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Storm Characterization in the Yucatan Peninsula

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Description and Motivation

Yucatan coast subject to storm impacts (mid latitude anticyclonic systems & tropical cyclonic systems) Latest hurricane Rina Oct 2011

Image taken from Historical Hurricane Tracks NOAA

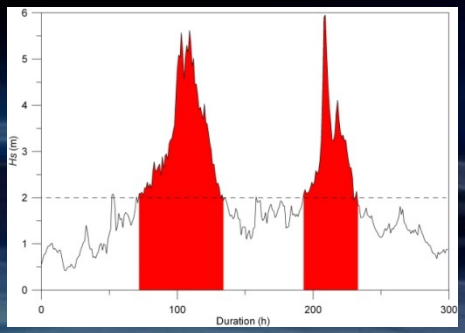
Description and Motivation

STORM IMPACTS

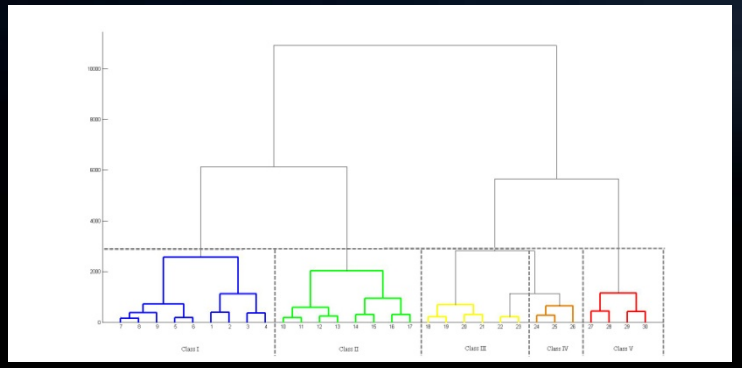
Methodology

Wave hindcast (1979-2008)

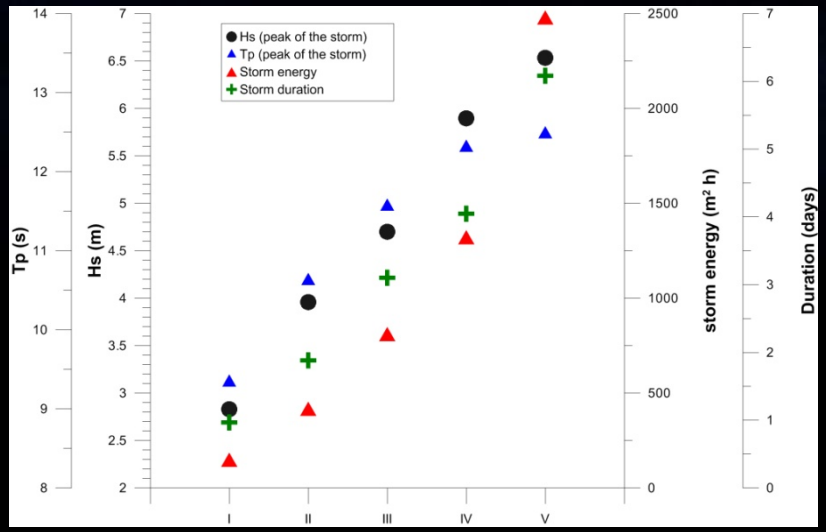
Storm definition



classification parameter



Classification procedures



Final Classification

Conclusions

- A 5-class intensity scale for wave storms in the Yucatan coast is presented

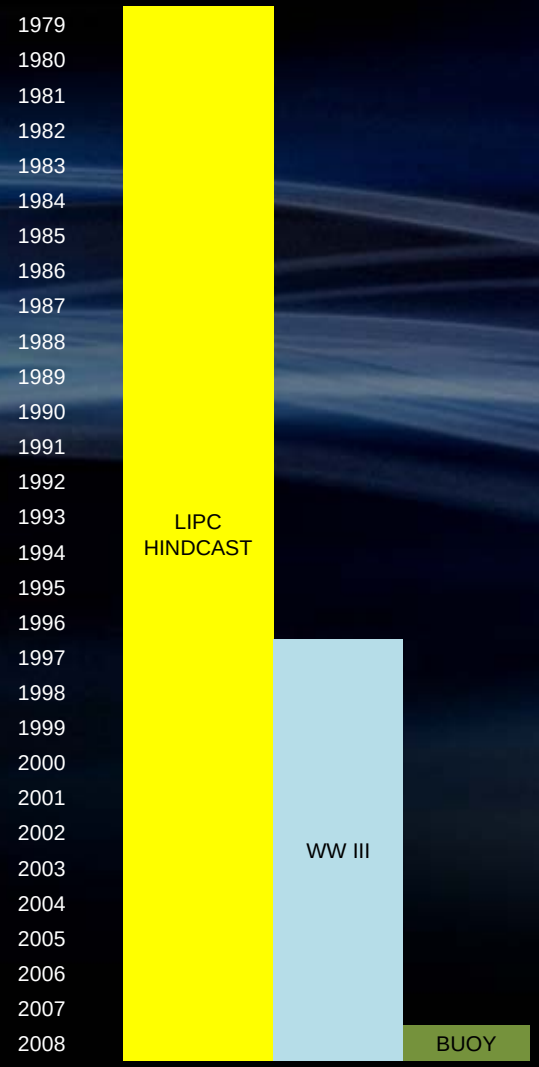
- The obtained classification reflects the increase in wave storm properties as storm category increases from weak (Hs=2.8 duration 23 hrs) to extreme (Hs = 6.5 duration 146h)

- Storminess trends suggest an increase in number of storms and storm energy.

		Hs max (m)	Tp max (seg)	Dur (h)	Energy (m^2h)
Weak	I	2.8	9.3	23	150
Moderate	II	4	10.6	45	419
Significant	III	4.7	11.6	75	812
Severe	IV	5.9	12.3	97	1321
Extreme	V	6.5	12.5	146	2480

Details of the study

Wave data



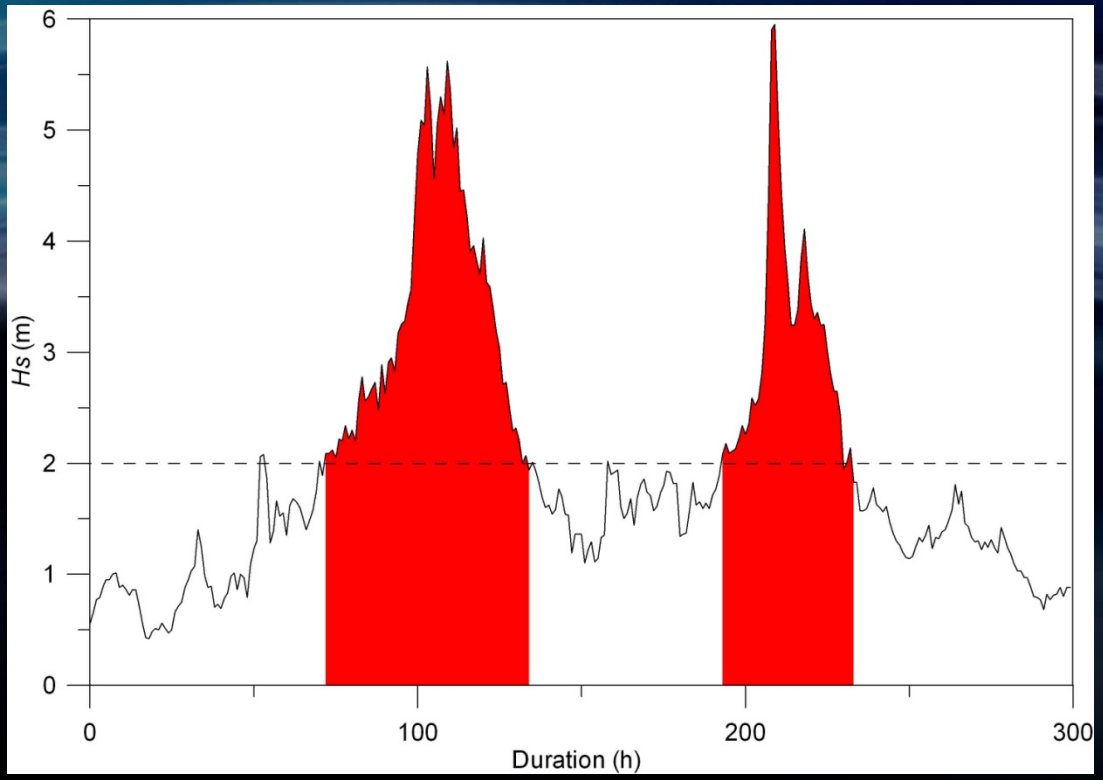
Details of the study

Identification of wave events

Storm definition

Hs threshold >2 m

Minimum duration > 12 hr



Storm clasification
based on “energy content”

$$E = \int Hs^2 \, dt$$

Details of the study

Identified wave events

421 storms

384 storms

376 storms

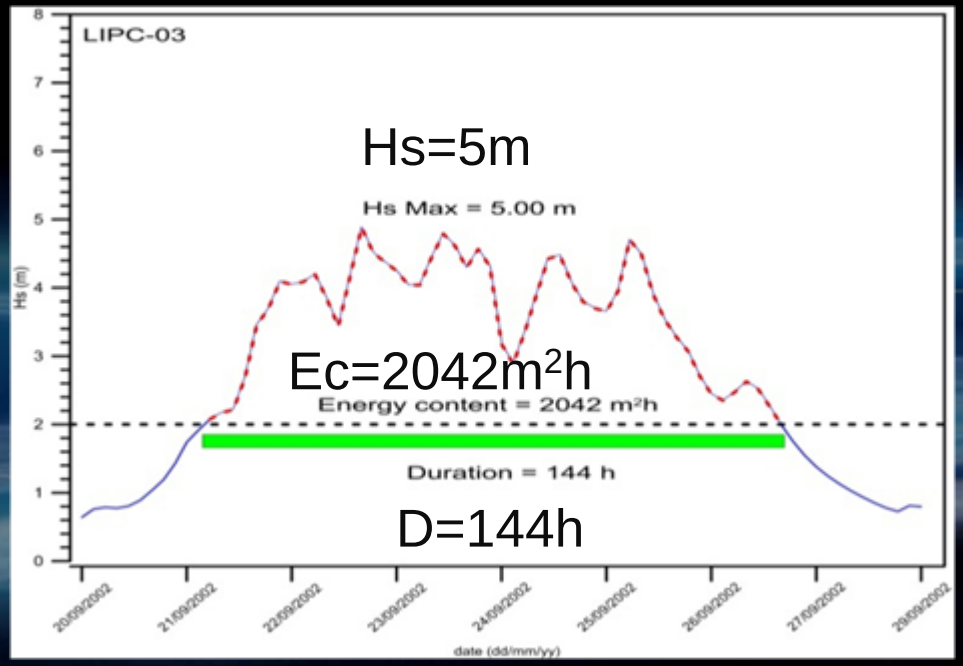
360 storms

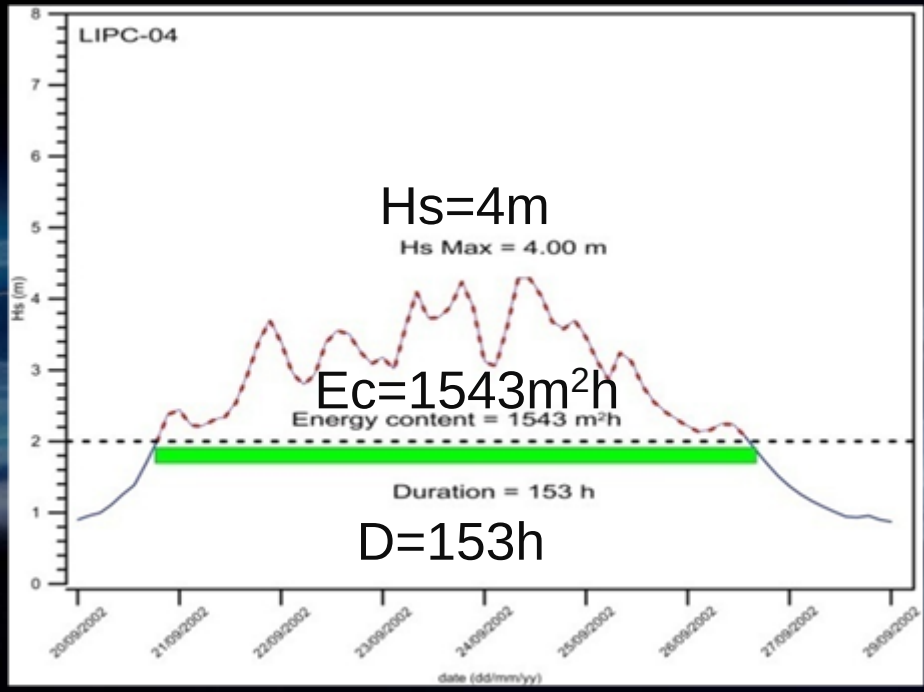
- All identified storms were integrated into a single data set

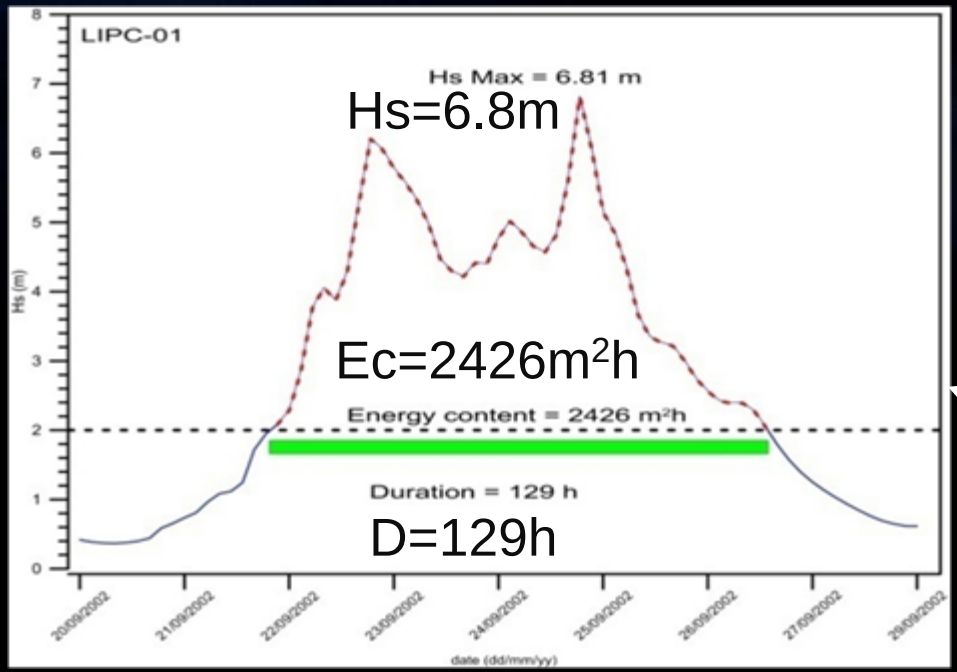
Details of the study

Spatial variation

September 2002 Hurricane ISIDORE



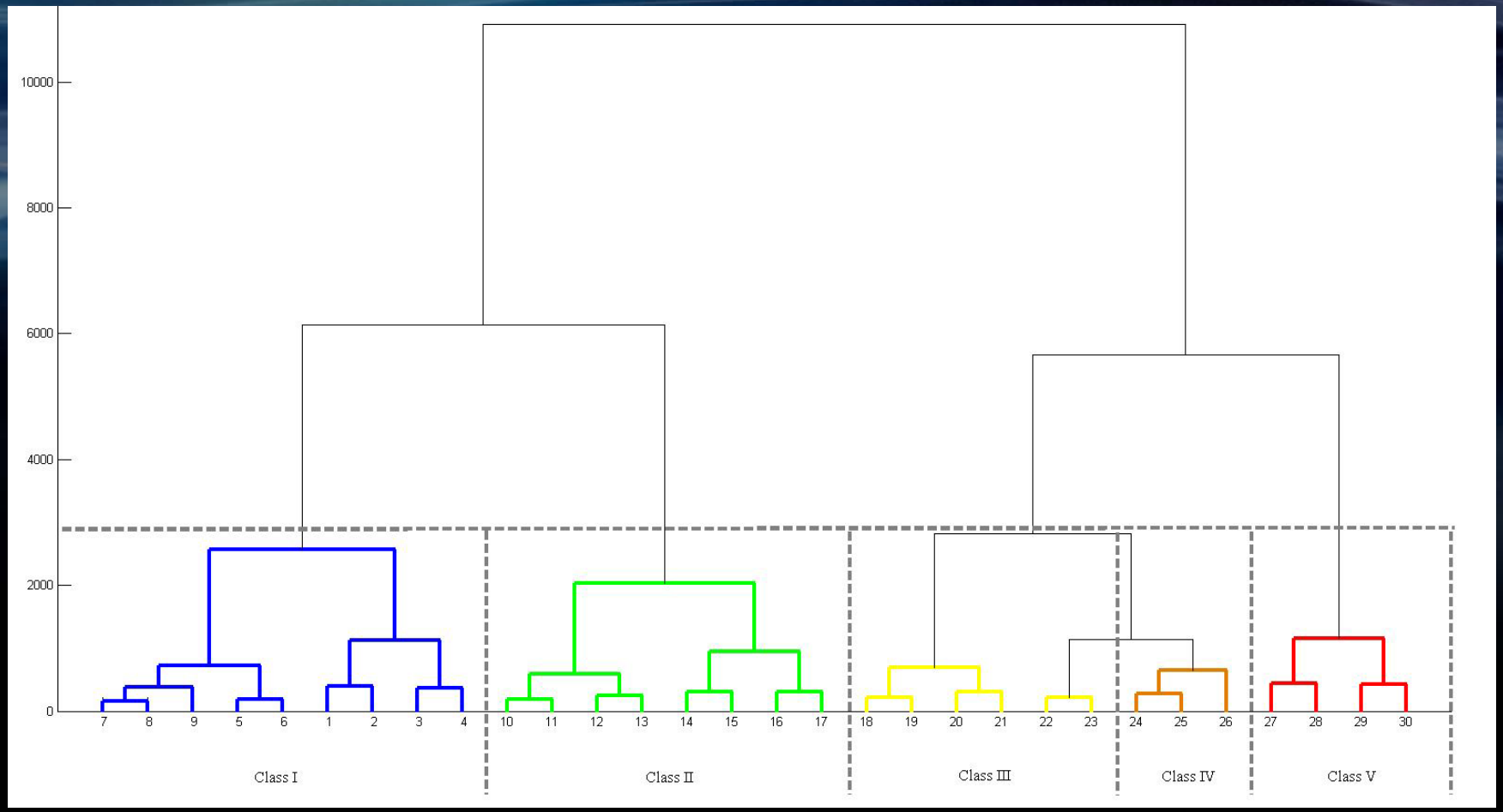




Details of the study

Storm classification

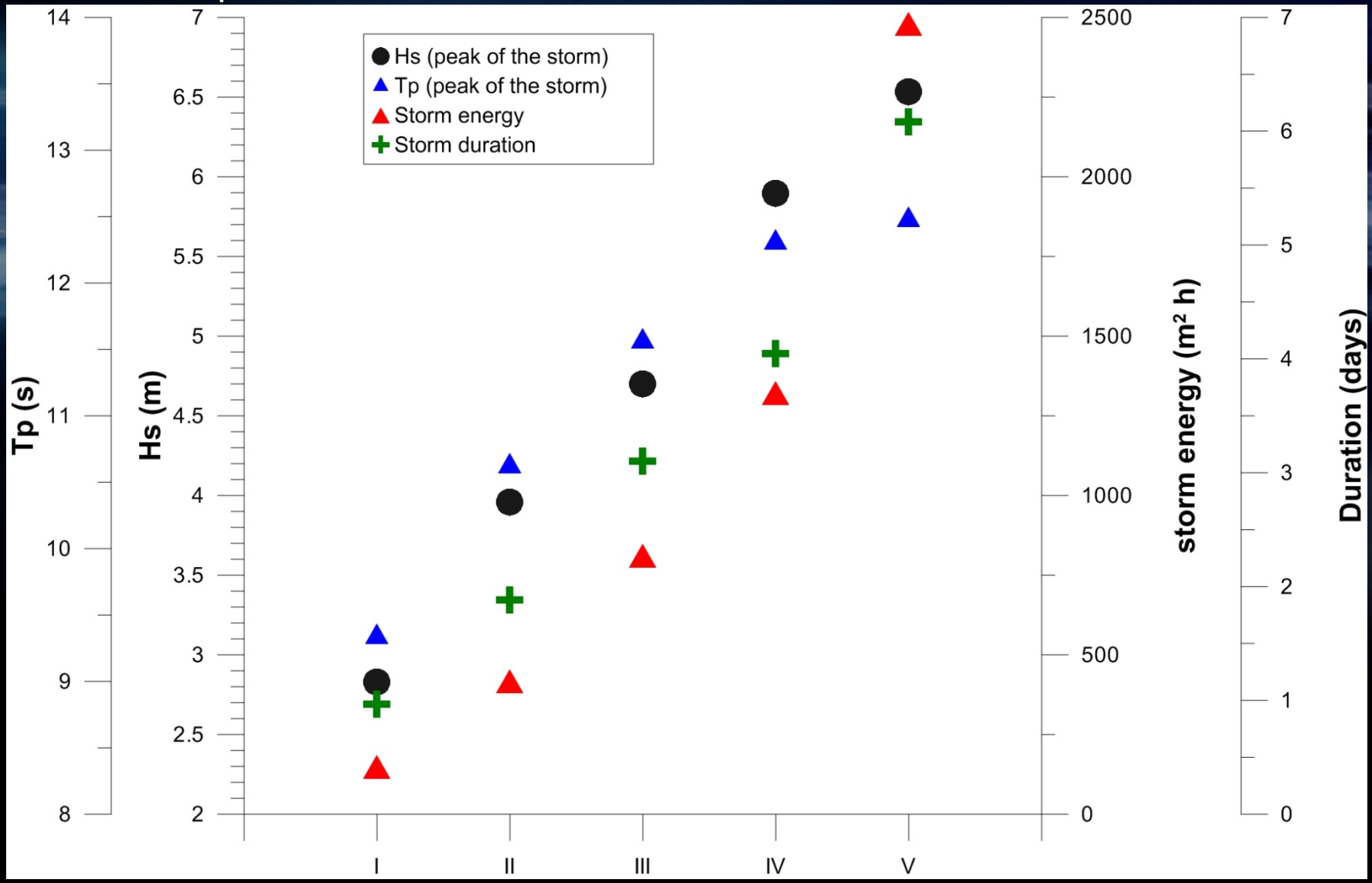
cluster analysis (solid line)+ supervised classification (dashed line).



Details of the study

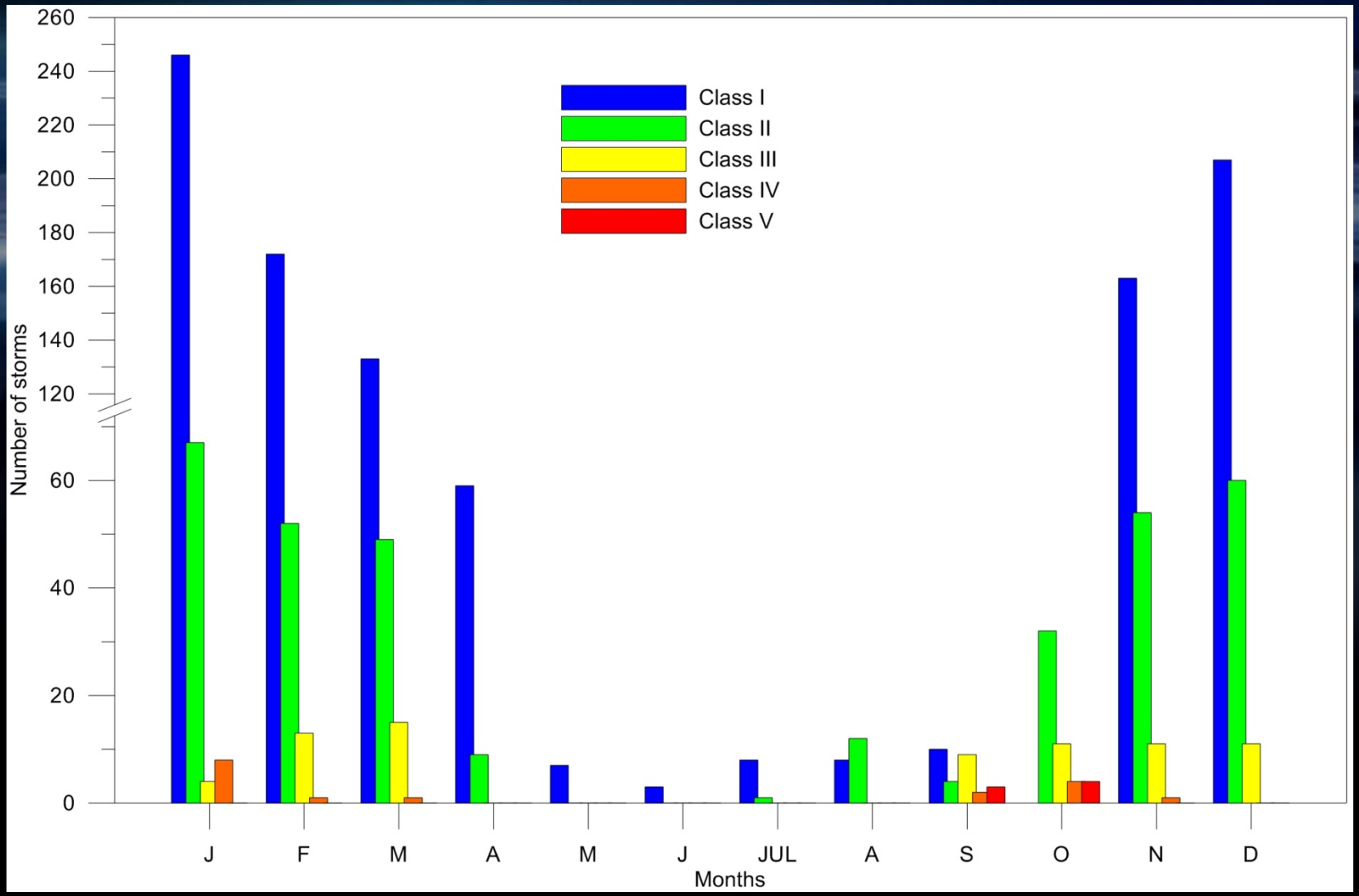
Classification

Mean values per storm class



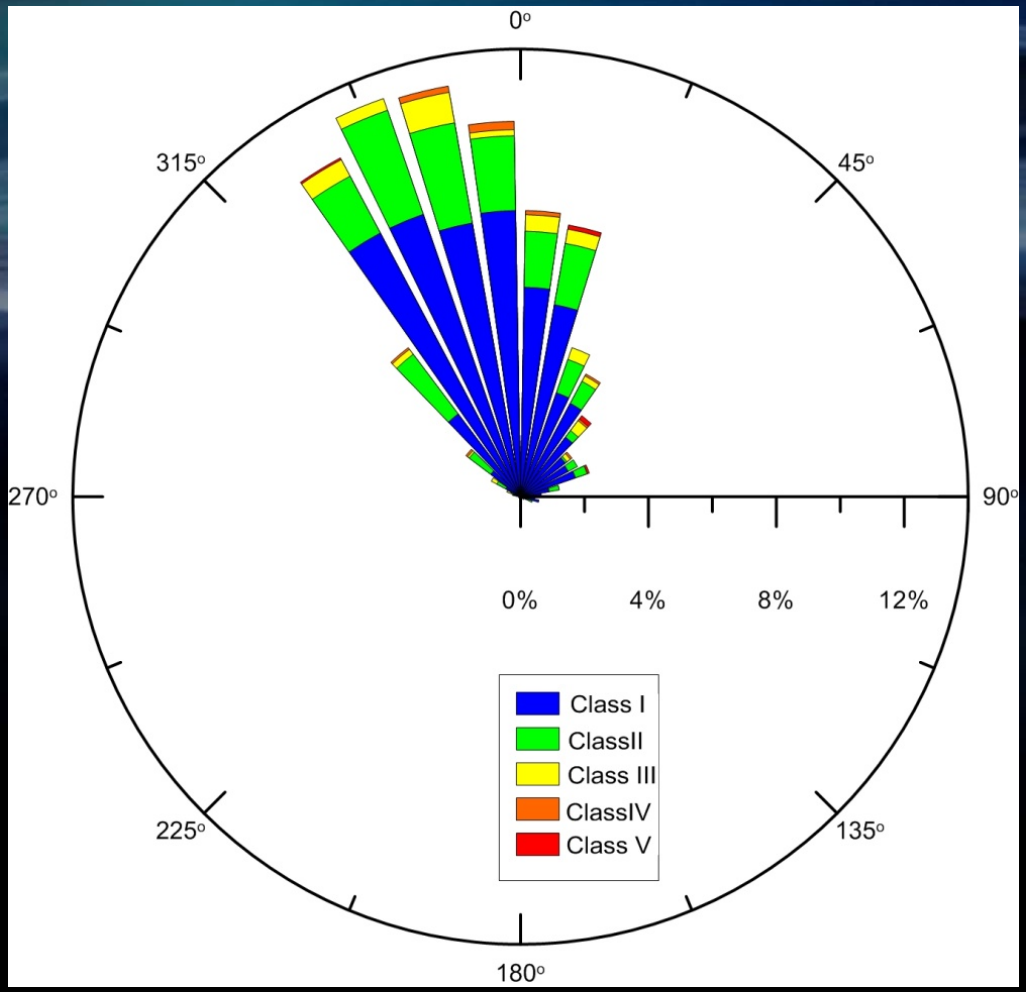
Details of the study

Storm seasonal distribution



Details of the study

Storms directional distribution



Details of the study

Storm classification

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~x2.3

~X6

~X16

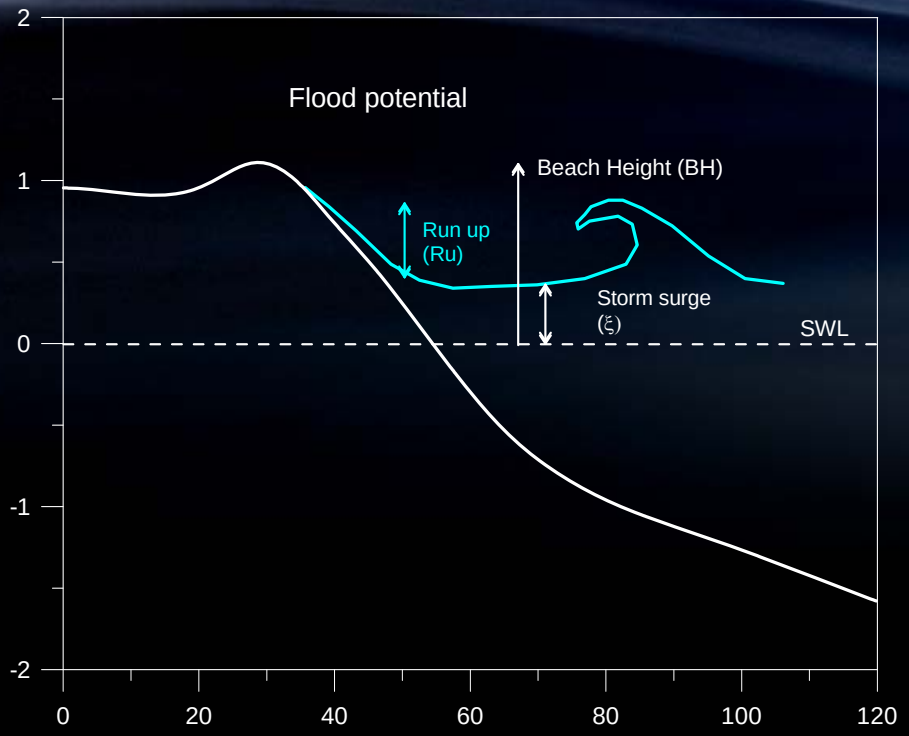
Details of the study

Application for coastal management:
Preliminary assessment of the storm-induced inundation hazard

Run-up assesment for 25 profiles along the Yucatan coast

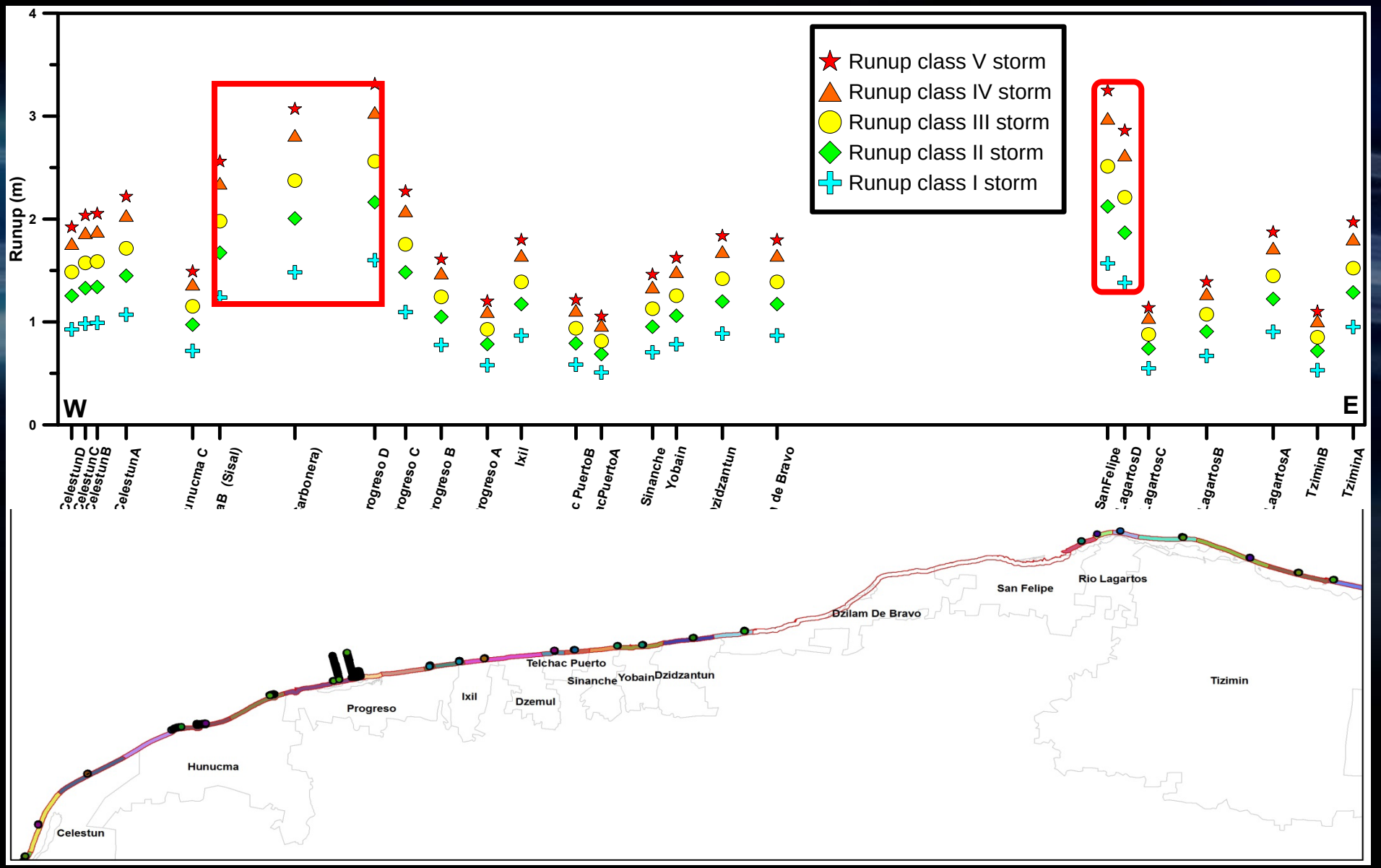
$$R_2 = 1.1\left(0.35\beta_f \left(H_o L_o\right)^{1/2} + \frac{\left[H_o L_o (0.563\beta_f{}^2 + 0.004\right]^{1/2}}{2} \right)$$

Run up : Stockdon *et al*. (2006)



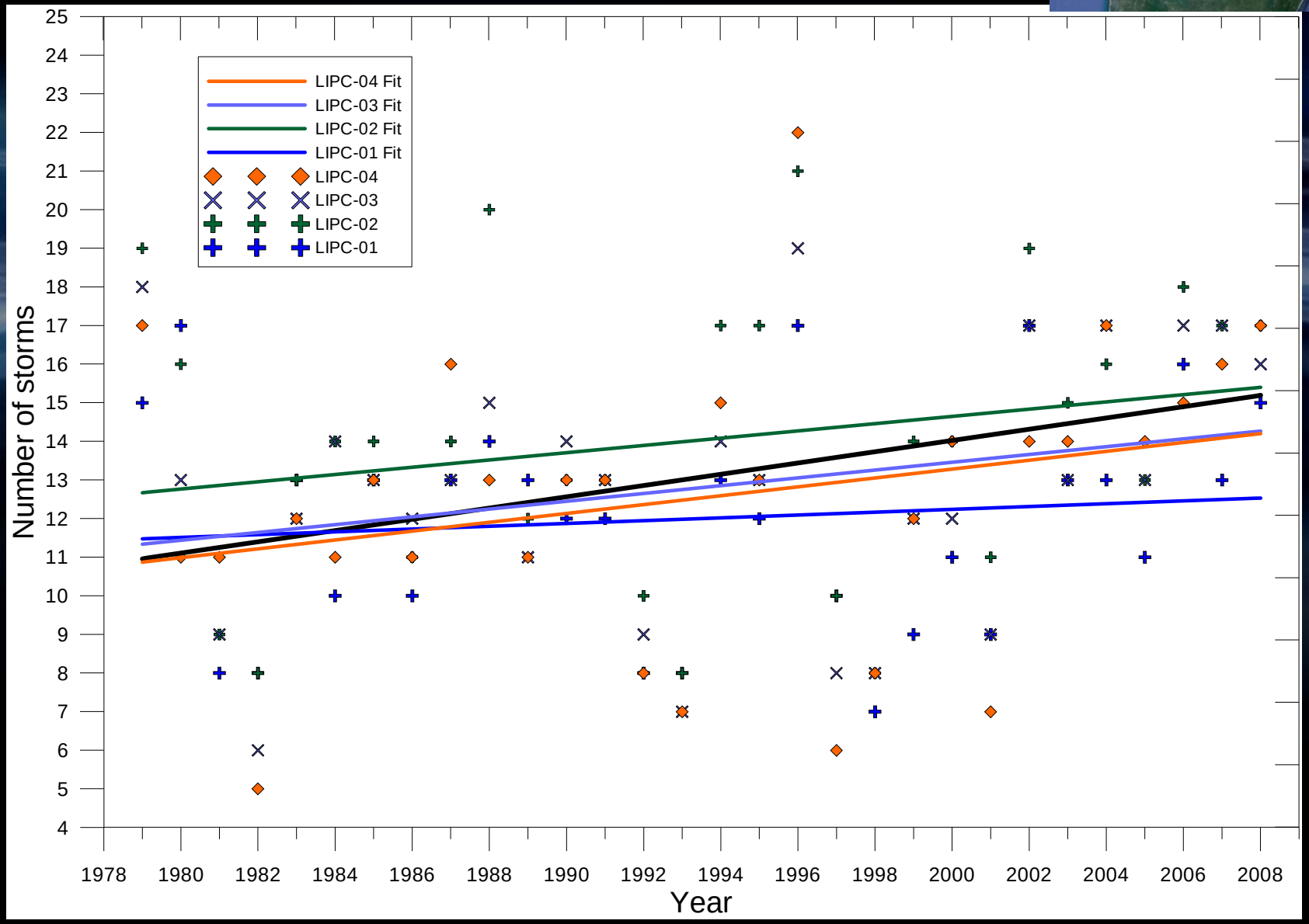
Details of the study

Preliminary runup assessment



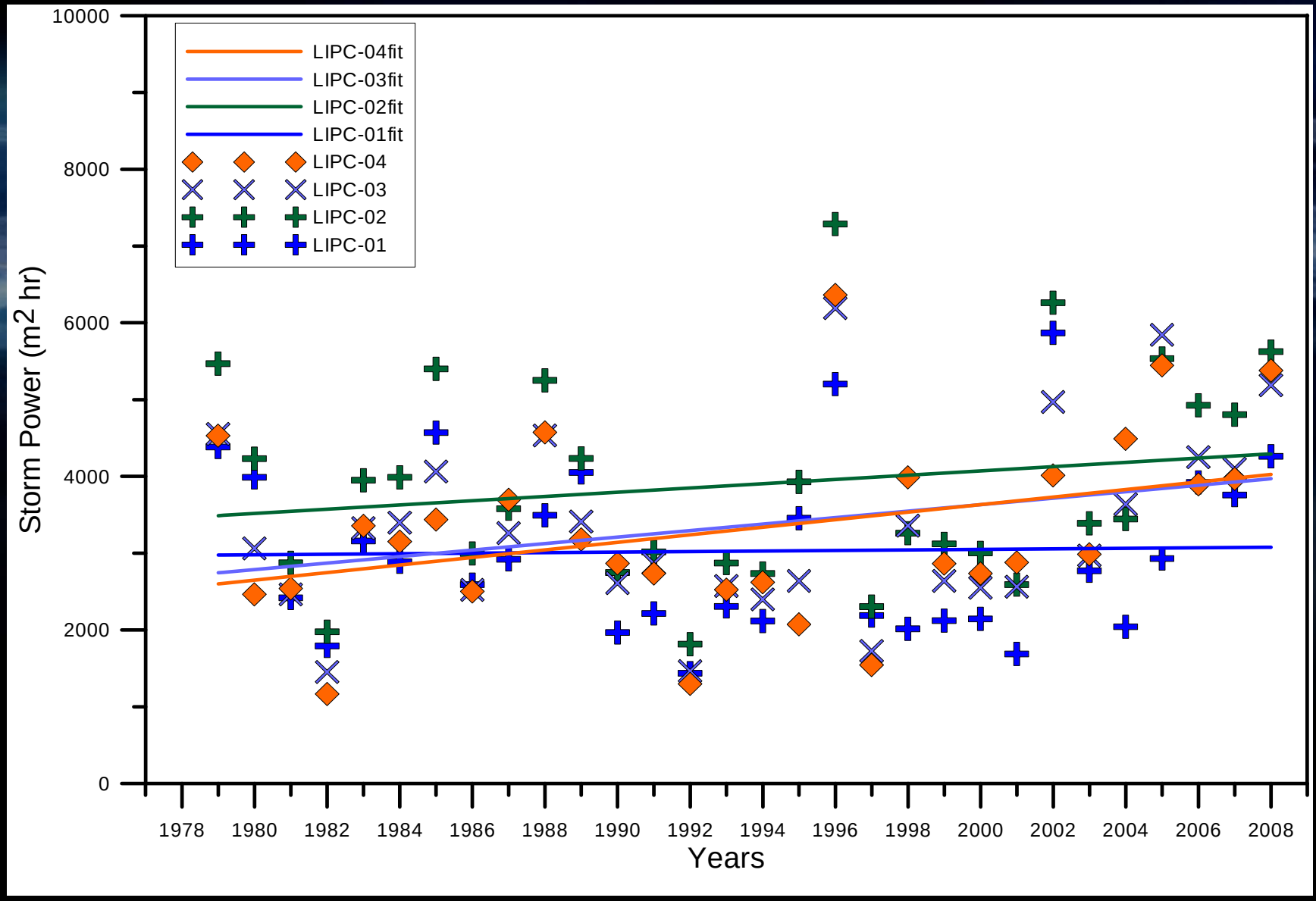
Details of the study

Storminess trends
Number of storms per year



Details of the study

Storminess trends
Storm energy content per year



Concluding remarks

- A 5-class intensity scale for wave storms in the Yucatan coast is presented

- The obtained classification reflects the increase in wave storm properties as storm category increases from weak (Hs=2.8 dur 23 hrs) to extreme (Hs = 6.5 duration 146h)

- Storminess trends suggest an increase in number of storms and storm energy.

- Preliminary run up results suggest that the highest potential flooding are in Hunucma and San Felipe regions

Acknowledgments

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