

MARS 2026 - EXPERT MARITIME REPORT - KORSO MARITIME



Module M1 v2.4 - Numerical modelling and synoptic analysis of the Mediterranean Basin

Oran

2026-06-01 12:00 UTC / 13:00 HL

ERA5 / ECMWF

Window H-12/H+12

5 synoptic times

MARS ⚡ MARS v1.1 actif - 2/5 échéances reconstruites

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01 FORENSIC REPORT

MARS 2026 - NUMERICAL MODELLING AND SYNOPTIC ANALYSIS OF THE MEDITERRANEAN BASIN - MODULE M1 V2.4

Weather & Marine Analysis

Oran - 2026-06-01 12:00 UTC / 13:00 Heure Locale (GMT+1)

ERA5 / ECMWF

ORAN

H-12/H+12

LOW

FLUX E - 9.4 KT

MESO ESTABLISHED

MARS ACTIF ⚡

GMT+1 / HL

PH.0 TEMPORAL ANCHORING

Incident	2026-06-01 12:00 UTC - 13:00 Heure Locale (GMT+1)
Window	2026-06-01 → 2026-06-02
Synoptic times	2026-06-01 00Z / 2026-06-01 06Z / 2026-06-01 12Z / 2026-06-01 18Z / 2026-06-02 00Z

PH.1 ERA5 ACQUISITION - VERIFIED

Sources	8 pts / 5 synoptic times
Max Hs offshore	0.22 m
Max wind 10m	6.1 kt
Acquisition time	9893 ms
MARS	⚡ MARS v1.1 actif - 2/5 échéances reconstruites

PH.2 MACRO SYNOPTIC ANALYSIS

SYSTEM EVOLUTION - 24H

Trend	MATURE
Detail	Established system, stable gradient around H0 (2.5 hPa). Window range: 2.4-3.8 hPa (variation: 1.4 hPa).
Range variation	1.4 hPa

i Mature system: persistent conditions throughout the observation window. The sea state at H0 is representative of the meteorological episode as a whole.

MSL PRESSURES - ALL SYNOPTIC TIMES (HPA)

BASIN	2026-06-01 00Z	2026-06-01 06Z	2026-06-01 12Z ★	2026-06-01 18Z	2026-06-02 00Z
ALBO undefined	1016.8	1015.9	1016.5	1014.3	1015.4
ALGP undefined	1017.8 ▲	1017.2 ▲	1017.6 ▲	1015.3	1014.5
LION undefined	1016.4	1016.2	1015.8	1013.4	1013.3 ▼
TYRR undefined	1015.8	1015.0	1015.1 ▼	1013.3 ▼	1013.6
IONI undefined	1016.4	1016.0	1017.0	1015.7 ▲	1016.5 ▲
EGEE undefined	1014.0 ▼	1014.4 ▼	1015.3	1014.7	1015.3

▼ min · ▲ max · ★ H0

H0 GRADIENTS (HPA/100KM)

P	PAIR	ΔP	KM	hPa/100km	CLASS
1	Alboran ↔ Algéro-Provençal	+1.1	645	0.170	LOW
↳ Trigger for westerly wind events on the Algerian coast					
2	Algéro-Provençal ↔ Lion	-1.8	558	-0.323	LOW
↳ North and North-West flow					
3	Algéro-Provençal ↔ Tyrrhénienne	-2.5	667	-0.375	LOW
↳ East and North-East flow					
4	Lion ↔ Tyrrhénienne	-0.7	610	-0.115	LOW
5	Alboran ↔ Lion	-0.7	968	-0.072	LOW
6	Tyrrhénienne ↔ Ionienne	+1.9	688	0.276	LOW
7	Ionienne ↔ Égée	-1.7	723	-0.235	LOW

DOMINANT FLUX H0 - ALGP

Theoretical direction	165° SSE
ERA5 measured direction	86° E - 9.4 kt
Deviation	79°
Coriolis concordance	ACCEPTABLE (61-90°)

PH.3 ALGERO-PROVENÇAL MESO ANALYSIS

ALGP POSITION - H0

ALGP pressure	1017.6 hPa
Rank	–
vs ALBO	+1.1 hPa – W → E flow on Algerian coast (ALGP higher than Alboran)
vs LION	+1.8 hPa – ALGP higher than Lion – S→N flow (unusual)
vs TYRR	+2.5 hPa – ALGP higher than Tyrrhenian – flow towards eastern basin

The Algero-Provençal basin constitutes the barometric maximum of the area (1017.6 hPa). The dominant gradient is ALGP/Tyrrhenian ($\Delta P = 2.50$ hPa), forcing an easterly flow towards the eastern basin (ALGP → TYRR). The ALGP/Lion gradient ($\Delta P = 1.80$ hPa) and Alboran/ALGP gradient ($\Delta P = 1.10$ hPa) are secondary.

ALGP PRIORITY GRADIENTS - H0

P	PAIR	GRADIENT	CLASS.	ACTIVE REGIME
1	ALBO ↔ ALGP	0.170 hPa/100km	LOW	Low gradient – poorly organised flow ↳ Main trigger for westerly wind events on the Algerian coast. A positive gradient (ALGP > ALBO) drives an established westerly flow.
2	ALGP ↔ LION	-0.323 hPa/100km	LOW	Low gradient – poorly organised flow ↳ Driver of North and North-West flows. High gradient: amplified tramontane and mistral descending directly onto the Algerian coast.
3	ALGP ↔ TYRR	-0.375 hPa/100km	LOW	Low gradient – poorly organised flow ↳ Easterly flow from the eastern Mediterranean basin. A positive gradient (TYRR > ALGP) drives a warm, humid easterly flow with long-period swell from the eastern basin. Sirocco (warm SE/SW flow) is possible if temperature exceeds 25°C – thermal condition assessed separately.

MESO REGIME - H0 SUMMARY

Level	ESTABLISHED
Nav. constraint	Established meso circulation – formed sea
ALGP flux	E – 9.4 kt
Concordance	ACCEPTABLE (61-90°)

The meso-meteorological regime of the western Algerian coast is dominated by the ALGP ↔ TYRR gradient (0.375 hPa/100km — Low), main driver of East/North-East sector flows. Priority gradient hierarchy: ALBO ↔ ALGP: 0.170 hPa/100km (Low) | ALGP ↔ LION: 0.323 hPa/100km (Low) | ALGP ↔ TYRR: 0.375 hPa/100km (Low). ERA5 wind measured over the Algero-Provençal basin: E sector at 9.4 kt (Coriolis concordance: Acceptable (61–90°)). Significant discordance (79°) between geostrophic theory and ERA5 measurement. Possible causes: (1) orographic channelling effect (terrain funnelling), (2) sea breeze superimposed on synoptic flow, (3) mesoscale disturbance not captured at macro-basin resolution. Synoptic analysis remains valid at larger scale; local conclusions require additional verification.

MESO REGIME EVOLUTION OVER THE WINDOW

TIME	ΔH	LEVEL	MAX GRAD.	FLUX	SPD.
2026-06-01 00Z	-12h	ESTABLISHED	0.300	ESE	10
2026-06-01 06Z	-6h	ESTABLISHED	0.330	ESE	9.2
2026-06-01 12Z ★	+0h	ESTABLISHED	0.375	E	9.4
2026-06-01 18Z	+6h	ESTABLISHED	0.341	ESE	9.8
2026-06-02 00Z	+12h	CALM	0.215	ESE	12.4

PH.4 LOCAL ANALYSIS - ORAN

i Axe du courant algérien

📄 Coefficient 0.5 — Port of Oran: large commercial roadstead with partial breakwater. Moderate protection — PIANC Report 115 (2014). The Algerian current may induce residual long-period swell independent of local wind.

LOCAL ERA5 CONDITIONS - H0

Wind 10m	6.1 kt - 342°
Gust 10m	15.9 kt CONV. x2.6
Local pressure	1015.9 hPa
Hs offshore	0.14 m
Mean period (Tm)	3.7 s
Swell direction	25°
Attenuation coeff.	0.5 (ORAN - N sector, PIANC Report 115)
Est. Hs at berth	0.07 m OPERATIONAL

EFFECTIVE FETCH

Sector	N
Fetch	110 NM

ACTIVE SPECIAL FLAGS

No special flags active.

MACRO / LOCAL COHERENCE

Coherence	DISCORDANCE
Detail	Macro/local discordance (104°) – physical cause undetermined (insufficient data for thermal/orographic classification). Possible causes: thermal land-sea breeze, orographic channelling, or mesoscale disturbance. Cross-reference with local port anemometric data is essential.
Macro direction (ALGP)	86° - 9.4 kt
Local direction (port)	342° - 6.1 kt

HS AT BERTH - WINDOW EVOLUTION

TIME	ΔH	Hs OFF.	Hs BERTH	SEVERITY	WIND	FETCH
2026-06-01 00Z	-12h	0.10 m	0.02 m	OPERATIONAL	2.3 kt	220 NM
2026-06-01 06Z	-6h	0.08 m ^{MARS}	0.04 m	OPERATIONAL	2.1 kt	115 NM
2026-06-01 12Z ★	+0h	0.14 m	0.07 m	OPERATIONAL	6.1 kt	110 NM
2026-06-01 18Z	+6h	0.13 m ^{MARS}	0.07 m	OPERATIONAL	2.8 kt	110 NM
2026-06-02 00Z	+12h	0.22 m	0.09 m	OPERATIONAL	4.1 kt	180 NM

FORENSIC CONCLUSION

At the time of the incident (2026-06-01 12:00 UTC), analysis of ERA5 reanalysis data from the European Centre for Medium-Range Weather Forecasts (ECMWF) over the western Mediterranean basin reveals The meso-meteorological regime of the western Algerian coast is dominated by the ALGP ↔ TYRR gradient (0.375 hPa/100km — Low), main driver of East/North-East sector flows. Priority gradient hierarchy: ALBO ↔ ALGP: 0.170 hPa/100km (Low) | ALGP ↔ LION: 0.323 hPa/100km (Low) | ALGP ↔ TYRR: 0.375 hPa/100km (Low). ERA5 wind measured over the Algero-Provençal basin: E sector at 9.4 kt (Coriolis concordance: Acceptable (61–90°)). Significant discordance (79°) between geostrophic theory and ERA5 measurement. Possible causes: (1) orographic channelling effect (terrain funnelling), (2) sea breeze superimposed on synoptic flow, (3) mesoscale disturbance not

captured at macro-basin resolution. Synoptic analysis remains valid at larger scale; local conclusions require additional verification. Mature system: persistent conditions throughout the observation window. The sea state at H0 is representative of the meteorological episode as a whole.

At the port of Oran, certified ERA5 data records at H0 (2026-06-01 12:00 UTC): a North-North-West wind (342°) at 6.1 knots with gusts reaching 15.9 knots; an offshore significant wave height (Hs) of 0.14 metre(s) (ERA5 — partially reconstructed by MARS v1.1); a mean wave period (Tm) of 3.7 second(s); an estimated significant wave height at berth (Hs berth) of 0.07 metre(s) after applying attenuation coefficient 0.5 (0.5 (ORAN — N sector, PIANC Report 115)).

The gust-to-mean-wind ratio at H0 is 2.6 (15.9 kt gust / 6.1 kt mean). A ratio exceeding 1.8 is atypical of an organised synoptic flow and is characteristic of an active convective regime (thermal squall, diurnal instability). Surface temperature at H0 (29.6°C) is consistent with active diurnal convective heating. Under OCIMF MEG4 (2018) §6.4, convective gusts generate impulsive dynamic loads on mooring lines that are not captured by mean wind speed alone. The mean wind speed of 6.1 kt therefore understates the peak mechanical stress experienced by mooring equipment during this period.

Analysis of the effective fetch for the dominant direction (sector N) determines a swell generation distance of 110 nautical miles.

The coherence between macro data (Algero-Provençal basin) and local measurements (port of Oran) is assessed as "Discordance". Macro/local discordance (104°) — physical cause undetermined (insufficient data for thermal/orographic classification). Possible causes: thermal land-sea breeze, orographic channelling, or mesoscale disturbance. Cross-reference with local port anemometric data is essential.

Based on the foregoing and on certified ERA5/ECMWF data, the weather and marine conditions at the port of Oran at the time of the incident must be characterised as favourable for navigation and port operations. The estimated significant wave height at berth (Hs = 0.07 m) remains below the operational threshold of 0.5 m generally applied for maritime operations (PIANC Report 115, 2014). These conditions do not support a causal link with the alleged damage. Window analysis (H-12/H+12) confirms that the estimated Hs at berth remained below the PIANC operational threshold of 0.5 m throughout the entire observation window (range: 0.02–0.09 m). The rising trend observed reflects normal swell propagation dynamics and does not alter the favourable characterisation of conditions at H0.

02 GRAPHICAL ANALYSIS

PORT Oran (ORAN)	H0 2026-06-01 12:00 UTC	HS MAX 0.22 m	TM MAX 4.8 s	P MIN 1013.3 hPa	MARS ⚡ 2/5
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Time evolution of weather and marine parameters over the H-12/H+12 window. **Orange points = values reconstructed by MARS v1.1 (SMB/Wilson 1965)**. Red dashed line on chart B = Tm 8.0 s threshold (MARS L2 residual swell criterion).

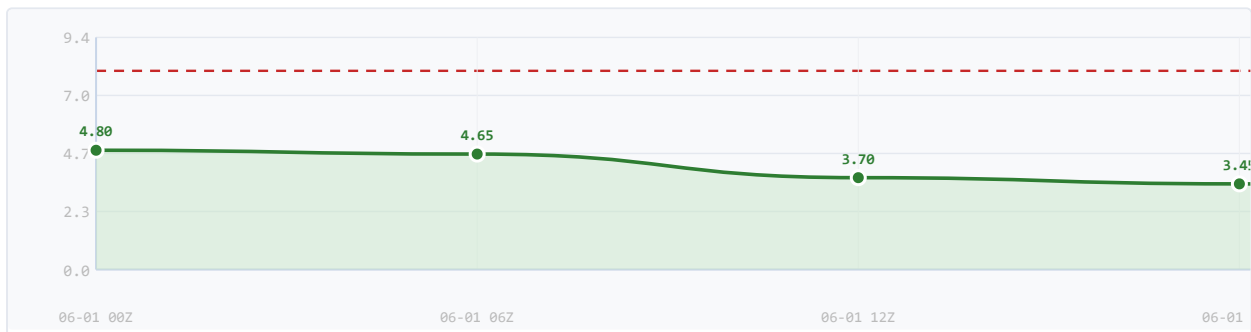
A HS PROFILE – SIGNIFICANT WAVE HEIGHT

ERA5 direct MARS reconstructed
Offshore significant wave height (m).



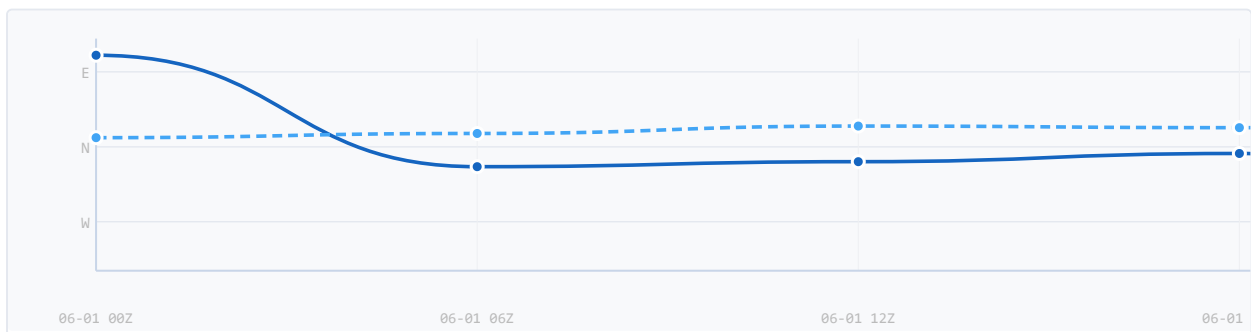
B TM SPECTRUM – MEAN WAVE PERIOD

Tm (s) Threshold 8.0 s
Mean wave period (s). Red dashed line = 8.0 s residual swell detection threshold (MARS L2).



C DIRECTIONAL CORRELATION – WIND VS WAVES

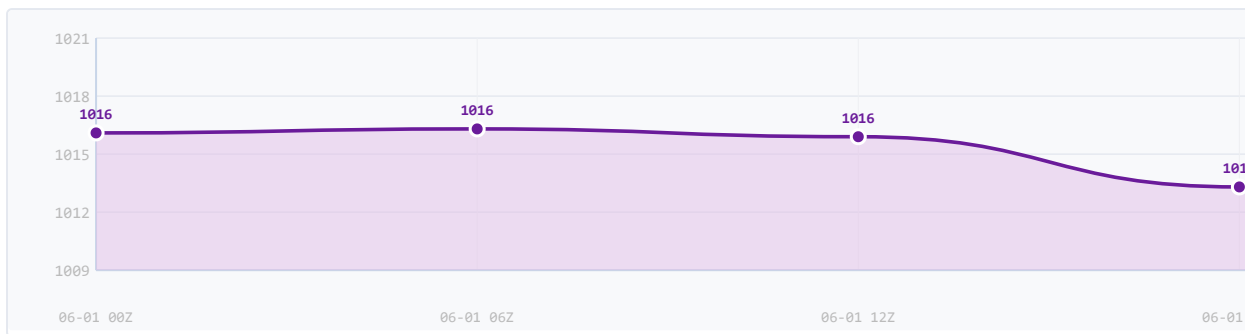
Wind direction (°) Wave direction (°) —
Wind direction (solid blue) vs wave direction (dashed light blue). Persistent gap = residual swell or distant forcing.
⚠ Angular unwrap applied: transitions near N (e.g. 355°→5°) are rendered as continuous rotations to avoid misleading visual jumps.



D BAROMETRIC TREND – MSL PRESSURE

P MSL (hPa)

Mean sea level atmospheric pressure (hPa). Synoptic context.



03 RAW ERA5 DATA

M1 ERA5 PRESSURES – MACRO BASINS (HPA)

BASIN	2026-06-01 00Z	2026-06-01 06Z	2026-06-01 12Z	2026-06-01 18Z	2026-06-02 00Z
ALBO Alboran	1016.8	1015.9	1016.5	1014.3	1015.4
ALGP Algero-Provençal	1017.8	1017.2	1017.6	1015.3	1014.5
LION Lion	1016.4	1016.2	1015.8	1013.4	1013.3
TYRR Tyrrhenian	1015.8	1015.0	1015.1	1013.3	1013.6
IONI Ionian	1016.4	1016.0	1017.0	1015.7	1016.5
EGEE Aegean	1014.0	1014.4	1015.3	1014.7	1015.3

M1 PORT DATA – ORAN

PARAMETER	2026-06-01 00Z	2026-06-01 06Z	2026-06-01 12Z	2026-06-01 18Z	2026-06-02 00Z
MSL Pressure	1016.1hPa	1016.3hPa	1015.9hPa	1013.3hPa	1015.1hPa
Wind 10m	2.3 kt	2.1 kt	6.1 kt	2.8 kt	4.1 kt
Wind dir.	110.0°	336.0°	342.0°	352.0°	231.0°
Gust	4.9 kt	5.2 kt	15.9 kt	10.5 kt	5.8 kt
Temp.	21.6°C	21.0°C	29.6°C	28.8°C	23.6°C
Precip.	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm

M1 OFFSHORE SEA STATE

MARS ACTIVE ⚡

⚡ MARS active – orange values = reconstructed data (SMB/Wilson 1965).

PARAMETER	2026-06-01 00Z	2026-06-01 06Z	2026-06-01 12Z	2026-06-01 18Z	2026-06-02 00Z
Hs	0.10 m	0.08 m ⚡	0.14 m	0.13 m ⚡	0.22 m
Tm	4.8 s	4.7 s ⚡	3.7 s	3.5 s ⚡	2.9 s
Swell dir.	11°	16° ⚡	25°	23° ⚡	19°

Data retrieved via the Open-Meteo computational interface, sourced from ERA5 reanalyses produced by the European Centre for Medium-Range Weather Forecasts (ECMWF), a world-reference institution whose data are recognised and accepted by British maritime jurisdictions.

✓ RFC 3161 Timestamp – FreeTSA.org (eIDAS compliant)

Certified at (UTC) 2026-06-08T01:49:46Z
TSA Serial 056fff03
SHA-256 45f1f445146f9d12af684e82e6925fa21ec3a4b483cdb8b1da88421293758
TSR Token (Base64) MIIISHADAgEAMIISFQYJKoZIhvcNAQoCoIISBjCCEGICAOQxZANBg1ghkgBQZQEAgMFADCCAGCygSIB3DQeIAEE0IIBfSWCAXSwggf3Ag...

Independent verification (OpenSSL):

```
openssl ts -verify -in token.tsr -digest 45f1f445146f9d12af684e82e6925fa21ec3a4b483cdb8b1da88421293758 -CAfile freetsa.crt -untrusted freetsa_intermediate.crt
```

FreeTSA certificates : https://freettsa.org/files/tsa.crt · https://freettsa.org/files/cacert.pem

TR ACQUISITION URLS – 8 SOURCES

01 – MACRO – Alboran (ALBO)

proxy.php?endpoint=atmos&latitude=36&longitude=-3&start_date=2026-06-01&end_date=2026-06-02&hourly=pressure_msl%2Cwind_speed_10m%2Cwind_direction_10m%2Ctemperature_2m%2Cwind_gusts_10m%2Cprecipitation&wind_speed_unit=kn&timezone=UTC

API : ERA5 Archive – Open-Meteo | 2026-06-08T01:49:35.109Z | Lat 36 / Lon -3

02 – MACRO – Algero-Provençal (ALGP)

proxy.php?endpoint=atmos&latitude=37.5&longitude=4&start_date=2026-06-01&end_date=2026-06-02&hourly=pressure_msl%2Cwind_speed_10m%2Cwind_direction_10m%2Ctemperature_2m%2Cwind_gusts_10m%2Cprecipitation&wind_speed_unit=kn&timezone=UTC

API : ERA5 Archive – Open-Meteo | 2026-06-08T01:49:35.938Z | Lat 37.5 / Lon 4

03 – MACRO – Lion (LION)

proxy.php?endpoint=atmos&latitude=42.5&longitude=4.5&start_date=2026-06-01&end_date=2026-06-02&hourly=pressure_msl%2Cwind_speed_10m%2Cwind_direction_10m%2Ctemperature_2m%2Cwind_gusts_10m%2Cprecipitation&wind_speed_unit=kn&timezone=UTC

API : ERA5 Archive – Open-Meteo | 2026-06-08T01:49:37.950Z | Lat 42.5 / Lon 4.5

04 – MACRO – Tyrrhenian (TYRR)

proxy.php?endpoint=atmos&latitude=40&longitude=11&start_date=2026-06-01&end_date=2026-06-02&hourly=pressure_msl%2Cwind_speed_10m%2Cwind_direction_10m%2Ctemperature_2m%2Cwind_gusts_10m%2Cprecipitation&wind_speed_unit=kn&timezone=UTC

API : ERA5 Archive – Open-Meteo | 2026-06-08T01:49:38.892Z | Lat 40 / Lon 11

05 – MACRO – Ionian (IONI)

proxy.php?endpoint=atmos&latitude=36&longitude=17&start_date=2026-06-01&end_date=2026-06-02&hourly=pressure_msl%2Cwind_speed_10m%2Cwind_direction_10m%2Ctemperature_2m%2Cwind_gusts_10m%2Cprecipitation&wind_speed_unit=kn&timezone=UTC

API : ERA5 Archive – Open-Meteo | 2026-06-08T01:49:39.767Z | Lat 36 / Lon 17

06 – MACRO – Aegean (EGEE)

proxy.php?endpoint=atmos&latitude=37&longitude=25&start_date=2026-06-01&end_date=2026-06-02&hourly=pressure_msl%2Cwind_speed_10m%2Cwind_direction_10m%2Ctemperature_2m%2Cwind_gusts_10m%2Cprecipitation&wind_speed_unit=kn&timezone=UTC

API : ERA5 Archive – Open-Meteo | 2026-06-08T01:49:41.709Z | Lat 37 / Lon 25

07 – PORT ATMOS – Oran (ORAN)

proxy.php?endpoint=atmos&latitude=35.69&longitude=-0.63&start_date=2026-06-01&end_date=2026-06-02&hourly=pressure_msl%2Cwind_speed_10m%2Cwind_direction_10m%2Ctemperature_2m%2Cwind_gusts_10m%2Cprecipitation&wind_speed_unit=kn&timezone=UTC

API : ERA5 Archive – Open-Meteo | 2026-06-08T01:49:43.717Z | Lat 35.69 / Lon -0.63

08 – PORT MARINE OFFSHORE – Oran (ORAN)

proxy.php?endpoint=marine&latitude=35.85&longitude=-0.63&start_date=2026-06-01&end_date=2026-06-02&hourly=wave_height%2Cwave_period%2Cwave_direction%2Cswell_wave_height&timezone=UTC

API : ERA5 Marine – Open-Meteo | 2026-06-08T01:49:44.407Z | Lat 35.85 / Lon -0.63