



NATHAN WORLD MAP OF NATURAL HAZARDS



2011 version

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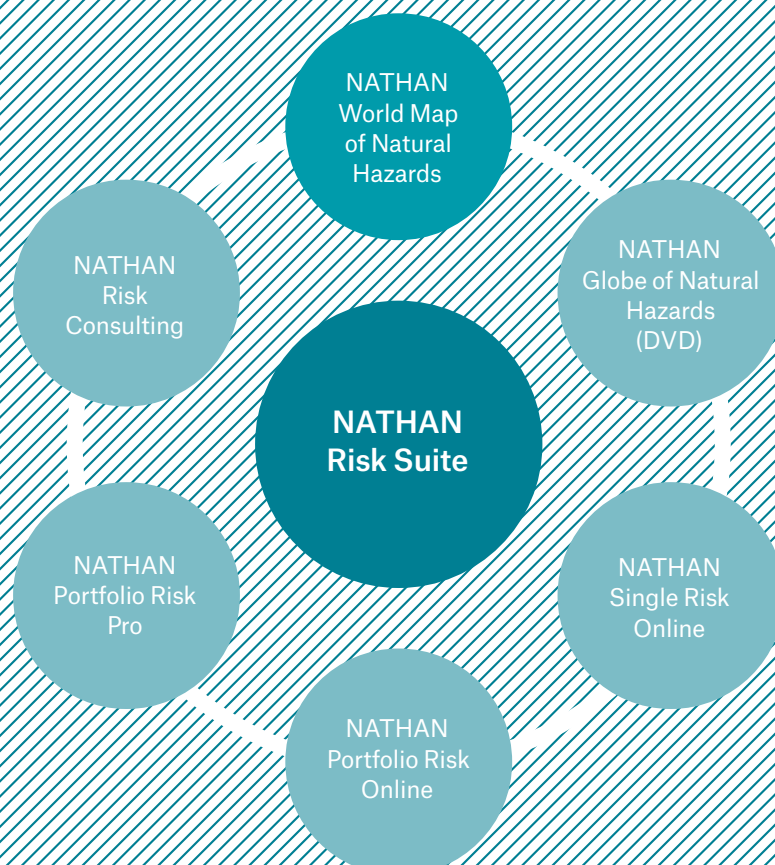
GEOINTELLIGENCE FOR YOUR BUSINESS

A new name but the recipe for success is the same: In the 2011 version, we are offering both proven and new maps of natural hazards developed by our geoscientists – now as part of the comprehensive NATHAN Risk Suite.

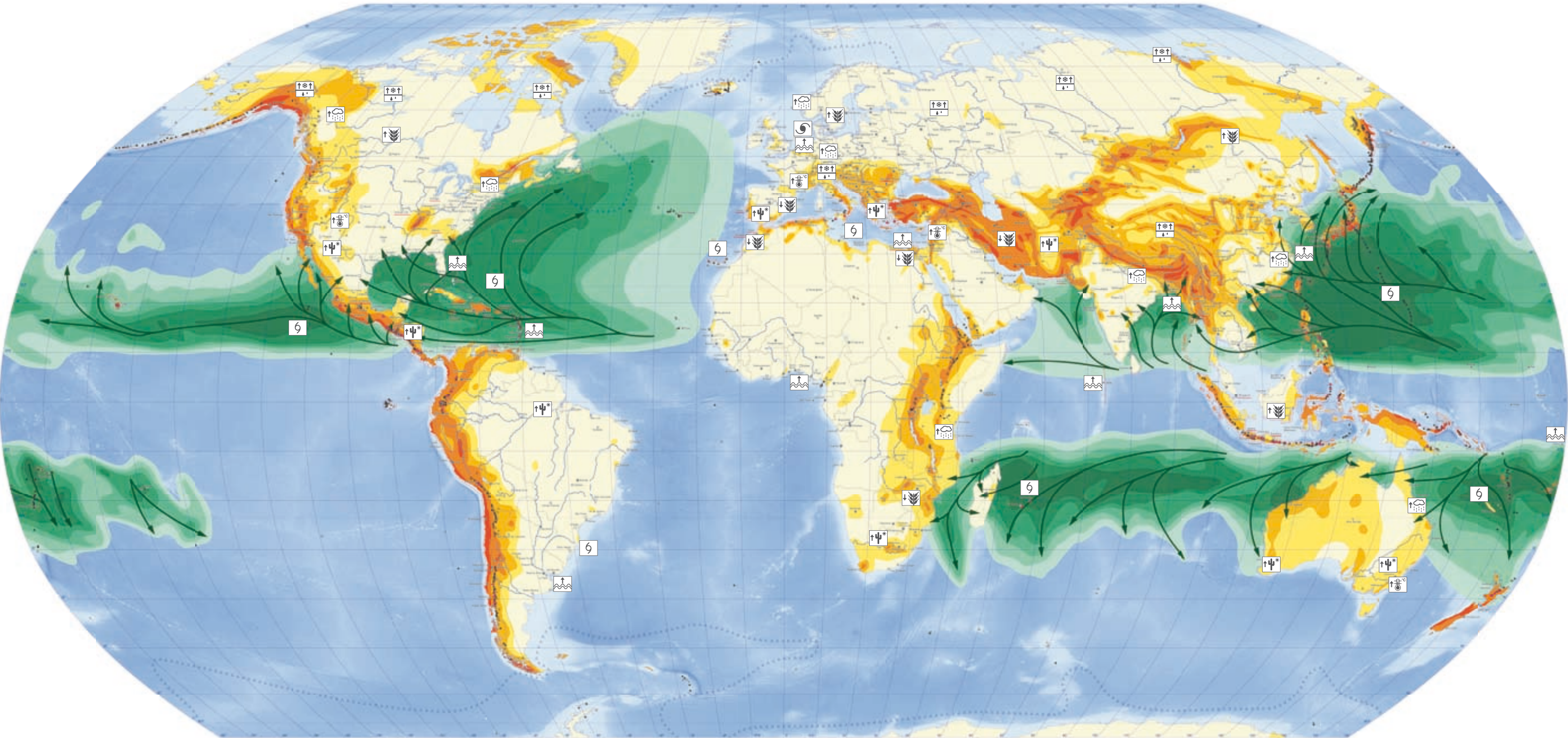
The exposure levels shown on the maps and the experience from major natural catastrophes form the basis for risk assessment and support risk rating calculation – for the first time with a global hazard map for wildfires.

Munich Re is also publishing a new version of the widely known NATHAN Globe of Natural Hazards DVD at the same time. Our extensive knowledge in the field of geo-related risks has been concentrated in this tool. With this product, Munich Re offers a highly flexible assessment tool for identifying complex natural hazard risks. The depth of information provided is ideal for assessing individual risks and is accurate down to the city level.

What's more, the other parts of our NATHAN Risk Suite, i.e. the applications NATHAN Single Risk Online and NATHAN Portfolio Risk Online, are also available at our client portal connect.munichre.com.



NATHAN WORLD MAP OF NATURAL HAZARDS



EARTHQUAKES

- Zone 0: MM V and below
- Zone 1: MM VI
- Zone 2: MM VII
- Zone 3: MM VIII
- Zone 4: MM IX and above

Probable maximum intensity (MM: Modified Mercalli scale) with an exceedance probability of 10% in 50 years (equivalent to a "return period" of 475 years) for medium subsoil conditions.

Large city with "Mexico City effect"

TROPICAL CYCLONES

Peak wind speeds (in km/h)*

- Zone 0: 76-141
- Zone 1: 142-184
- Zone 2: 185-212
- Zone 3: 213-251
- Zone 4: 252-299
- Zone 5: ≥300

* Probable maximum intensity with an exceedance probability of 10% in 10 years (equivalent to a "return period" of 100 years).

Typical track directions

VOLCANOES

- Last eruption before 1800 AD
- Last eruption after 1800 AD
- Particularly hazardous volcanoes

TSUNAMIS AND STORM SURGES

- Tsunami hazard (seismic sea wave)
- Storm surge hazard
- Tsunami and storm surge hazard

ICEBERG DRIFTS

Extent of observed iceberg drifts

CLIMATE IMPACTS

Main impacts of climate change already observed and/or expected to increase in the future

- Change in tropical cyclone activity
- Intensification of extratropical storms
- Increase in heavy rain
- Increase in heatwaves
- Increase in droughts
- Threat of sea level rise
- Permafrost thaw
- Improved agricultural conditions
- Unfavourable agricultural conditions

POLITICAL BORDERS

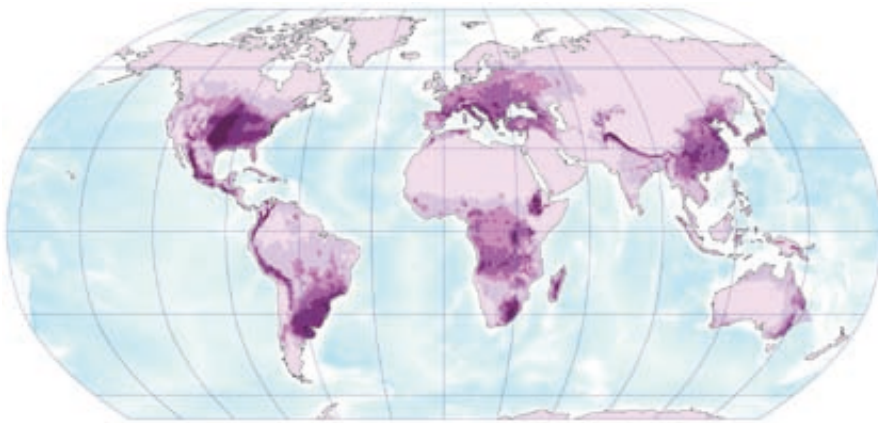
- State border
- State border controversial (political borders not binding)

CITIES

- Denver >1 million inhabitants
- San Juan 100,000 to 1 million inhabitants
- Maun <100,000 inhabitants
- Berlin Capital city

Data resources

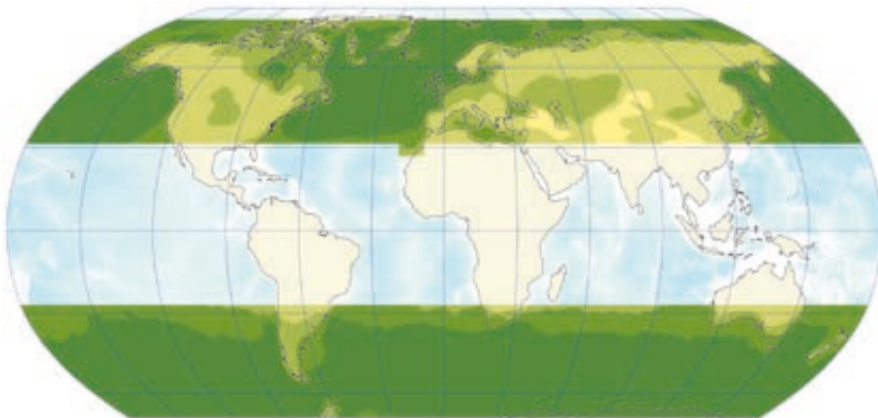
Bathymetry: Amante, C. and B. W. Eakins, ETOPO1 1 Arc-Minute Global Relief Model: Procedures, Data Sources and Analysis, National Geophysical Data Center, NESDIS, NOAA, U.S. Department of Commerce, Boulder, CO, August 2008. **Extratropical storms:** KNMI (Royal Netherlands Meteorological Institute). **Temperature/Precipitation 1978-2007:** Climatic Research Unit, University of East Anglia, Norwich.



HAILSTORMS

Frequency and intensity of hailstorms

- Zone 1: Low
- Zone 2:
- Zone 3:
- Zone 4:
- Zone 5: ↓
- Zone 6: High



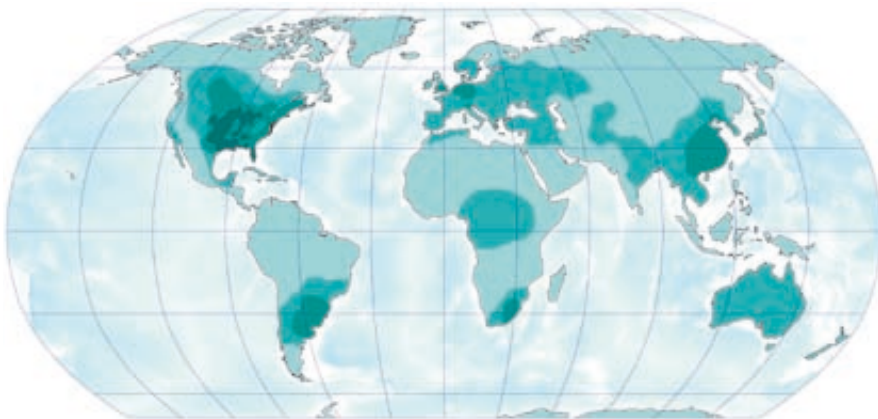
EXTRATROPICAL STORMS (WINTER STORMS)

Peak wind speeds (in km/h)*

- Zone 0: ≤80
- Zone 1: 81-120
- Zone 2: 121-160
- Zone 3: 161-200
- Zone 4: >200

Areas were examined in which there is a high frequency of extratropical storms (approx. 30°-70° north and south of the equator).

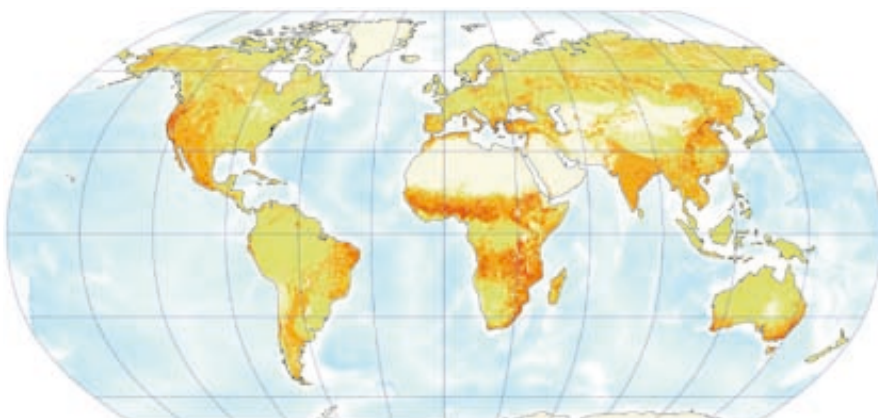
* See "Tropical cyclones"



TORNADOS

Frequency and intensity of tornados

- Zone 1: Low
- Zone 2: ↓
- Zone 3: ↓
- Zone 4: High

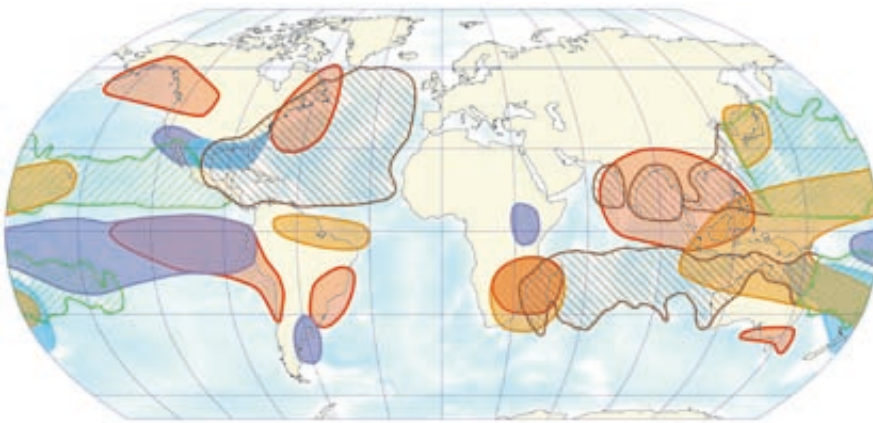


WILDFIRES

Hazard

- No hazard for bodies of water, areas of urban development and areas without vegetation
- Zone 1: Low
- Zone 2: ↓
- Zone 3: ↓
- Zone 4: High

The effects of wind, arson and fire-prevention measures are not considered.



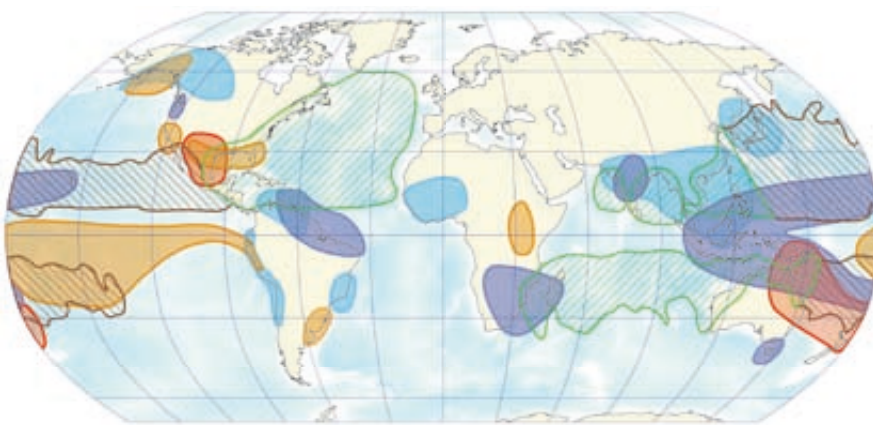
ANOMALIES DURING EL NIÑO

Weather conditions

Tropical cyclone activity

- Wetter
- Drier
- Cooler
- Warmer

- Fewer storms
- More storms



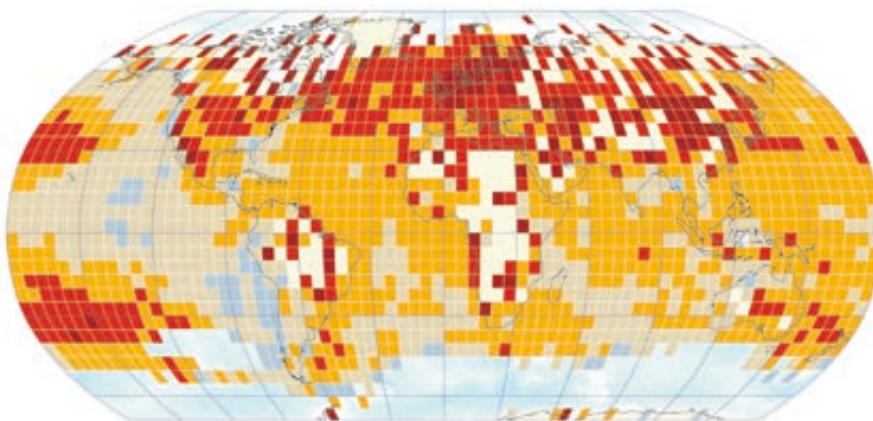
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Weather conditions

Tropical cyclone activity

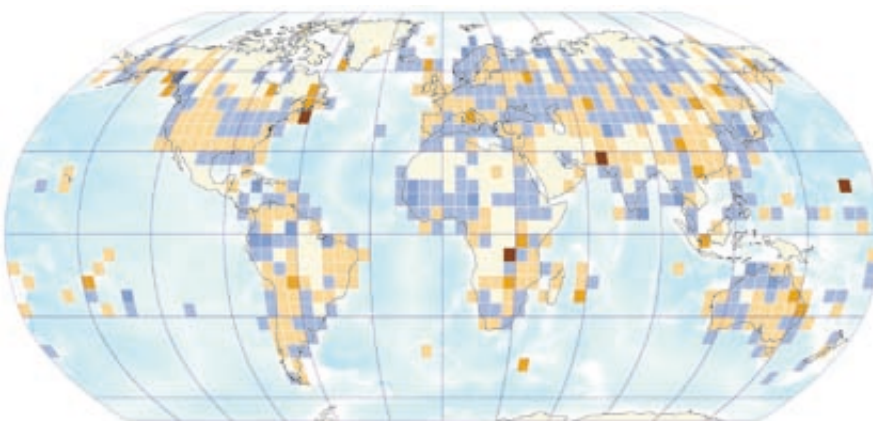
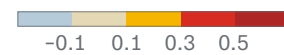
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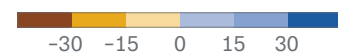
OBSERVED TREND IN MEAN TEMPERATURE IN THE PERIOD 1978-2007

in °C per decade



OBSERVED TREND IN PRECIPITATION IN THE PERIOD 1978-2007

in percentage per decade



SCALES AND EFFECTS

WINDSTORM

Beaufort Scale						
Bft	Descriptive term	Mean wind speed (10-minute average)			Wind pressure	
		m/s	km/h	mph	Knots	kg/m ²
0	Calm	0-0.2	0-1	0-1	0-1	0
1	Light air	0.3-1.5	1-5	1-3	1-3	0-0.1
2	Light breeze	1.6-3.3	6-11	4-7	4-6	0.2-0.6
3	Gentle breeze	3.4-5.4	12-19	8-12	7-10	0.7-1.8
4	Moderate breeze	5.5-7.9	20-28	13-18	11-15	1.9-3.9
5	Fresh breeze	8.0-10.7	29-38	19-24	16-21	4.0-7.2
6	Strong breeze	10.8-13.8	39-49	25-31	22-27	7.3-11.9
7	Near gale	13.9-17.1	50-61	32-38	28-33	12.0-18.3
8	Gale	17.2-20.7	62-74	39-46	34-40	18.4-26.8
9	Strong gale	20.8-24.4	75-88	47-54	41-47	26.9-37.3
10	Storm	24.5-28.4	89-102	55-63	48-55	37.4-50.5
11	Violent storm	28.5-32.6	103-117	64-72	56-63	50.6-66.5
12	Hurricane	>32.6	>117	>72	>63	>66.5


Saffir-Simpson Hurricane Scale						
SS	Descriptive term	Mean wind speed (1-minute average)				
		m/s	km/h	mph	Knots	
1	Weak	32.7-42.6	118-153	73-95	64-82	
2	Moderate	42.7-49.5	154-177	96-110	83-96	
3	Strong	49.6-58.5	178-209	111-130	97-113	
4	Very strong	58.6-69.4	210-249	131-155	114-134	
5	Devastating	>69.4	>249	>155	>134	

Enhanced Fujita Tornado Scale						
EF	Descriptive term	Mean wind speed (3-second average)				
		m/s	km/h	mph	Knots	
0	Weak	29-38	105-137	65-85	57-74	
1	Moderate	39-49	138-178	86-110	75-96	
2	Strong	50-60	179-218	111-135	97-117	
3	Devastating	61-74	219-266	136-165	118-143	
4	Annihilating	75-89	267-322	166-200	144-174	
5	Disaster	>89	>322	>200	>174	

EARTHQUAKE

Earthquake Intensity Scales						Earthquake Magnitude Scale
MM	Descriptive term	Acceleration	EMS	RF	JMA	According to Richter (1956): Log ₁₀ E = 11.8 + 1.5 M
1956		% g	1992	1883	1951	
I	Imperceptible	<0.1	II	II		E = energy released (in erg); to be multiplied by 32 for each full M grade M = Richter magnitude (up to M ≈ 9.5) In addition to M, effects observed on the surface (→ intensities) depend mainly on the depth of and the distance from the focus, the prevailing subsoil conditions.
II	Very slight	0.1-0.2			I	
III	Slight	0.2-0.5	III	III		
IV	Moderate	0.5-1	IV	IV	II	
V	Rather strong	1-2	V	V	III	
VI	Strong	2-5	VI	VI	IV	
VII	Very strong	5-10		VII		
VIII	Destructive	10-20	VII	VIII	V	
IX	Devastating	20-50	VIII	IX		
X	Annihilating	50-100 (≈ 1g)	IX		VI	
XI	Disaster	1-2 g	XI	X		
XII	Major disaster	>2 g	XII		VII	

MM: 1956 Modified Mercalli
EMS: 1992 European Macroseismic Scale (Improvement of Medwedew-Sponheuer-Karnik, 1964)
RF: 1883 Rossi-Forel
JMA: 1951 Japan Meteorological Agency



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Order number
302-05972 NATHAN World Map of Natural Hazards (folding map)

further order numbers
302-05912 NATHAN World Map of Natural Hazards (wall map)
302-05913 NATHAN Globe of Natural Hazards (DVD)