19TH WORLDCONFERENCE ON DISASTER MANAGEMENT

Monday, June 22, 1:30 pm - 1:45 pm

Frequency Analysis Methodologies for Investigating 100-Year Extreme Water Levels in the Coastal Areas of USA

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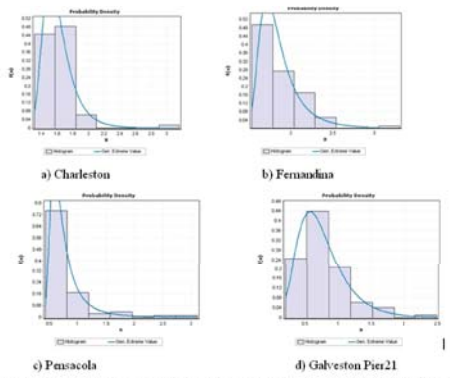
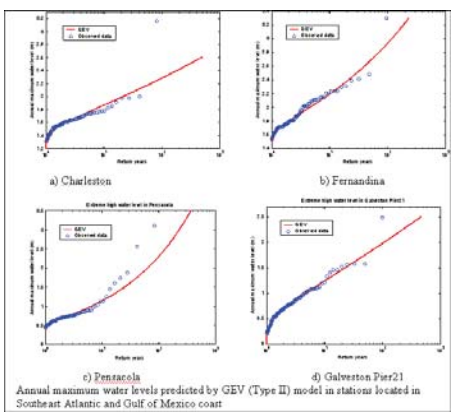
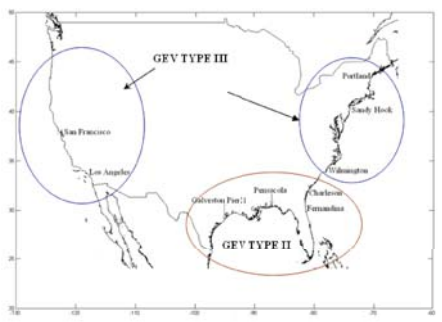
A: Traditional GEV method for frequency analysis of 100-year coastal flood results in errors ranging from 10%-28% in Southeast Atlantic coasts as well as Gulf of Mexico coastal areas in USA.



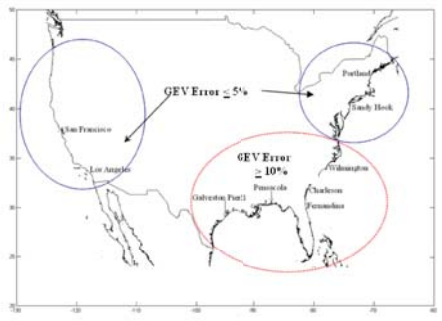
Probability density function (PDF) of annual maximum water levels in Southeast Atlantic and Gulf of Mexico coasts characterized by GEV Type II model. x is annual maximum water level.



Annual maximum water levels predicted by GEV (Type II) model in stations located in Southeast Atlantic and Gulf of Mexico coast



Annual maximum water levels in coastal zones characterized by different types of GEV model along the coast of USA.



GEV models performance for estimating annual maximum water levels for return periods of approximate 100 years.

B: A recent frequency analysis method by Xu and Huang (2008) substantially improve the accuracy for estimating 100-year coastal extreme water levels.

A frequency method developed by Xu and Huang (2008):

Cumulative Frequency: $F(X \le x) = 1 - e^{-\left(\frac{x-c}{a}\right)^{1/2}}$

Frequency Density Function: $f(x) = \frac{dF(X \le x)}{dx} = \frac{1}{2a}\left(\frac{x-c}{a}\right)^{-1/2} \cdot e^{-\left(\frac{x-c}{a}\right)^{1/2}}$

Table: Errors in Predicting Maximum Recorded Water Levels (m)

Maximum Recorded Elevation	Models	Gumbel	Weibull	Lognormal	GEV	Xu-Huang
Pensacola 3.11 m Return period =83 years	Elevation	1.990	1.786	1.673	2.146	2.937
	Difference	-1.119	-1.323	-1.436	-0.963	-0.173
	Error%	36%	42.6%	46.2%	31.0%	5.5%
Fernandina 3.30 m Return period =95 year	Elevation	2.694	2.585	2.566	2.850	3.267
	Difference	-0.604	-0.713	-0.732	-0.448	-0.030
	Error%	18.3%	21.6%	22.2%	13.6%	0.92%

Note: a). Maximum recorded water level in Pensacola is 3.11 m in 2004.
b). Maximum recorded water level in Fernandina is 3.30 m in 1898.