

CATÁSTROFES NATURAIS

Uma realidade multidimensional

Catástrofes naturais: o que são?
Há ordem no caos?

Jorge A. Gil Saraiva

Definição

Um desastre natural é um **acontecimento (perigo)** que resulta de processos naturais da Terra ou que a afecta e que leva à perda de vidas humanas, ocorrência de feridos ou ainda a perdas económicas ou ambientais (**qual é o limite inferior?**).

A severidade das perdas depende da capacidade das populações afectadas resistirem quer ao acontecimento quer às suas consequências; os desastres ocorrem quando os perigos se cruzam com a vulnerabilidade.

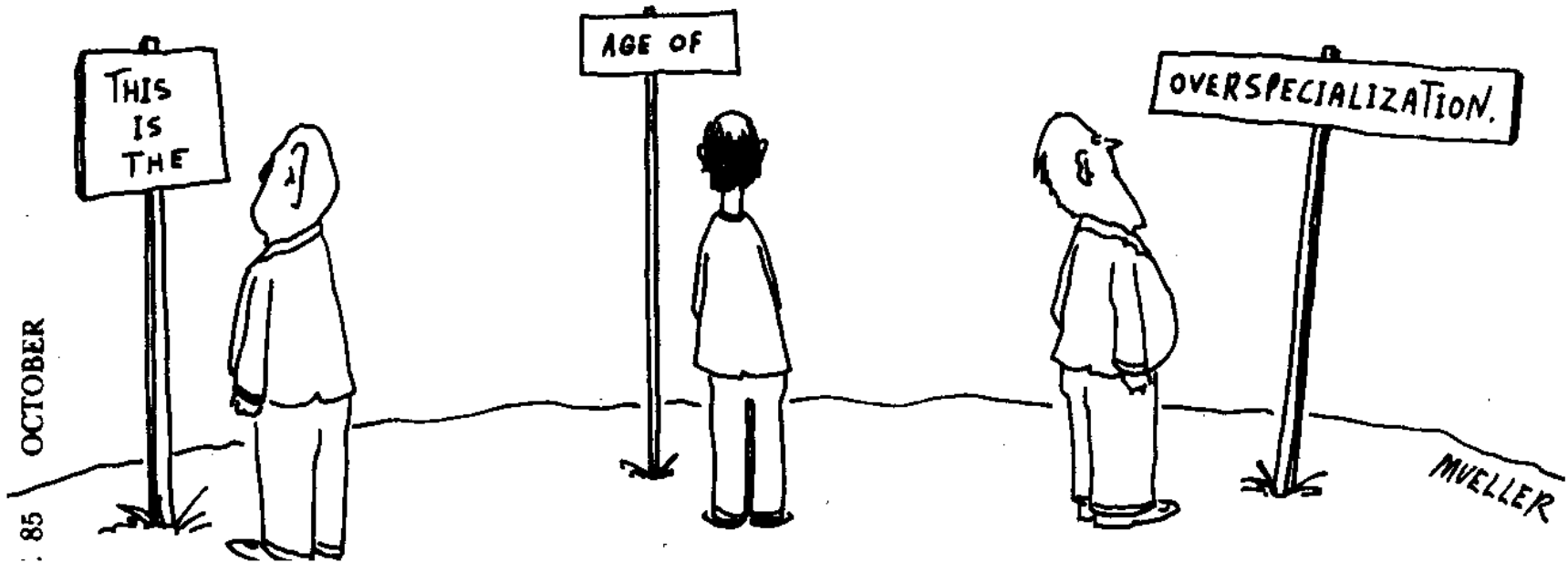
Corolário: Só há desastres naturais por que o Homem existe

Classificação (Resseguros)

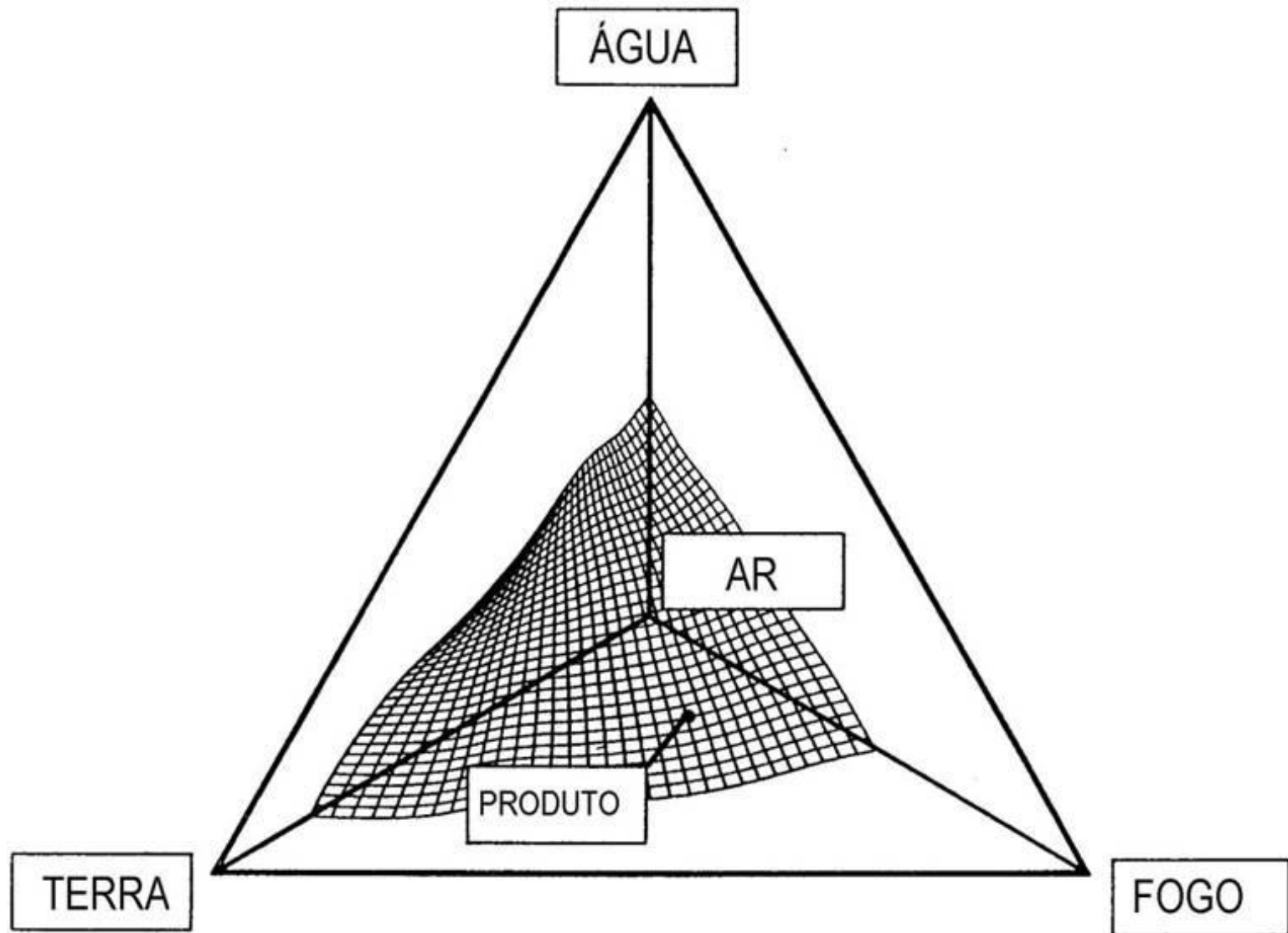
Grupo	Tipo Principal	Sub-tipo	Sub-sub-tipo		
Geofísico	Terramoto	Tremor de terra			
		Tsunami			
	Deslizamento de massas	Vulcão	Erupção		
			Queda de rochas	Avalanche	Neve Detritos
		Deslizamento de terras			Lamas Lahar Detritos
				Subsidiência	
		Meteorológico	Tempestade	Tropical	
				Extra-tropical ciclone	
				Locais (convectivas)	
Hidrológico	Cheias	Lentas (rio)			
		Rápidas			
		Depressão/inundação costeira			
		Deslizamento de terras	Detritos		
		Avalanche		Neve Detritos	
			Subsidiência		Súbita Lenta

Classificação (Resseguros)

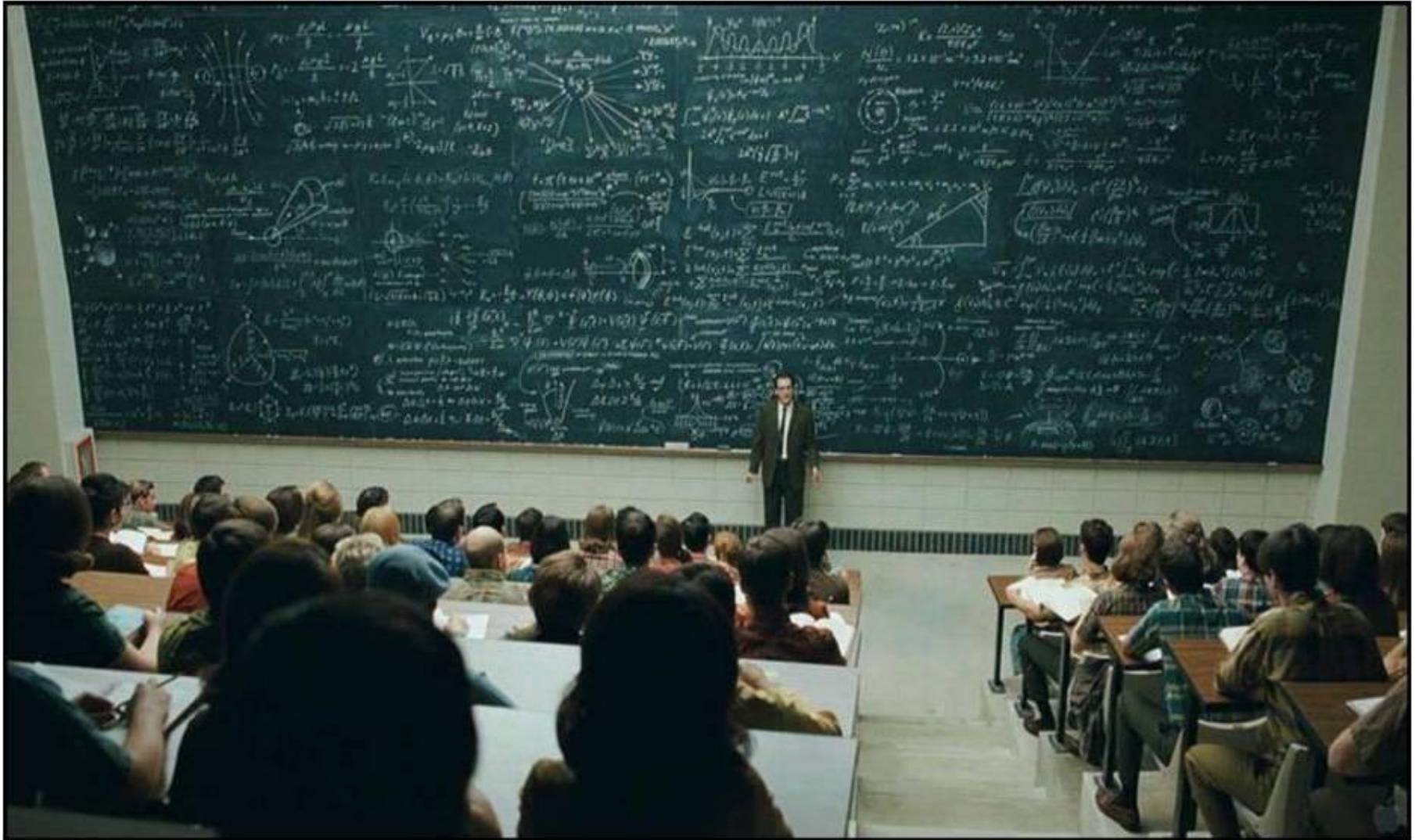
Grupo	Tipo Principal	Sub-tipo	Sub-sub-tipo
Climatológico	Temperaturas extremas	Onda de calor	
		Onda de frio	Geada/gelo
		Invernia	Pressão neve
			Gelo
		Granizo	
		Avalanche detritos	
	Seca		
Fogos	Florestais		
		Terreno	
Biológicos	Epidémicos	Infecções	Virus
			Bactérias
			Parasitas
			Fungos
			Prião
Pragas			
Pânico (animais)			
Extra-terrestres	Meteoritos/Asteróides		





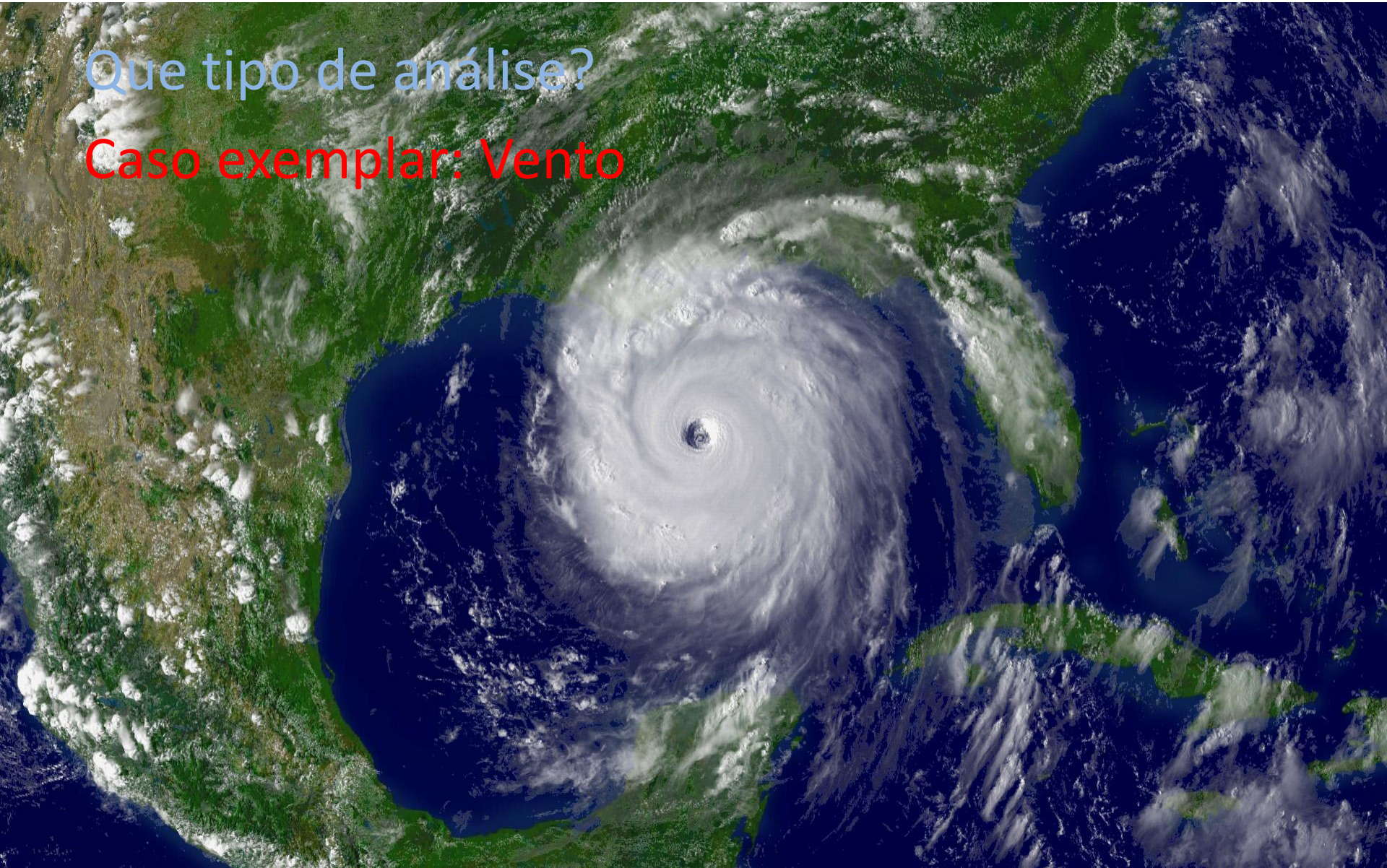






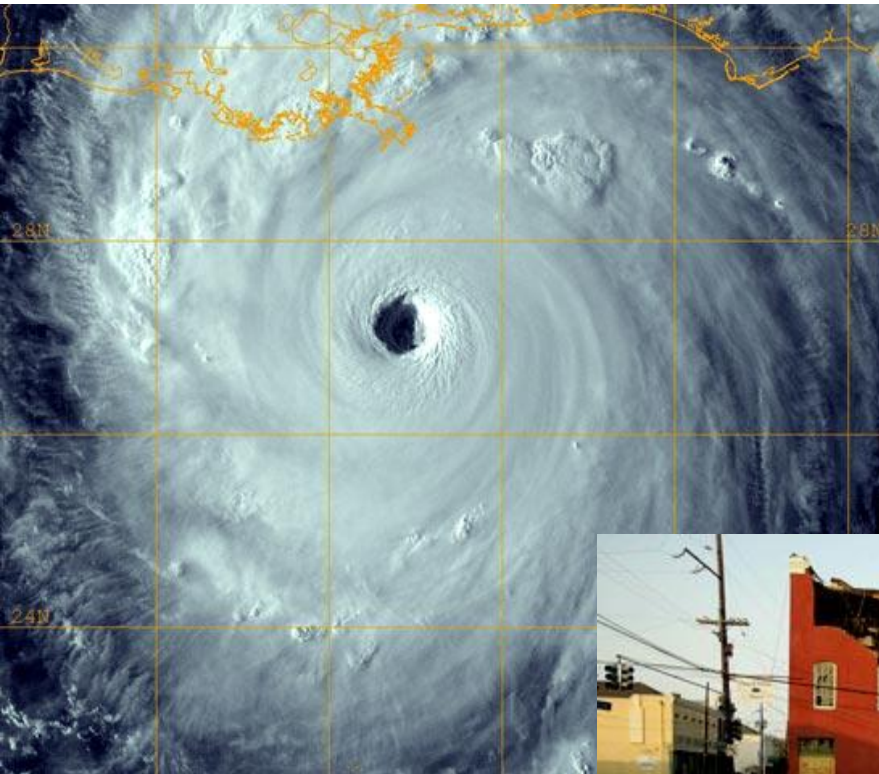
Que tipo de análise?

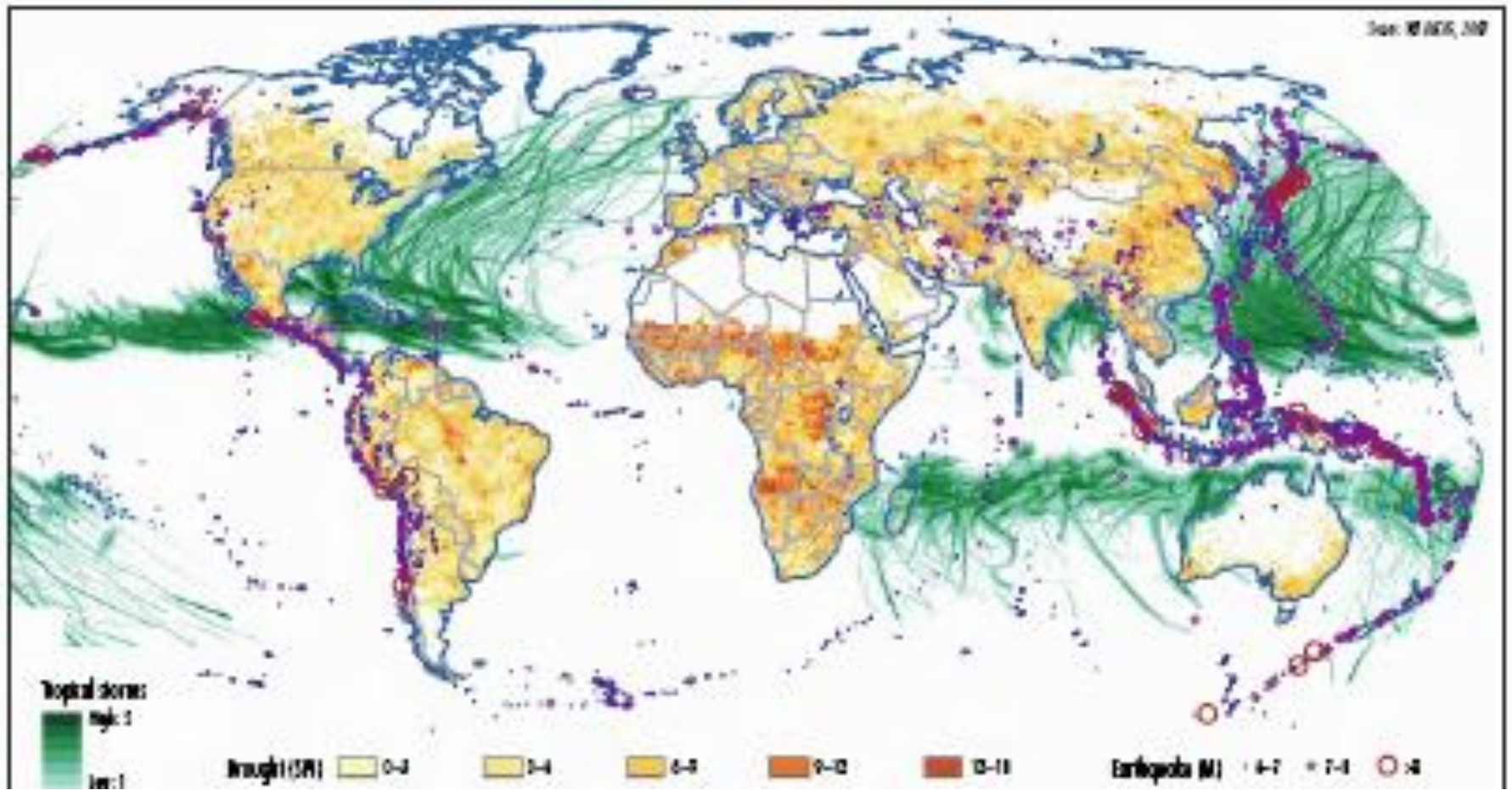
Caso exemplar: Vento



Catástrofes naturais – o que são?

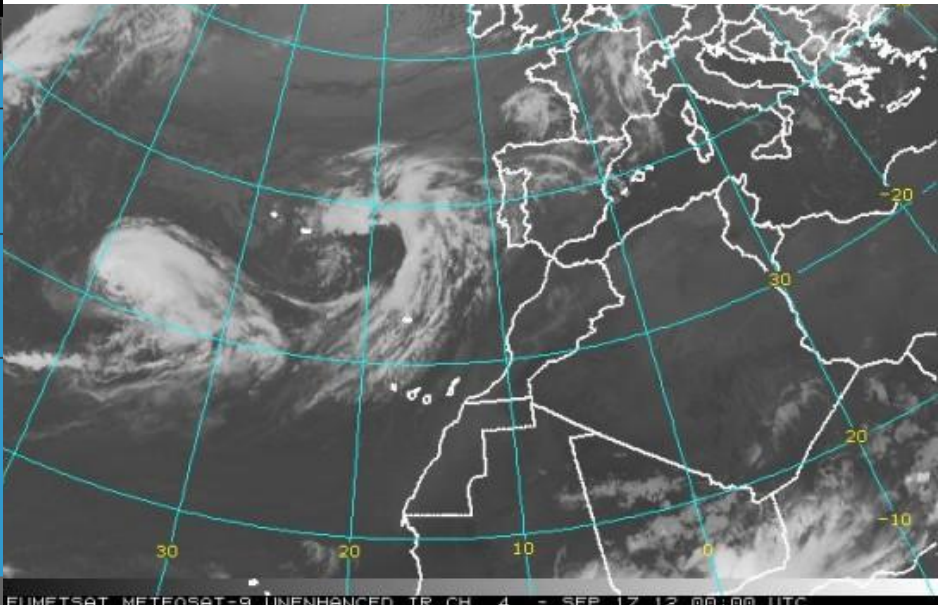
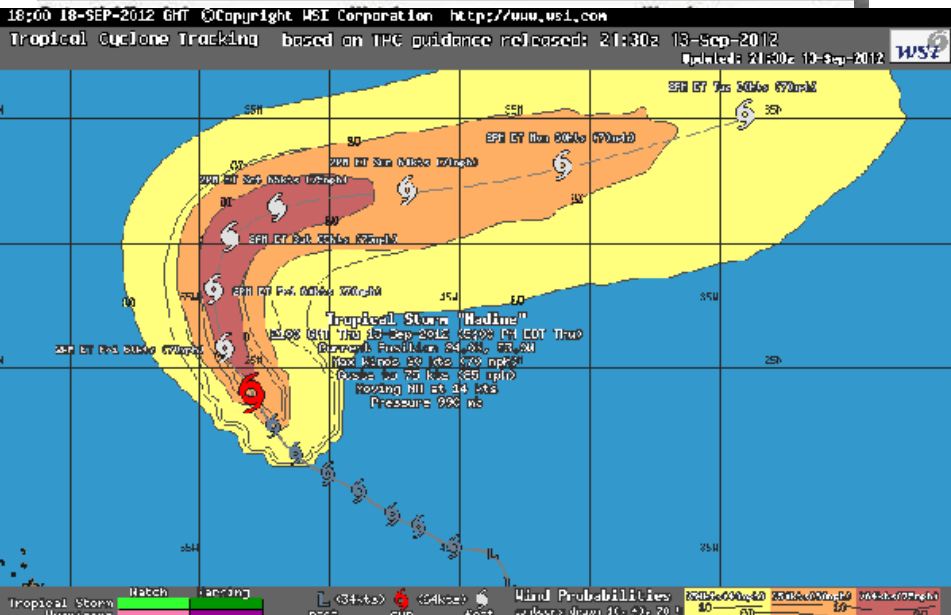
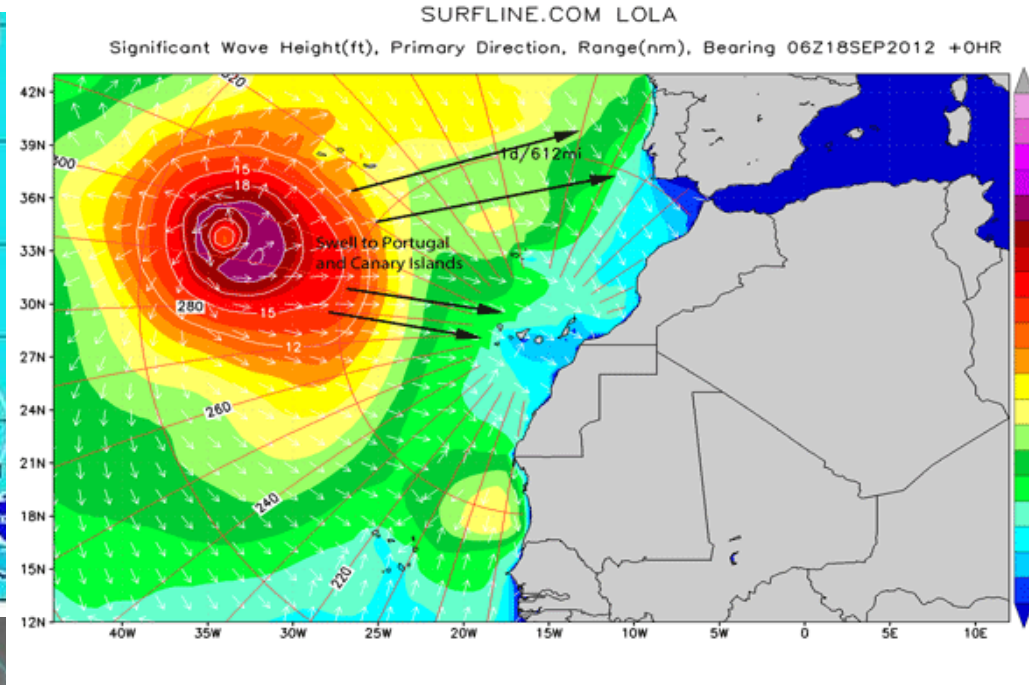
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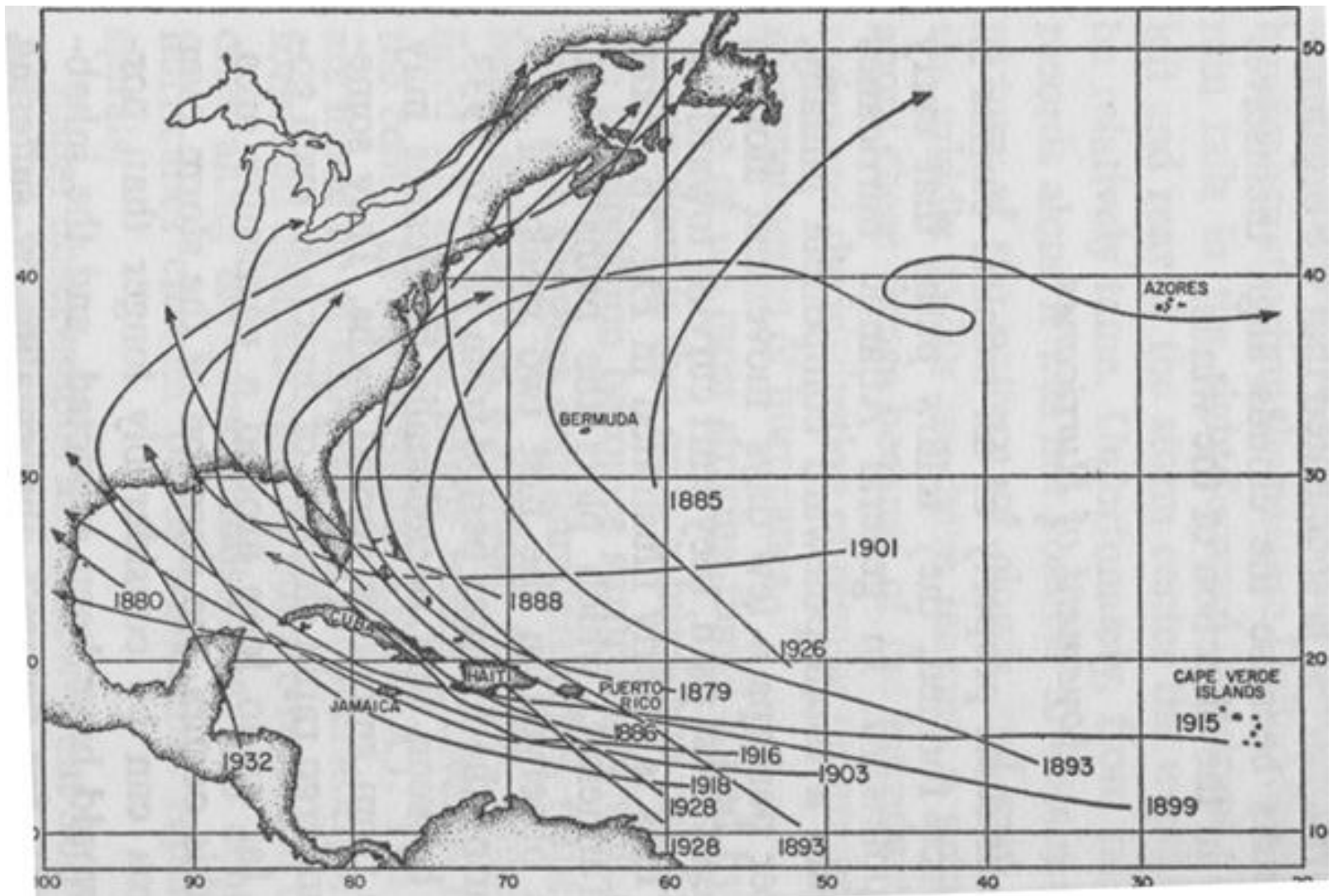
Catástrofes naturais – o que são?

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Catástrofes naturais – o que são?

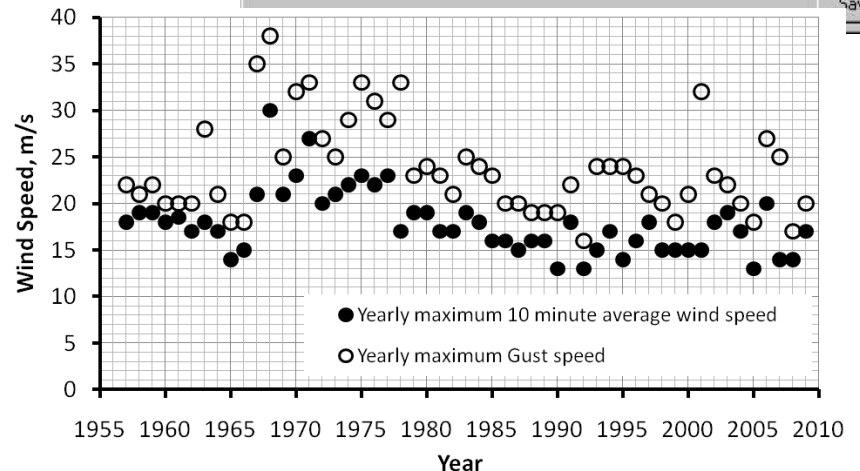
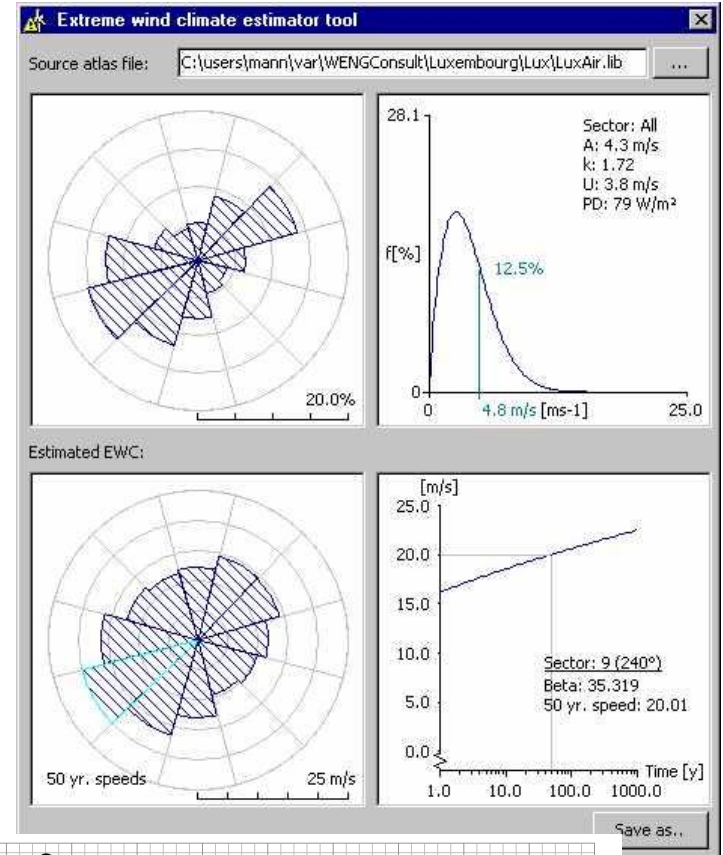
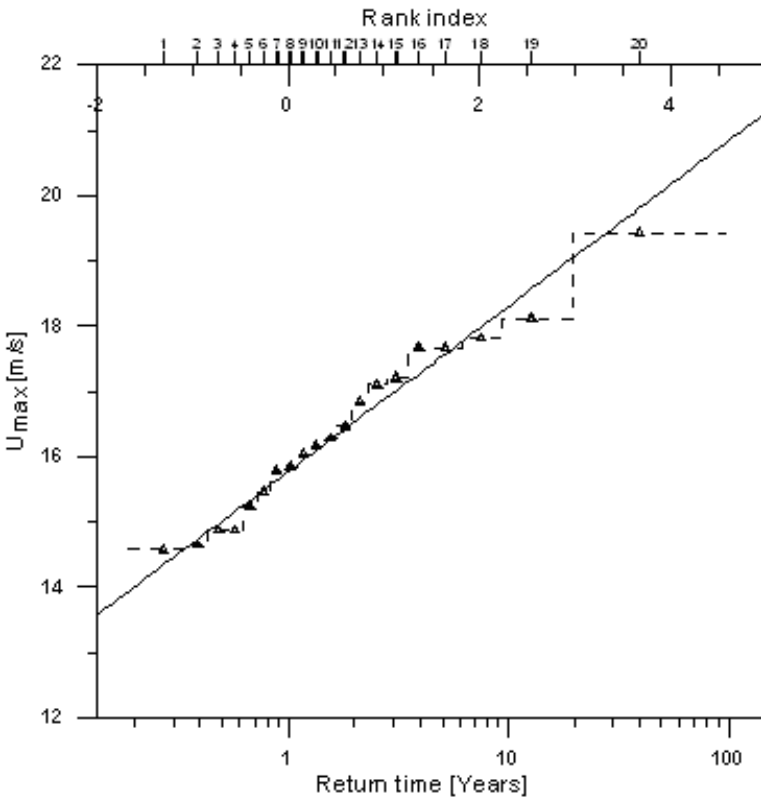
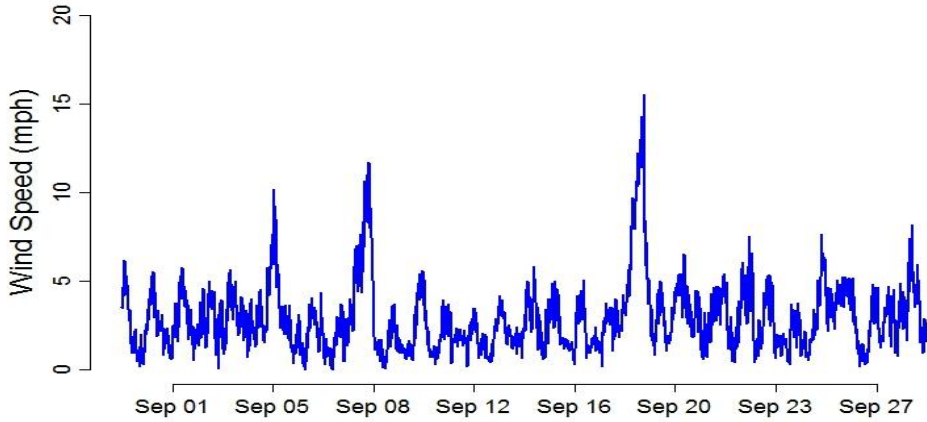
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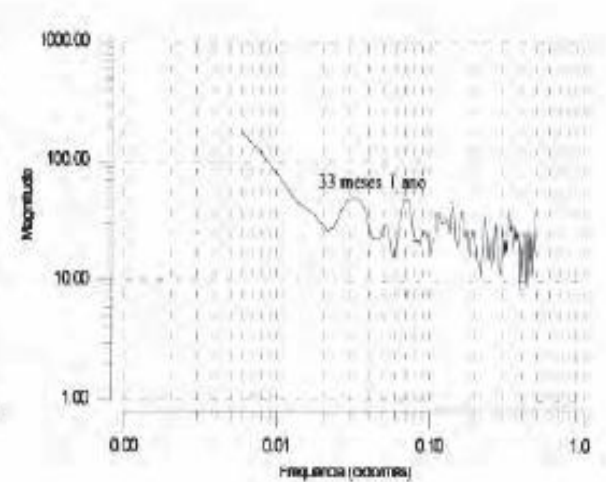
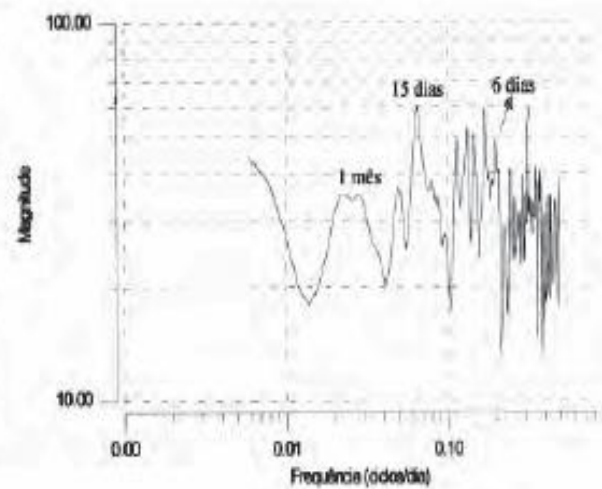
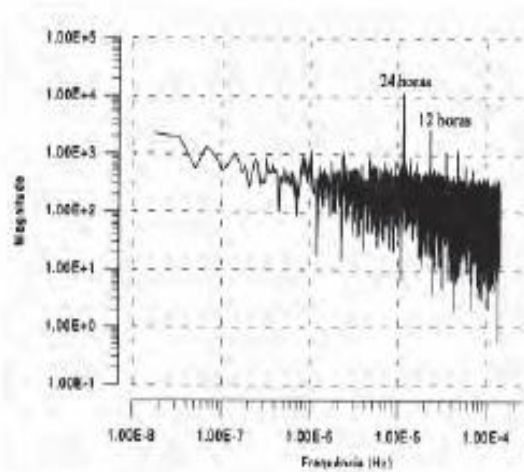
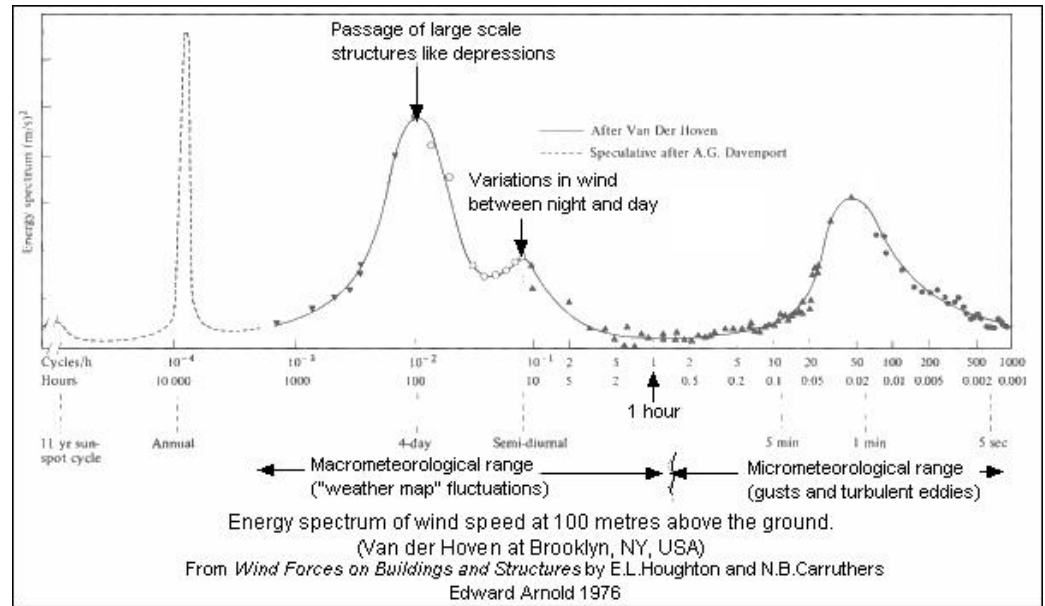
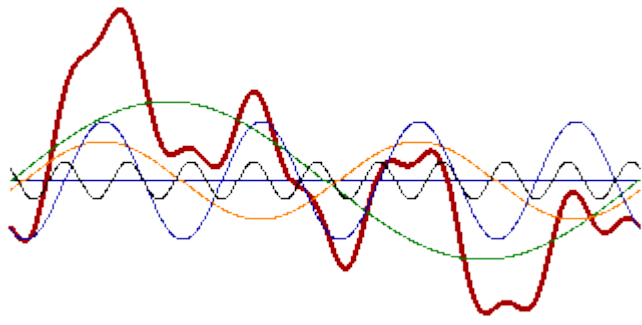
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Wind Speed



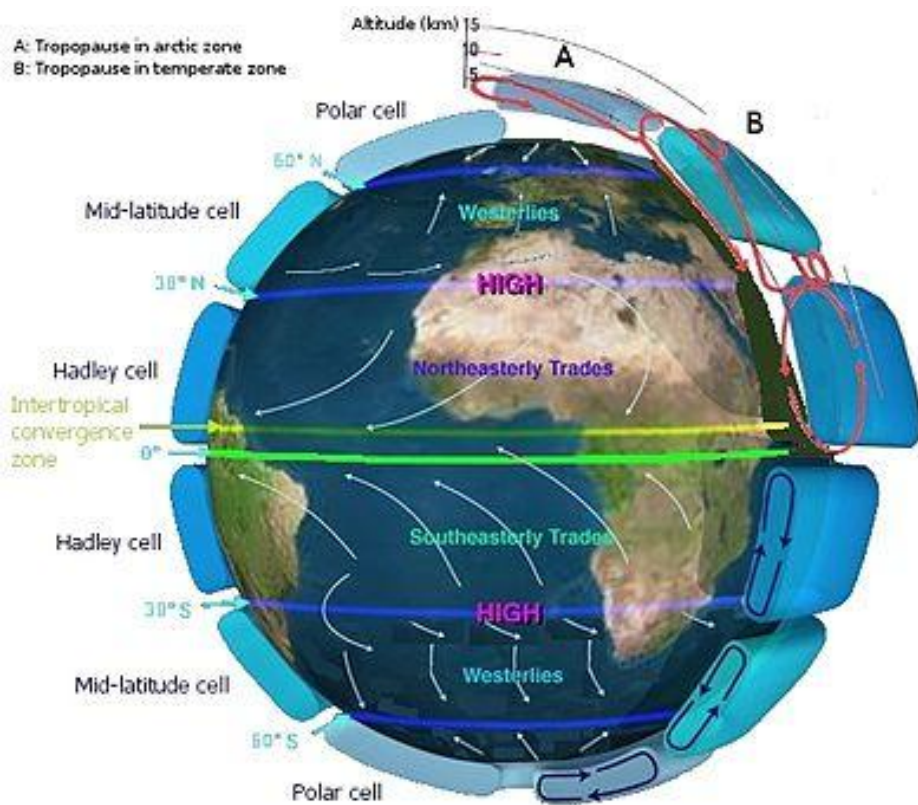
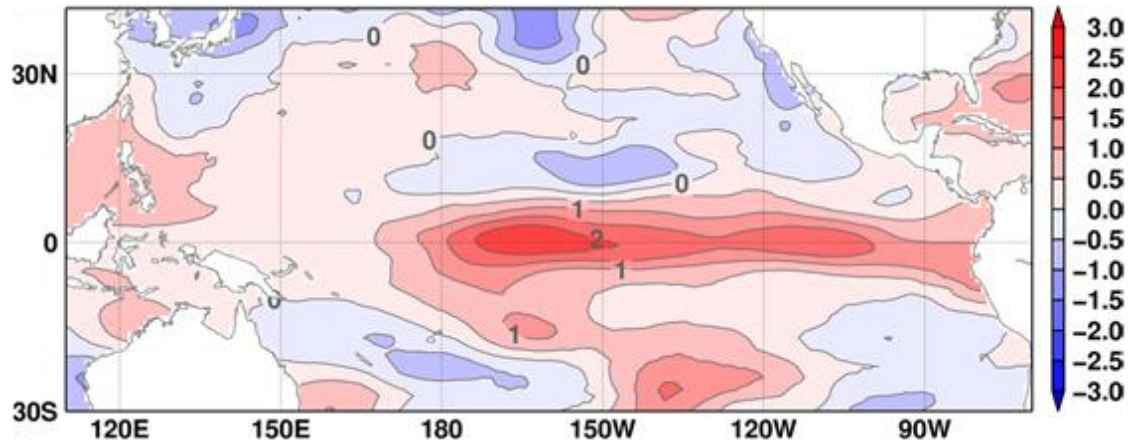
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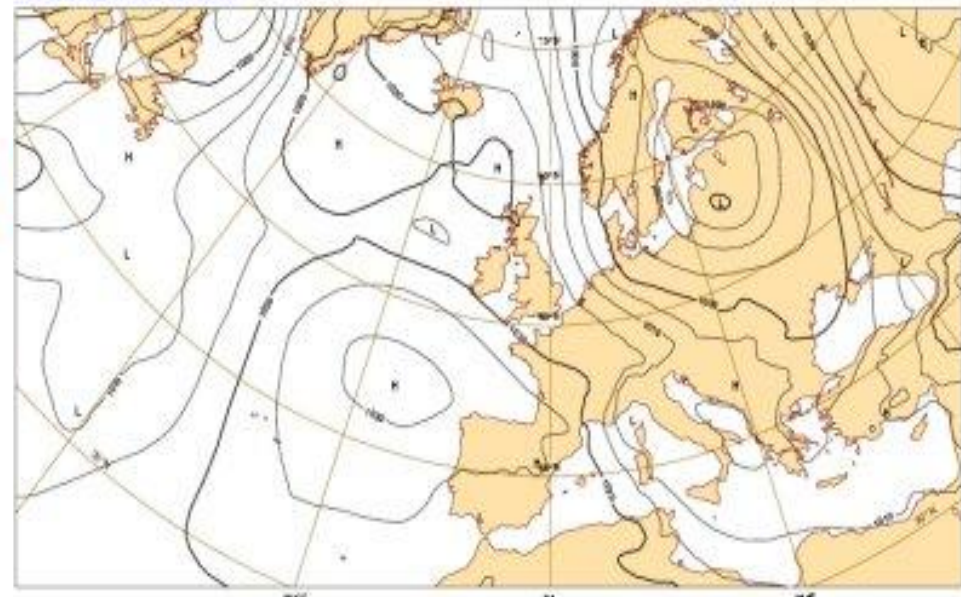


Catástrofes naturais – o que são?

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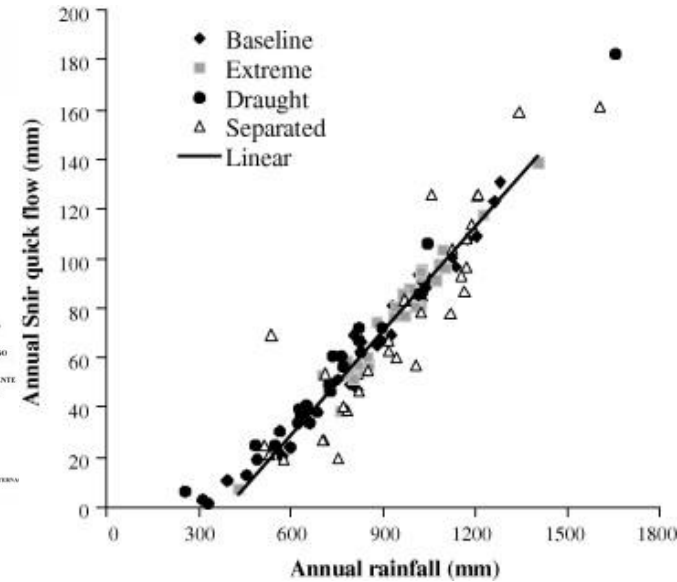
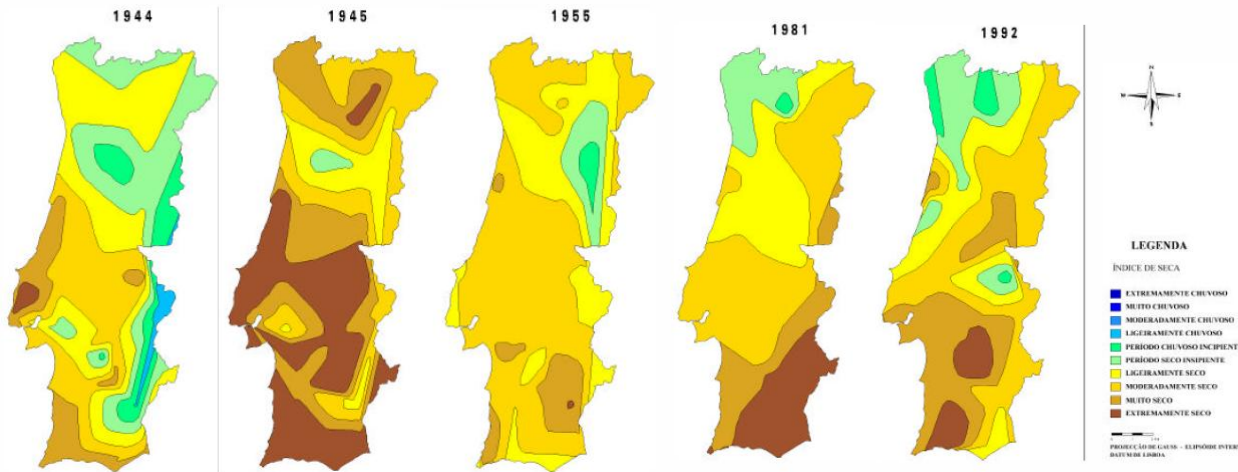


ECMWF Analysis VT: Saturday 22 January 2005 00UTC
SURFACE: MSL Pressure

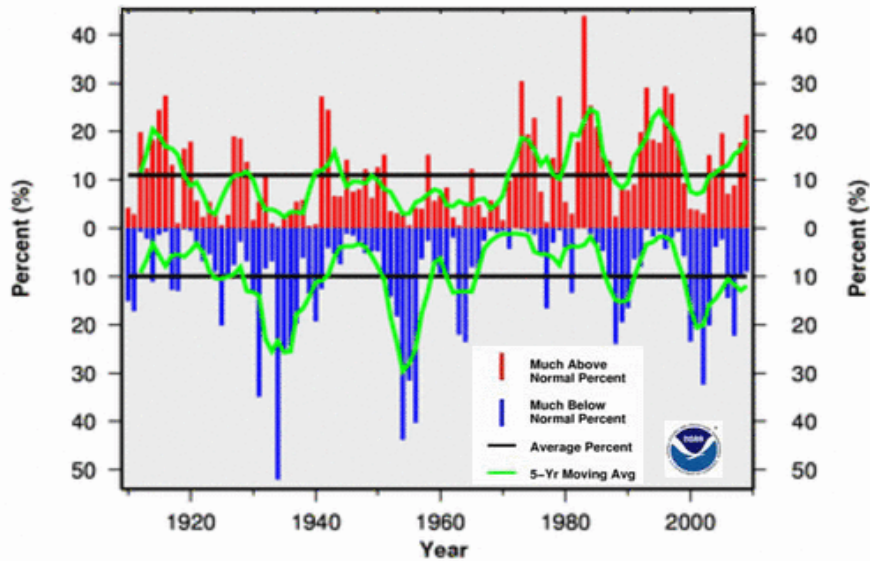


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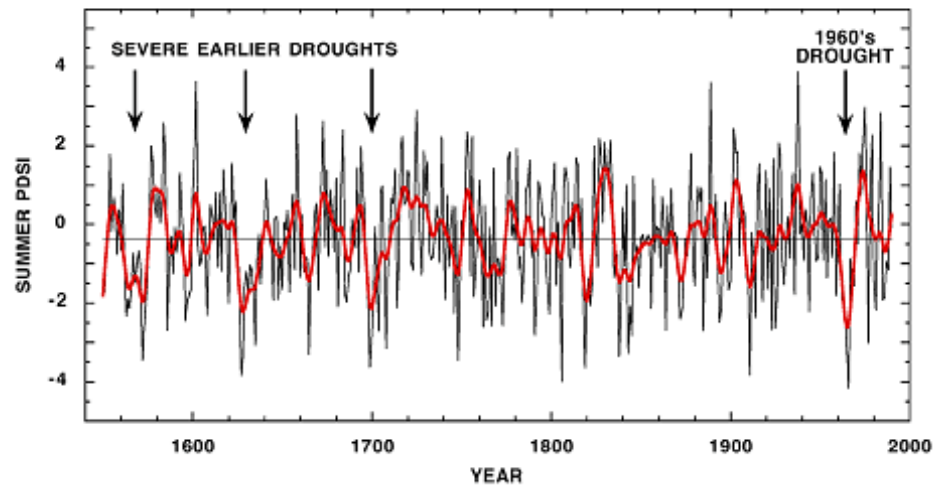
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U.S. Climate Extremes Index for Drought
Jan - Nov, 1910 - 2009

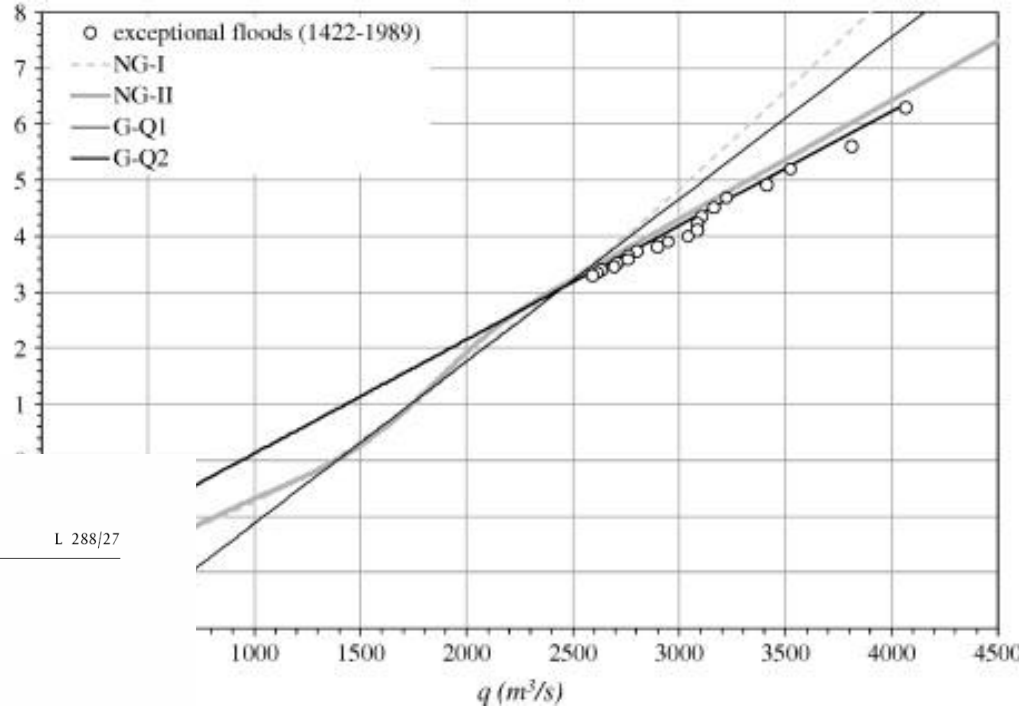
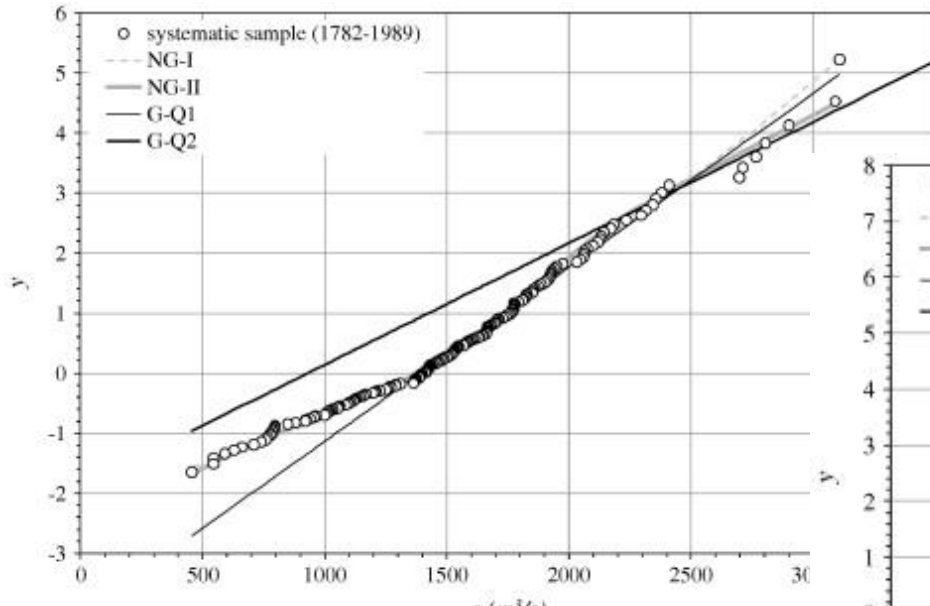


EXTENDED TREE-RING DROUGHT RECONSTRUCTION FOR THE NEW YORK METROPOLITAN AREA



Catástrofes naturais – o que são?

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6.11.2007

EN

Official Journal of the European Union

L 288/27

DIRECTIVES

DIRECTIVE 2007/60/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 October 2007 on the assessment and management of flood risks (Text with EEA relevance)

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

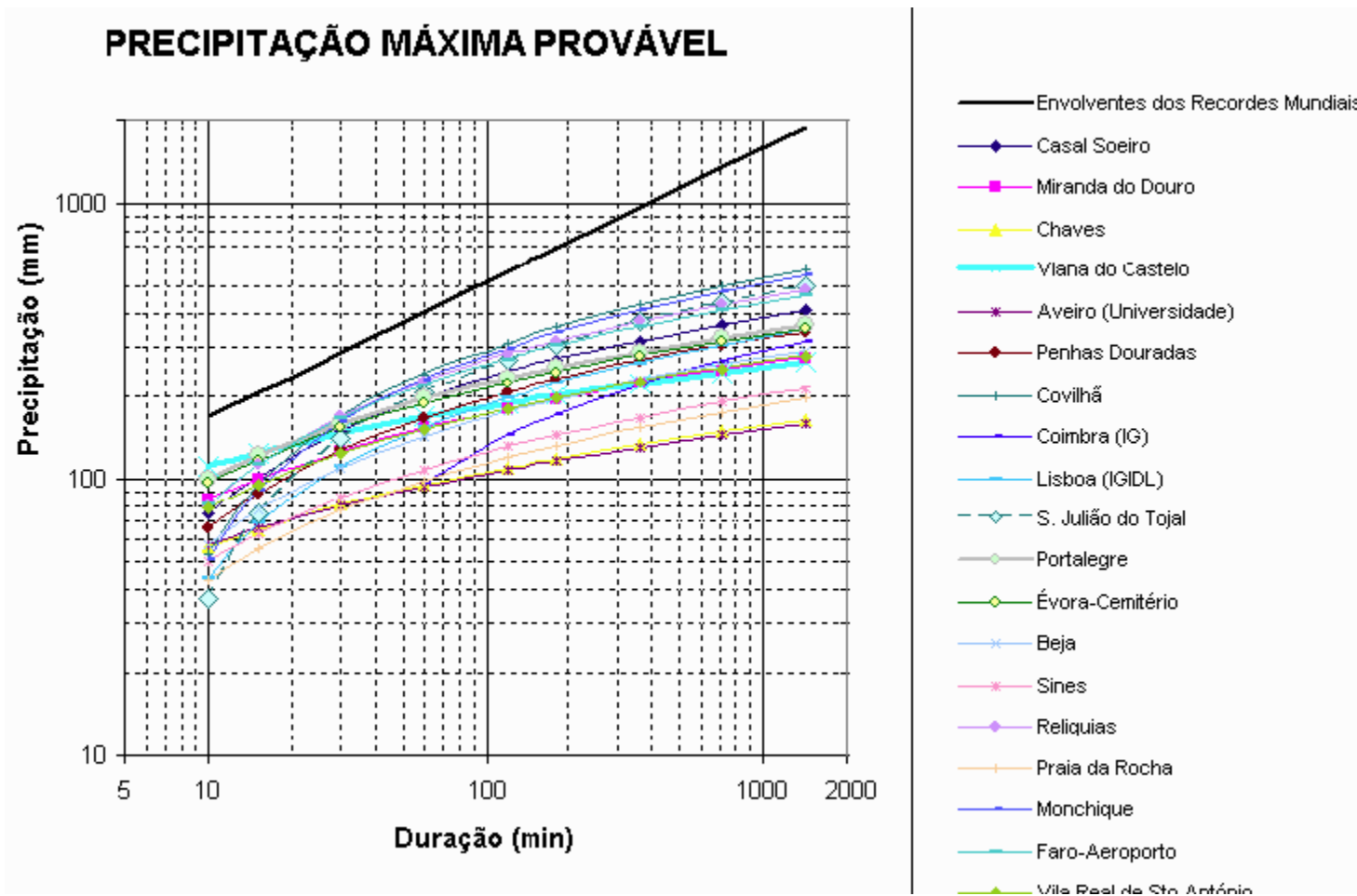
coordinated throughout a river basin if they are to be effective.

Having regard to the Treaty establishing the European Community, and in particular Article 175(1) thereof,

- (4) Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy⁽¹⁾ requires river basin management plans to be developed for each river basin district in order to achieve good ecological and chemical status, and it will contribute to mitigating the effects of floods. However, reducing the risk of floods is not one of the principal objectives of that Directive, nor does it take into account the future changes in the risk of flooding as a result of climate change.

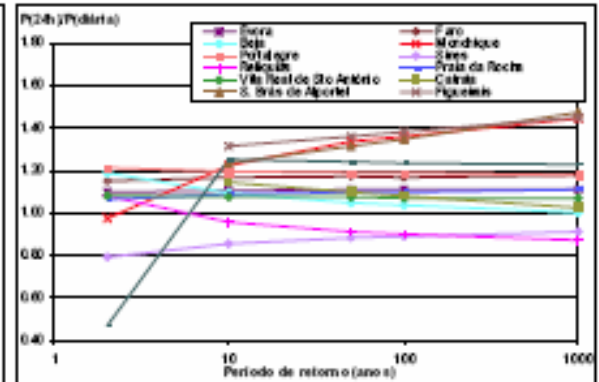
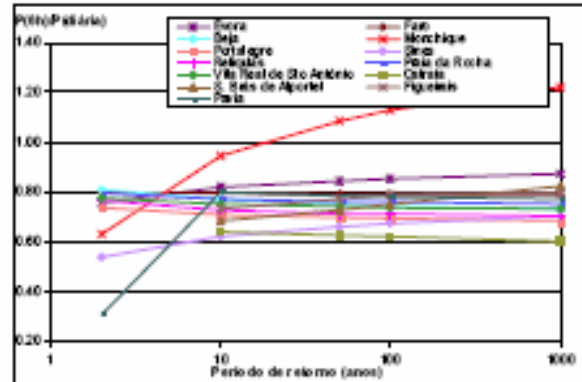
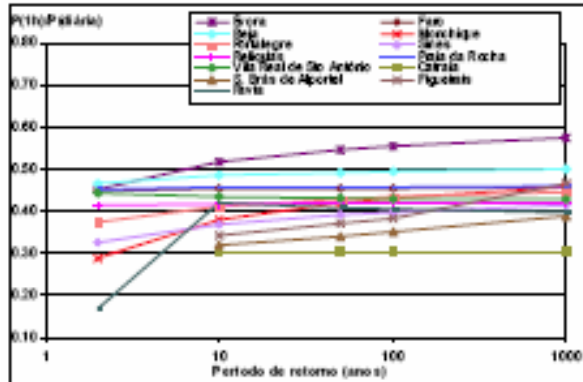
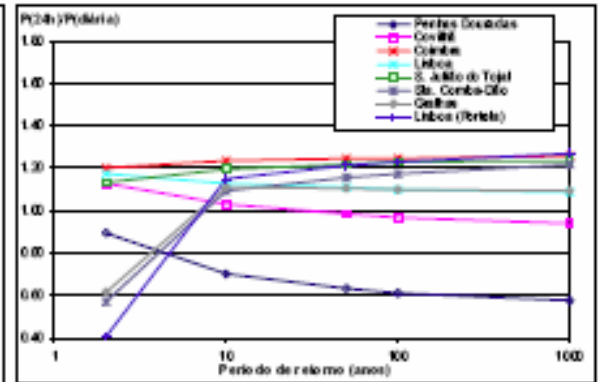
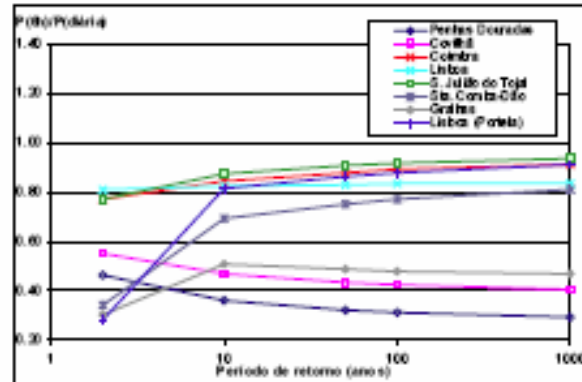
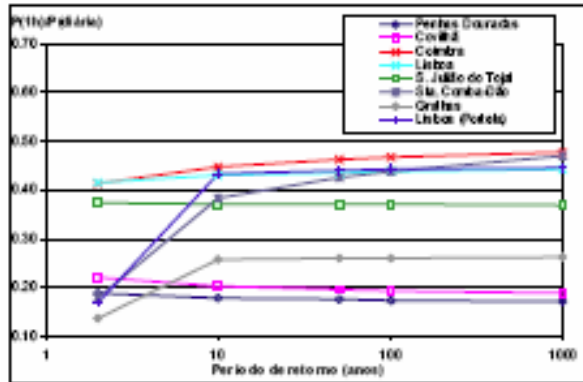
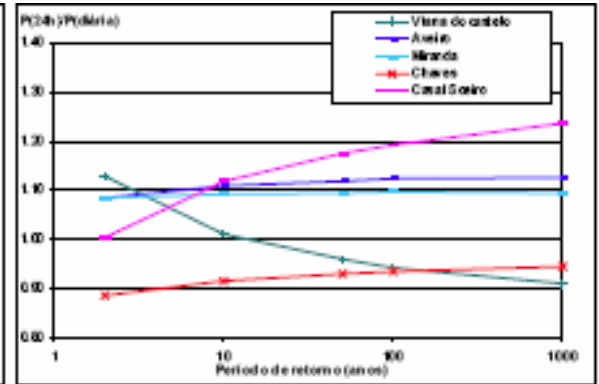
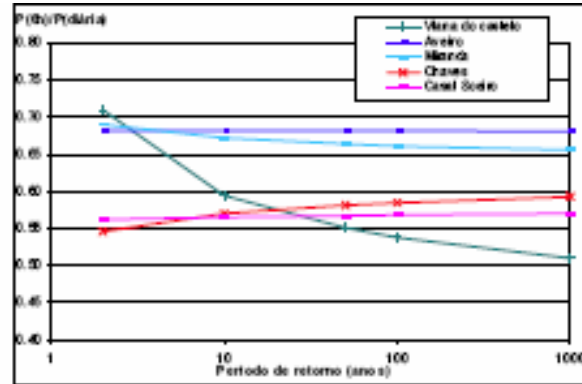
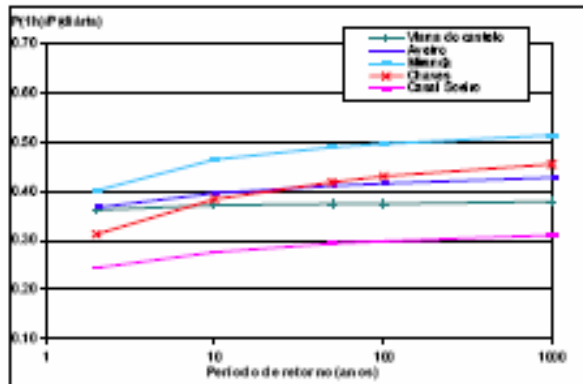
Having regard to the proposal from the Commission,

Having regard to the Opinion of the European Economic and Social Committee⁽²⁾,

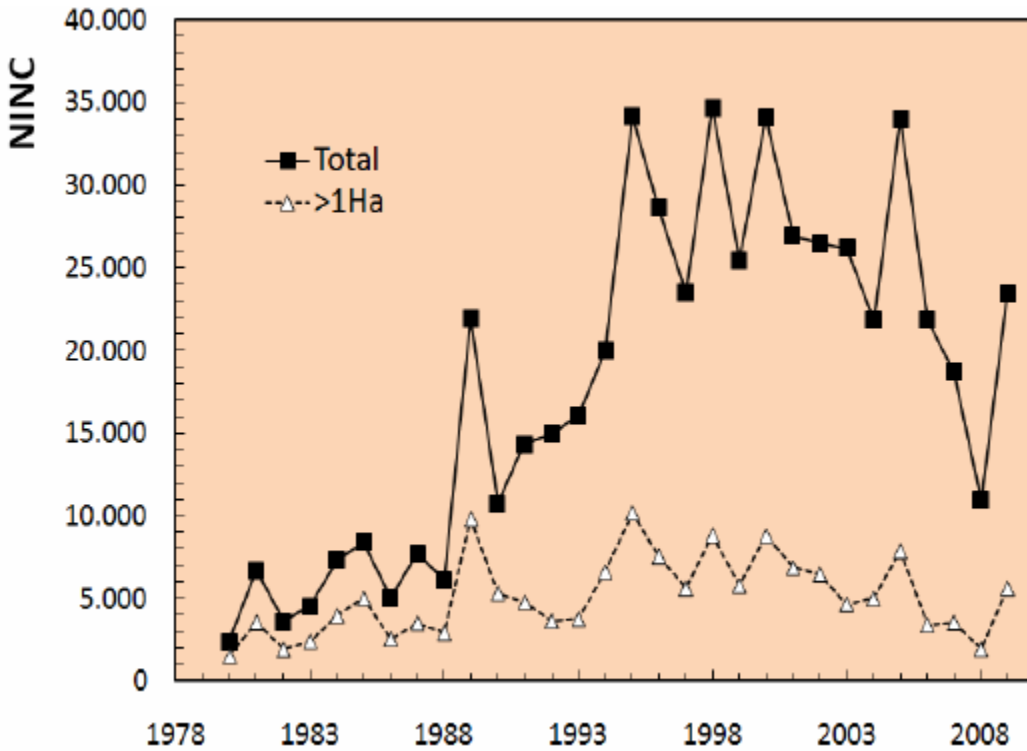


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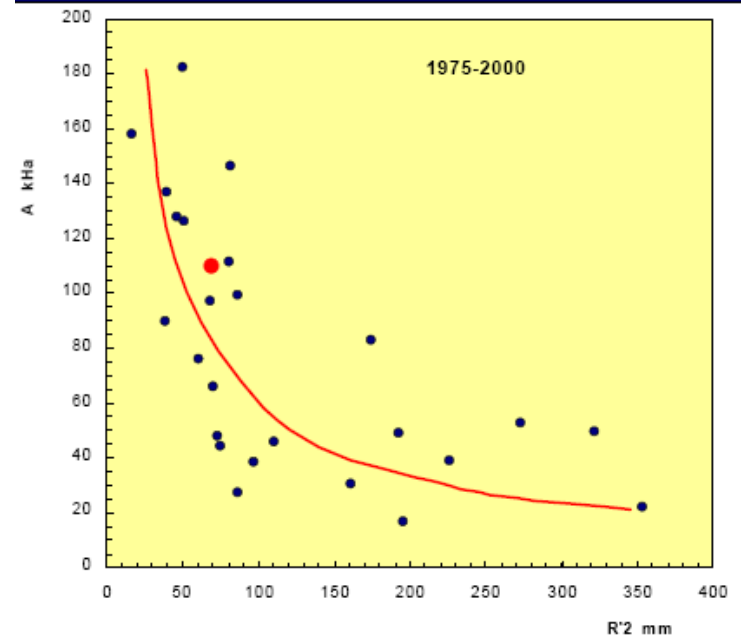
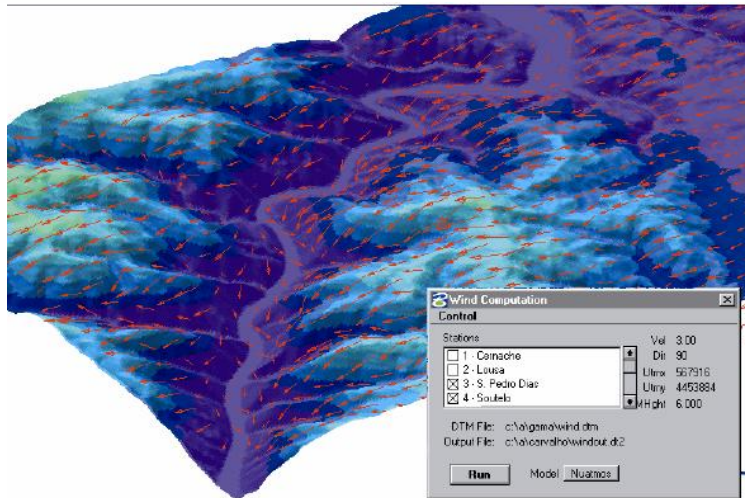
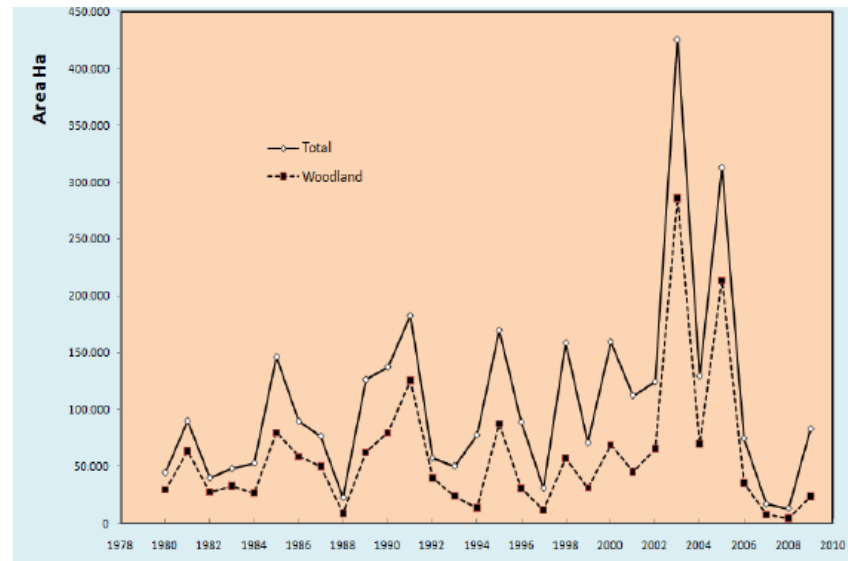
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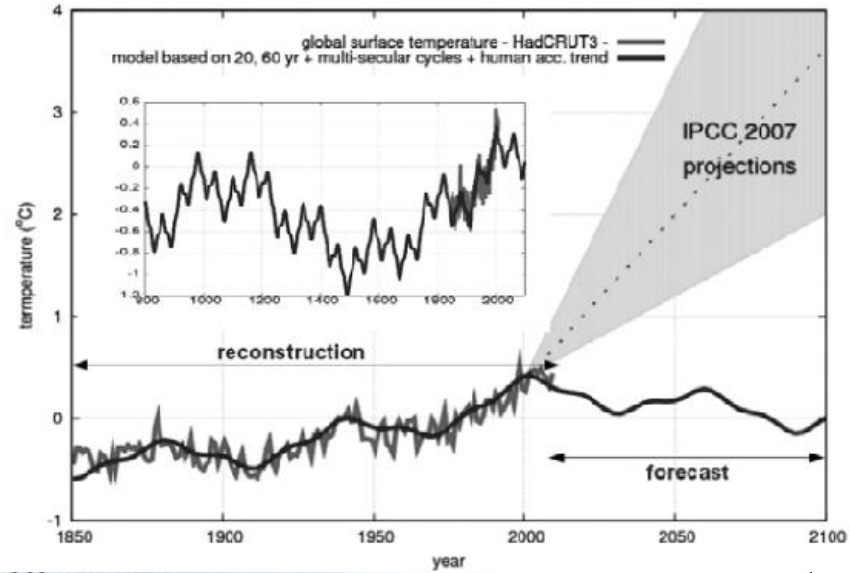
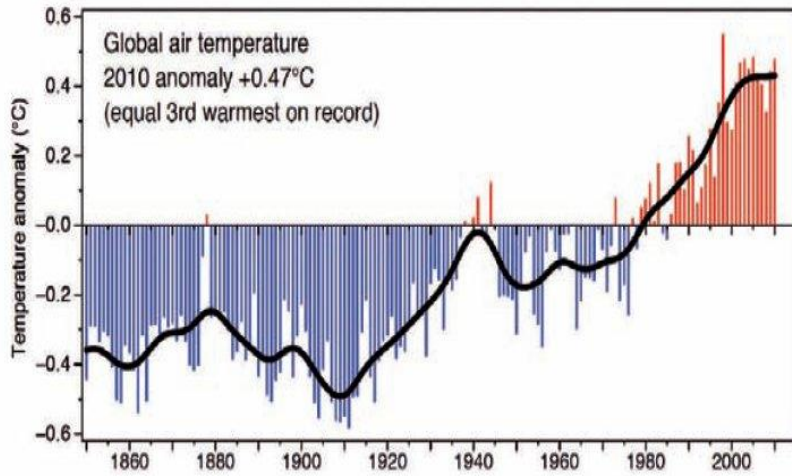


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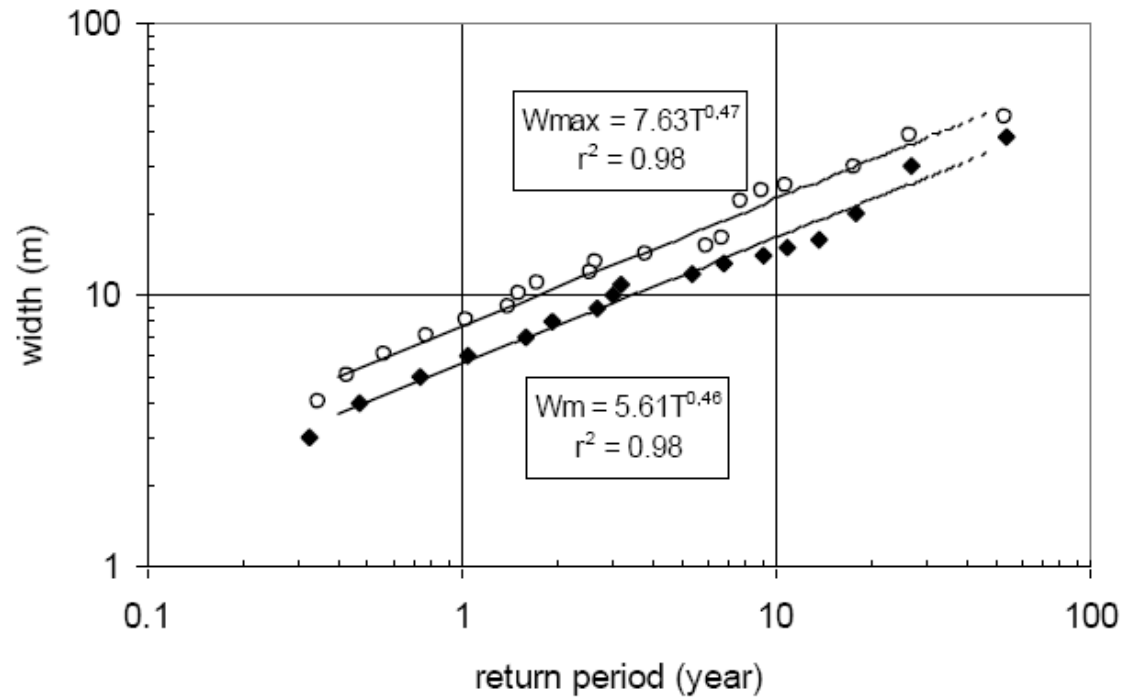
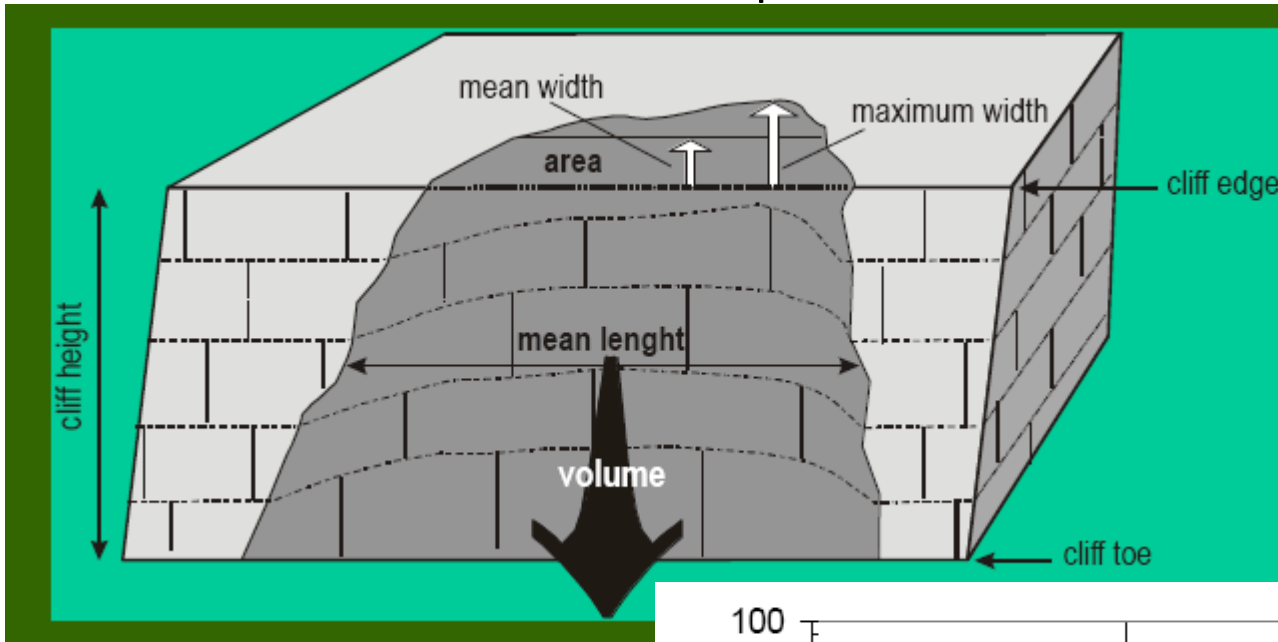
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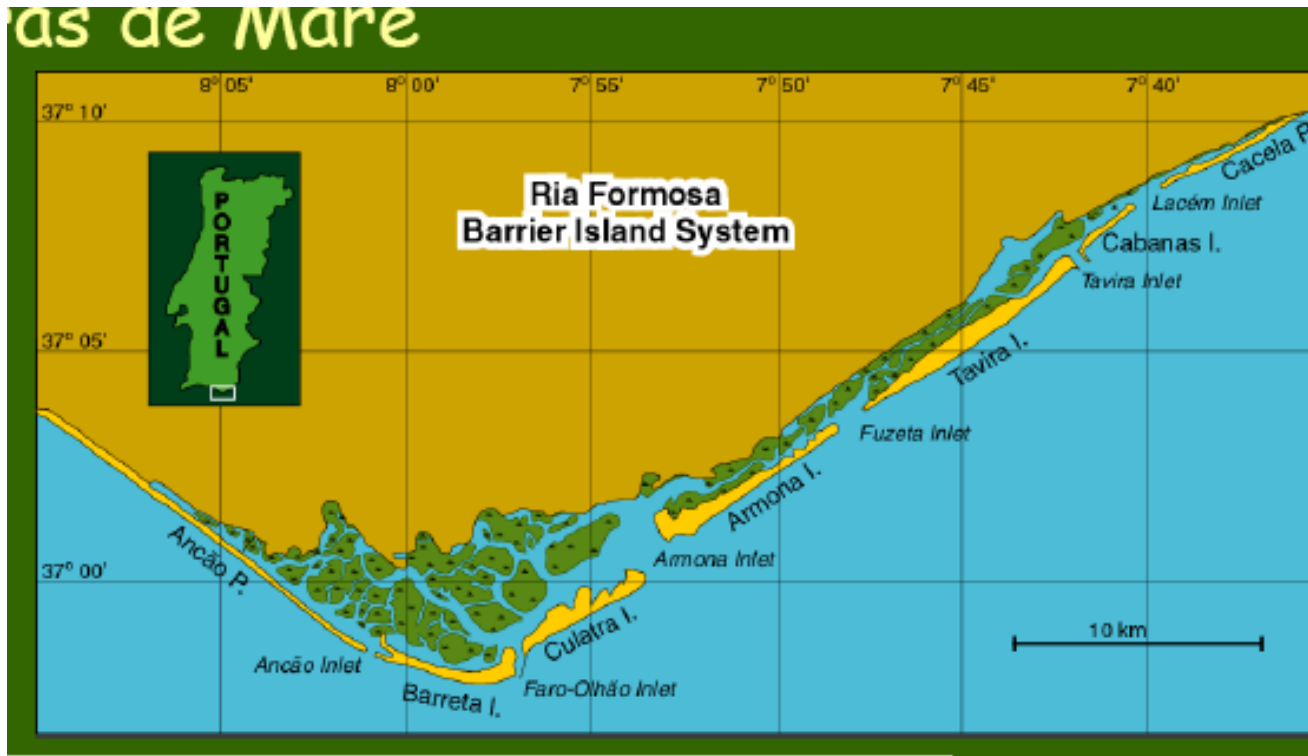
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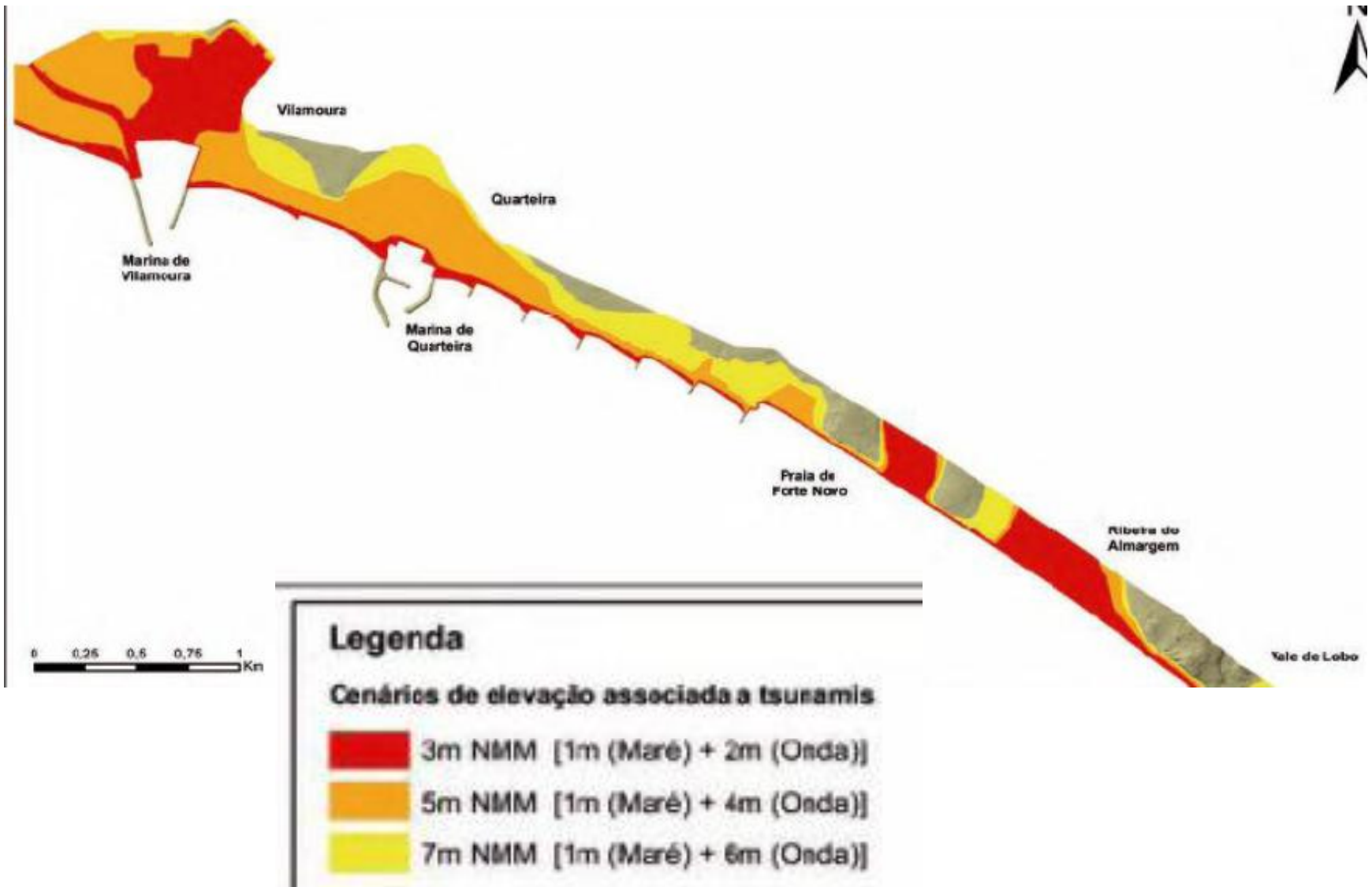
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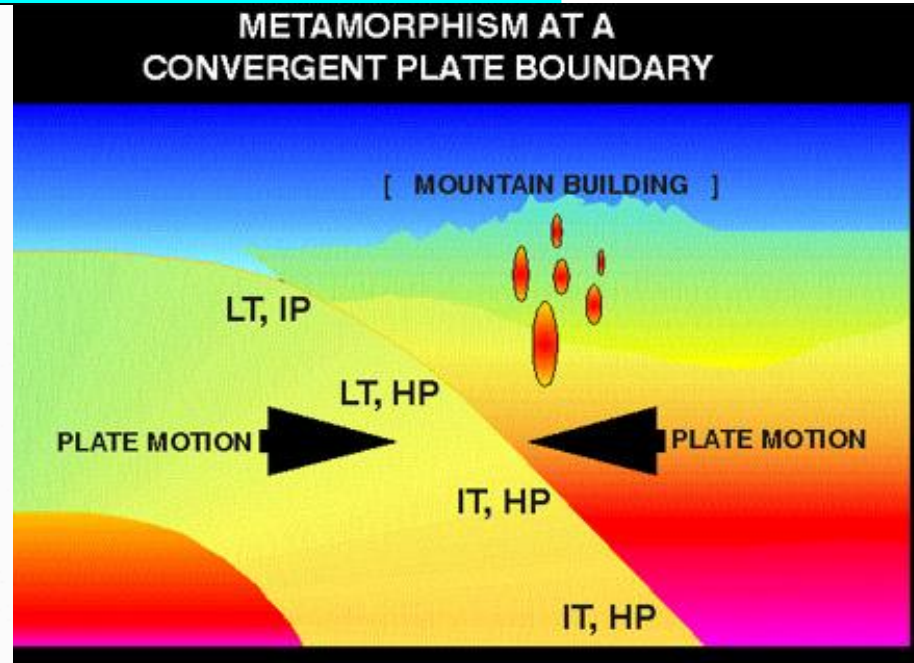
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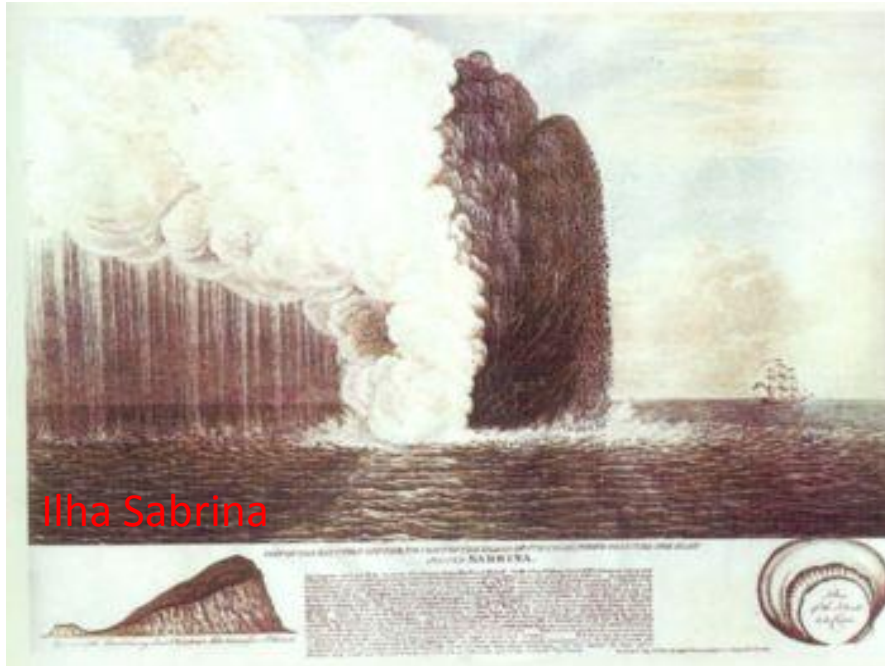


Active Volcanoes, Plate Tectonics, and the "Ring of Fire"



Catástrofes naturais – o que são?

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Ilha Sabrina



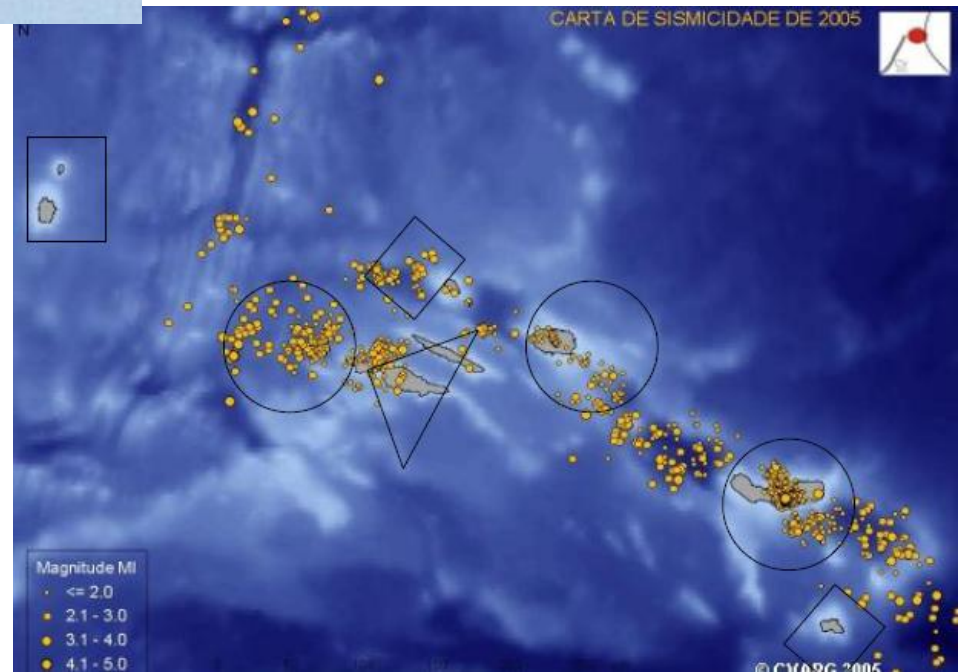
Urzelina



Capelinhos

Catástrofes naturais – o que são?

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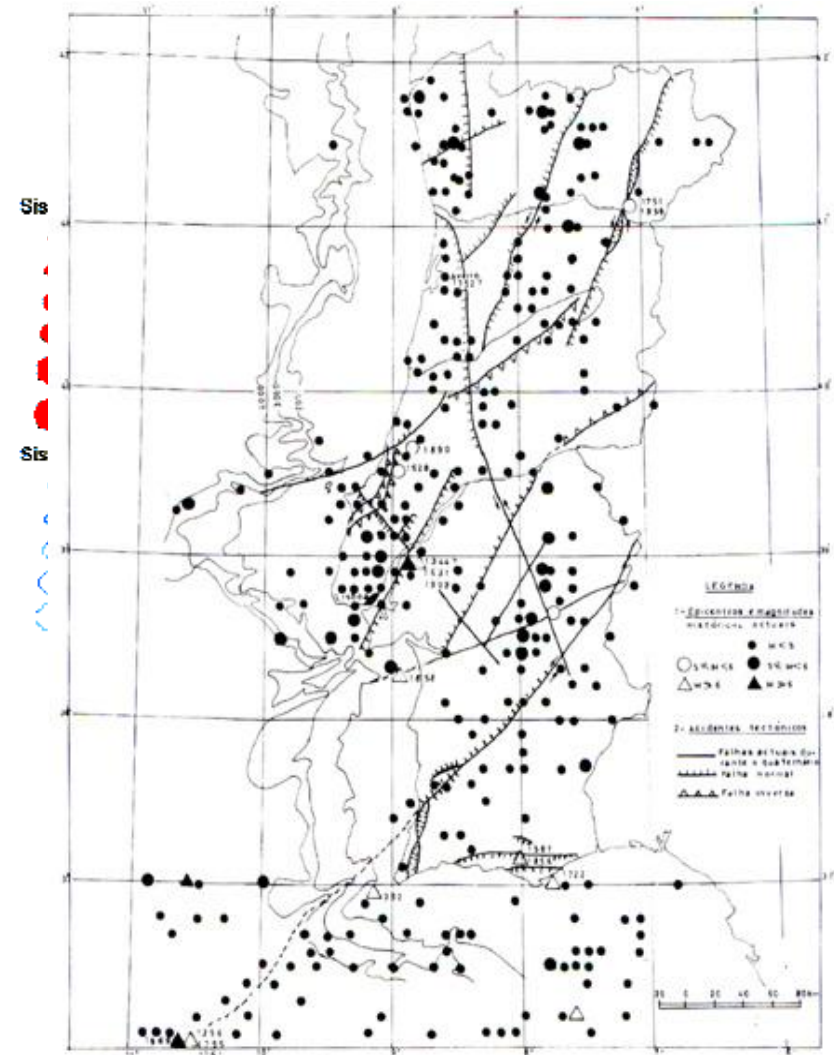
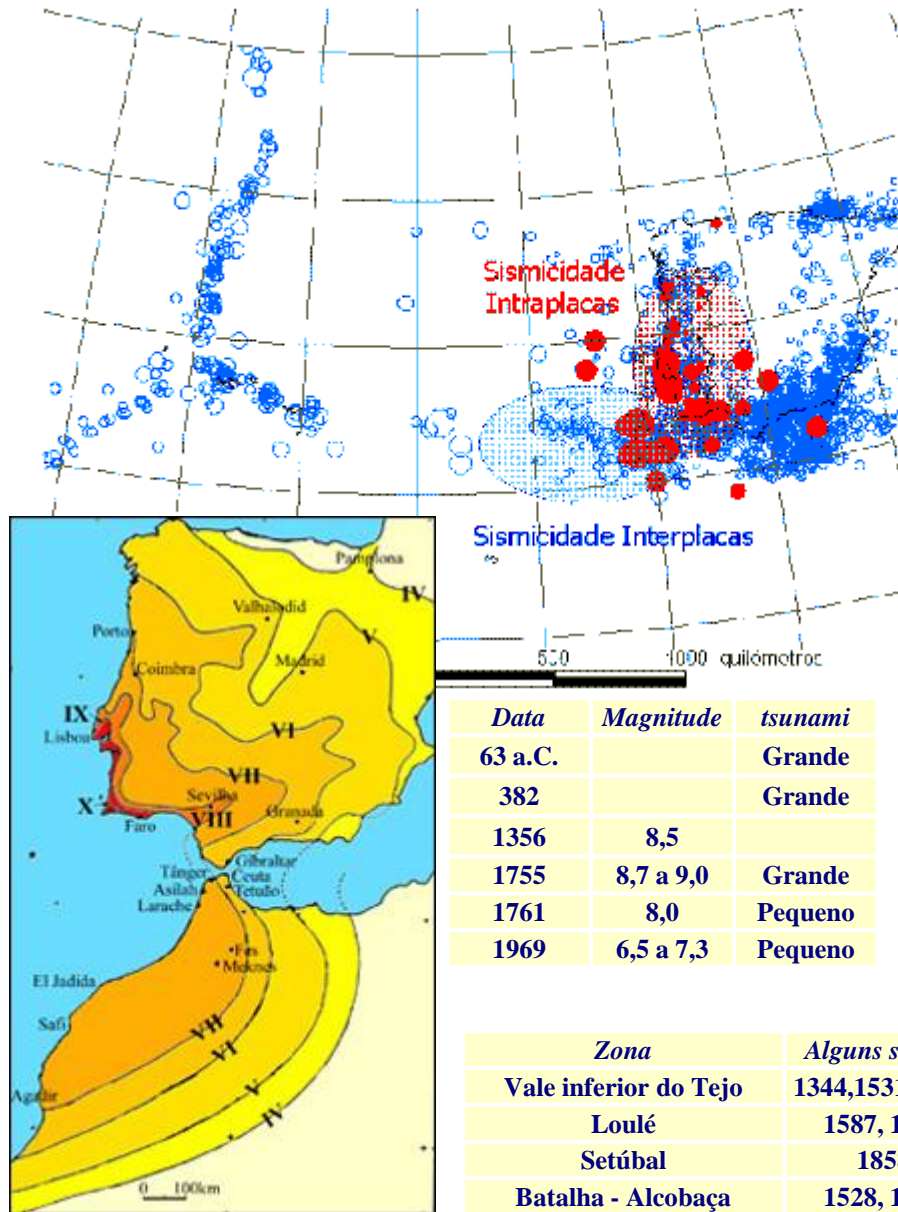


Fig. 4. Carta sismotectónica de Portugal Continental (Instituto Nacional de Meteorologia e Geofísica).

Data	Magnitude	Obs.
1344		Grande destruição em Lisboa
1531	7,0 a 7,5	Grande destruição em Lisboa
1909	6,4 a 7,1	Destruição de Benavente; intensidade IX a X

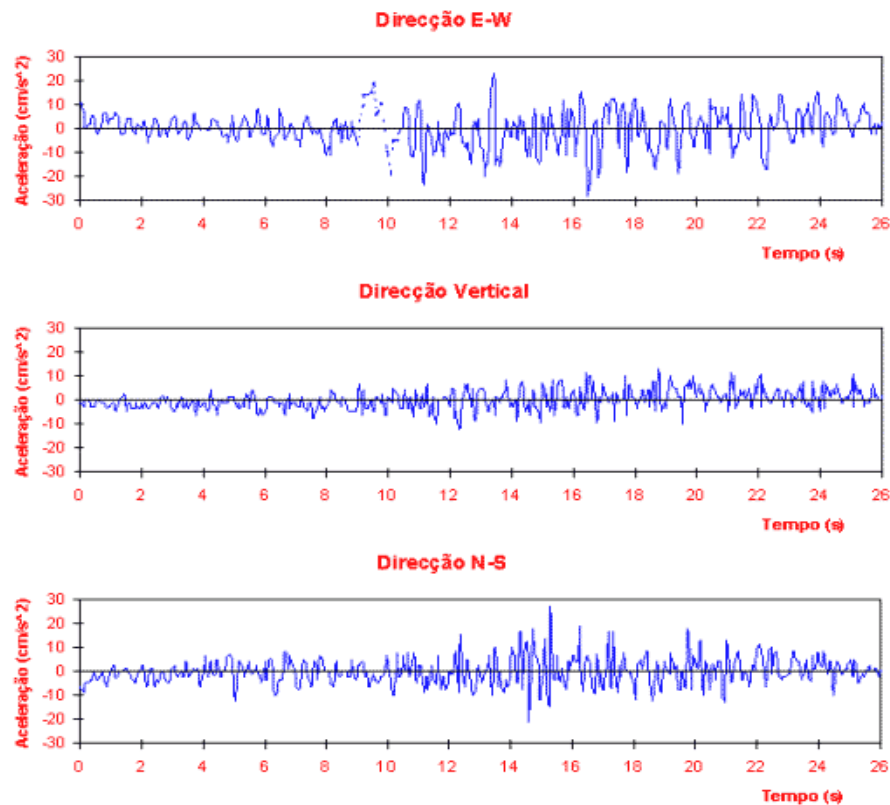
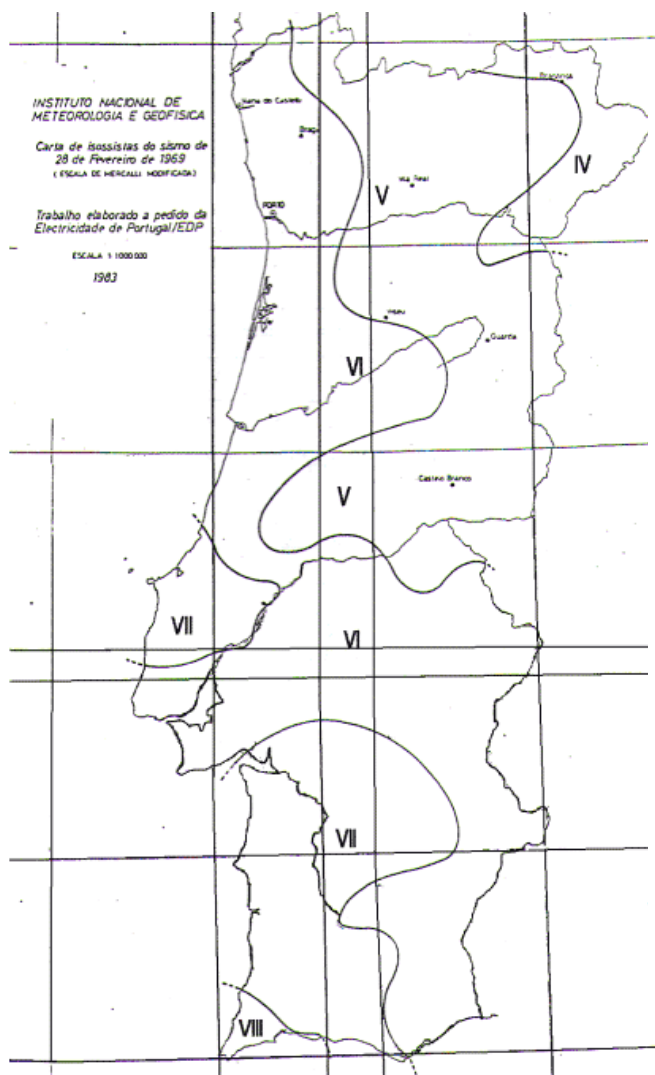


Figura 3 – Acelerogramas do sismo de 1969 registados em Lisboa

Figura 2 – Isosistas do sismo de 1969 de acordo com IM [1983] citado por Oliveira [1986].

Catástrofes naturais – o que são?

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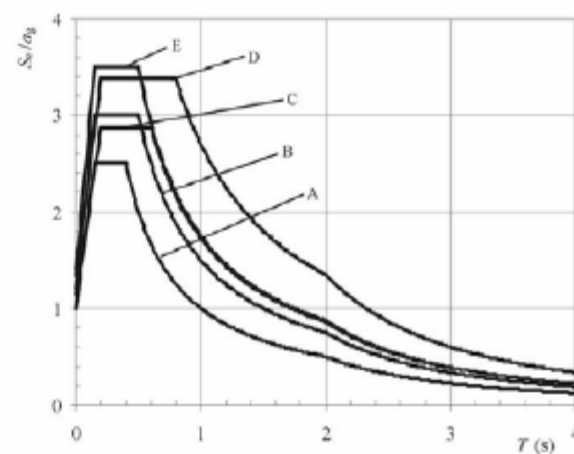
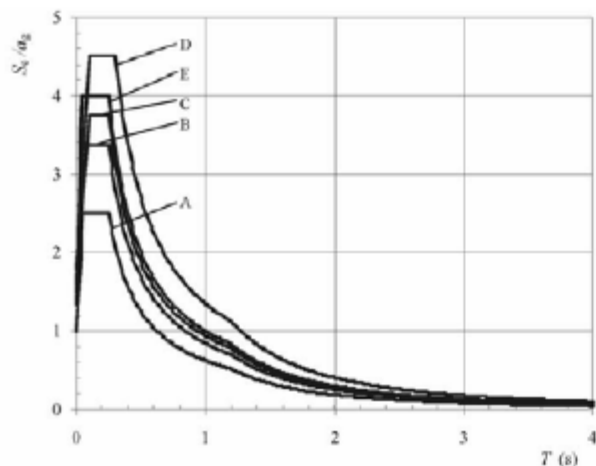
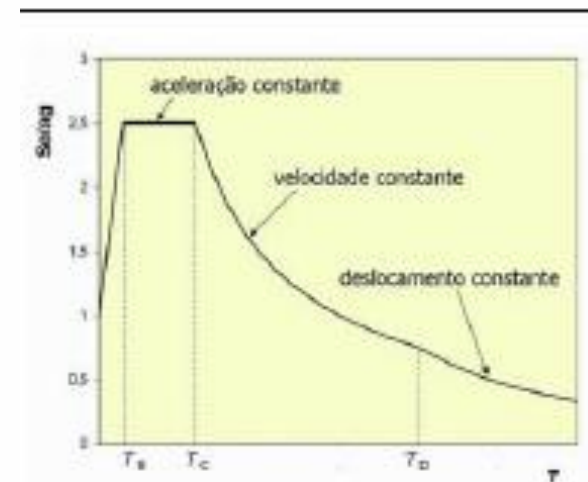
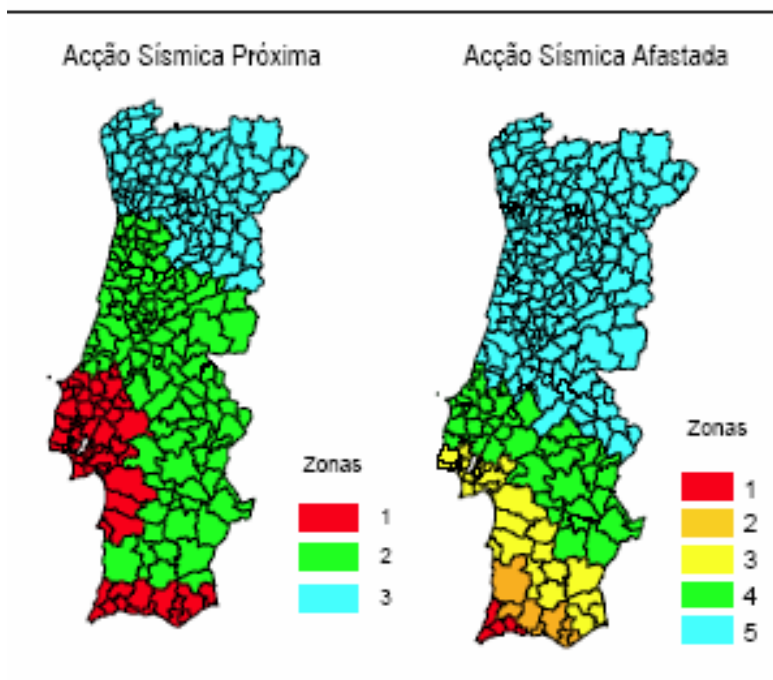
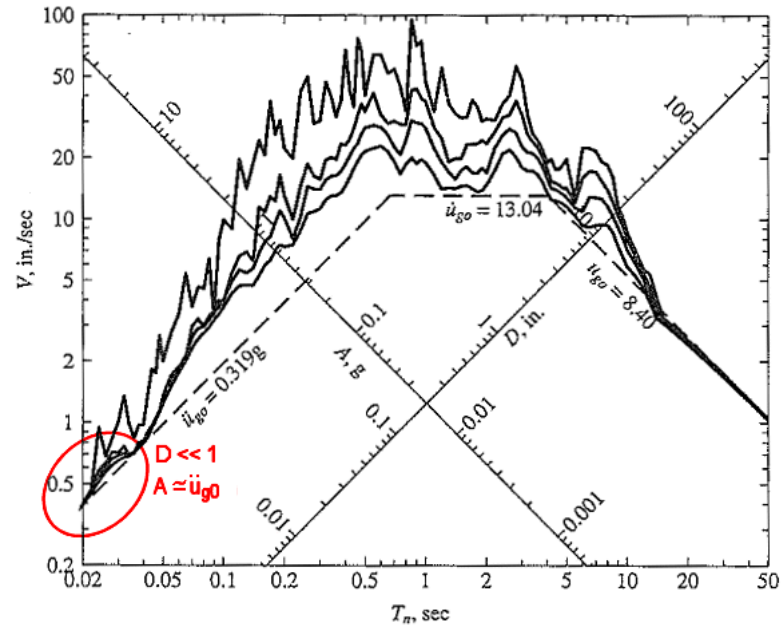


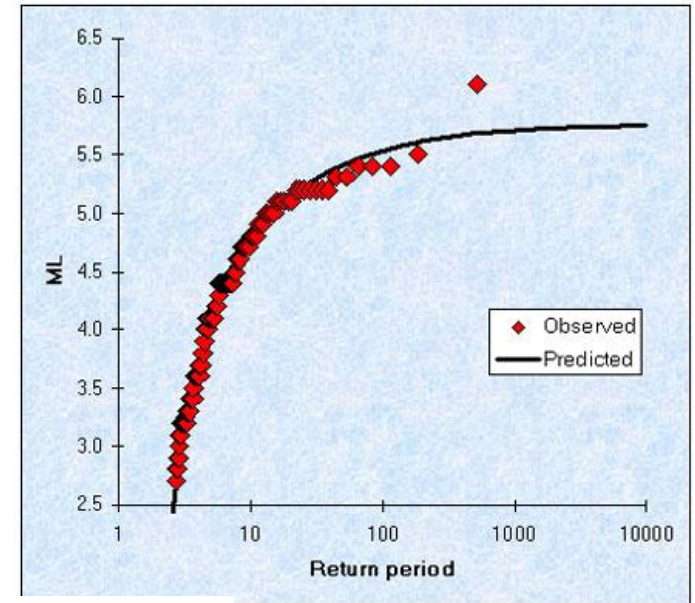
Fig. 2.4 e 2.5 – Espectros de resposta elásticos propostos no EC8 para a Acção Sísmica Afastada (à esquerda) e Acção

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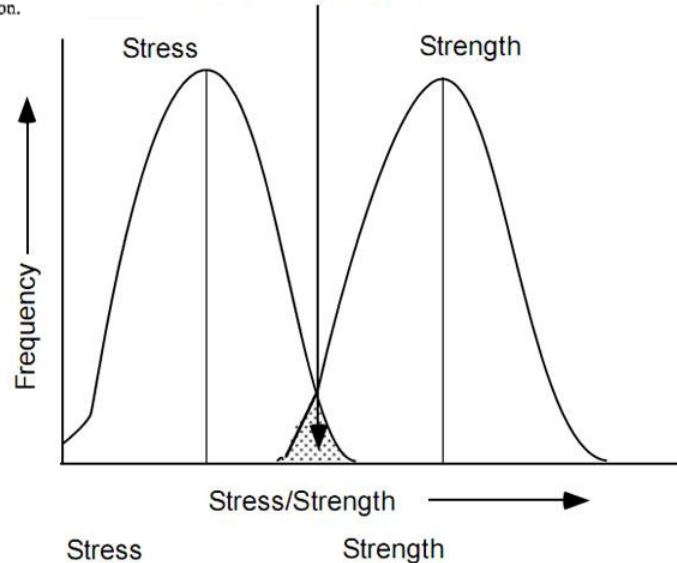
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Response spectrum ($\zeta = 0, 2, 5, \text{ and } 10\%$) and peak values of ground acceleration, ground velocity, and ground displacement for El Centro ground motion.

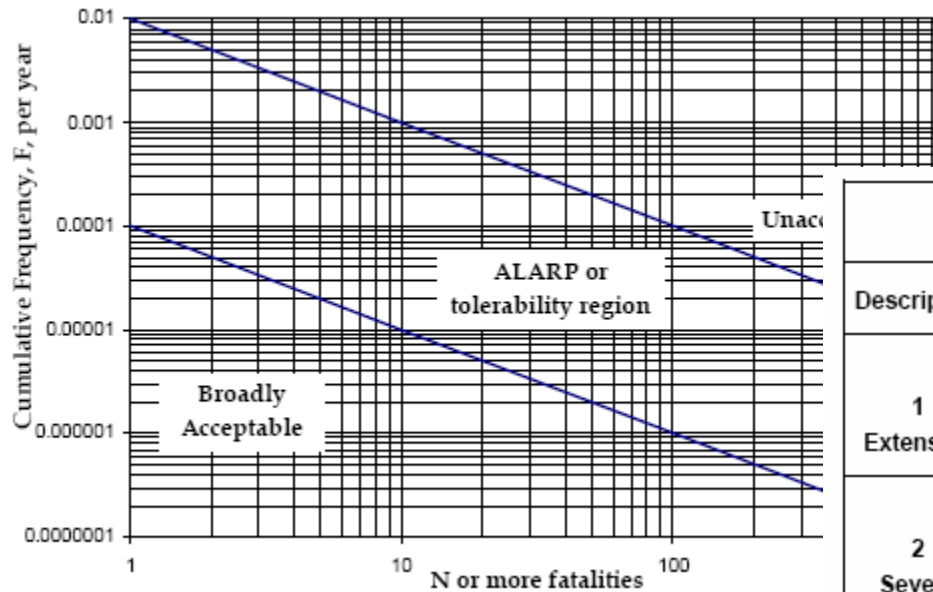


Region of Stress/
Strength Interference Where
Failures Can Occur



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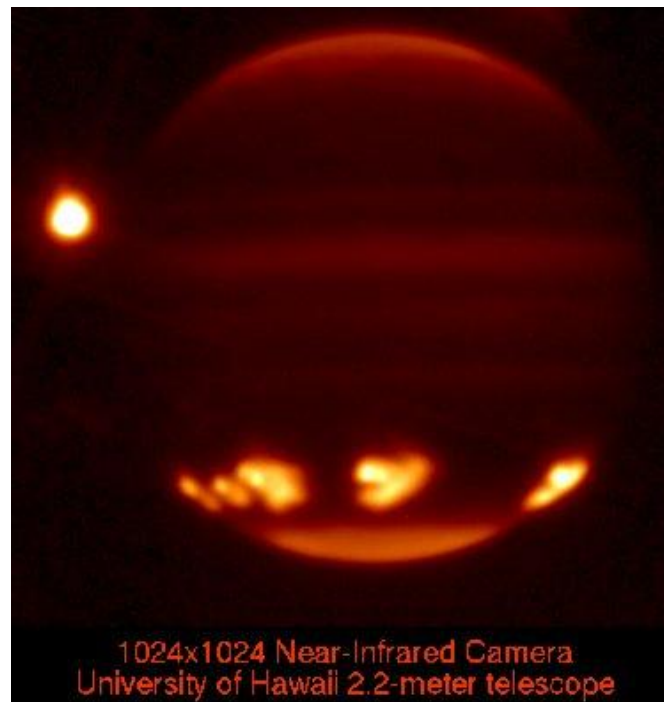
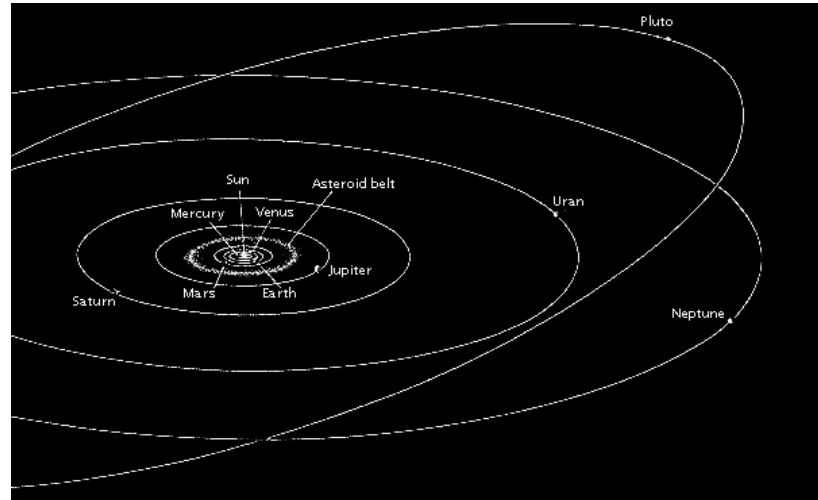
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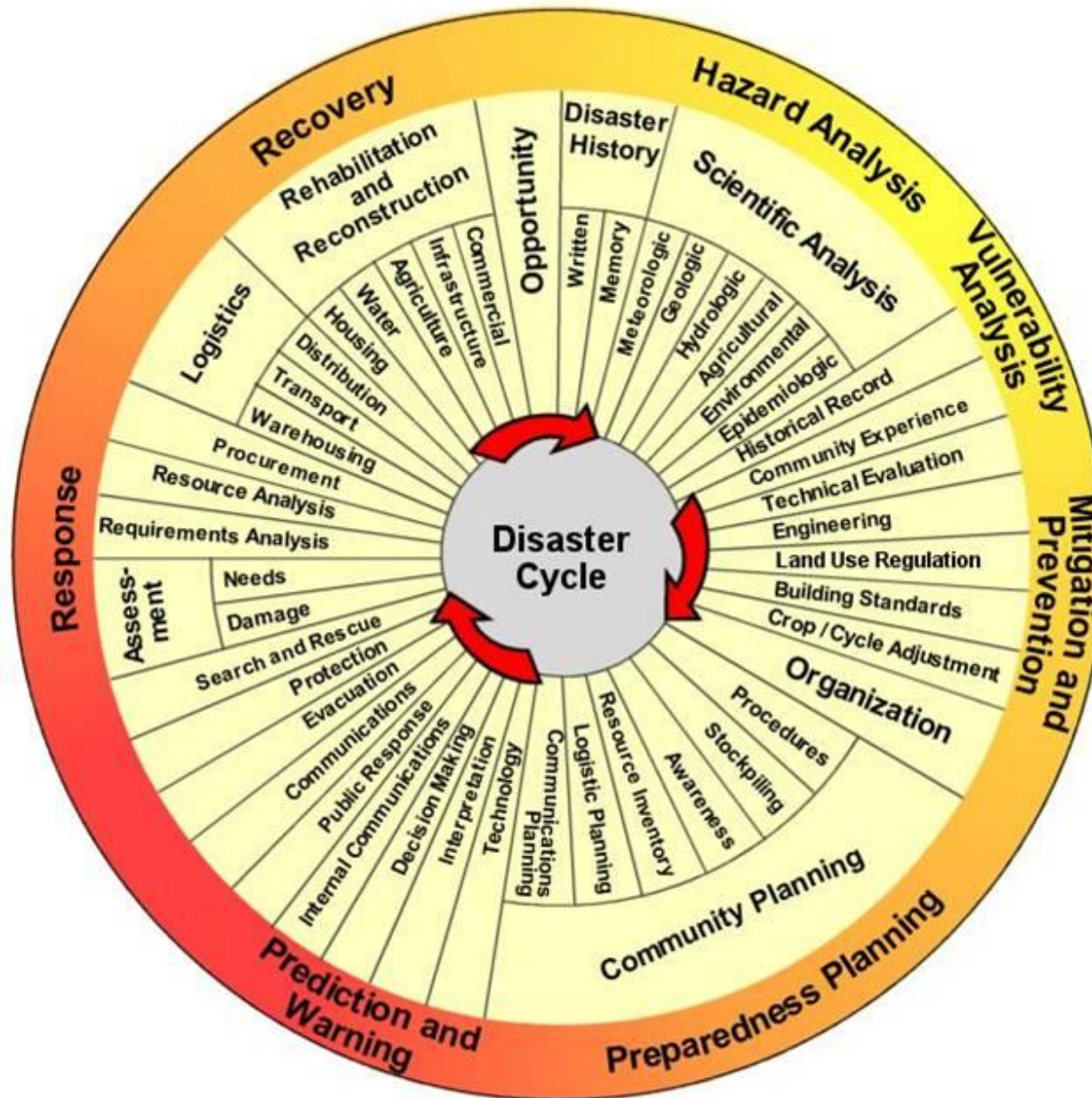


Consequences			Probability (increasing probability →)			
Descriptive	People	Environment	Remote ($< 10^{-5}/y$)	Unlikely ($10^{-5} - 10^{-3}/y$)	Likely ($10^{-3} - 10^{-2}/y$)	Frequent ($10^{-2} - 10^{-1}/y$)
1 Extensive	Fatalities	Global or national effect. Restoration time > 10 year	A1	B1	C1	D1
2 Severe	Major Injury	Restoration time > 1 yr. Restoration cost > USD 1 mil.	A2	B2	C2	D2
3 Moderate	Minor Injury	Restoration time > 1 month. Restoration cost > USD 1 K	A3	B3	C3	D3
4 Minor	Illness or Slight Injury	Restoration time < 1 month. Restoration cost < USD 1 K	A4	B4	C4	D4
HIGH	The risk is considered intolerable so that safeguards (to reduce the expected occurrence frequency and/or the consequences severity) must be implemented to achieve an acceptable level of risk; the Project should not be considered feasible without successful implementation of safeguards					
MEDIUM	The risk should be reduced if possible, unless the cost of implementation is disproportionate to the effect of the possible safeguards					
LOW	The risk is considered tolerable and no further actions are required					

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Conclusões:

-1 – acontecimento; perigo; e risco

0 – escala de tempos

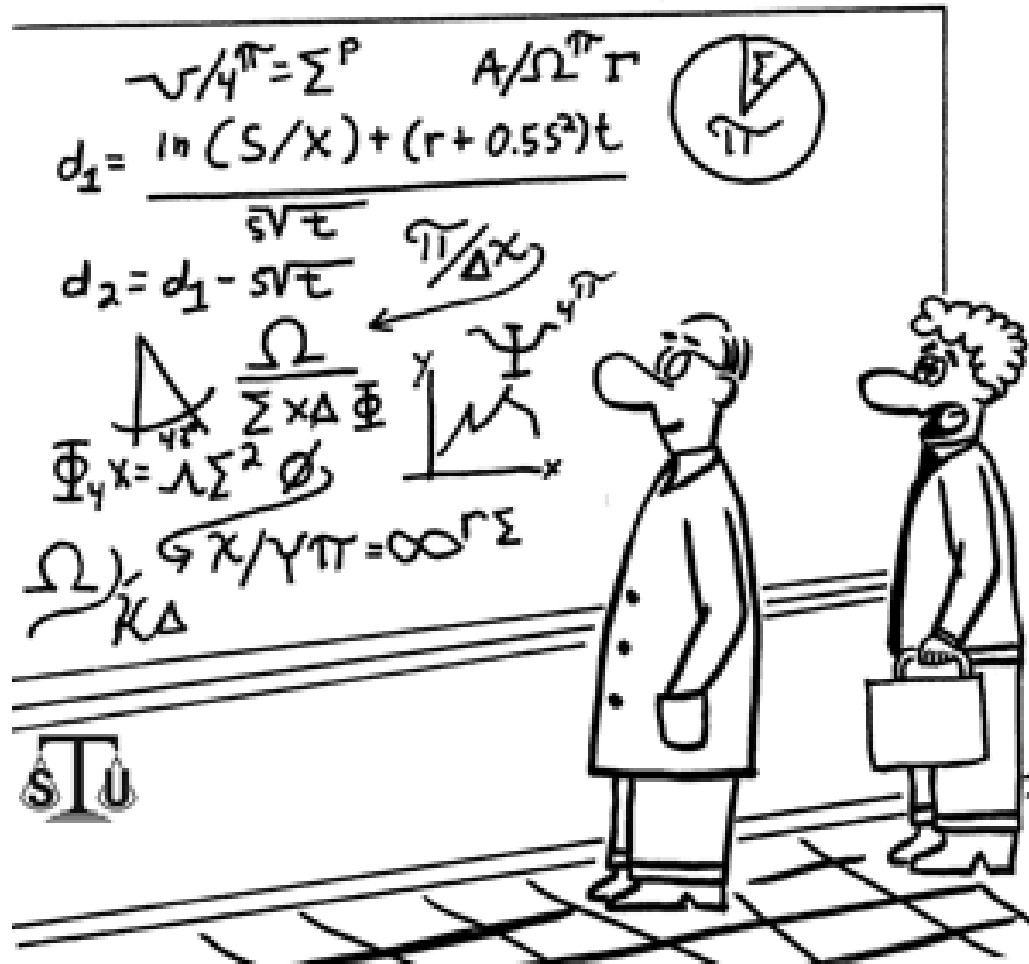
1 – base tempo vs base frequência

2 – séries e distribuições de probabilidade vs
funções de densidade espectral

3 – distribuições de extremos – período de retorno

4 – critérios de protecção/dimensionamento

5 – pixelizar a sociedade ou socializar os pixeis?



To patent it, I'd have to understand it.
You may need a different lawyer.