Scientific articles

Final Version of 23/12/2021

Deliverable Number D.2.2.5

Project Acronym	CHANGE WE CARE
Project ID Number	10043385
Project Title	Climate cHallenges on coAstal and traNsitional chanGing arEas: WEaving a Cross-Adriatic REsponse
Priority Axis	2
Specific objective	2.1
Work Package Number	2
Work Package Title	Communication activities
Activity Number	2.2
Activity Title	Promotional and Dissemination material
Partner in Charge	CNR-ISMAR
Partners involved	ALL
Status	Final
Distribution	**Public**

Summary

Foreword

This document has been produced in the framework of the INTERREG Italy – Croatia CHANGE WE CARE Project. CHANGE WE CARE fosters concerted and coordinated climate adaptation actions at transboundary level, tested in specific and representative pilot sites, exploring climate risks faced by coastal and transitional areas contributing to a better understanding of the impact of climate variability and change on water regimes, salt intrusion, tourism, biodiversity and agro-ecosystems affecting the cooperation area. The main goal of the Project is to deliver integrated, ecosystem-based and shared planning options for different problems related to climate change (CC), together with adaptation measures for vulnerable areas, to decision makers and coastal communities. Additional information and updates on the CHANGE WE CARE can be found at https://www.italy-croatia.eu/web/changewecare.

Executive Summary

In the framework of CHANGE WE CARE project nine scientic articles and one book chapter have been published. In this document, the main reference citation along with the abstract abstract are reported for each articles. The publication of the articles were advertized within project web site and social media.

Scientific article n.1

Bonaldo D., Bucchignani E., Pomaro A., Ricchi A., Sclavo M., Carniel S., 2020. **Wind waves in the Adriatic Sea under a severe climate change scenario and implications for the coasts**. *International Journal of Climatology* 40: 5389–5406. https://doi.org/10.1002/joc.6524

Abstract : Wave climate projections at global scales are often of little direct use for local or regional coastal applications, where bathymetric gradients and coastal geometry dominate onshore wave propagation and transformation. In such systems, and even more in the case of semi-enclosed basins where coastal orography can play a major role in wind modulation, wave climate assessments require a specific effort, with particularly strict prescriptions in terms of model resolution and quality of the wind forcing. In this work, we provide a numerical modelling estimate of the expected variations of wave regime in the Adriatic Sea (a semi-enclosed basin of the Mediterranean Sea) under an IPCC RCP 8.5 climate change scenario at the end of the current century, focusing on the implications for energy modulation in the coastal regions. Results tend to confirm the evolution towards an overall decrease of wave storminess in the basin, as suggested by previous studies, but show that some regions might experience a local increase in the severity of the sea states impacting the coast. The model resolution and the unprecedented directional skills of the climatological wind forcings allow to ascribe this behaviour to a shift in the directional wind regime that can be related to a northward translation of the Mediterranean cyclones trajectory. Although in the absence of a quantitative assessment of the uncertainty associated with the choice of the climate model, our results give an account of the possible extent of the spatial variability of the response of coastal dynamics to mid-latitude storm tracks modification induced by climate change.

RESEARCH ARTICLE | Full Access

Wind waves in the Adriatic Sea under a severe climate change scenario and implications for the coasts

Davide Bonaldo ✉, Edoardo Bucchignani, Angela Pomaro, Antonio Ricchi, Mauro Sclavo, Sandro Carniel

First published: 18 February 2020 | **https://doi.org/10.1002/joc.6524** | Citations: 2

Funding information: Interreg Italy-Croatia Programme, Grant/Award Number: CHANGE WE CARE; Ministero dell'Istruzione, dell'Università e della Ricerca, Grant/Award Number: RITMARE - La Ricerca Italiana per il Mare; Ministry of Education, University and Research

Scientific article n.2

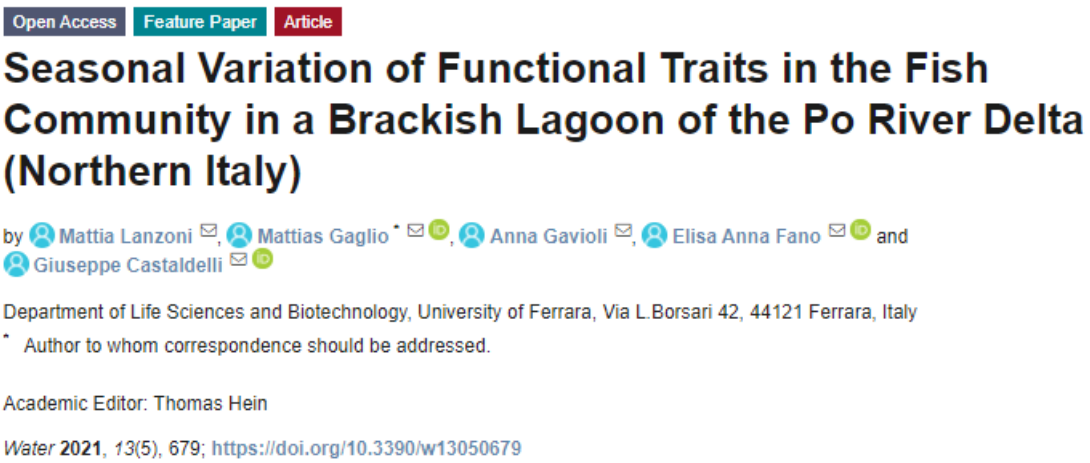
Denamiel C., Tojčić I., Vilibić I., 2020. **Far future climate (2060–2100) of the northern Adriatic air–sea heat transfers associated with extreme bora events**. *Climate Dynamics* 55: 3043–3066. https://doi.org/10.1007/s00382-020-05435-8

Abstract: The northernmost part of the Mediterranean Sea, the northern Adriatic shelf, is a complex area where the intensity of dense water formation and the consequent Adriatic-Ionian thermohaline circulation are shaped by a combination of extreme wintertime bora winds and substantial freshwater loads. To better understand the impact of global warming on extreme bora dynamics and the associated sea surface cooling, this study applies the Adriatic Sea and Coast (AdriSC) kilometer-scale modelling suite to the far future climate (2060–2100) period. Under both Representative Concentration Pathway (RCP) 4.5 and RCP 8.5 greenhouse emission scenarios, the AdriSC simulations are carried out via the combination of a statistical approach—consisting of an ensemble of 3-day simulations for 22 extreme bora events, and a pseudo-global warning (PGW) methodology—imposing a climatological change to the forcing used to produce the evaluation (present climate) runs. Despite a noteworthy decrease in intensity of the bora winds (by up to 3 m/s), the latent heat losses are simulated to increase (by up to 150 W/m2) due to the reduction in relative humidity in the northern Adriatic (by up to 3%). Consequently, the sea surface cooling associated with severe bora events and preconditioning the dense shelf water formation in the northern Adriatic is projected to not significantly change compared to present climate. Although these results need to be further confirmed, this study thus provides a new view on the future of processes driven by sea surface cooling, such as the dense shelf water formation or the Adriatic-Ionian thermohaline circulation, that were projected to decrease in the future climate by regional climate models an order of magnitude coarser than the AdriSC simulations.

Scientific article n.3

Lanzoni M., Gaglio M., Gavioli A., Fano E.A., Castaldelli G., 2021. **Seasonal variation of functional traits in the fish community in a brackish lagoon of the Po River Delta (Northern Italy).** *Water* 13, 679. https://doi.org/10.3390/w13050679

Abstract: Brackish lagoons are highly productive systems that support fishing and aquaculture activities with important revenue. At the same time, they function as fundamental habitats for the conservation of a number of species that use lagoons for reproduction and feeding. The presentstudy aims at describing the seasonal structural and functional variations of fish communities in the Fattibello lagoon, a small but important nursery ground of the Po River delta (northern Italy), historically exploited for fishing. The fish community was sampled monthly over a six-years' period (2009–2014). The results were normalized in catch per unit of effort (CPUE) and are expressed both as individual abundances (ind/CPUE) and biomass (g/CPUE). Higher biodiversity levels were observed in autumn, when both lagoon residents and marine species coexist, and summer, for individual abundances and biomass. Biomass was a better descriptor than individual abundance of the functional use of the lagoon. In autumn, the lagoon resident species increased significantly, while marine feeding ground species decreased. Vice versa, lagoon residents decreased in winter, when the lagoon were mainly used as feeding ground by marine fishes. Marine migrating species were present throughout the whole year. Overall, the lagoon serves as (i) reproduction habitats for different species, as well as habitat for the pre-reproductive period for the European anchovy; (ii) nursery grounds for a number of commercial species; and (iii) habitats for lagoon resident species, supporting them for the whole life cycle. Overall, the results highlight the fundamental conservation role of the lagoon throughout the whole year, and that seasonal structural and functional patterns of fish communities should be carefully considered when seeking to harmonize direct uses, such as fishing and bivalve farming, as well as nature conservation.



Open Access Feature Paper Article

Seasonal Variation of Functional Traits in the Fish Community in a Brackish Lagoon of the Po River Delta (Northern Italy)

by Mattia Lanzoni, Mattias Gaglio *, Anna Gavioli, Elisa Anna Fano and Giuseppe Castaldelli

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Academic Editor: Thomas Hein

Water **2021**, *13*(5), 679; https://doi.org/10.3390/w13050679

Scientific article n.4

Bezzi A., Casagrande G., Fracaros S., Martinucci D., Pillon S., Sponza S., Bratus A., Fattor F., Fontolan G., 2021. **Geomorphological Changes of a Migrating Sandbank: Multidecadal Analysis as a Tool for Managing Conflicts in Coastal Use**. *Water* 13, 3416. https://doi.org/10.3390/w13233416

Abstract: While beach erosion and sand loss are typically of great concern to the tourism industry, managing rapid morphological changes linked to large amounts of moving sediments is the challenge facing Grado, an important seaside resort in the northern Adriatic, Italy. The cause of the unusual management conflict is the presence of the Mula di Muggia Bank, a nearshore depositional system made up of relict and active migrating sandbanks extending up to 2 km seawards from the touristic beachfront. A reconstruction of the morpho-sedimentary evolution of the coastal system over a 200-year period was done using a large dataset which includes historical cartography, topographic maps, aerial photos and topo-bathymetric surveys. The results show the growth of a significant urban development aimed at creating a tourist destination by occupying the waterfront along fetchlimited coastal tracts with very shallow water and scarce hydrodynamics. Furthermore, a number of sandy dynamic landforms (longshore migrating bars, a bypass corridor, an ebb-tidal delta) and accumulation zones attest to a sediment excess which can be mostly attributed to the eastern river supplies. The progressive constant migration rate of 12.6 my□1 allowed the bank to induce the expansion of the low-energy silty backbarrier environment, characterised by abundant seagrass meadows a short distance directly in front of the tourist beaches of Grado. As a result of historical analysis and more current observations, areas with diverse morphosedimentary features and with varying tourist/recreational, ecological, and conservation values have been identified. These can be considered as basic units for future accurate planning and re-evaluation of coastal management choices to balance environmental protection and tourist use. A soft coastal defence approach is proposed which includes either the preservation of specific environments or the proper use of excess sand for beach nourishment via periodic dredging or sediment bypassing.

Open Access Feature Paper Article

Geomorphological Changes of a Migrating Sandbank: Multidecadal Analysis as a Tool for Managing Conflicts in Coastal Use

by Annelore Bezzi [1,*], Giulia Casagrande [1], Saverio Fracaros [1], Davide Martinucci [1], Simone Pillon [1], Stefano Sponza [1], Antonio Bratus [2], Fabrizio Fattor [2] and Giorgio Fontolan [1,3,*]

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Academic Editor: Miguel Ortega-Sánchez

Water **2021**, *13*(23), 3416; https://doi.org/10.3390/w13233416

Scientific article n.5

Pranić, P., Denamiel, C., Vilibić, I., 2021. **Performance of the Adriatic Sea and Coast (AdriSC) climate component - A COAWST V3.3-based one-way coupled atmosphere-ocean modelling suite: Ocean results.** Geoscientific Model Development, 14(10), 5927–5955. https://doi.org/10.5194/gmd-14-5927-2021

Abstract: In this study, the Adriatic Sea and Coast (AdriSC) kilometre-scale atmosphere-ocean climate model covering the Adriatic Sea and northern Ionian Sea is presented. The AdriSC ocean results of a 31-year-long (i.e. 1987-2017) climate simulation, derived with the Regional Ocean Modeling System (ROMS) 3 km and 1 km models, are evaluated with respect to a comprehensive collection of remote sensing and in situ observational data. In general, it is found that the AdriSC model is capable of reproducing the observed sea surface properties, daily temperatures and salinities, and the hourly ocean currents with good accuracy. In particular, the AdriSC ROMS 3 km model demonstrates skill in reproducing the main variabilities of the sea surface height and the sea surface temperature, despite a persistent negative bias within the Adriatic Sea. Furthermore, the AdriSC ROMS 1 km model is found to be more capable of reproducing the observed thermohaline and dynamical properties than the AdriSC ROMS 3 km model. For the temperature and salinity, better results are obtained in the deeper parts than in the shallow shelf and coastal parts, particularly for the surface layer of the Adriatic Sea. The AdriSC ROMS 1 km model is also found to perform well in reproducing the seasonal thermohaline properties of the water masses over the entire Adriatic-Ionian domain. The evaluation of the modelled ocean currents revealed better results at locations along the eastern coast and especially the northeastern shelf than in the middle eastern coastal area and the deepest part of the Adriatic Sea. Finally, the AdriSC climate component is found to be a more suitable modelling framework to study the dense water formation and long-term thermohaline circulation of the Adriatic-Ionian basin than the available Mediterranean regional climate models.

Geosci. Model Dev., 14, 5927–5955, 2021
https://doi.org/10.5194/gmd-14-5927-2021

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Model evaluation paper

30 Sep 2021

Performance of the Adriatic Sea and Coast (AdriSC) climate component – a COAWST V3.3-based one-way coupled atmosphere–ocean modelling suite: ocean results

Petra Pranić[1], Cléa Denamiel[1,2], and Ivica Vilibić[1,2]
[1]Physical Oceanography Laboratory, Institute of Oceanography and Fisheries, Šetalište I. Meštrovića 63, 21000 Split, Croatia
[2]Division for Marine and Environmental Research, Ruđer Bošković Institute, Bijenička cesta 54, 10000 Zagreb, Croatia

Correspondence: Petra Pranić (pranic@izor.hr)

Scientific article n.6

Denamiel, C., Pranić, P., Ivanković, D., Tojčić, I., Vilibić, I., 2021. **Performance of the Adriatic Sea and Coast (AdriSC) climate component - a COAWST V3.3-based coupled atmosphere-ocean modelling suite: atmospheric dataset.** Geoscientific Model Development, 14(6), 3995–4017. https://doi.org/10.5194/gmd-14-3995-2021

Abstract: In this evaluation study, the coupled atmosphere-ocean Adriatic Sea and Coast (AdriSC) climate model, which was implemented to carry out 31-year evaluation and climate projection simulations in the Adriatic and northern Ionian seas, is briefly presented. The kilometre-scale AdriSC atmospheric results, derived with the Weather Research and Forecasting (WRF) 3gkm model for the 1987-2017 period, are then thoroughly compared to a comprehensive publicly and freely available observational dataset. The evaluation shows that overall, except for the summer surface temperatures, which are systematically underestimated, the AdriSC WRF 3gkm model has a far better capacity to reproduce surface climate variables (and particularly the rain) than the WRF regional climate models at 0.11° resolution. In addition, several spurious data have been found in both gridded products and in situ measurements, which thus should be used with care in the Adriatic region for climate studies at local and regional scales. Long-term simulations with the AdriSC climate model, which couples the WRF 3gkm model with a 1gkm ocean model, might thus be a new avenue to substantially improve the reproduction, at the climate scale, of the Adriatic Sea dynamics driving the Eastern Mediterranean thermohaline circulation. As such it may also provide new standards for climate studies of orographically developed coastal regions in general.

Geosci. Model Dev., 14, 3995–4017, 2021
https://doi.org/10.5194/gmd-14-3995-2021

Geoscientific Model Development
Open Access
EGU

Performance of the Adriatic Sea and Coast (AdriSC) climate component – a COAWST V3.3-based coupled atmosphere–ocean modelling suite: atmospheric dataset

Cléa Denamiel[1,2], Petra Pranić[1], Damir Ivanković[1], Iva Tojčić[1], and Ivica Vilibić[1]

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Received: 6 January 2021 – Discussion started: 23 March 2021
Revised: 19 May 2021 – Accepted: 27 May 2021 – Published: 29 June 2021

Scientific article n.7

Tojčić, I., Denamiel, C., and Vilibić, I., 2021. **Performance of the Adriatic early warning system during the multi-meteotsunami event of 11–19 May 2020: an assessment using energy banners**, Nat. Hazards Earth Syst. Sci., 21, 2427–2446. https://doi.org/10.5194/nhess-21-2427-2021

Abstract: This study quantifies the performance of the Croatian meteotsunami early warning system (CMeEWS) composed of a network of air pressure and sea level observations, a high-resolution atmosphere–ocean modelling suite, and a stochastic surrogate model. The CMeEWS, which is not operational due to a lack of numerical resources, is used retroactively to reproduce the multiple events observed in the eastern Adriatic between 11 and 19 May 2020. The performances of the CMeEWS deterministic models are then assessed with an innovative method using energy banners based on temporal and spatial spectral analysis of the high-pass-filtered air pressure and sea level fields. It is found that deterministic simulations largely fail to forecast these extreme events at endangered locations along the Croatian coast, mostly due to a systematic northwestward shift of the atmospheric disturbances. Additionally, the use of combined ocean and atmospheric model results, instead of atmospheric model results only, is not found to improve the selection of the transects used to extract the atmospheric parameters feeding the stochastic meteotsunami surrogate model. Finally, in operational mode, the stochastic surrogate model would have triggered the warnings for most of the observed events but also set off some false alarms. Due to the uncertainties associated with operational modelling of meteotsunamigenic disturbances, the stochastic approach has thus proven to overcome the failures of the deterministic forecasts and should be further developed.Abstract: Climate change, with its effects, is deeply threatening marine and coastal systems, endangering the correct functioning of their processes and in consequence negatively affecting citizens and communities residing the coastal territories. Their protection can be carried out and consolidated through Marine Protected Areas (MPAs), identified since a long time as an efficient instrument, if appropriately managed, to safeguard the health of ecosystems. The correct implementation of protection measures requires dedicated planning and must answer to a plurality of needs, achieve purposes in a short and long time perspective and involve actively the local communities and the stakeholders. This publication aims to identify constraints and strategies for a sound management of MPAs, with particular focus to coastal areas, in order to develop appropriate adaptation and mitigation measures in contrast to climate change effects.


Nat. Hazards Earth Syst. Sci., 21, 2427–2446, 2021
https://doi.org/10.5194/nhess-21-2427-2021

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Research article

18 Aug 2021

Performance of the Adriatic early warning system during the multi-meteotsunami event of 11–19 May 2020: an assessment using energy banners

Iva Tojčić[1], Cléa Denamiel[1,2], and Ivica Vilibić[1,2]
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Scientific article n.8

Zemunik, P., Šepić, J., Pellikka, H., Ćatipović, L., and Vilibić, I., 2021. **Minute Sea-Level Analysis (MISELA): a high-frequency sea-level analysis global dataset**. Earth Syst. Sci. Data, 13, 4121–4132 https://doi.org/10.5194/essd-13-4121-2021

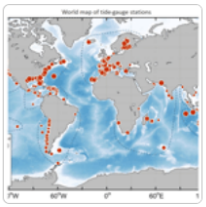
Abstract: Sea-level observations provide information on a variety of processes occurring over different temporal and spatial scales that may contribute to coastal flooding and hazards. However, global research on sea-level extremes is restricted to hourly datasets, which prevent the quantification and analyses of processes occurring at timescales between a few minutes and a few hours. These shorter-period processes, like seiches, meteotsunamis, infragravity and coastal waves, may even dominate in low tidal basins. Therefore, a new global 1 min sea-level dataset – MISELA (Minute Sea-Level Analysis) – has been developed, encompassing quality-checked records of nonseismic sea-level oscillations at tsunami timescales (T<2 h) obtained from 331 tide-gauge sites (https://doi.org/10.14284/456, Zemunik et al., 2021b). This paper describes data quality control procedures applied to the MISELA dataset, world and regional coverage of tide-gauge sites, and lengths of time series. The dataset is appropriate for global, regional or local research of atmospherically induced high-frequency sea-level oscillations, which should be included in the overall sea-level extremes assessments.

Earth Syst. Sci. Data, 13, 4121–4132, 2021
https://doi.org/10.5194/essd-13-4121-2021

Data description paper

24 Aug 2021

Minute Sea-Level Analysis (MISELA): a high-frequency sea-level analysis global dataset



Petra Zemunik[1], Jadranka Šepić[2], Havu Pellikka[3], Leon Ćatipović[2], and Ivica Vilibić[1,4]
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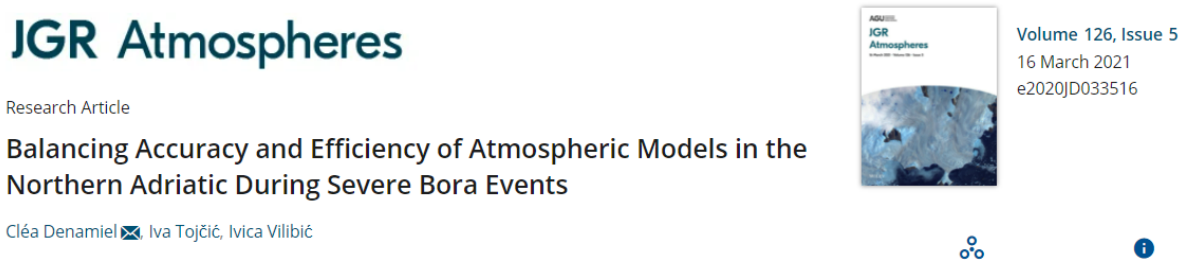
Correspondence: Petra Zemunik (zemunik@izor.hr)

Scientific article n.9

Denamiel, C., Tojčić, I., Vilibić, I., 2021. **Balancing Accuracy and Efficiency of Atmospheric Models in the Northern Adriatic During Severe Bora Events**. IGR Atmospheres, 126, 5, e2020JD03351. https://doi.org/10.1029/2020JD033516

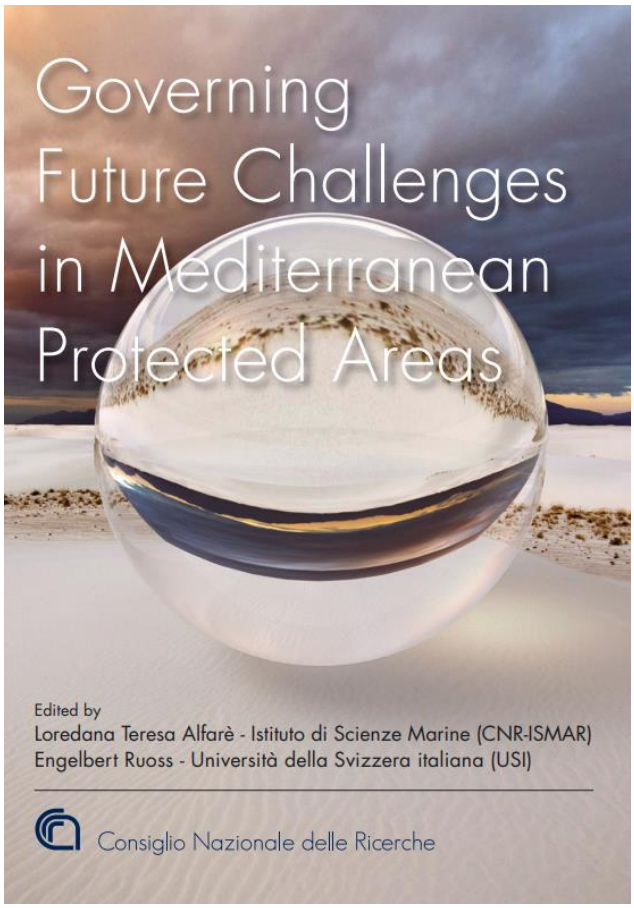
Abstract: In process-oriented studies, accurate representation of severe bora rotor dynamics in the northern Adriatic is known to require the use of model resolutions of the order of 100 m. In regional climate studies, computation time and numerical cost are, however, minimized with resolutions of the order of 10 km. The latter is not accurate enough to drive the coastal dense water formation and the long-term Adriatic-Ionian thermohaline circulation resulting from these events. This work leverages the capacity of kilometer-scale atmospheric models to balance accuracy and efficiency in coupled atmosphere-ocean climate studies in the Adriatic Sea. The sensitivity of severe bora dynamics and air-sea interactions to atmospheric model resolution is thus tested within the Adriatic Sea and Coast (AdriSC) modeling suite as well as with the best available reanalysis. The Weather Research and Forecasting (WRF) model at 15-km, 3-km, and 1.5-km resolution, and ERA5 at 30-km resolution, are compared for an ensemble of 22 severe bora storms spanning between 1991 and 2019. It is found that (1) ERA5 reanalysis and WRF 15-km model highly diverge (up to 43% for the wind speed) from WRF 3-km results while (2) WRF 3-km conditions converge toward the WRF 1.5-km solution for both basic bora dynamics (differences below 6% for the wind speed) and air-sea interactions (differences 5 times smaller than with WRF 15-km results). Consequently, kilometer-scale atmospheric models should be used to reproduce properly the dense water formation during severe bora events and the long-term thermohaline circulation of the Adriatic-Ionian basin.



Book chapter

Vitelletti M.L., Bonaldo D., 2020. **Response to climate change in coastal and marine protected areas: threats and opportunities**". In: *Governing Future Challenges in the Mediterranean Protected Areas*. Loredana Teresa Alfarè, Engelbert Ruoss (Eds), Cnr Edizioni. ISBN digital version 978 88 8080 402 4. DOI 10.26383/978-88-8080-402-4.

Abstract: Climate change, with its effects, is deeply threatening marine and coastal systems, endangering the correct functioning of their processes and in consequence negatively affecting citizens and communities residing the coastal territories. Their protection can be carried out and consolidated through Marine Protected Areas (MPAs), identified since a long time as an efficient instrument, if appropriately managed, to safeguard the health of ecosystems. The correct implementation of protection measures requires dedicated planning and must answer to a plurality of needs, achieve purposes in a short and long time perspective and involve actively the local communities and the stakeholders. This publication aims to identify constraints and strategies for a sound management of MPAs, with particular focus to coastal areas, in order to develop appropriate adaptation and mitigation measures in contrast to climate change effects.



Articles metrics

In the following conclusive table the metrics regarding the papers were reported according to the most used bibliographic scientific database (updated at 23/12/2021).

Scienfic Article	Title, Journal, doi	Web Of Science	Scopus	Research Gate		Journal metrics	
		Article citations	*Article citations*	*Article reads*	*Article citations*	*Cumulative views and downloads*	*Cross ref*
1.Bonaldo et al. 2020	Wind waves in the Adriatic Sea under a severe climate change scenario and implications for the coasts. International Journal of Climatolology 40: 5389–5406. https://doi.org/10.1002/joc.6524	3	3	144	5	-	2
2.Denamiel et al. 2020	Far future climate (2060–2100) of the northern Adriatic air–sea heat transfers associated with extreme bora events. Climate Dynamics 55: 3043–3066. https://doi.org/10.1007/s00382-020-05435-8	4	5	184	8	383	6
3.Lanzoni et al., 2021	Seasonal variation of functional traits in the fish community in a brackish lagoon of the Po River Delta (Northern Italy). Water 13, 679. https://doi.org/10.3390/w13050679	0	1	73	1	547	1
4.Bezzi et al., 2021	Geomorphological Changes of a Migrating Sandbank: Multidecadal Analysis as a Tool for Managing Conflicts in Coastal Use. Water 13, 3416. https://doi.org/10.3390/w13233416	0	1	110	1	328	1
5.Pranić et al., 2021	Performance of the Adriatic Sea and Coast (AdriSC) climate component - A COAWST V3.3-based one-way coupled atmosphere-ocean modelling suite: Ocean results. Geoscientific Model Development, 14(10), 5927–5955. https://doi.org/10.5194/gmd-14-5927-2021	0	0	61	3	1200	2
6.Denamiel et al., 2021	Performance of the Adriatic Sea and Coast (AdriSC) climate component - a COAWST V3.3-based coupled atmosphere-ocean modelling suite: atmospheric dataset. Geoscientific Model Development, 14(6), 3995–4017. https://doi.org/10.5194/gmd-14-3995-2021	1	1	86	3	1368	3
7.Tojčić et al., 2021	Performance of the Adriatic early warning system during the multi-meteotsunami event of 11–19 May 2020: an assessment using energy banners, Nat. Hazards Earth Syst. Sci., 21, 2427–2446. https://doi.org/10.5194/nhess-21-2427-2021	0	1	78	2	1059	4
8. Zemunik etal., 2021	Minute Sea-Level Analysis (MISELA): a high-frequency sea-level analysis global	0	0	74	1	1235	1

	dataset. Earth Syst. Sci. Data, 13, 4121–4132 https://doi.org/10.5194/essd-13-4121-2021						
9. Denamiel et al., 2021	Balancing Accuracy and Efficiency of Atmospheric Models in the Northern Adriatic During Severe Bora Events. IGR Atmospheres, 126, 5, e2020JD03351. https://doi.org/10.1029/2020JD033516	1	3	71	6	-	3
10.Vitelletti and Bonaldo, 2020	Response to climate change in coastal and marine protected areas: threats and opportunities". In: Governing Future Challenges in the Mediterranean Protected Areas. Loredana Teresa Alfarè, Engelbert Ruoss (Eds), Cnr Edizioni. ISBN digital version 978 88 8080 402 4. DOI 10.26383/978-88-8080-402-4.	-	-	345	1	-	-

As a whole, the papers were cumulatively read by 7346 people and obtained 31 citations.