REGIONAL ESTIMATES

APPLICATION

SOCIB Satellite imagery

Western Mediterranean Sea & sub-regions

Mélanie Juza

Last version: 13-Nov-2023

SOCIB Balearic Islands Coastal Observing and Forecasting System

MINISTERIO DE CIENCIA E INNOVACIÓN | CSIC | GOVERN ILLES BALEARS

Contents

How to cite?

Juza, M. (2021). Regional estimates in the application "SOCIB Satellite imagery: western Mediterranean Sea and sub-regions". Balearic Islands Coastal Observing and Forecasting System, SOCIB.

Juza, M., and Tintoré, J. (2021). SOCIB Satellite imagery: western Mediterranean Sea and sub-regions. [Web app]. Balearic Islands Coastal Observing and Forecasting System, SOCIB. https://apps.socib.es/satellite-imagery.

---

https://apps.socib.es/satellite-imagery

Balearic Islands Coastal Observing and Forecasting System (SOCIB)
c/ Isaac Newton, Edificio Naorte, Bloque A, 2a planta, puerta 3. ParcBit - 07121 Palma, Islas Baleares, Spain
Tel. +034 971 43 99 98

1. INTRODUCTION

The satellite observations provide essential information about the ocean surface circulation and its spatio-temporal variability for several decades. The multi-year products allow the characterization and quantification of regional oceanographic features. This document proposes a synthesis established through the analysis of the climatological satellite imagery in the following geographical areas (Figure 1): Alboran Sea - Algerian basin - Balearic Islands - North-western Mediterranean.

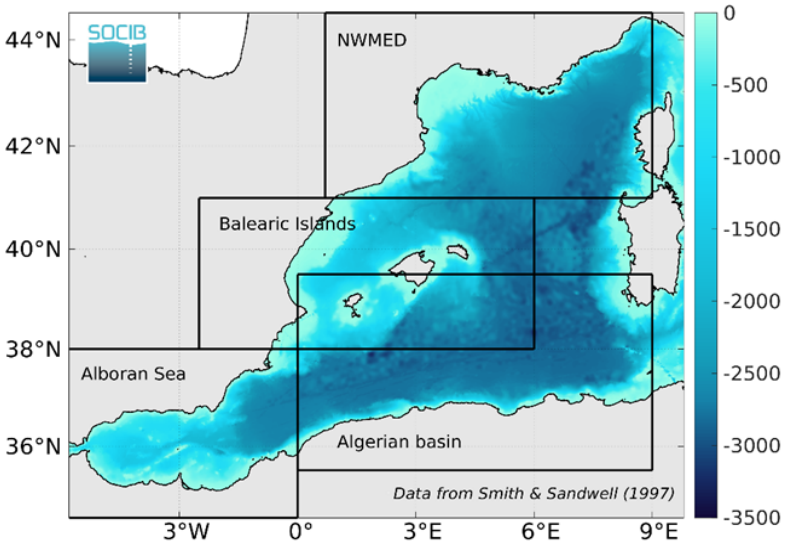

Figure 1: Bathymetry (in m) in the western Mediterranean and its sub-regions: Alboran Sea, Algerian sub-basin, Balearic Islands region and north-western Mediterranean (NWMED).

2. ALBORAN SEA

Acronyms

AJ	Atlantic Jet	**GV**	Geostrophic velocity
AO	Almeria-Oran	**TKE**	Total kinetic energy derived from GV
EAG	Eastern Anticyclonic Gyre	**WAG**	Western Anticyclonic Gyre

Regional estimates

Regional features	Geographical position	Mean velocity (GV)	Direction	Width (km)	Temporal variability	Additional characteristics
AJ	Strait of Gibraltar	0.4 m/s	Eastward	-	-	-
WAG	Centered at 35.7°N-4.4°W	0.64 m/s	Anti-cyclonic	110-130	Seasonal (max. summer)	Permanent (max TKE in July)

EAG	Centered at 35.7.°N-1.9°W	0.45 m/s	Anti-cyclonic	50-60	Seasonal (max. in fall)	Intermittent (summer-fall)
AO front	AO line centered at 36°N-1.7°W	0.35 m/s	South-eastward	-	Seasonal (max. in fall)	Max. TKE in fall
Up-welling	Spanish coast	-	-	-	Seasonal (Nov to Apr)	-

Suggested references

- Juza et al. (2016). Impacts of reprocessed altimetry on the surface circulation and variability of the Western Alboran Gyre. Adv. Space Res., 58(3), 277-288.
- Renault et al. (2012). Surface circulation in the Alboran Sea (western Mediterranean) inferred from remotely sensed data. J. Geophys. Res.: Oceans, 117(C8).
- Tintoré et al. (1988). A study of an intense density front in the eastern Alboran Sea: the Almeria–Oran front. J. Phys. Oceanogr., 18(10), 1384-1397.
- Viúdez et al. (1998). On the upper layer circulation in the Alboran Sea. J. Geophys. Res.: Oceans, 103(C10), 21653-21666.

3. ALGERIAN SUB-BASIN

Acronyms

AAE Algerian Anticyclonic Eddy
AC Algerian Current
GV Geostrophic velocity

Regional estimates

Regional features	Geographical position	Mean velocity (GV)	Direction	Width (km)	Temporal variability	Additional characteristics
AC	Along the North African coast	0.4 m/s	Eastward	30-50	Seasonal (max. in winter)	-
AAE	Algerian sub-basin	Intense	Ant-icyclonic	150	Interannual	Forming two Algerian gyres barotropic circulation

Suggested references

- Escudier et al. (2016). Subsurface circulation and mesoscale variability in the Algerian sub-basin from altimeter-derived eddy trajectories. J. Geophys. Res.: Oceans, 121(8), 6310-6322.

4. BALEARIC SEA

Acronyms

AE Anticyclonic Eddy
AWr Recent Atlantic Water
BC Balearic Current
CHL Chlorophyll-a concentration
IC Ibiza Channel
GV Geostrophic velocity
MC Mallorca Channel
NC Northern Current

Regional estimates

Regional features	Geographical position	Mean velocity Transport	Direction	Width (km)	Temporal variability	Additional characteristics
NC	Along the Spanish coast	GV: 0.2 m/s	South-ward	15-50	Seasonal (max. autumn)	-
BC	Along northern shelf of Balearic Islands	GV: 0.2 m/s	North-eastward	20-35	Seasonal (max. autumn)	-
IC transport *	IC	Northward: 0.25-0.7 Sv Southward: 0.25-0.95 Sv	South-ward	-	Seasonal (inflow max. late-summer) (outflow max. winter-spring)	Strong AW inflow (1Sv): sep-2016, sep/oct-2017 Strong outflow (>2Sv): mar-2014
MC transport	MC	-	North-ward	-	Seasonal (max. summer)	-
AE	North Mallorca	-	Anti-cyclonic	>100	Interannual	Events in 1998, 2008, 2010, 2018
Ebro river discharge	Ebro delta (Spain)	-	-	-	-	Signature in CHL (max. in winter)

** From the SOCIB glider endurance-line (Heslop et al., 2012; Juza and Tintoré, 2021)*

Suggested references

- Aguiar et al. (2019). Anticyclonic Eddy Anomaly: impact on the boundary current and circulation in the western Mediterranean Sea. J. Op. Oceanogr., 12, S1-S123.
- Barceló-Llull et al. (2019). Temporal and spatial hydrodynamic variability in the Mallorca channel (western Mediterranean Sea) from 8 years of underwater glider data. J. Geophys. Res.: Oceans, 124(4), 2769-2786.

- Heslop et al. (2012). Autonomous underwater gliders monitoring variability at "choke points" in our ocean system: A case study in the Western Mediterranean Sea. Geophys. Res. Lett., 39(20).
- Juza et al. (2013). Origin and pathways of Winter Intermediate Water in the Northwestern Mediterranean Sea using observations and numerical simulation. J. Geophys. Res.: Oceans, 118(12), 6621-6633.
- Juza et al. (2019). Characterization of changes in Western Intermediate Water properties enabled by an innovative geometry-based detection approach. J. Mar. Syst., 191, 1-12.
- Mason et al. (2013). Multiscale variability in the Balearic Sea: An altimetric perspective. J. Geophys. Res.: Oceans, 118(6), 3007-3025.
- Pinot et al. (1995). Multivariate analysis of the surface circulation in the Balearic Sea. Prog. Oceanogr., 36(4), 343-376.
- Pinot et al. (1999). The role of winter intermediate waters in the spring-summer circulation of the Balearic Sea: 1. Hydrography and inverse box modeling. J. Geophys. Res.: Oceans, 104(C12), 29843-29864.
- Vargas-Yáñez et al. (2020). Climatological Hydrographic Properties and Water Mass Transports in the Balearic Channels from Repeated Observations Over 1996–2019. Front. Mar. Sci.
- Vargas-Yáñez et al. (2021). Long-term changes in the water mass properties and sea level in the Balearic Channels over the period 1996-2019. Front. Mar. Sci., 8, 237.

5. NORTH-WESTERN MEDITERRANEAN

Acronyms

CHL Chlorophyll-a concentration
GV Geostrophic velocity
NC Northern Current
WCC Western Corsica Current

Regional estimates

Regional features	Geographical position	Mean velocity (GV)	Direction	Width (km)	Temporal variability	Additional characteristics
NC	Along the French & Catalan coasts	0.35 m/s	Westward South-westward	15-55	Seasonal intensity/width (max. in autumn) (min. in summer)	-
WCC	Along the western Corsica coast	0.2 m/s	Northward	-	Seasonal (max. in summer) (min. in autumn)	-

Convection	Gulf of Lion Ligurian Sea	-	-	-	Seasonal (max. in winter) Interannual (strong events)	Signature in CHL (max. in April) (centered at 42°N-5°E)
Rhone River discharge	Rhone deltas	-	-	-	Seasonal (max. in winter)	Signature in CHL (max. in winter)

Suggested references

- Houpert et al. (2016). Observations of open–ocean deep convection in the northwestern Mediterranean Sea: seasonal and interannual variability of mixing and deep water masses for the 2007–2013 Period. J. Geophys. Res. Oceans 121, 8139–8171.
- Margirier et al. (2020). Abrupt warming and salinification of intermediate waters interplays with decline of deep convection in the Northwestern Mediterranean Sea. Sci. Rep. 10, 1–11.
- Millot (1999). Circulation in the Western Mediterranean Sea. J. Mar. Sys., 20, 423-442.
- Millot and Taupier-Letage (2005). Circulation in the Mediterranean Sea. In the Mediterranean Sea, pp.29-66, Springer, Berlin Heidelberg.
- Testor et al. (2018). Multiscale observations of deep convection in the northwestern Mediterranean Sea during winter 2012–2013 using multiple platforms. J. Geophys. Res. Oceans 123, 1745–1776.

DATA CREDITS

The sub-regional indicators are generated using satellite products from E.U. Copernicus Marine Service.

We research the sea;
we share the future

SOCIB
Balearic Islands
Coastal Observing
and Forecasting System

MINISTERIO DE CIENCIA E INNOVACIÓN | CSIC | GOVERN ILLES BALEARS | ICTS

Isaac Newton St., Naorte Building,
Block A, Floor 2, Door 3. ParcBit | 07121 Palma
Balearic Islands, Spain | Tel. +034 971 43 99 98

socib.es @socib_icts ICTS SOCIB