1️⃣ Tsunami (USGS Earthquake API)

Only USGS is really useful here. Weather/marine data don't "cause" tsunamis, they only change local impact.

Key USGS parameters (typical): `magnitude`, `depth`, `latitude`, `longitude`, `time`
(I'm assuming you'll get these from USGS even though you didn't list names.)

Parameter / Condition (near max severity)	Criticality	Notes
`magnitude ≥ 8.0` AND `depth ≤ 50 km` (offshore)	**Warning**	Very high tsunami potential
`7.0 ≤ magnitude < 8.0` AND `depth ≤ 70 km`	**Alert**	Significant tsunami possible
`6.0 ≤ magnitude < 7.0` offshore	**Watch**	Small/remote tsunami possible
`magnitude < 6.0` OR `depth > 100 km`	**No Threat**	Very low tsunami risk

You can *optionally* combine with your tide data:

Extra Parameter (from your list)	Condition	Effect
`tide_height_mt > 1.5` during a **tsunami Warning/Alert**	Upgrade to **higher local risk**	High tide + tsunami → more flooding

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2️⃣ Cyclone / Sea Storm (WeatherAPI + a bit of Marine)

Use as many weather parameters as possible.

Main Weather Parameters at Extreme Values

Parameter (your name)	Condition (high/exreme)	Criticality	Why
`wind_kph ≥ 90` OR `wind_mph ≥ 55`	**Warning**	Cyclone/very severe storm	
`70 ≤ wind_kph < 90` OR `45–55 wind_mph`	**Alert**	Very strong gale	
`50 ≤ wind_kph < 70`	**Watch**	Strong winds, monitor	
`gust_kph ≥ 110` OR `gust_mph ≥ 70`	**Warning**	Dangerous gusts	
`90 ≤ gust_kph < 110`	**Alert**	Strong gusts	
`pressure_mb < 985`	**Warning**	Deep low / cyclone	
`985 ≤ pressure_mb < 995`	**Alert**	Strong low system	
`995 ≤ pressure_mb < 1005`	**Watch**	Developing system	
`precip_mm ≥ 30` (per hr)	**Warning**	Very heavy rain (flood risk)	
`20 ≤ precip_mm < 30`	**Alert**	Heavy rain	

Parameter (your name)	Condition (high/exreme)	Criticality	Why
`10 ≤ precip_mm < 20`	**Watch**	Moderate rain	
`will_it_rain = 1` AND (`precip_mm ≥ 20`)	**Alert/Warning**	Confirms model rain expectation	
`vis_km ≤ 2`	**Warning**	Very poor visibility, often with heavy rain / storm	
`2 < vis_km ≤ 5`	**Alert**	Reduced visibility	
`temp_c` OR `feelslike_c` very high (`> 35`) with `humidity > 80`	**Watch**	Oppressive conditions, pre-storm environment sometimes	
`humidity ≥ 90` + `cloud ≥ 80`	**Watch/Alert**	Very moist, overcast, often with rain system	
`cloud ≥ 90`	**Watch**	Thick cloud deck / system present	
`uv` is not very relevant for cyclone itself	–	Use for general sun exposure messaging, not hazard	

Cyclone Overall Criticality (combine key signals)

- **Warning**
  - `wind_kph ≥ 90` OR
  - `gust_kph ≥ 110` OR
  - `pressure_mb < 985` OR
  - `precip_mm ≥ 30` with `vis_km ≤ 2`
- **Alert**
  - `70 ≤ wind_kph < 90` OR
  - `985 ≤ pressure_mb < 995` OR
  - `20 ≤ precip_mm < 30` OR
  - `2 < vis_km ≤ 5`
- **Watch**
  - `50 ≤ wind_kph < 70` OR
  - `995 ≤ pressure_mb < 1005` OR
  - `10 ≤ precip_mm < 20`
- **No Threat**
  - `wind_kph < 50`, `pressure_mb ≥ 1005`, `precip_mm < 10`, `vis_km > 5`

Astronomy tie-in:

- `is_day = 0` or `time` between `sunset` and `sunrise`: same hazard, but message can say “night-time cyclone, visibility lower”.

3️⃣ High Tide / High Waves (Marine + Tide + some Weather)

Use *all* the marine parameters.

Marine Parameters at Extreme Values

Parameter	Condition (high/extreme)	Criticality	Effects
`sig_ht_mt > 4.0`	**Warning**	Very high significant wave height	
`3.0 < sig_ht_mt ≤ 4.0`	**Alert**	High waves, dangerous for small boats	
`2.0 < sig_ht_mt ≤ 3.0`	**Watch**	Rough sea	
`swell_ht_mt > 3.0`	**Warning**	Heavy swell, strong surges	
`2.0 < swell_ht_mt ≤ 3.0`	**Alert**	Large swell	
`1.5 < swell_ht_mt ≤ 2.0`	**Watch**	Moderate swell	
`swell_period_secs > 18`	**Warning**	Long-period swell, powerful waves	
`15 < swell_period_secs ≤ 18`	**Alert**	Strong energy swell	
`12 < swell_period_secs ≤ 15`	**Watch**	Notable swell	
`tide_height_mt > 2.0` AND `tide_type = "HIGH"`	**Warning**	Very high tide	
`1.5 < tide_height_mt ≤ 2.0` AND `tide_type = "HIGH"`	**Alert**	High tide	
`0.8 < tide_height_mt ≤ 1.5`	**Watch**	Moderately high	
`tide_time` within next 1–2 hours of current `time`	Increase level by one step	High tide soon	
`swell_dir` / `swell_dir_16_point` onshore (toward coast)	Increase level by one step	More impact on coastline	
`water_temp_c` high (`> 28`)	**Watch** for tourism	Encourages people into water → combine with rip/swell alerts	
`wind_kph > 30` onshore (`wind_dir` toward coast)	**Alert/Warning**	Wind amplifies breaking waves	

Overall High Tide / High Waves Criticality

- **Warning**
  - `sig_ht_mt > 4.0` OR
  - `swell_ht_mt > 3.0` OR
  - `swell_period_secs > 18` OR
  - `tide_height_mt > 2.0` with `tide_type = "HIGH"`
- **Alert**

    - `3.0 < sig_ht_mt ≤ 4.0` OR
    - `2.0 < swell_ht_mt ≤ 3.0` OR
    - `15 < swell_period_secs ≤ 18` OR
    - `1.5 < tide_height_mt ≤ 2.0`
- **Watch**
    - `2.0 < sig_ht_mt ≤ 3.0` OR
    - `1.5 < swell_ht_mt ≤ 2.0` OR
    - `12 < swell_period_secs ≤ 15` OR
    - `0.8 < tide_height_mt ≤ 1.5`

4️⃣ Flooded Coastline (Weather + Marine + Tide)

This is basically **High Tide + Heavy Rain + Poor Visibility**.

Parameters and Extremes

Parameter	Condition (extreme)	Criticality
`tide_height_mt > 2.0` AND `tide_type = "HIGH"`	**Warning**	3
`1.5 < tide_height_mt ≤ 2.0`	**Alert**	3
`precip_mm ≥ 30`	**Warning**	3
`20 ≤ precip_mm < 30`	**Alert**	2
`10 ≤ precip_mm < 20`	**Watch**	1
`vis_km ≤ 2`	**Warning** (very poor visibility)	4
`2 < vis_km ≤ 5`	**Alert**	3
`humidity ≥ 90` AND `cloud ≥ 80`	**Watch**	2
`sig_ht_mt > 3.0` OR `swell_ht_mt > 2.5`	**Alert/Warning** (adds wave-driven flooding)	2/3

Combined Criticality Logic

- **Warning** if:
    - `tide_height_mt > 2.0` AND `precip_mm ≥ 20`
    - OR `precip_mm ≥ 30` AND `vis_km ≤ 2`
    - OR any **High Tide/High Wave Warning** + `precip_mm ≥ 20`
- **Alert** if:
    - `1.5 < tide_height_mt ≤ 2.0` AND `10 ≤ precip_mm < 20`
    - OR `20 ≤ precip_mm < 30` alone
    - OR `sig_ht_mt > 3.0` with moderate rain
- **Watch** if:
    - `0.8 < tide_height_mt ≤ 1.5` OR
    - `10 ≤ precip_mm < 20` OR
    - `vis_km` between 2–5

5️⃣ Rip Currents (Marine + Weather)

Here we use **swell**, **wind**, **tide**, **water temperature**, **direction**.

Parameters at Extreme Values

Parameter	Condition	Criticality	Notes
`swell_period_secs > 18` AND `swell_ht_mt > 2.0`	**Warning**	Classic strong rip setup	
`15 < swell_period_secs ≤ 18` AND `1.5 < swell_ht_mt ≤ 2.0`	**Alert**	Strong rips likely	
`12 < swell_period_secs ≤ 15`	**Watch**	Moderate rips	
`swell_dir` / `swell_dir_16_point` roughly perpendicular to coast (onshore)	Increase one level	Waves hit directly, more rips	
`wind_kph > 35` AND onshore `wind_dir`	**Alert/Warning**	Wind-driven breakers → rips	
`tide_type = "LOW"` AND `tide_height_mt` near minimum	Increase rip risk	Many beaches: low tide = stronger rips	
`water_temp_c > 26` AND `is_day = 1`	Increase level for messaging	More swimmers in water	
`sig_ht_mt > 2.5`	**Alert/Warning**	Generally rough surf	

Rip Current Criticality

- **Warning**
  - `swell_period_secs > 18` AND `swell_ht_mt > 2.0`, or
  - `swell_period_secs > 15` + onshore `swell_dir` + onshore `wind_kph > 30`
- **Alert**
  - `15 < swell_period_secs ≤ 18` AND `1.5 < swell_ht_mt ≤ 2.0`
  - OR `sig_ht_mt > 2.5` with onshore winds
- **Watch**
  - `12 < swell_period_secs ≤ 15` or moderate swell (`1.0–1.5 m`)

6️⃣ Quick "Max Parameter → Criticality" Cheat Sheet

When any of these are near their **max** in real data, treat as **Warning**:

Parameter	"Max" Condition	Main Hazard
`magnitude ≥ 8.0`, shallow	Tsunami	

Parameter	“Max” Condition	Main Hazard
`wind_kph` ≥ 90 or `gust_kph` ≥ 110	Cyclone / Sea storm	
`pressure_mb` < 985	Cyclone / Deep low	
`precip_mm` ≥ 30	Flooded coastline, Cyclone	
`sig_ht_mt` > 4.0	High waves, Flooded coastline	
`swell_ht_mt` > 3.0	High waves, Rip currents	
`swell_period_secs` > 18	Rip currents, powerful surf	
`tide_height_mt` > 2.0 AND `tide_type` = "HIGH"	High tide / Flooding	
`vis_km` ≤ 2	Severe weather impact (Cyclone/Flood)	
`humidity` ≥ 90 + `cloud` ≥ 80 + `will_it_rain` = 1	Strong rain system in place	