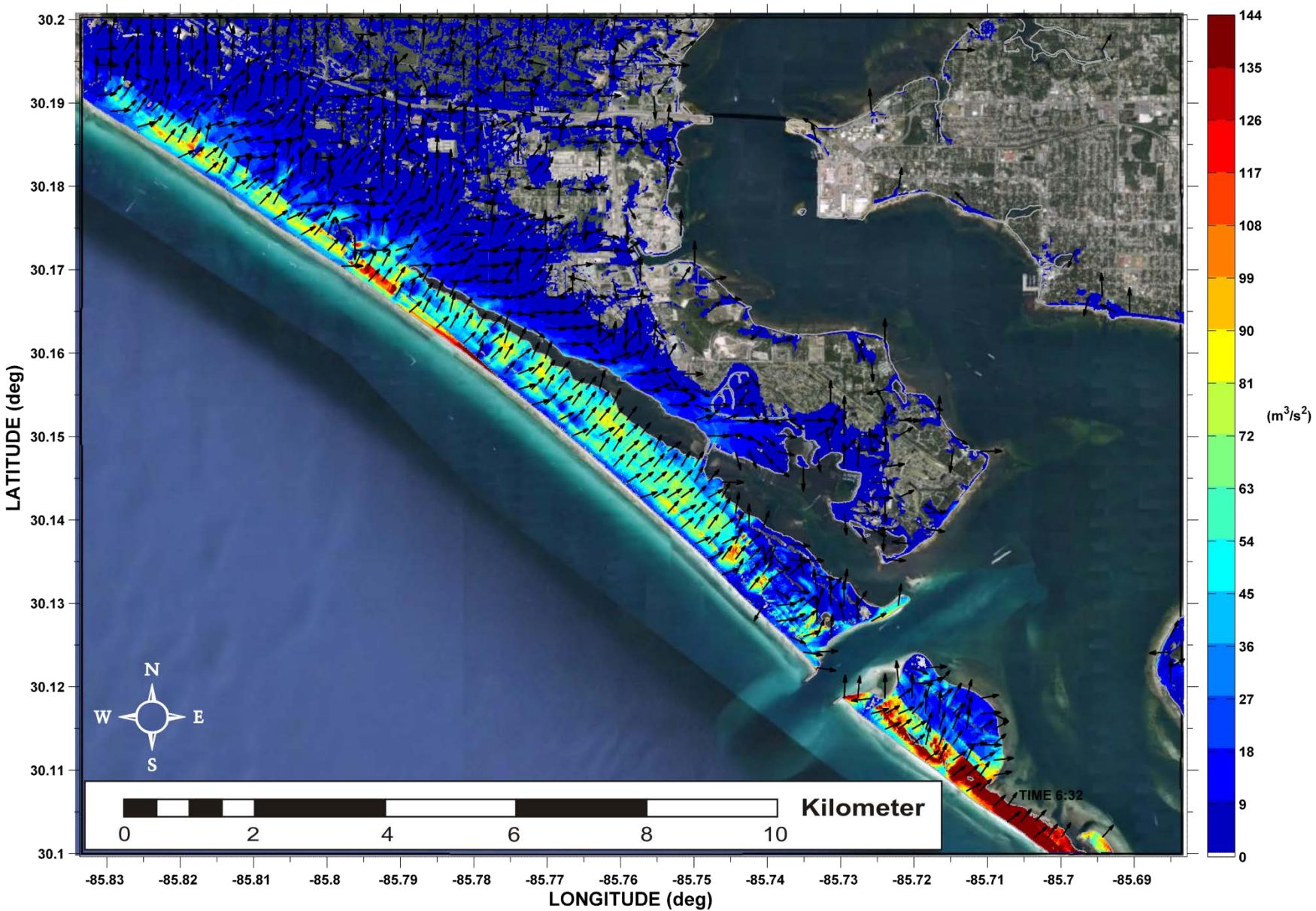
Maximum Wave Amplitude
Probabilistic Source Transect D



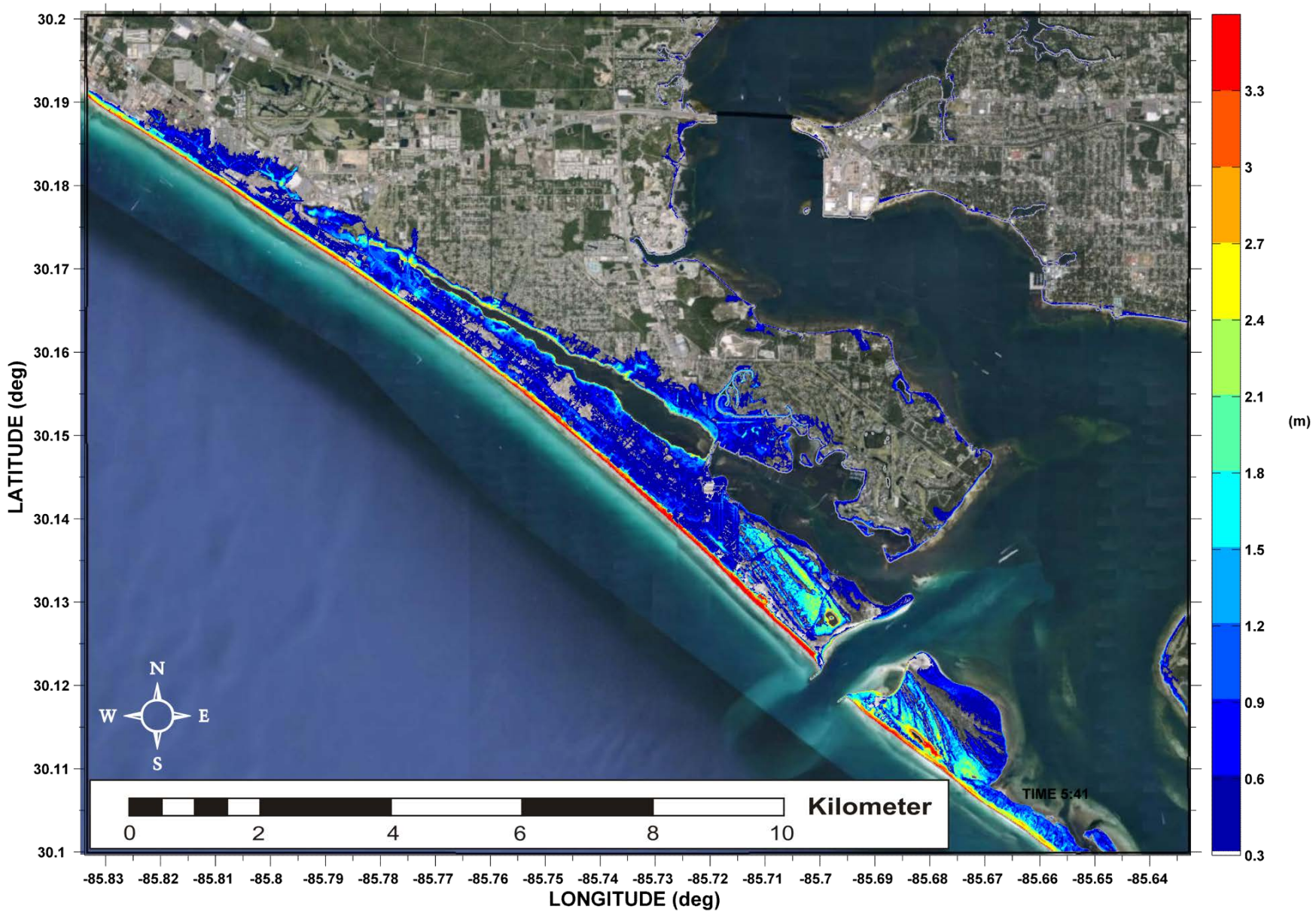
Panama City, FL
Maximum Inundation – Mississippi



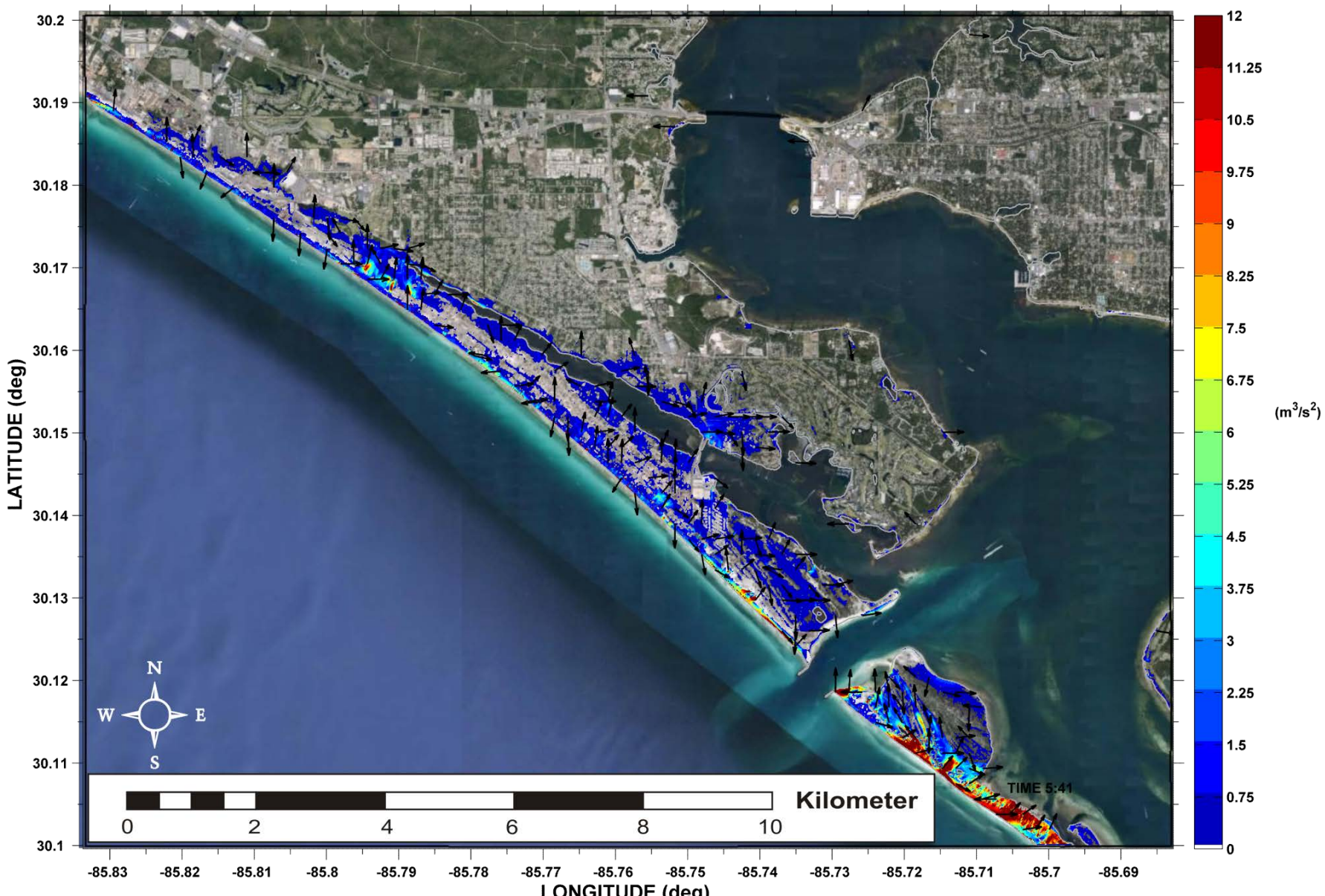
Panama City, FL
Maximum Momentum Flux – Mississippi



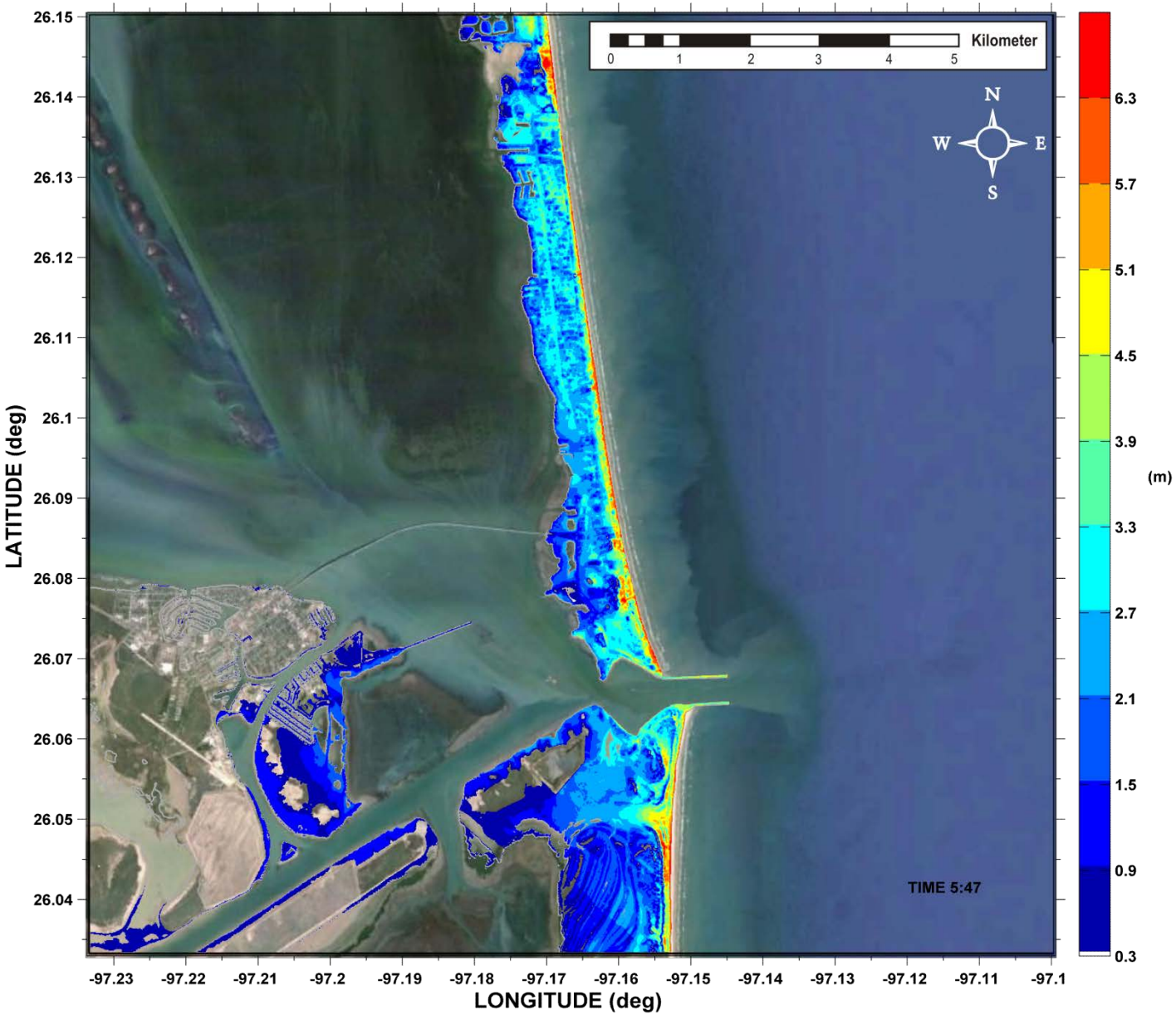
Panama City, FL
Maximum Inundation – Transect D



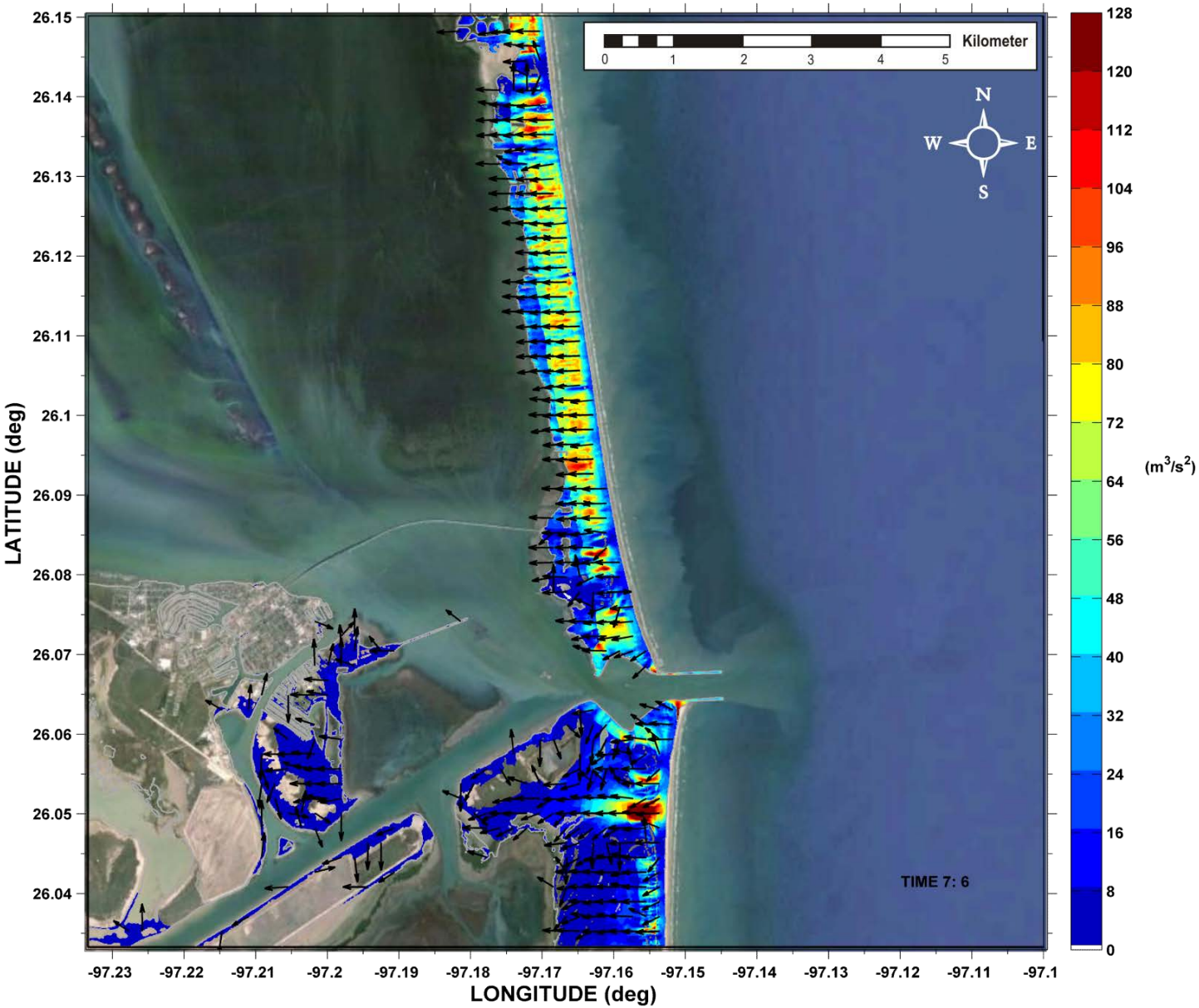
Panama City, FL
Maximum Momentum Flux – Transect D



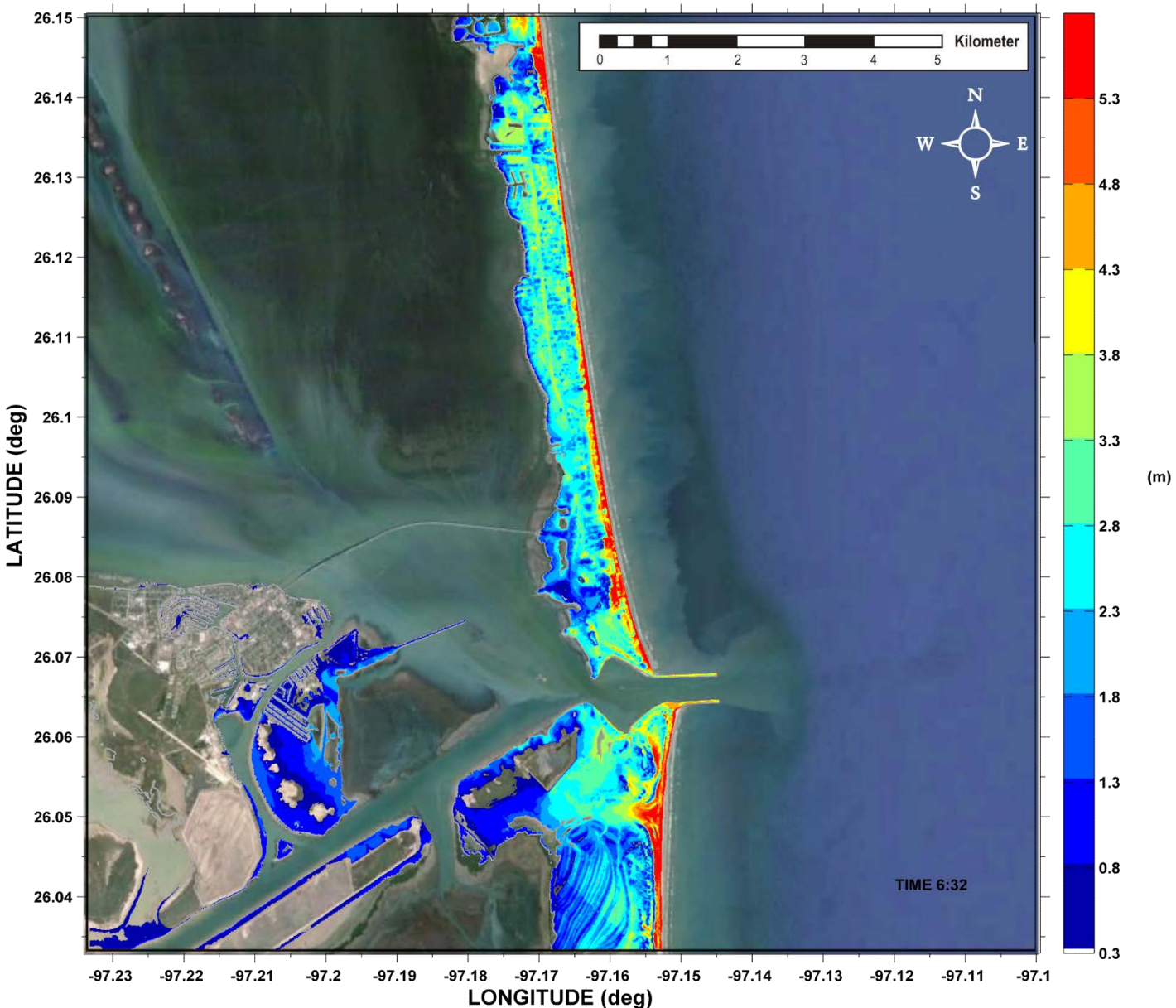
South Padre Island, TX
Maximum Inundation – East Breaks



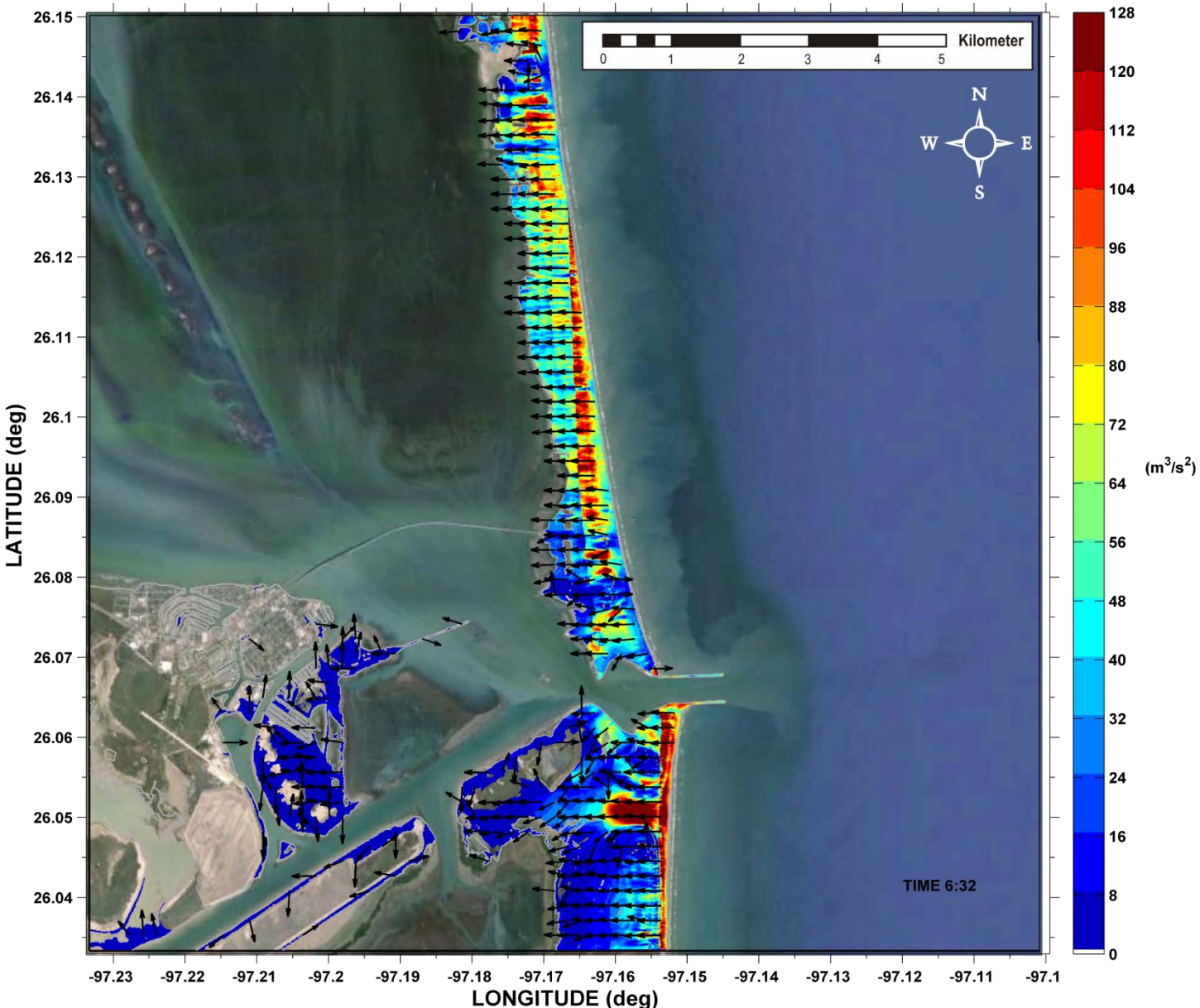
South Padre Island, TX
Maximum Momentum Flux – East Breaks



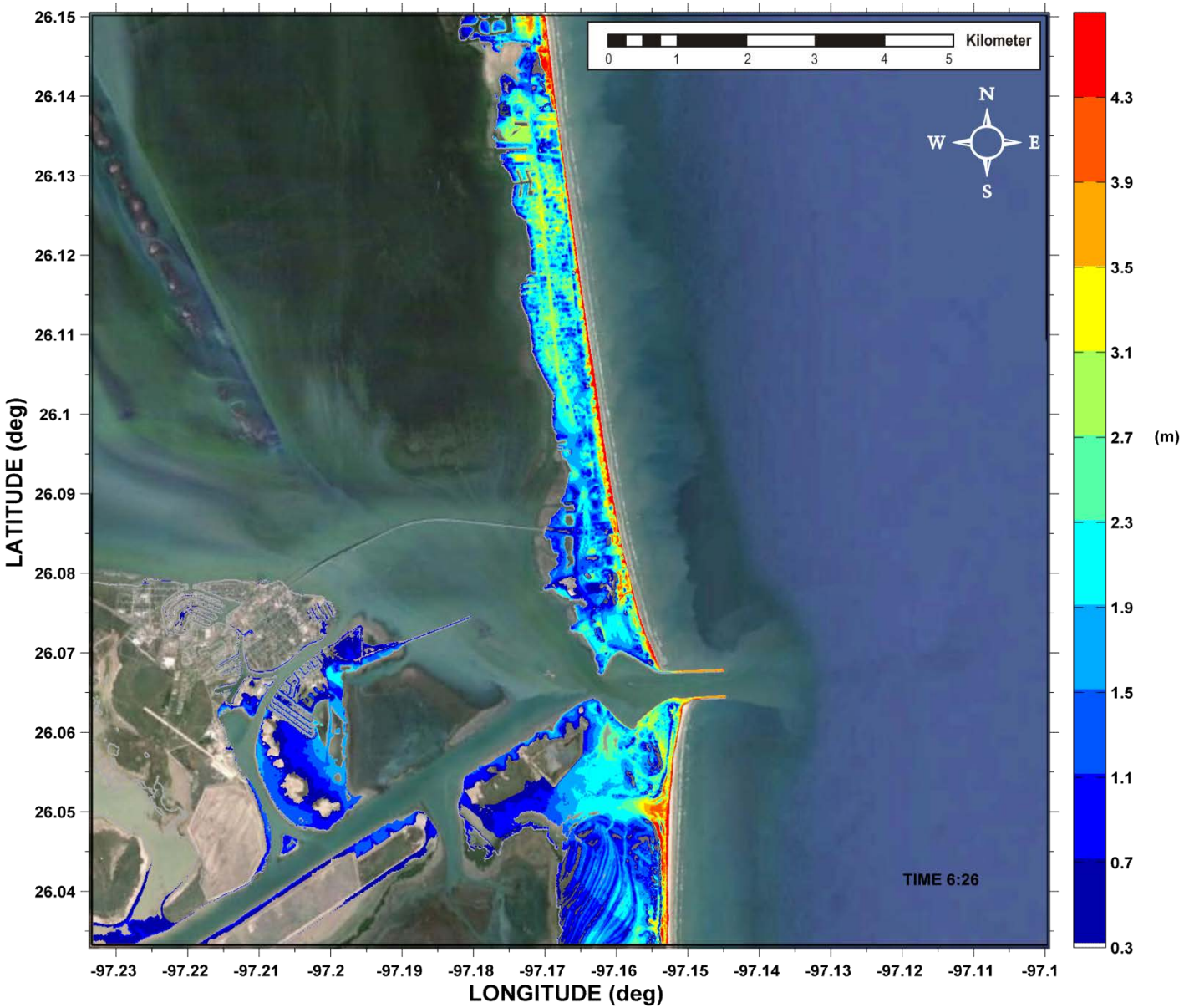
South Padre Island, TX
Maximum Inundation – Mississippi



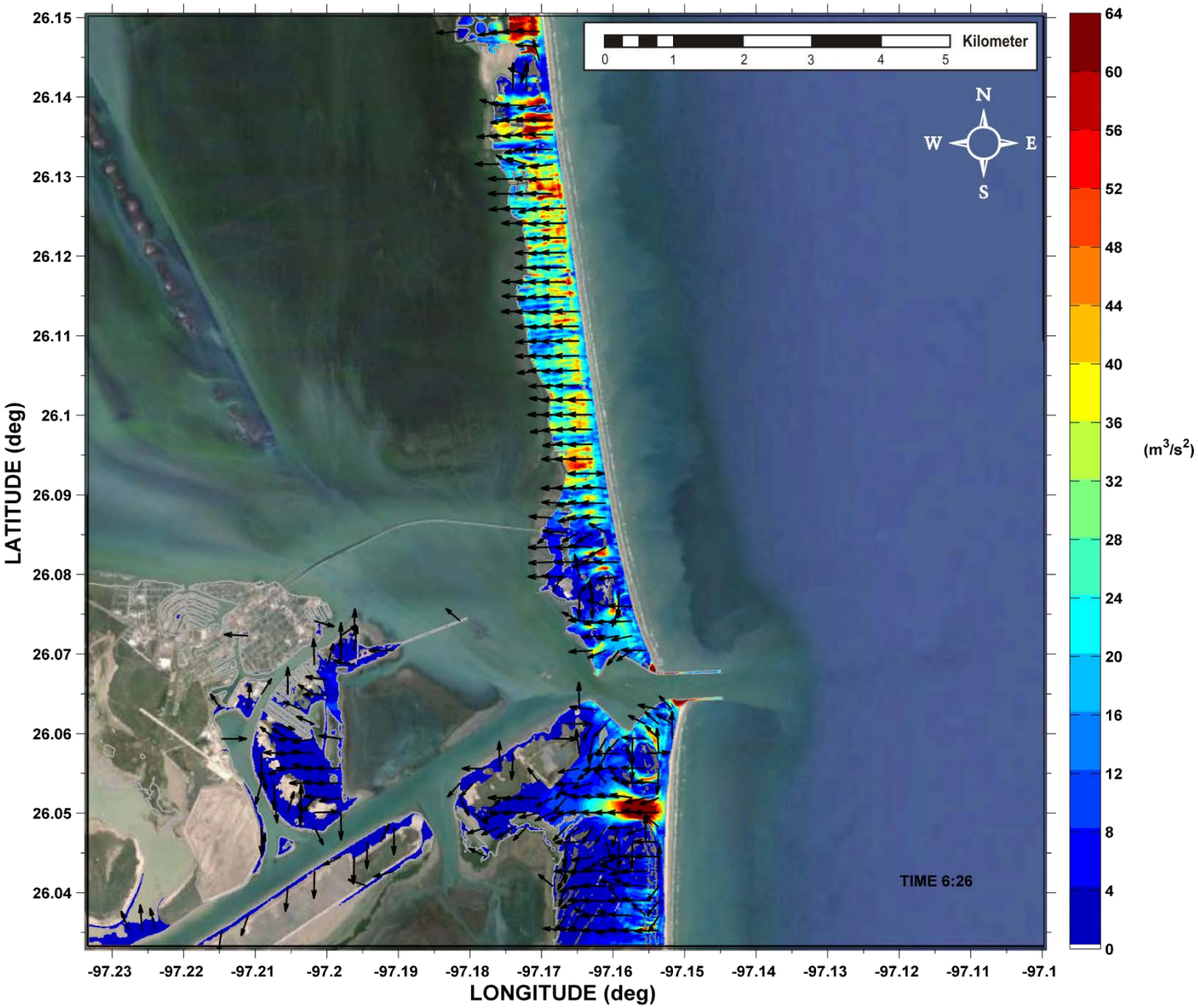
South Padre Island, TX
Maximum Momentum Flux – Mississippi



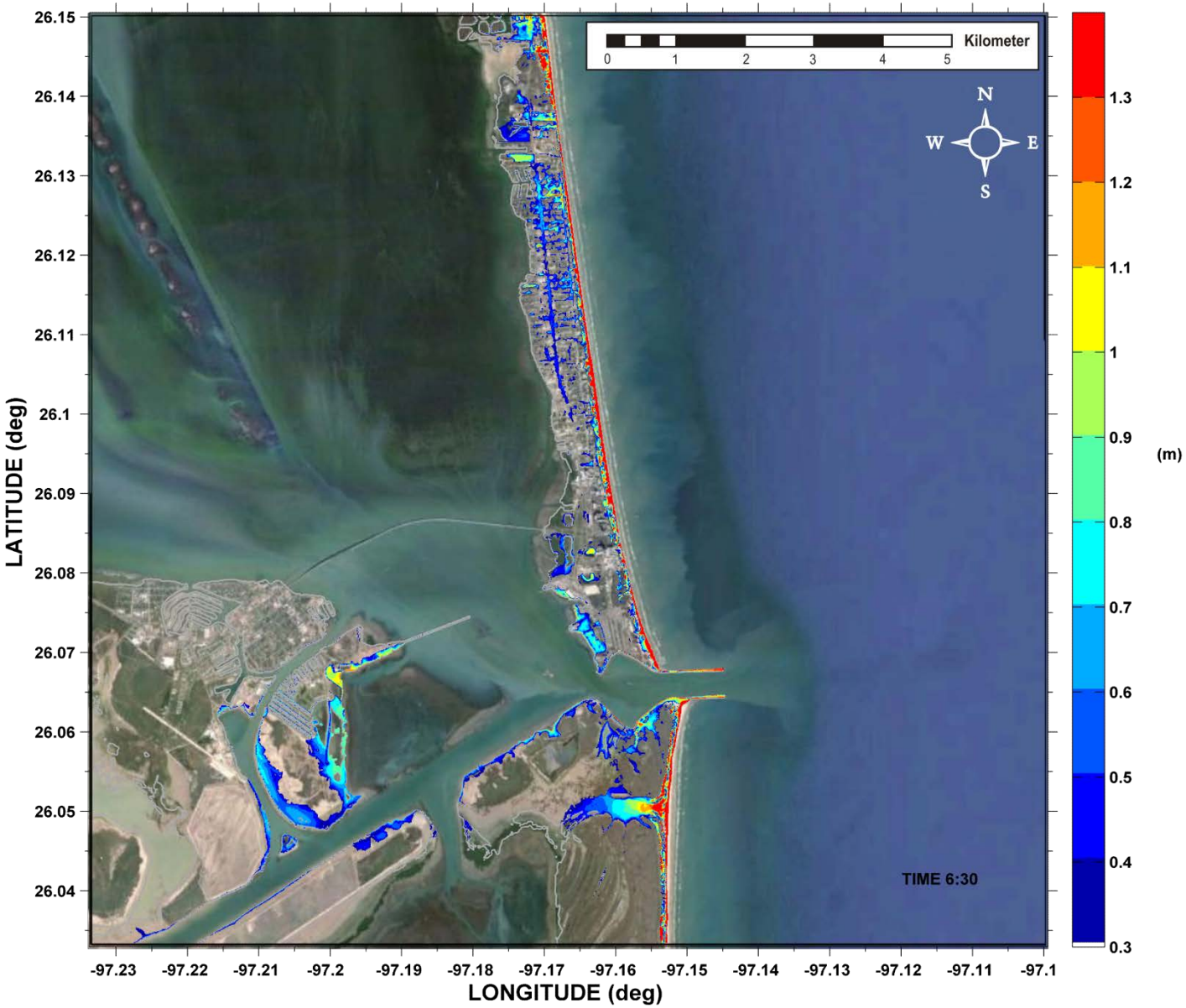
South Padre Island, TX
Maximum Inundation – Transect A



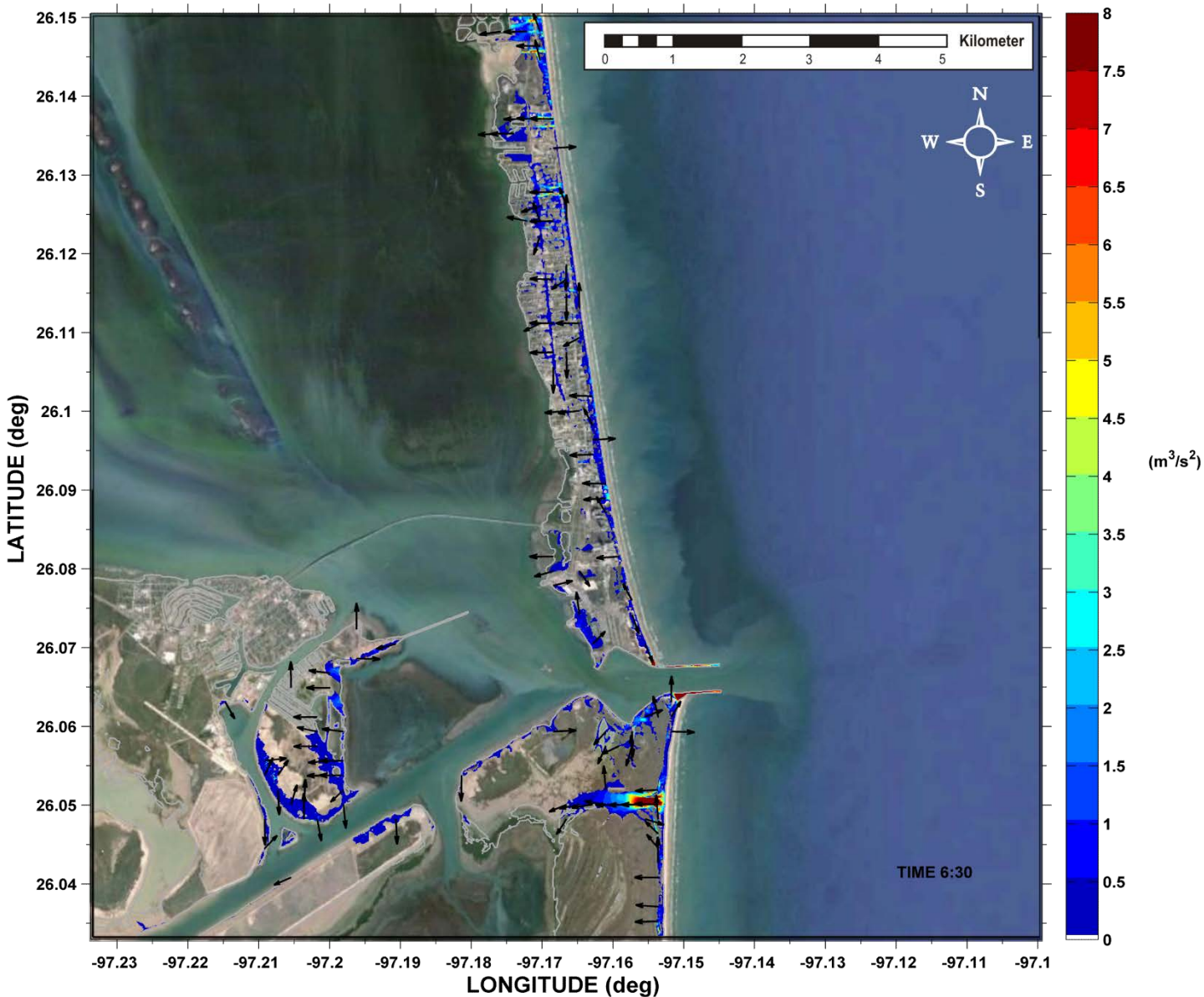
South Padre Island, TX
Maximum Momentum Flux – Transect A



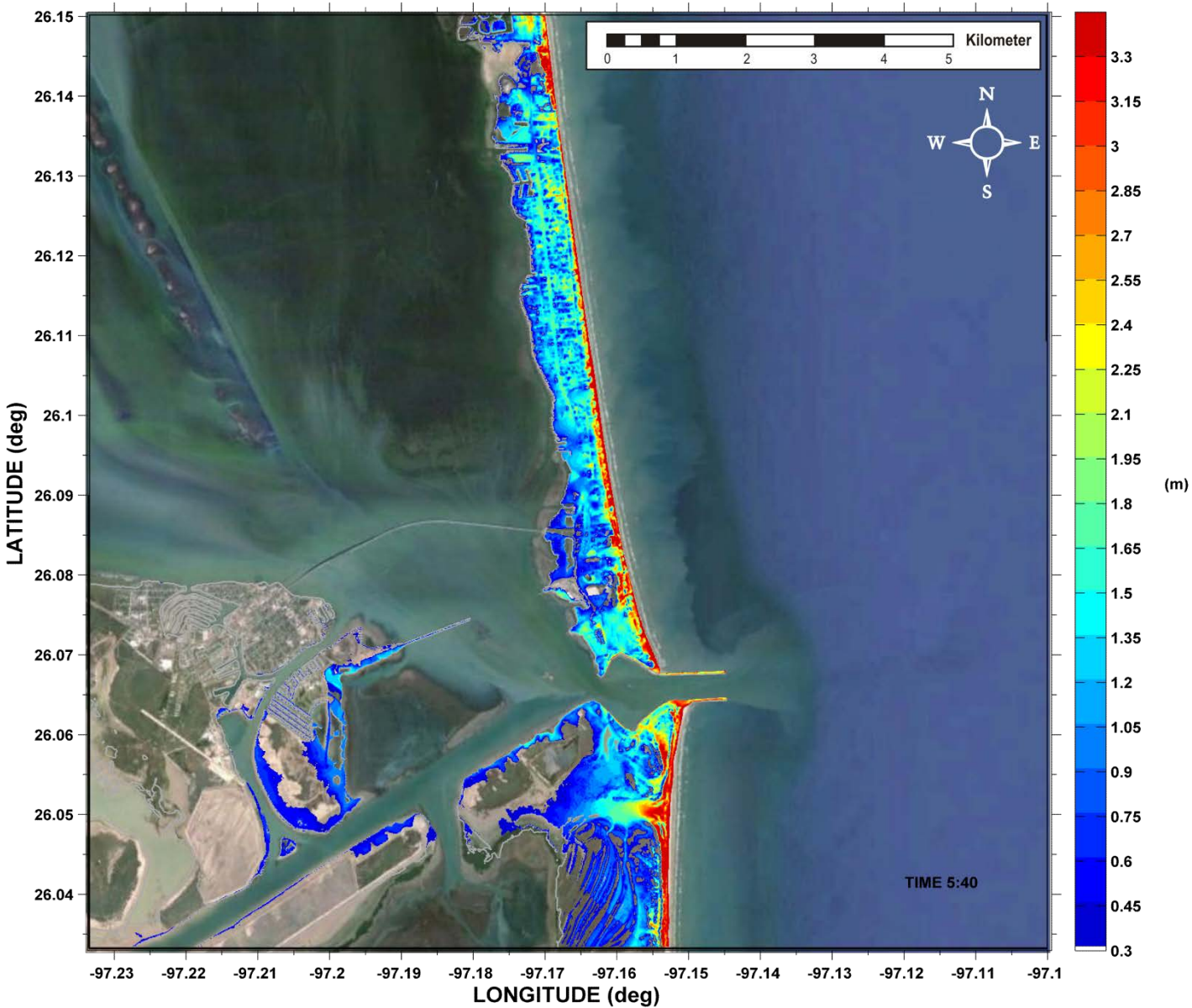
South Padre Island, TX
Maximum Inundation – Transect B1



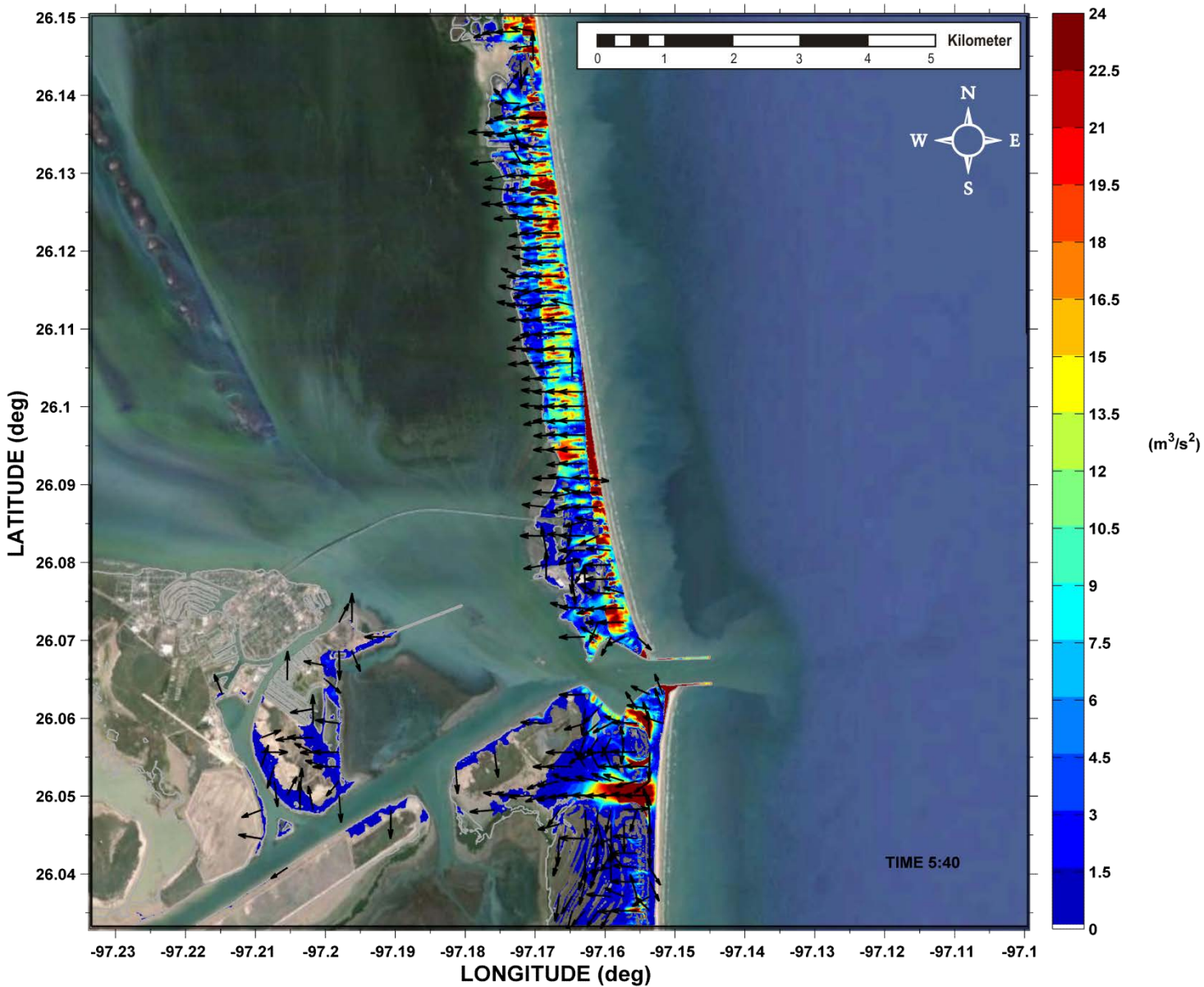
South Padre Island, TX
Maximum Momentum Flux – Transect B1



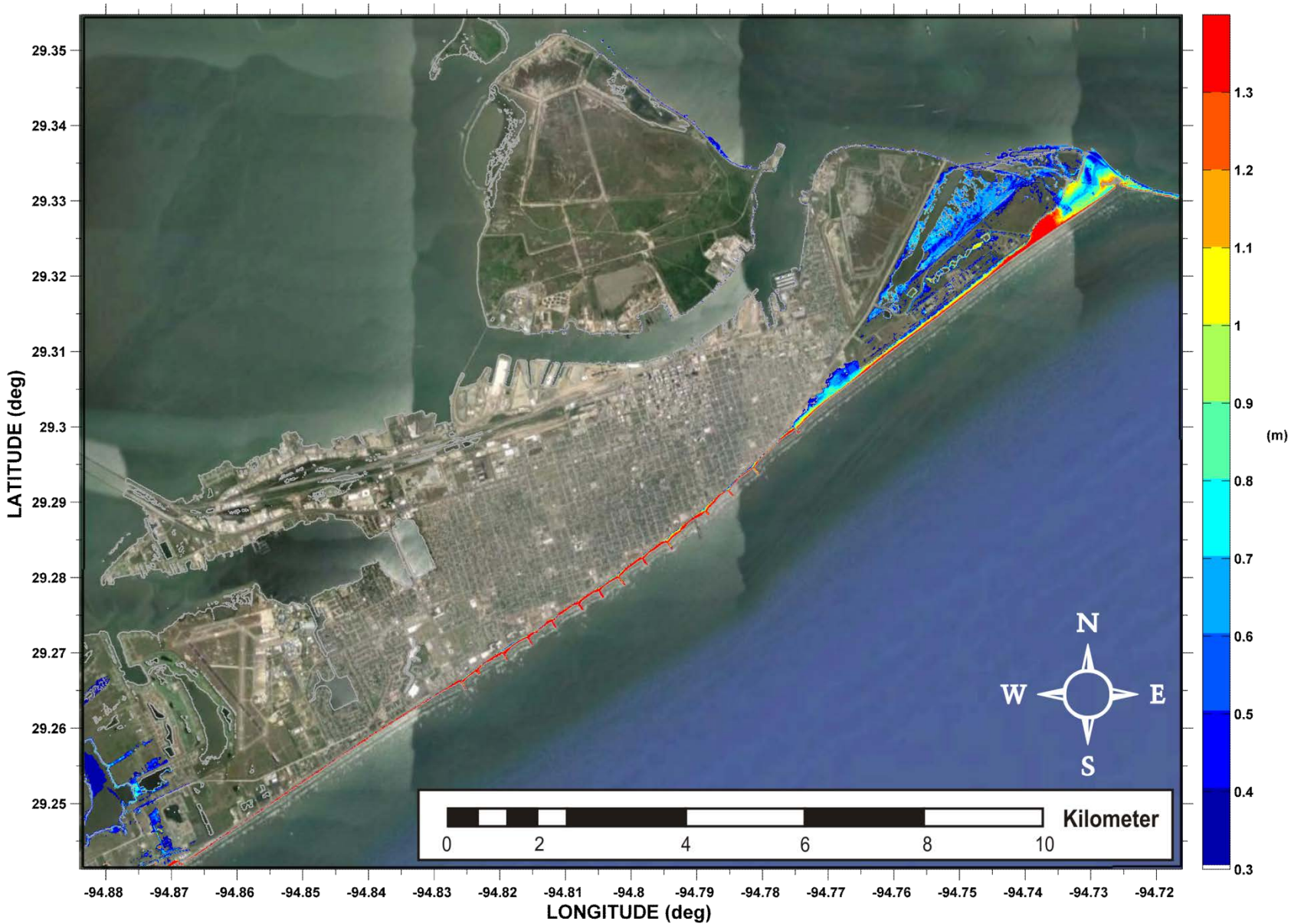
South Padre Island, TX
Maximum Inundation – Transect D



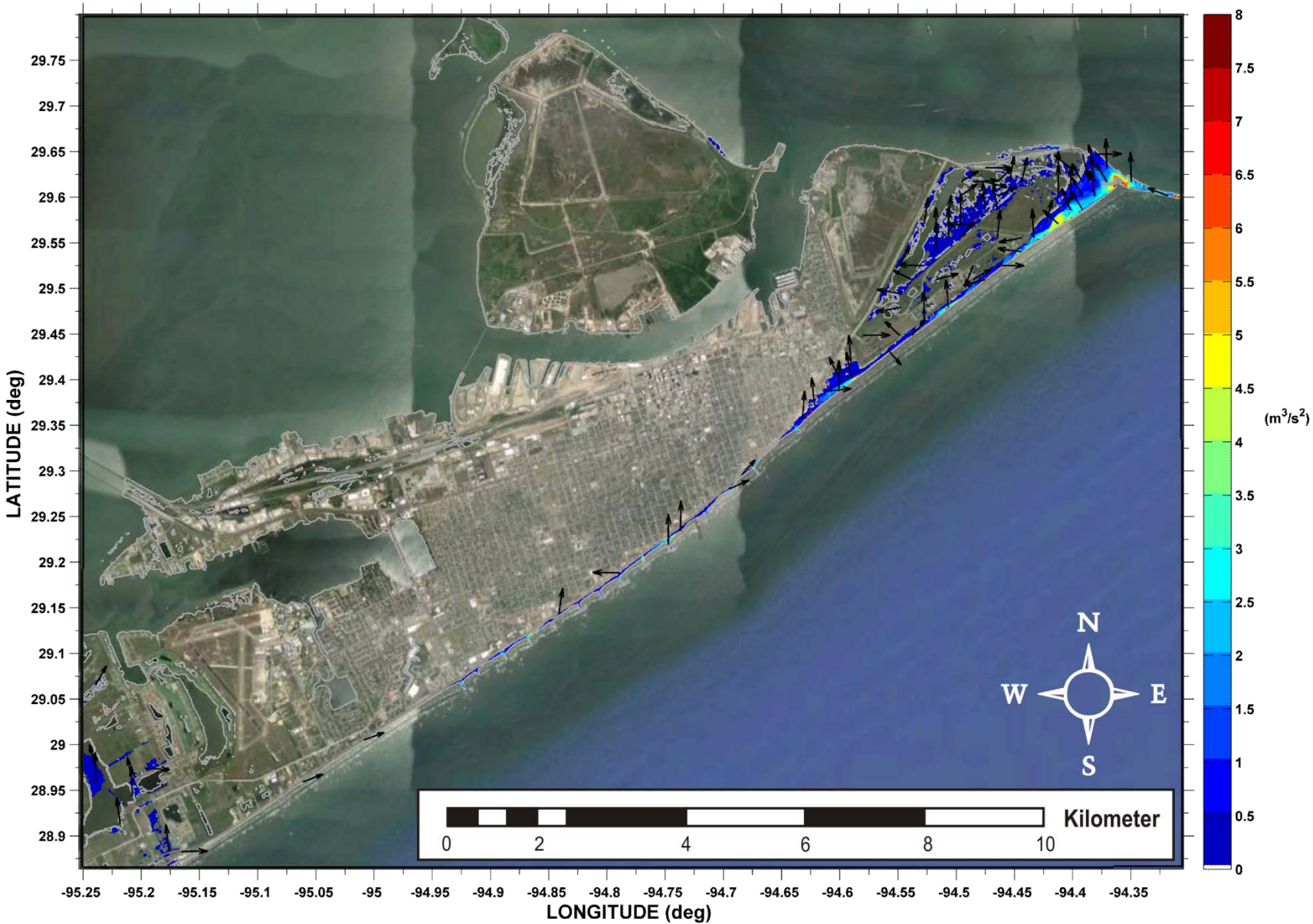
South Padre Island, TX
Maximum Momentum Flux – Transect D



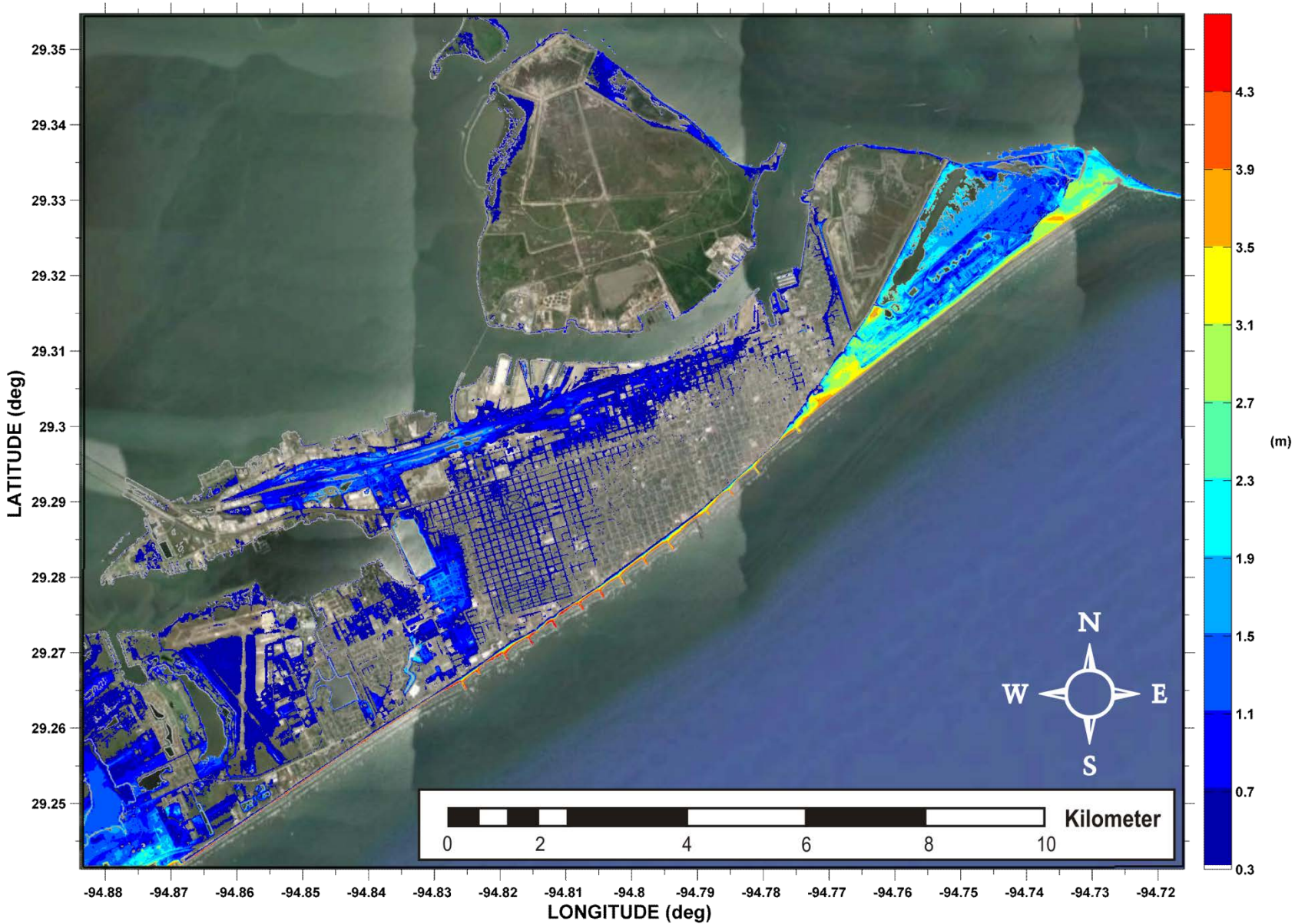
Galveston, TX
Maximum Inundation – East Breaks



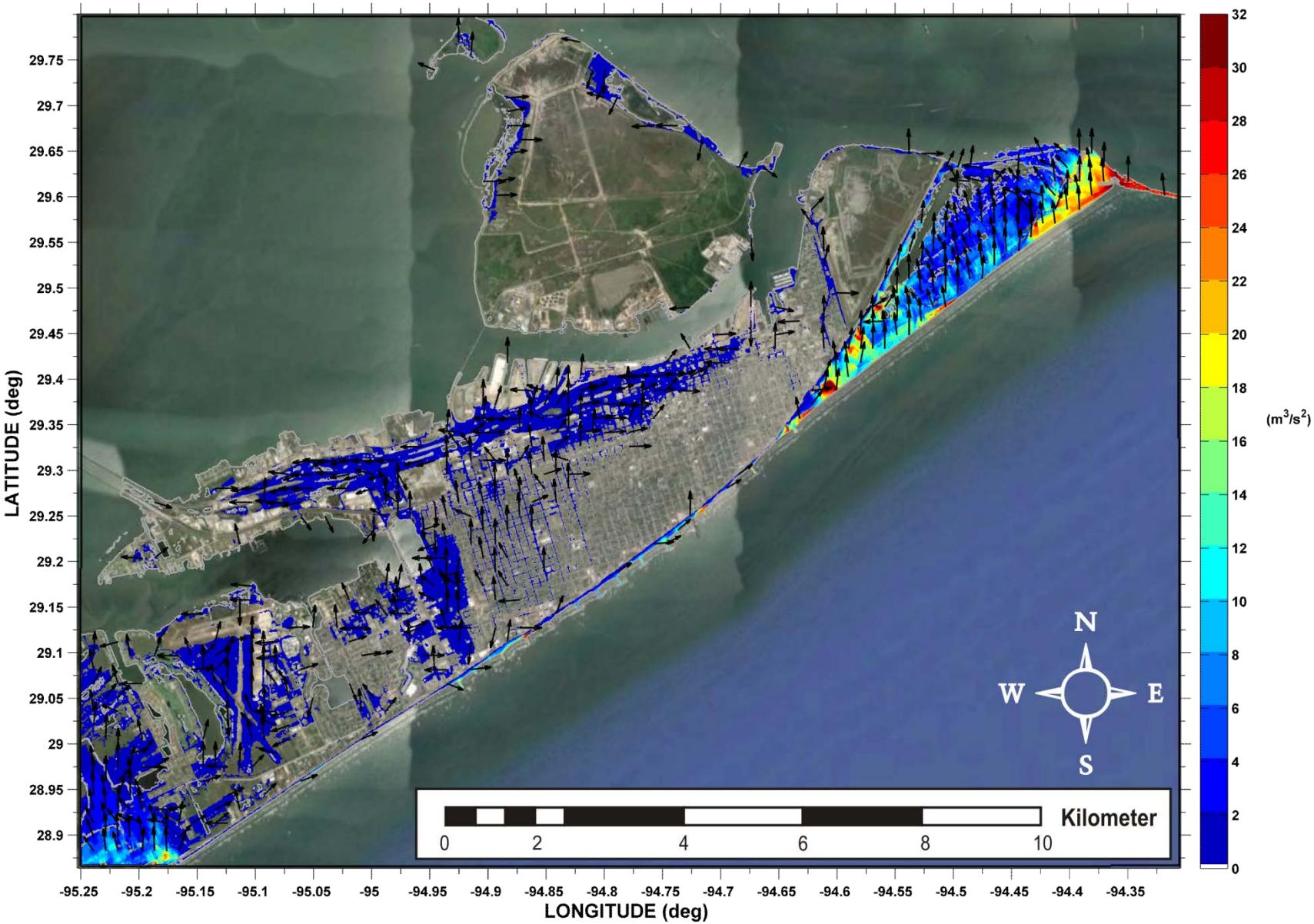
Galveston, TX
Maximum Momentum Flux – East Breaks



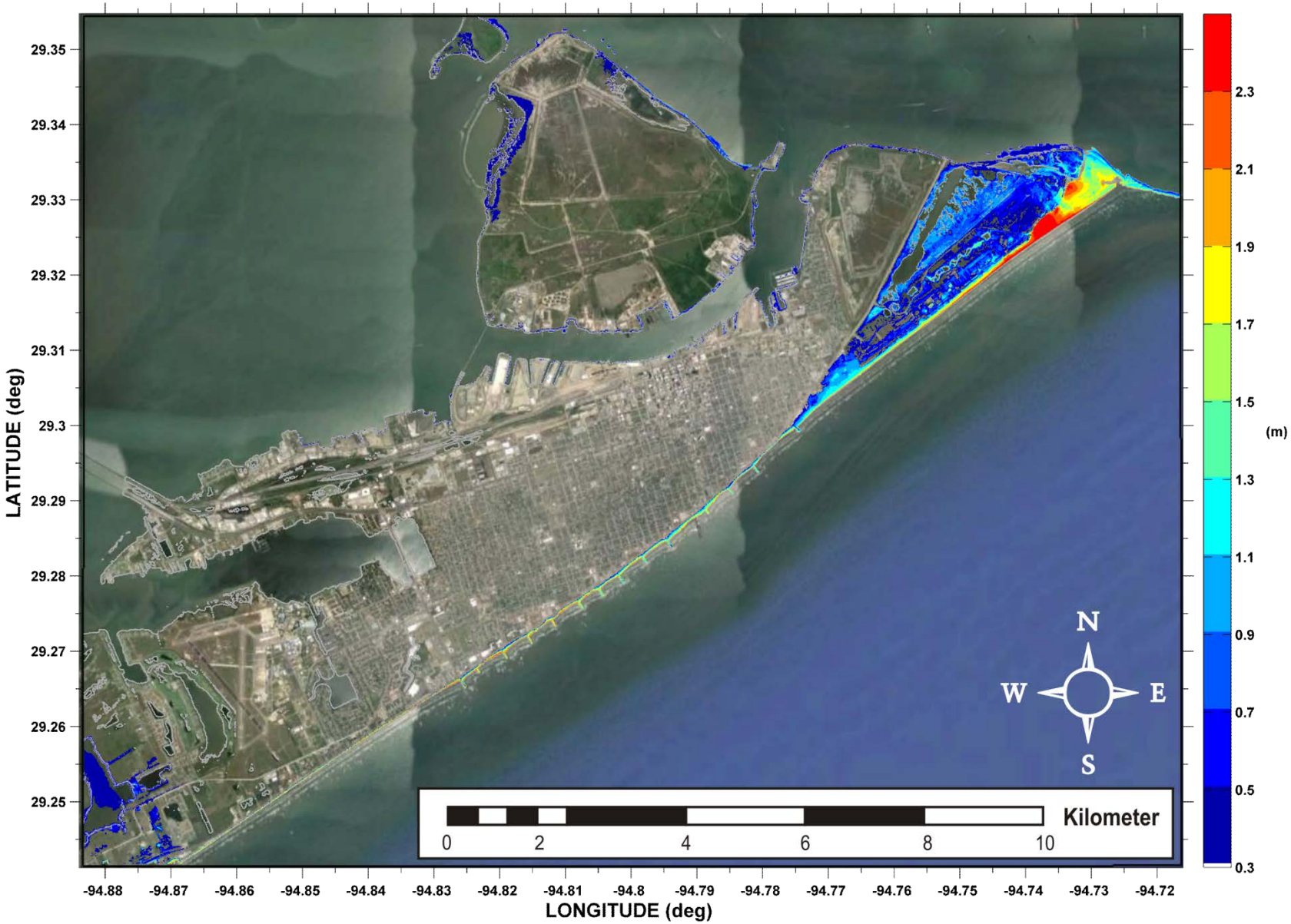
Galveston, TX
Maximum Inundation – Mississippi



Galveston, TX
Maximum Momentum Flux – Mississippi



Galveston, TX
Maximum Inundation – Transect A



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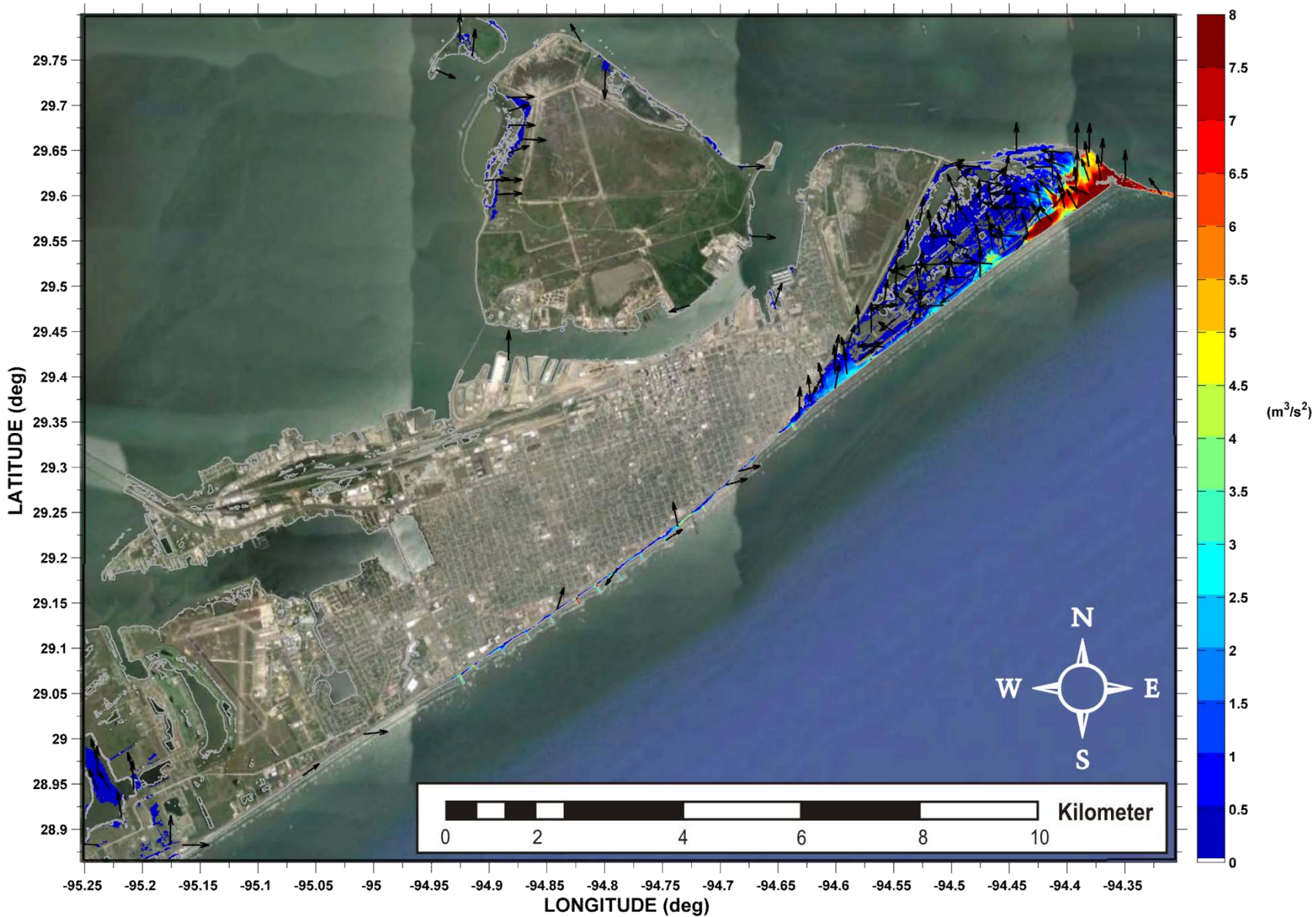
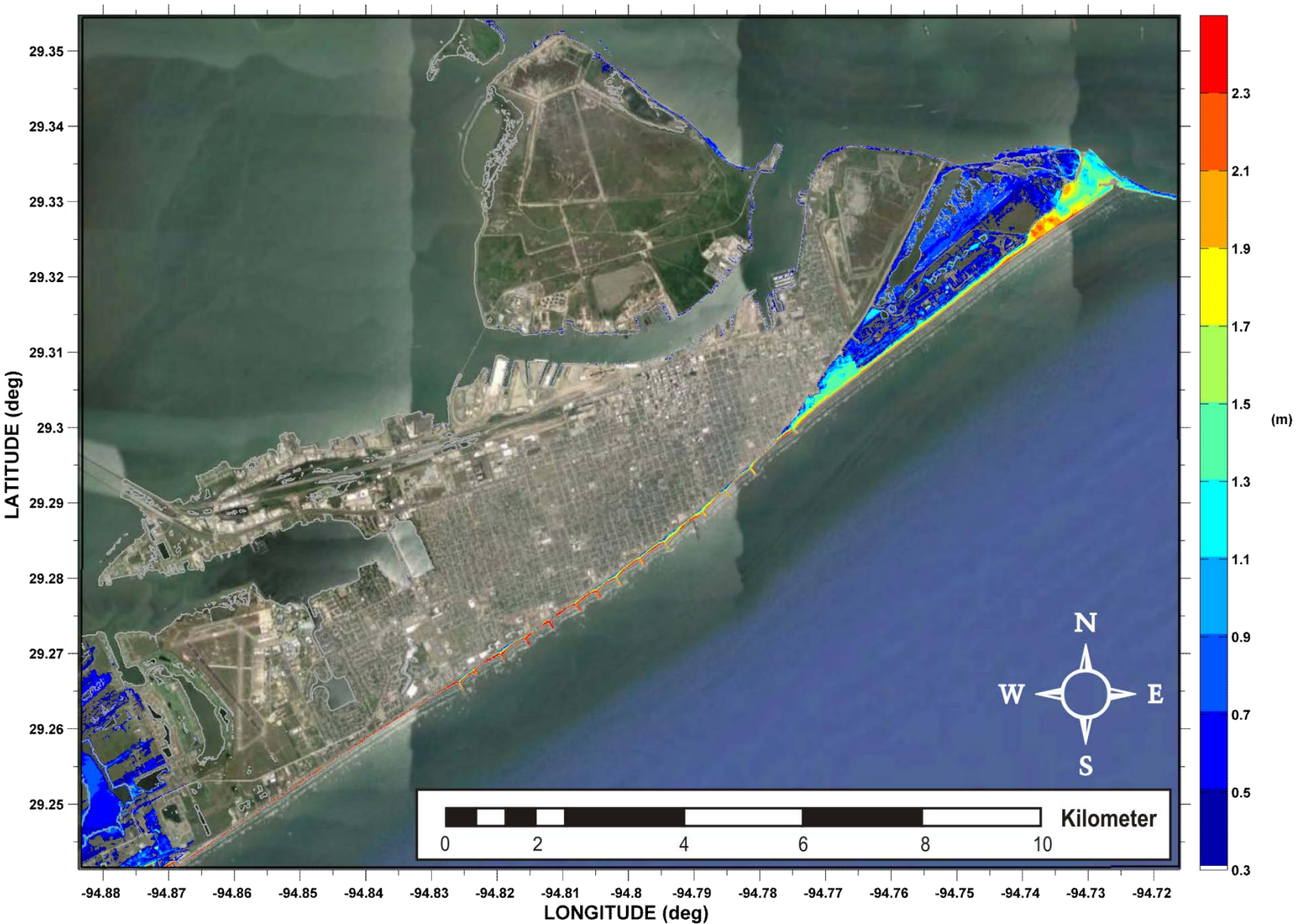
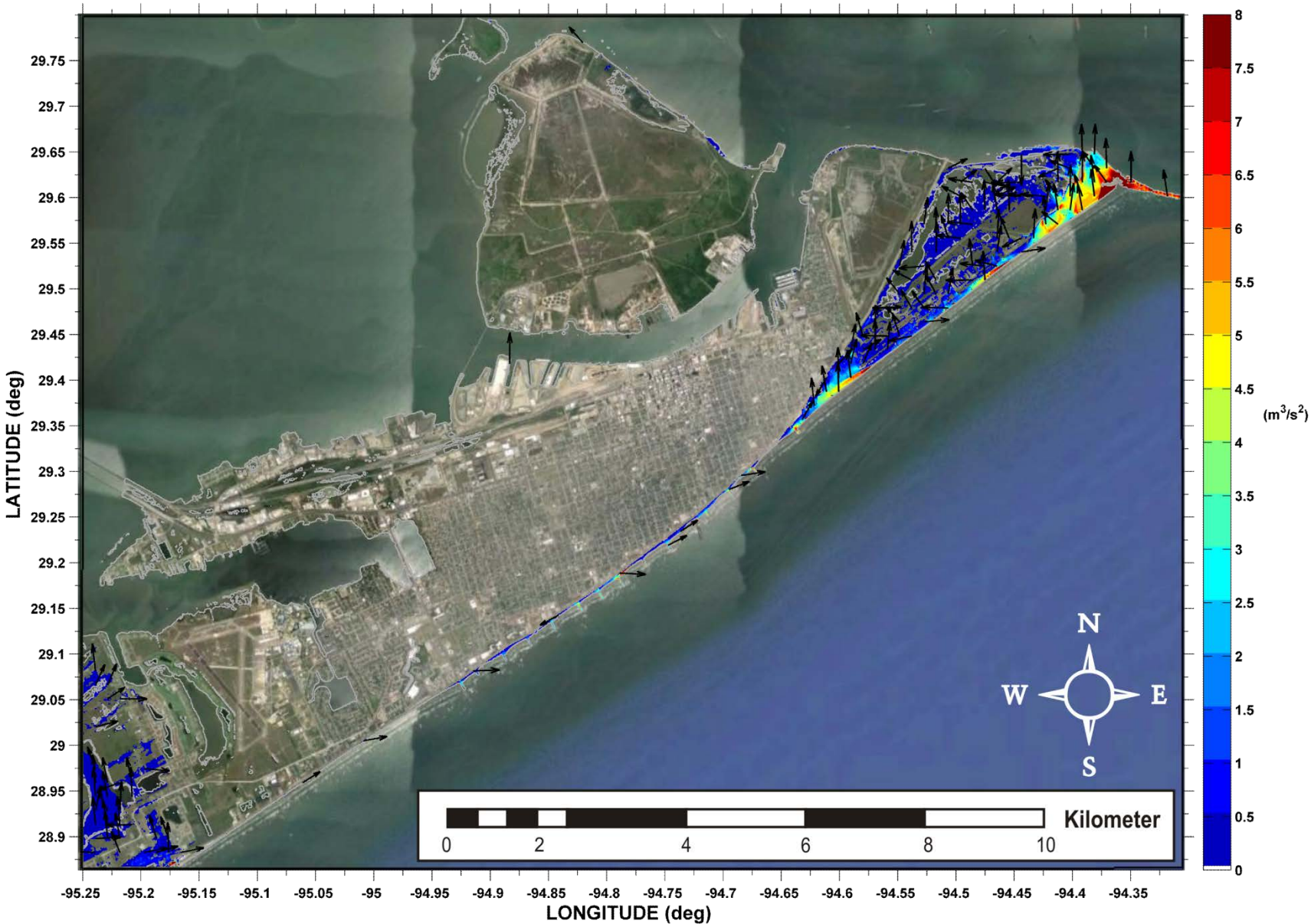
Maximum Momentum Flux – Transect A



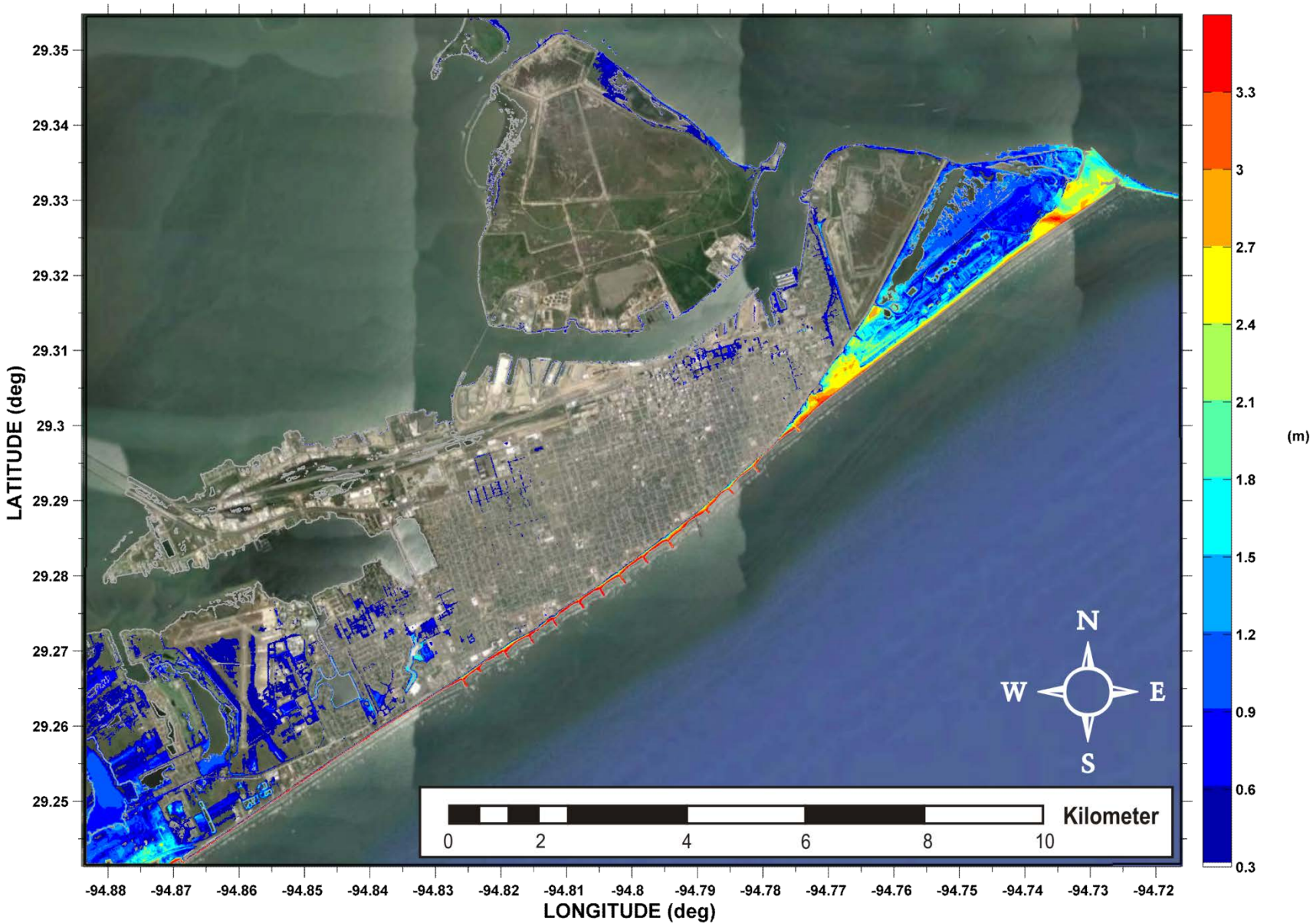
Galveston, TX
Maximum Inundation – Transect B1



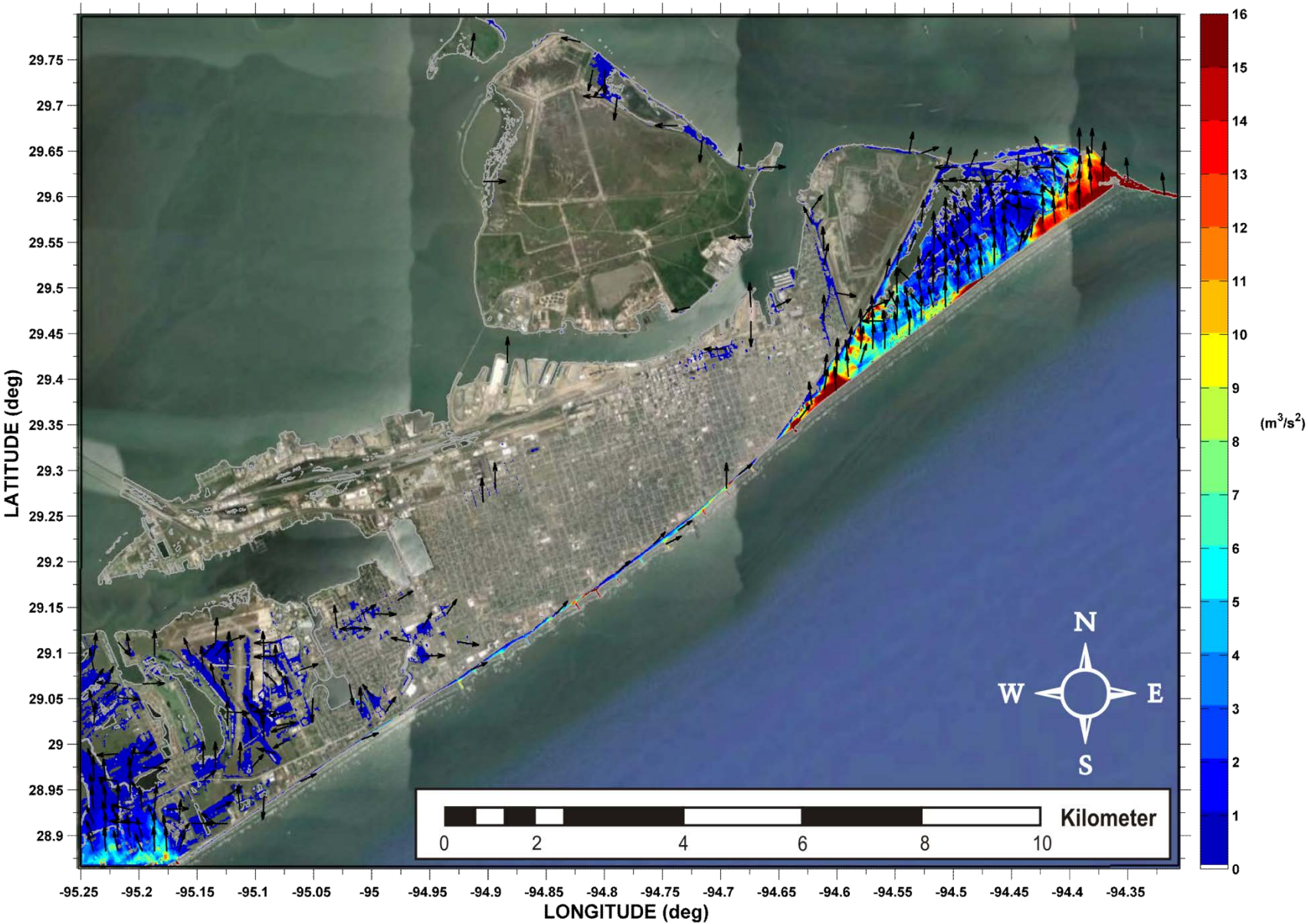
Galveston, TX
Maximum Momentum Flux – Transect B1



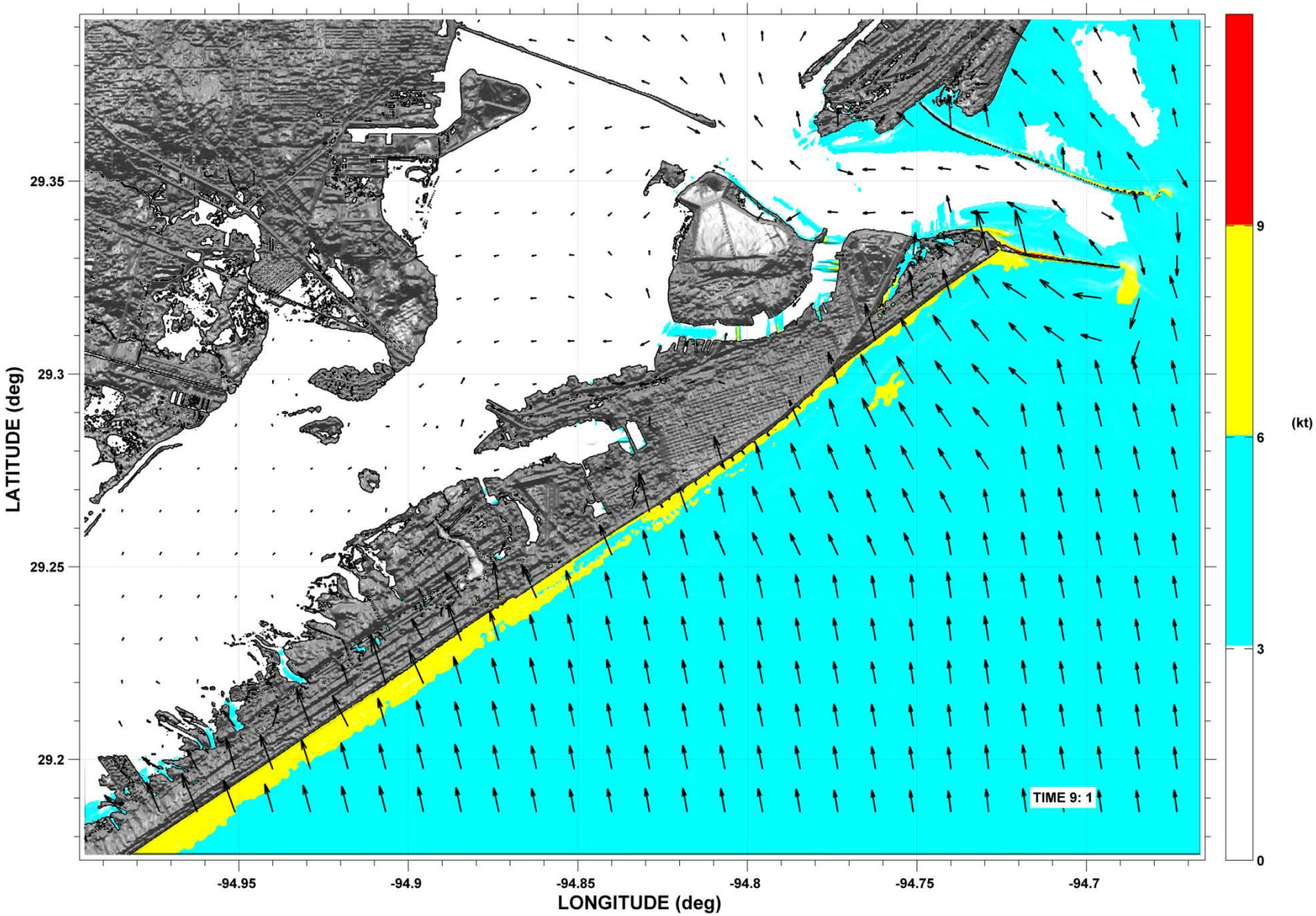
Galveston, TX
Maximum Inundation – Transect D



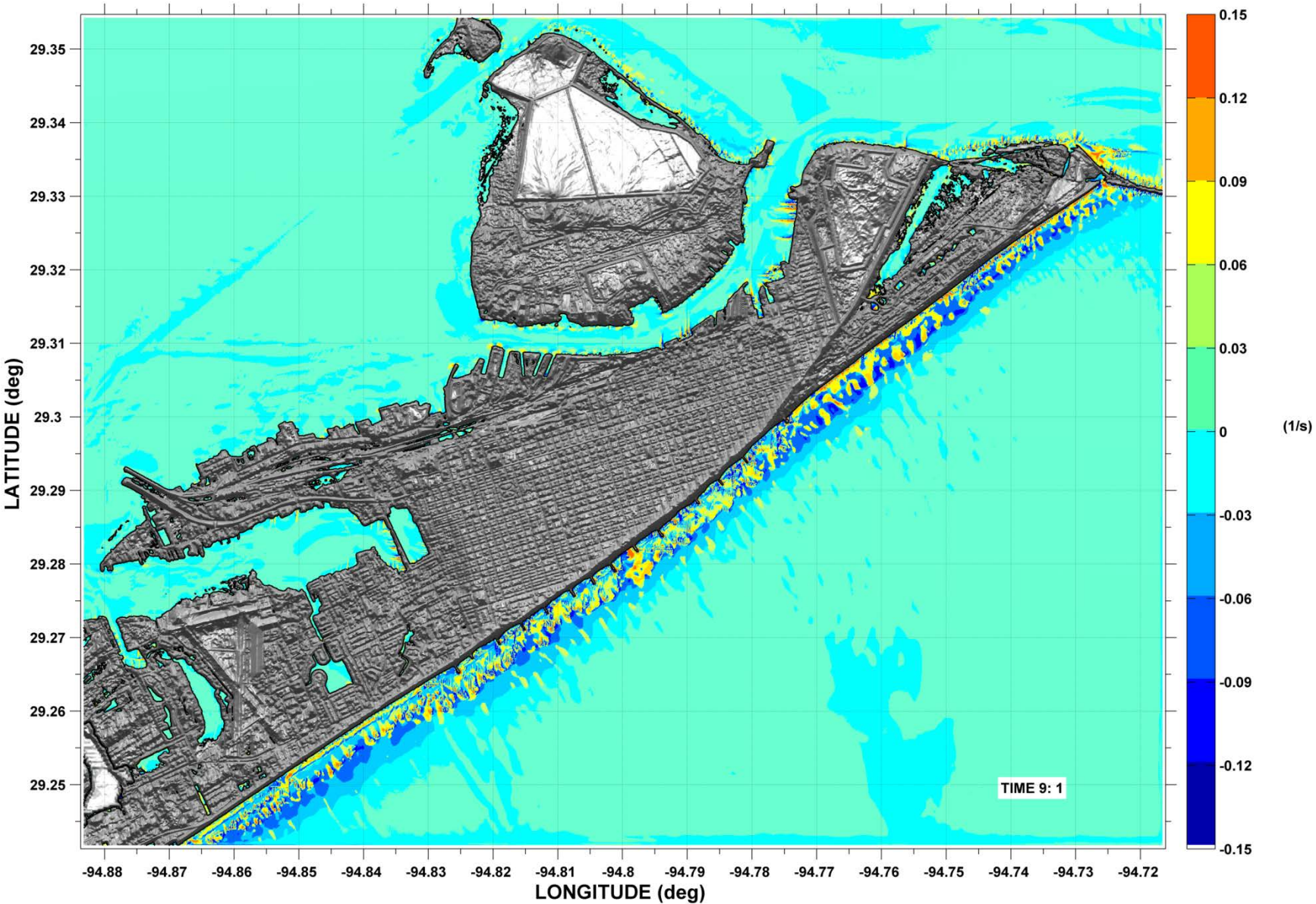
Galveston, TX
Maximum Momentum Flux – Transect D



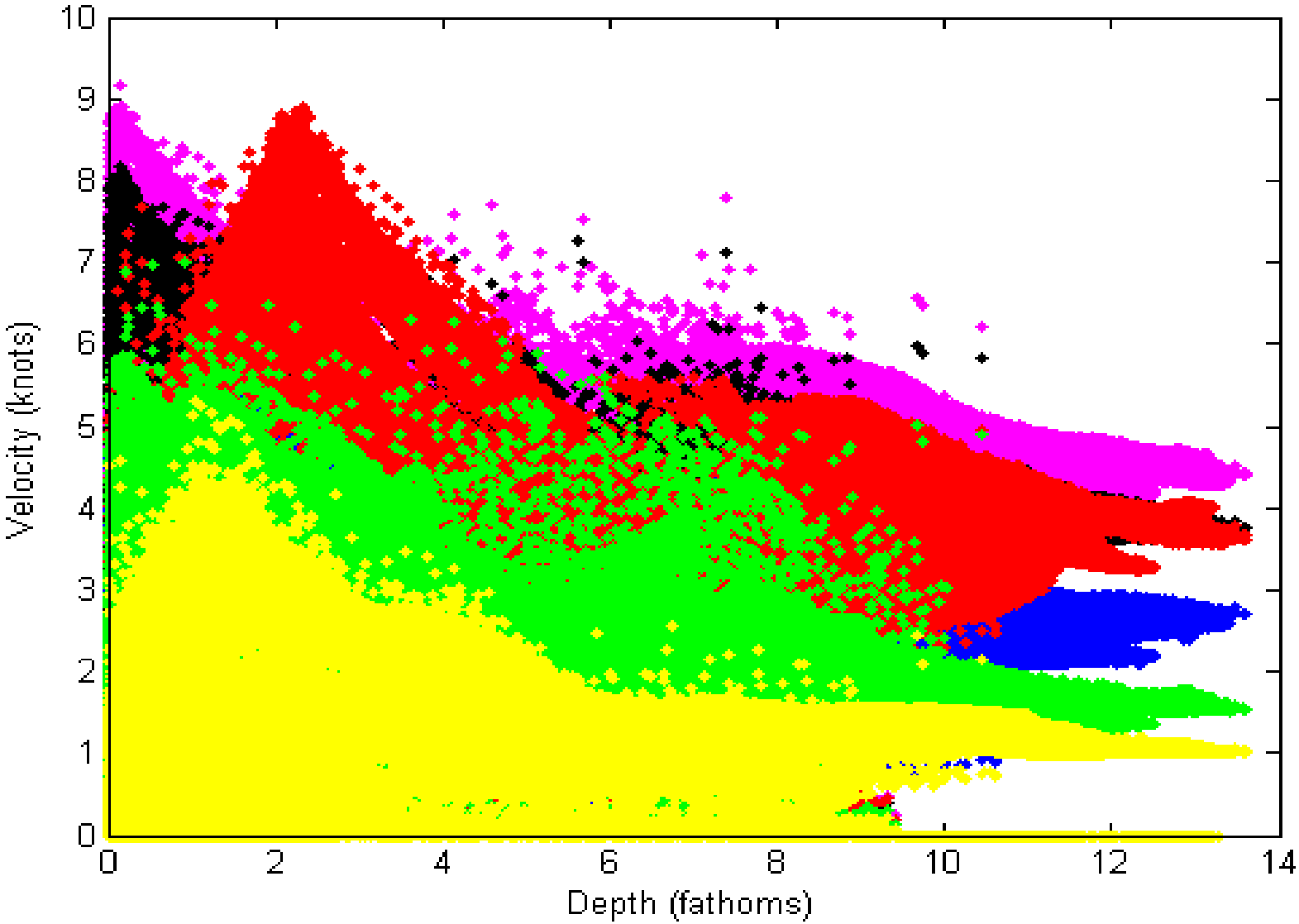
Galveston, TX
Maximum Wave Speed - Mississippi



Galveston, TX
Maximum Vorticity - Mississippi



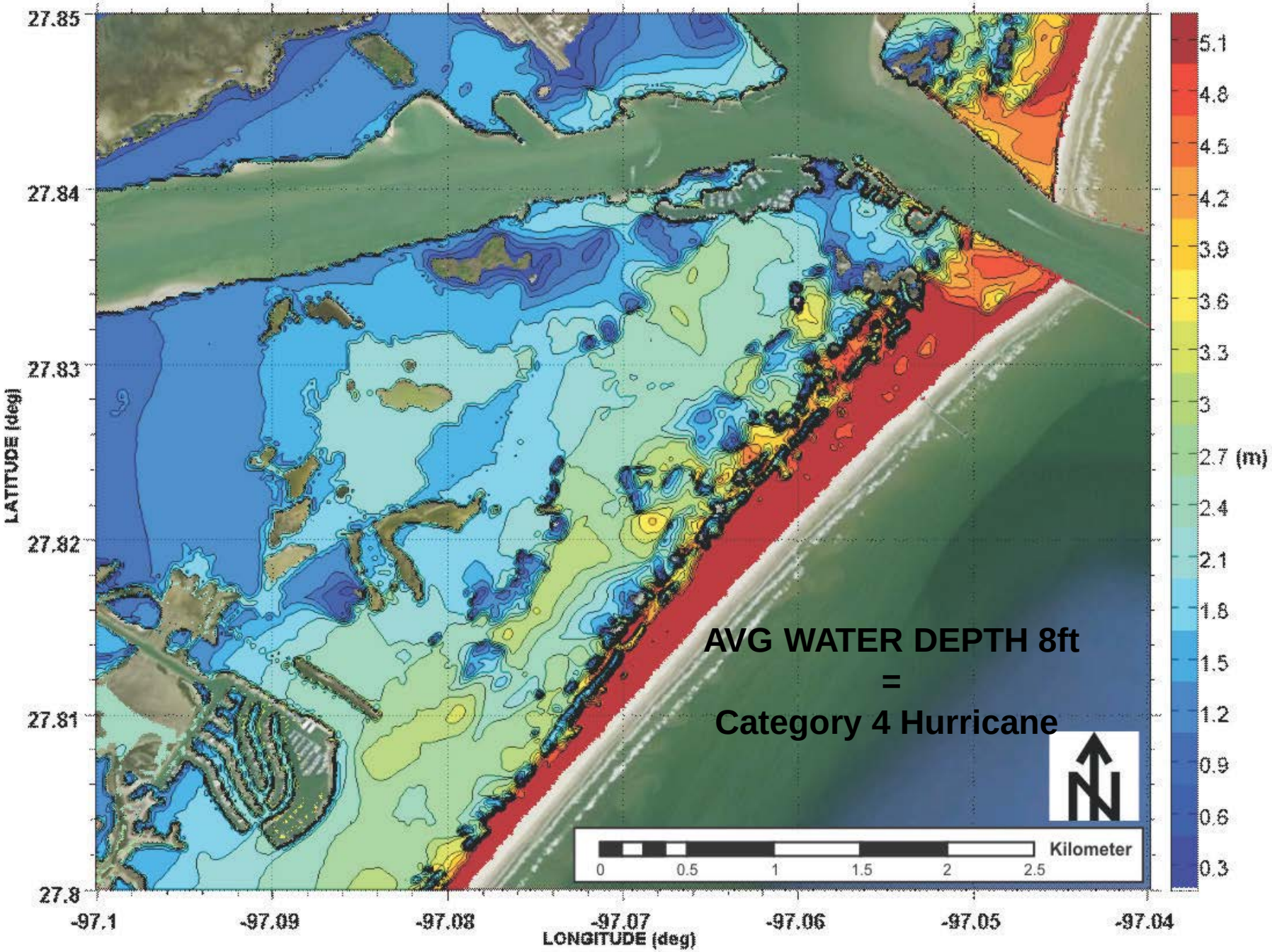
Galveston, TX
Maximum Wave Speed by WC scenarios



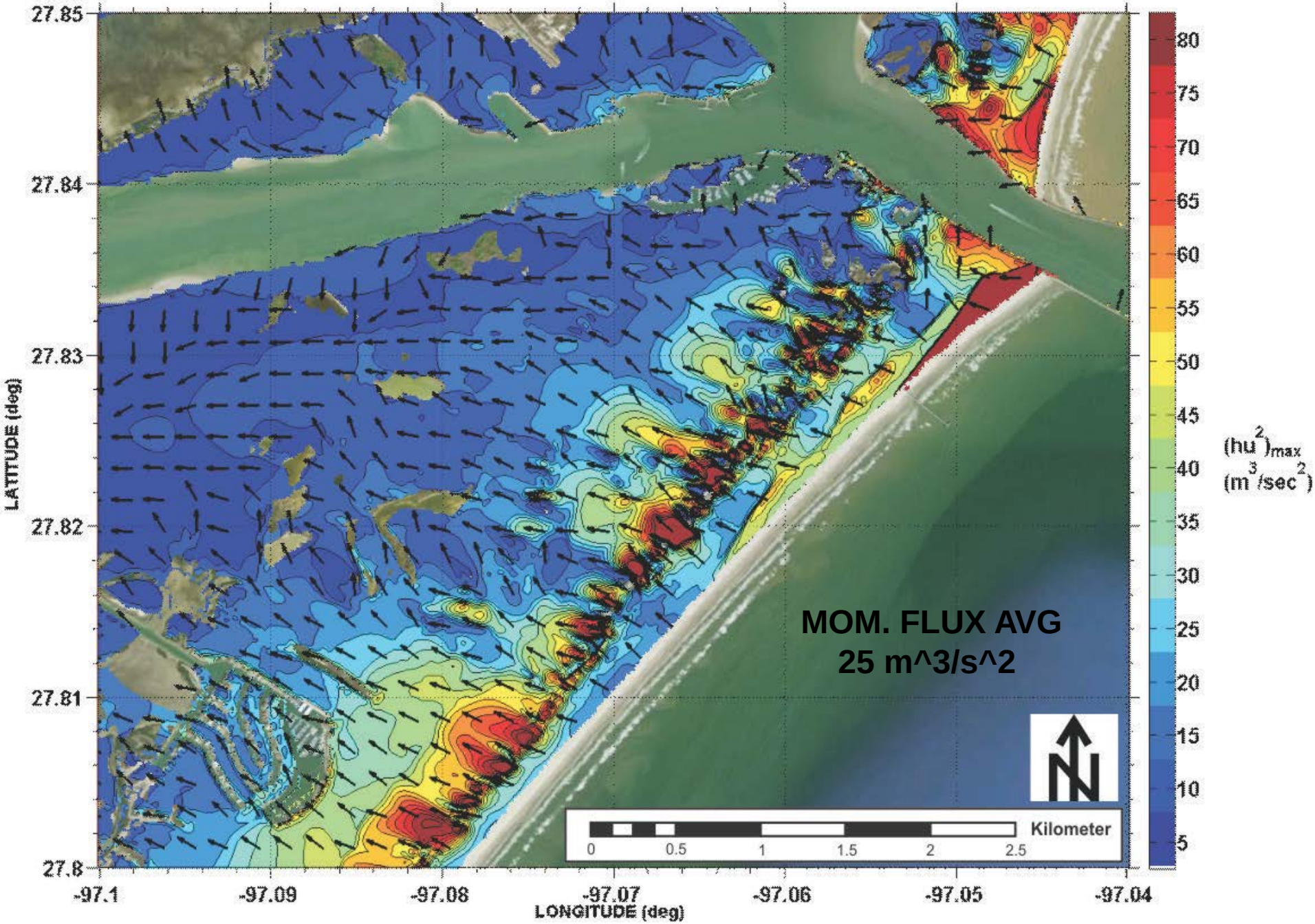
Future Work

- Inundation maps for Biloxi, MS; Mobile, AL; and Tampa Bay, FL
- Continuing with the Maritime product for the Houston-Galveston areas
- Correlate tsunami potential with hurricane storm surge for quick estimation in regions without tsunami inundation maps

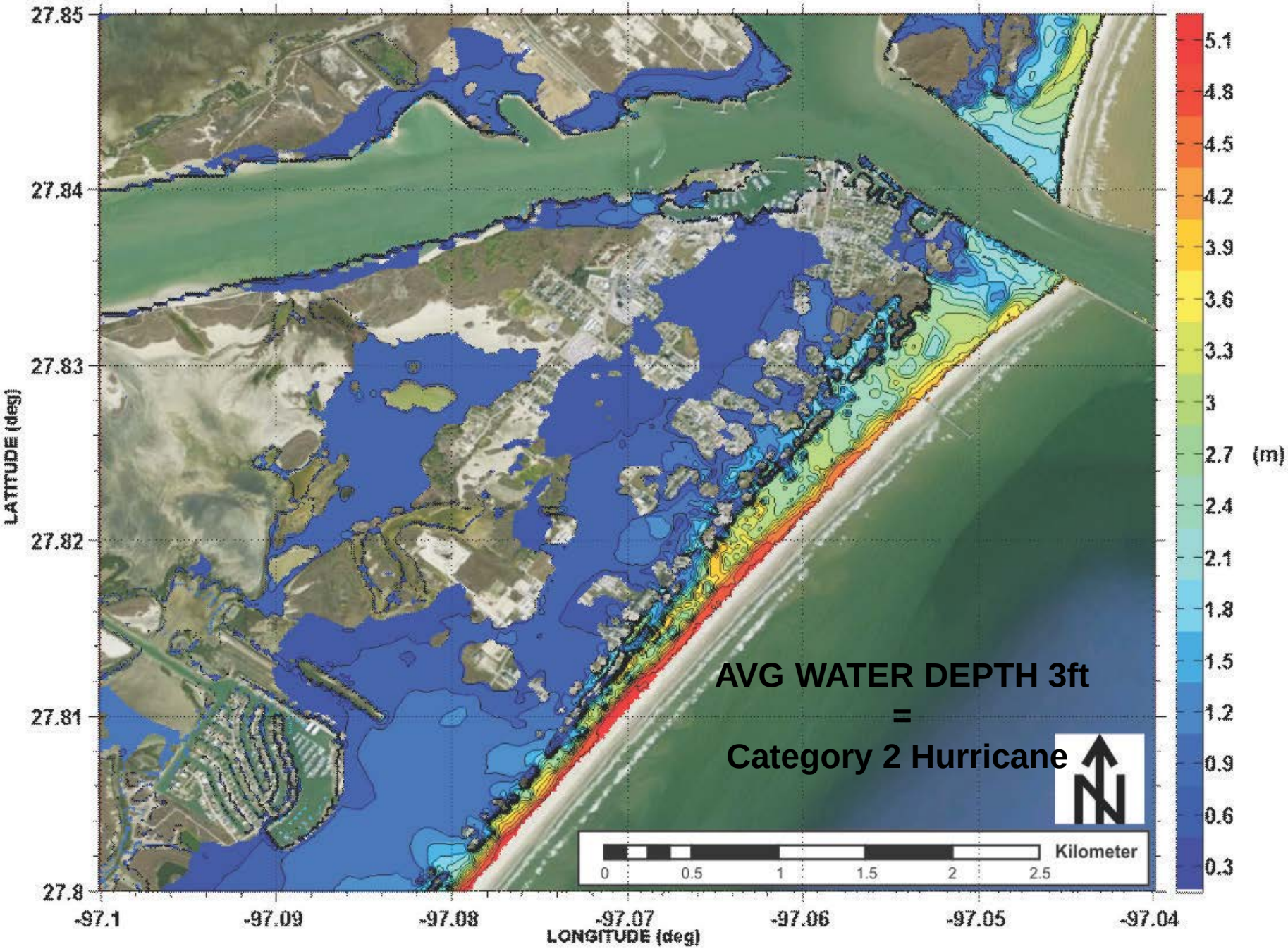
MISSISSIPPI CANYON INUNDATION DEPTH



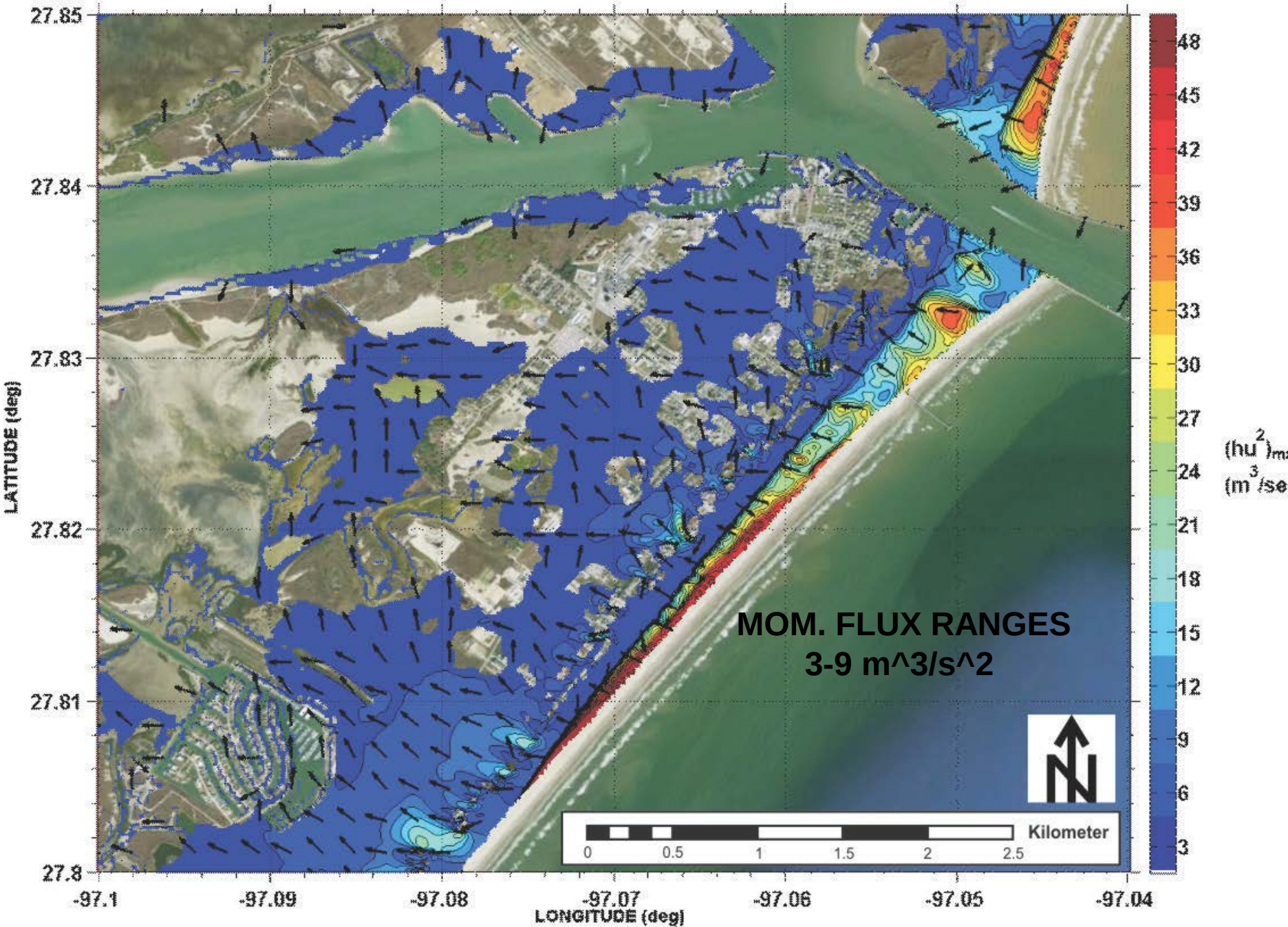
MISSISSIPPI CANYON MOMEMTUM FLUX



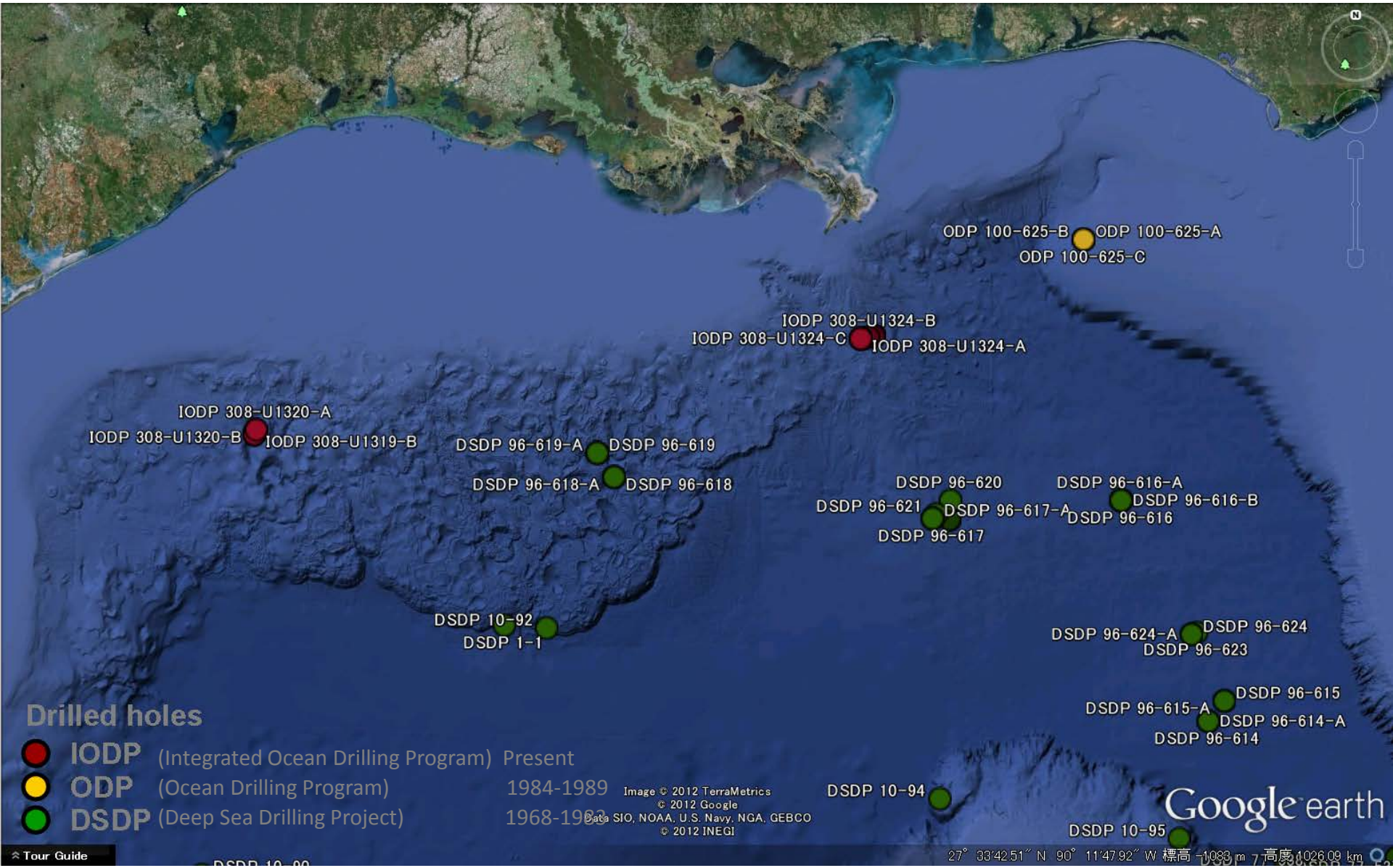
EAST BREAKS INUNDATION DEPTH



EAST BREAKS MOMEMTUM FLUX



Publicly available deep sediment data



Landslide statistics summary of the GOM

Slide No	Latitude	Longitude	type	Area: A	Depth of headscarp: D	Runout (HS to toe)	Unfailed adj. slope	Headscarp height: T	Slide volume	HS/RO (Headscarp/ Runout)	Volume: V	Scar (failed) Slope	Width: W	Length: L	W/L	T/L	
	degrees	degrees		sq. km	m	km	degrees	m	cubic km	unitless	cubic km	degrees	km	km	unitless	unitless	
1	26.25	-93	Disint.	452	-1918	49	1.1	60	8.9	0.00122	13.6	1	9.333	48.4303	0.19271	1.23889	
2	27.42	-92.49	Slump	44	-1423	3.8	2.1	140	2	0.0368421	3.08	5.8	4.667	9.4279	0.49502	14.8495	
3	27.39	-92.37	Disint.	29	-1469	12	3	111.7	1.1	0.00931	1.6	3.3	3.667	7.90837	0.46369	14.1243	
4	27.4	-92.27	Slump	62	-1356	12	3.1	148.3	3	0.0123583	4.5973	4.9	6.216	9.97426	0.6232	14.8683	
5	27.3	-92.19	Disint.	48	-1301	5.5	5.5	75	1.2	0.01364	1.8	4.3	5.039	9.5257	0.52899	7.87344	
6	26.67	-92.26	Disint.	52	-2024	14	5	200	3.4	0.01429	5.2	2.8	3.824	13.5983	0.28121	14.7077	
7	26.67	-92.19	Blocky	15	-1874	8.8	11.5	160	0.8	0.0181818	1.2	7.5	4.569	3.28299	1.39172	48.736	
8	26.28	-92.14	Disint.	15	-2053	8.6	1.1	110	0.5	0.01279	0.8	2.5	1.078	13.9147	0.07747	7.90533	
9	26.36	-91.98	Disint.	10.3	-2019	3	6	203.3	0.7	0.06777	1.0	5.1	1.765	5.83569	0.30245	34.8373	
10	26.74	-91.61	Disint.	1156	-2150	79	NaN	263.3	100.4	0.003	152.2	0.9	16.706	69.1967	0.24143	3.80509	
11	27.29	-91.41	Blocky	9.6	-1757	4.9	12	160	0.5	0.0326531	0.768	8.6	1.765	5.43909	0.3245	29.4167	
12	27.11	-91.41	Disint.	34	-1733	7.6	2.5	60	0.7	0.00789	1.0	2.1	2.549	13.3386	0.1911	4.49824	
13	27.94	-91.32	Blocky	143	-1076	12	5	176.3	8.3	0.0146917	12.6055	6	12.118	11.8006	1.02689	14.9399	
14	26.21	-91.19	Disint.	28	-2399	7.3	5.1	191.7	1.8	0.02626	2.7	7.2	4.51	6.20843	0.72643	30.8774	
15	27.79	-91.18	Blocky	42	-1332	6.8	8.1	172.5	2.4	0.0253676	3.6225	3.2	6.275	6.69323	0.93751	25.7723	
16	28.03	-90.95	Disint.	70	-910	5.8	3.1	146.7	3.4	0.02529	5.1	4.4	14.706	4.75996	3.08952	30.8196	
17	26.51	-90.88	Disint.	148	-2262	12	7.5	315	15.1	0.02625	23.3	10.9	11.51	12.8584	0.89514	24.4976	
18	26.72	-90.72	Disint.	55	-2395	7.1	9.9	255	5.6	0.03592	7.0	8.1	8.039	6.84165	1.17501	37.2717	
19	27.9	-90.54	Disint.	40	-1091	4.2	4.4	161.3	2.1	0.03840	3.2	4.5	10.98	3.64299	3.01401	44.2769	
20	27.57	-90.24	Disint.	748	-1404	45	1	55	13.6	0.00122	20.6	0.9	17.608	42.4807	0.41449	1.29471	
21	27.46	-90.04	Disint.	5509	-2328	167	1.3	53.8	97.7	0.00032	148.2	1.1	30.451	180.914	0.16832	0.29738	
22	28.01	-89.42	Disint.	1394	-2228	79	1.6	73.8	33.9	0.00093	51.4	0.9	18.51	75.3106	0.24578	0.97994	
23	29.1	-88.93	Disint.	2913	-1136	124	2	48.3	46.4	0.00039	70.3	1	23.02	126.542	0.18192	0.38169	
24	29.95	-87.64	Disint.	2460	-1414	111	1.3	97.5	79.1	0.00088	119.9	1	27.265	90.2256	0.30219	1.08063	
25	30.87	-87.02	Disint.	1098	-121	89	1.9	60	13.1	0.00067	32.9	1.9	12.804	85.7545	0.14931	0.69967	
26	27.71	-94.69	Disint.	519	-150	39	1.1	160	21.95	0.00410	21.95		13.3	39.0226	0.34083	4.10019	East Breaks
27	28.51	-89.78	Disint.	3687	-250	145	1	300	425	0.00207	425		25.4	145.157	0.17498	2.06672	Mississippi Canyon
28	26.09	-84.75	Disint.	647	-800	19	5.8	150	16.2	0.00789	16.2		34.1	18.9736	1.79723	7.90572	West Florida
Mean				765.3	-1513.3			146.7			41.1		11.8	38.1	0.7		
St Dev				1334.5	661.8			75.1			86.9		9.3	48.1	0.8		
Median				66.0	-1446.0			149.2			6.1		10.2	13.1	0.4		
Max				-9.6	2399			315			425.0		34.1	180.914	3.08952		
Min				-5509	121			48.3			0.8		1.078	3.28299	0.07747		

MCS Parameter Values

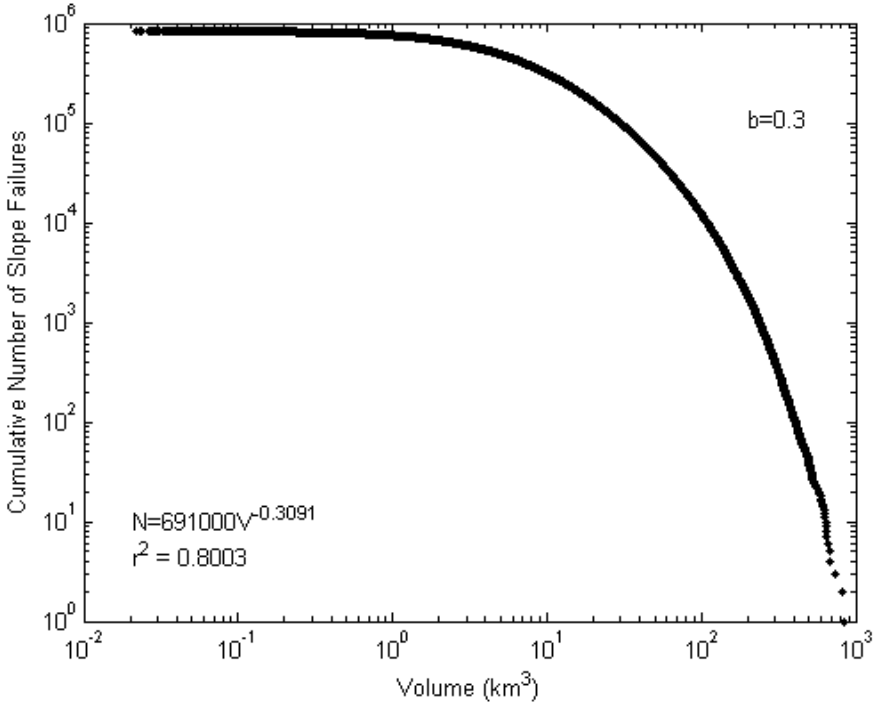
Name	Description	Unit	Distribution	Parameter 1 mu	Parameter 2 sigma	Max (MCS limit)	Min (data)	Max (data)
D	depth	m	normal	1513.32	661.76	transect-dependent	121	2399
A	area	km^2	lognormal	5.03475	1.95449	7659.714573	9.6	5509
V	volume	km^3	lognormal	2.21175	1.78178	N/A	0.8	425
L	length (A/W)	km	lognormal	2.91557	1.21752	210.7368081	3.28	180.91
W	width	km	lognormal	2.11918	0.928221	53.28324878	1.078	34.1
LR	runout length	km	lognormal	3.14034	1.33762	N/A	3	167
T	thickness	m	lognormal	4.7788	0.630824	N/A	48.3	315

Average Landslide Dimensions from MCS Output

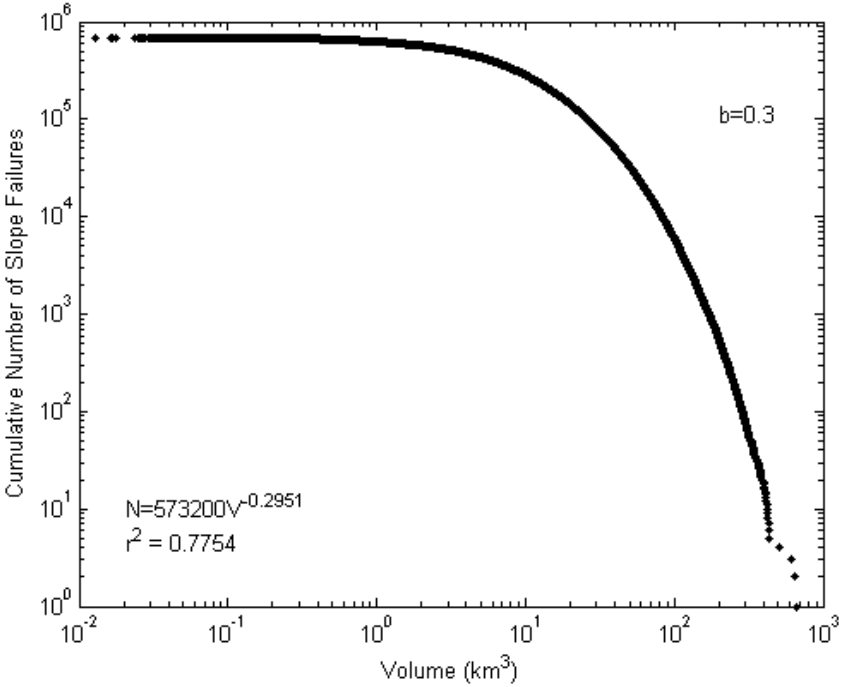
- Transect D (900-1100 yr)
  - D = -1128 m
  - L = 33 km
  - T = 391 m
  - W = 38 km
  - →V = 358 km^3
- Transect A (9600-9700 yr)
  - D = -86 m
  - L = 69 km
  - T = 68 m
  - W = 27 km
  - →V = 352 km^3

Cumulative Number of Slope Failures - GoM

Transect D



Transect A



Data: b=0.34

Probabilistic Source Transect D Wave Generation