ISSN: 0001-5113 AADRAY	ACTA ADRIAT., 47 (Suppl.): 133 - 148, 2006	UDC: 551.46.081(262.3) 551.58 551.501(497.5 Split) (262.3)

Automatic meteo-ocean station (AMOS): real-time data acquisition, validation, archiving and numerical modeling

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In the framework of the Croatian national oceanographic monitoring program an automatic meteo-ocean measuring system has been under development. It is expected to be an important improvement for monitoring and analyses of various physical processes in the Adriatic Sea. As a first phase in the development of the system, an automatic station (AMOS) was placed at Marjan Cape, Split. It enables acquisition, validation and archiving of data for eleven meteorological and oceanographic parameters in real time, as well as calculation of some derived parameters and their dissemination in graphic format over the Internet (http://www.izor.hr/eng/online). Most of the measured data have been compared with data obtained from the permanent meteorological station located at the top of Marjan hill, which is three kilometres away. Also, data from the AMOS station have been used by two high-resolution numerical models with the aim of achieving time-dependent spatial fields of oceanographic parameters in Kaštela Bay. The AMOS station was a part of the Integrated coastal zone management system in the Adriatic Sea (ADRICOSM) project, where its data were very useful for various analyses in the Pelješac-Vis-Drvenik area. Data analyses and numerical models results will be used for further improvements in the automatic monitoring system.

Key words: observing system, data acquisition, validation, numerical modeling

INTRODUCTION

Classical oceanographic measurements by ships are very complex and expensive for a variety of reasons; e.g. measurements are possible only during calm weather. These disadvantages can be avoided with the development of a fully automatic measuring system with buoys located in the most representative locations in the study area. One of the main objectives of such a kind of system is periodical oceanographic monitoring in previously defined time intervals, transmitting data to a data centre, validation, archiving and publishing on web pages.

In the period 1987-1989 an automatic meteo-ocean buoy system was developed in the Institute of Oceanography and Fisheries (IOF) (DADIĆ *et al.*, 1990), but unfortunately due to financial difficulties and the war situation in Croatia this project was stopped in 1990.

Based on previous experience in the construction of an oceanographic measuring system, at the beginning of 1998 within the framework of the Croatian national monitoring program of the Adriatic Sea (Jadran), an automatic meteo-ocean system using new technology has been under development. It includes the development of a new automatic meteo-ocean system with several buoys deployed in specific locations over all of the Adriatic Sea (DADIĆ, 1998). According to plan, three buoys will be deployed in the coastal regions of the Adriatic Sea until the end of 2006.

As a pilot phase, an automatic meteo-ocean station AMOS, based on "Aanderaa Instruments" sensors, was developed and installed at the entrance to Kaštela Bay on the Cape of Marjan Peninsula at the beginning of 1999 (Fig. 1). Validation and analysis of data obtained by the AMOS station in the period 1999-2001 shows its very promising capability in supporting oceanographic research activities. Therefore, the AMOS station was included in the project Integrated coastal zone management system in the Adriatic Sea (ADRICOSM)[1].

The aim of the paper is to present the automatic measuring system and to propose improvements of the existing system on the basis of the data analyses and numerical models simulations.

STRUCTURE OF AMOS SYSTEM AND ITS FUNCTIONING

The AMOS station was located on the main berth in the port of the Institute of Oceanography and Fisheries (IOF). It consists of three main parts (DADIĆ & IVANKOVIĆ, 1999):

- Instruments for measuring meteorological and oceanographic parameters,
- Processing unit for data acquisition, their decoding and archiving, and
- Interface for connecting the processing unit to a local computer network in the receiving centre located in the Institute.

The installed instruments were envisaged to allow measurement of 11 meteorological and oceanographic parameters close to the sea surface level. Sea sensors are located at 0.5 m depth, the air pressure sensor is located at 2 m height and all other sensors are located at 10 m height above the sea. The processing unit of the AMOS station measures 8 meteorological

Fig. 1. Location of AMOS and Split-Marjan stations

[1] The contents of this paper were developed under financial support from the Instituto Nationale di Geofisica e Vulcanologia, Italy and funded under the Italian Ministry for the Environment and Territory contract ADRICOSM, and the Croatian national monitoring program JADRAN funded by the Croatian Ministry for Science, Education and Sports.

Table 1. Measured parameters with sensors resolution and accuracy, calculated parameters at the AMOS station and reconstructed fields in Kaštela Bay using numerical models

A	***Measured parameters***		
A_1	***Meteorological parameters***	***Resolution***	***Accuracy***
1.	*Wind velocity*	*$0.2\ ms^{-1}$*	*± 2%FS*
2.	*Wind direction*	*1^o*	*± 2.5^o*
3.	*Air pressure*	*0.2hP*	*2 hP*
4.	*Air temperature*	*0.091^oC*	*± 0.1FS*
5.	*Relative air humidity*	*0.1%*	*± 3%*
6.	*Solar radiation*	*$0.4Wm^{-2}$*	*$\pm 20Wm^{-2}$*
7.	*Net radiation*	*$0.4Wm^{-2}$*	*$\pm 20\ Wm^{-2}$*
8.	*Precipitation*	*0.02mm*	*±0.02 mm*
A_2	***Oceanographic parameters***	***Resolution***	***Accuracy***
1.	*Water temperature*	*$0.05\,^oC$*	*± 0.1%*
2.	*Water salinity*	*0.04ppt*	*± 0.2ppt*
3.	*Sea level*	*0.02mm*	*± 0.2 FS*

B	***Calculated parameters***
1.	**Net heat budget**
2.	*Evaporation*
3.	*Cloudiness*
C	***Reconstructed fields in Kaštela Bay***
1.	**Currents**
2.	*Temperature (& profiles)*
3.	*Salinity (& profiles)*
4.	*Faecal coliforms*
D	***Web CAM for calculation of wave height, wave direction and visibility***

(Table 1A_1) and three oceanographic parameters (Table 1A_2). Based on the measured parameters some additional parameters as net heat budget, evaporation and cloudiness have been calculated (Table 1B). In addition, the spatial fields of some oceanographic parameters have been reconstructed in Kaštela Bay using two different numerical models (Table 1C).

As a part of the AMOS station a web camera was mounted with the main objective of developing an algorithm for the calculation of wave height and direction, as well as visibility, from the AMOS imagery. In the next few months some additional parameters (oxygen, turbidity, sea currents and waves) will be added to the AMOS station.

The processing unit is a compact electronic device, which serves for scanning and reading data from all measuring sensors. It contains an analogue to digital converter and a digital control system based on a built in microprocessor. All measured data are recorded in the storage memory of the processing unit, which may be of significance in case of damage on instruments for the transmission of data from the measuring instruments to the receiving centre. The computer in the receiving centre directly controls the measuring intervals of the AMOS station, which can be changed to a wide range of intervals. Commonly, the time interval is set to 10 minutes as standard.

The receiving centre, with a personal computer (PC) operating under the Windows system, is located in the IOF. The computer is connected to the processing unit of the AMOS station by an RS232 cable (Fig. 2), and to the database server via local area network (LAN).

As the AMOS station is connected to the database server through the local area network (LAN), measured data have been stored in the Marine Environmental Database of the Adriatic Sea (MEDAS). The MEDAS database was designed as a relational database using the ORACLE-9i relational database management system (DADIĆ *et al.*, 1995; IVANKOVIĆ *et al.*, 2000). It consists of one reference database and more thematic databases, which include basic geographic data (coastline and bathymetry), and thematic data related to meteorology, physical and chemical oceanography, biology, fisheries, aquaculture and pollutants. Using MEDAS database capability, all relevant data from the

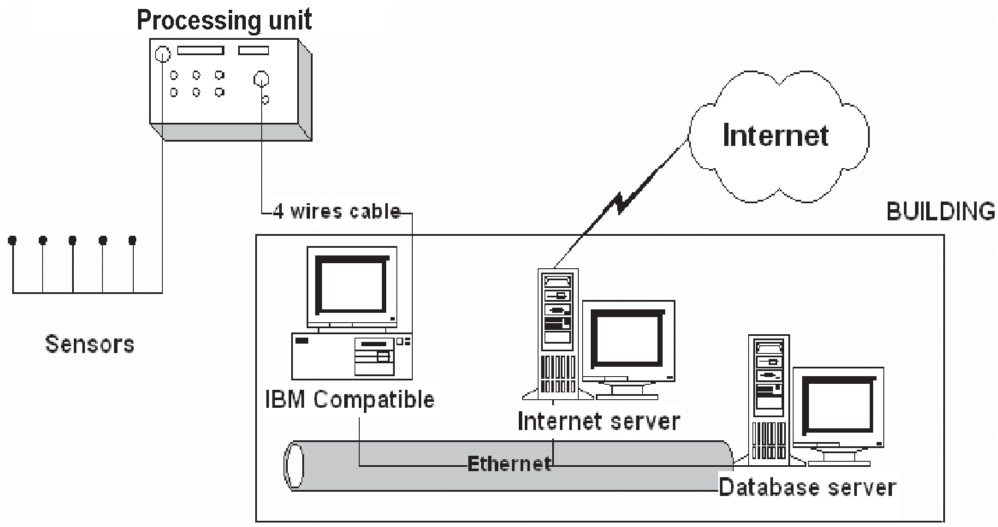


Fig. 2. Block scheme of hardware equipment

AMOS measuring station (real time measured data, historical data, and aggregated data) can be presented in graphical form using GIS software such as ArcView, ACAD-Map, Map-Info, etc. and by Java tools through web pages of the Internet.

Data measured by the AMOS station are automatically stored in an additionally developed thematic segment of the MEDAS database, called “ON-LINE BASE”. This segment provides all kinds of statistics output (row data, graphs and maps) including quality control procedures for data gathered from the AMOS station. The database has an Internet interface (Application server), which enables various operations on real time data sets to be performed thought a web interface (browser).

The programs “Weather” and “Graphs” were developed under Microsoft high level language Visual C++ 6.0 for managing the connection from PC to Processing Unit and providing presentation of gathered information on the Internet.

Basically, the system works by the following steps:

- The program “Weather” switches on AMOS every 10 minutes, downloads measured data from the corresponding sensors, then automatically passes the first step of data quality control (QC1) and stores them in the MEDAS database. Also, it calculates some additional parameters and produces figures with actual data on the web.
- Every three hours “Weather” starts the program “Graph”, which sends 24-hour graphic presentations to the Internet server using ORACLE graphic builder.
- Once a day at midnight “Weather” starts the program “Graph” for the calculation of monthly and yearly statistical views, and generates HTML forms of corresponding graphs using ORACLE graphic builder.
- Once a day two different numerical models (Z and Sigma coordinates) are automatically run for 24 hours and at the end of the simulation generate files with the results. The files are transmitted to the web pages that contain graphs with reconstructed fields at standard oceanographic levels and profiles of currents, temperature, salinity and faecal coliforms at selected points in Kaštela Bay.

Data validation

Data processing consists of two steps for validation (QC1 and QC2) and data presentation on web pages (MANZELLA, 2003). The QC1 procedure is done automatically by software based on predefined criteria taking into account maxima and minima values depending on seasons and data trends in the predefined time intervals. If a QC1 criterion is not achieved, the data will not be presented on the web pages and an e-message with a warning will be automatically sent to the responsible person.

The QC2 procedure serves as a final check of the data related to all measured parameters and was designed by data type experts. This checking procedure is done semi-automatically by experts with mandatory use of data visualization. Based on this validation all measured data have been assigned with a validation flag according to IOC (1993) and MEDAR/MEDATLAS-II (2001) procedures and archived in the MEDAS database.

Output data and their presentation via Internet

Using the above mentioned software tools both measured and aggregated data of various parameters versus time are presented on the Internet through web pages at http://www.izor.hr/eng/online.

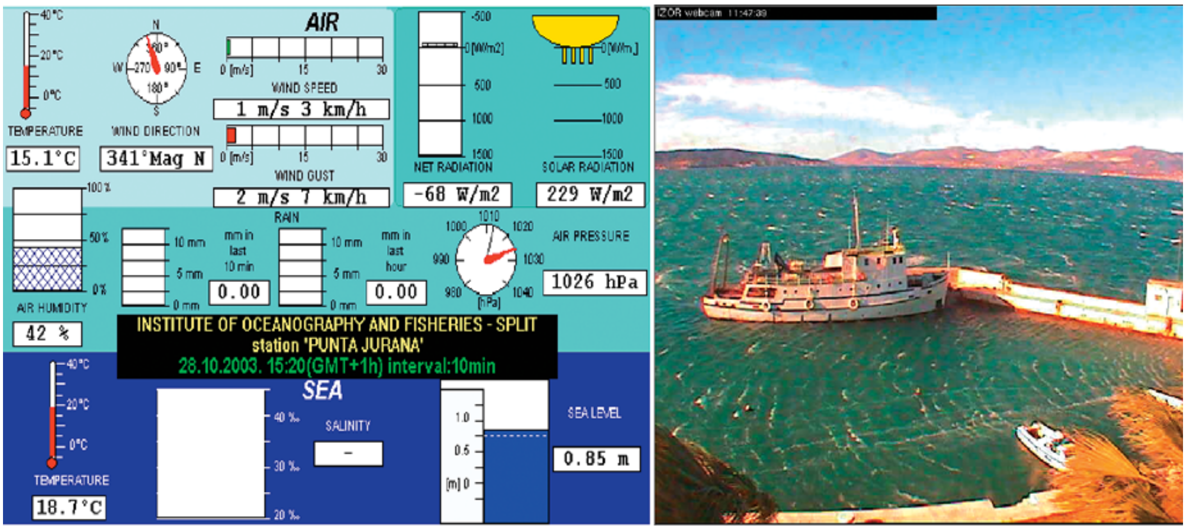
Common data outputs presented on IOF web pages include:

- Actual data - every 10 minutes a picture containing actual data is refreshed;
- Graph with recent data - refreshed every three hours for 24 recent hours;
- Daily statistics – generated every day at midnight for measured and calculated parameters;
- Monthly statistics – bar views at the end of the month;
- Yearly statistics – bar views at the end of the year;
- Daily maps with spatial fields of currents, temperature, salinity and faecal coliforms at standard oceanographic levels (0, 10, 20 and 30 meters) obtained by Z and Sigma numerical models.

Some typical outputs of measured and calculated parameters are presented in Figs. 3 to 5.

COMPARISON BETWEEN AMOS AND SPLIT – MARJAN STATION

As the AMOS station is located on the Cape of Marjan peninsula it is sheltered from winds blowing from northeast to southeast (45° to 135°) and velocities from these directions have been underestimated (DADIĆ *et al.,* 2001). Therefore, an extensive comparison of the meteorological data measured by the AMOS station and data from the meteorological station at



a b

Fig. 3. Real time data (a) and picture gathered from AMOS station (b) used for developing algorithms for calculations wave height and direction, as well as visibility based on pattern recognition

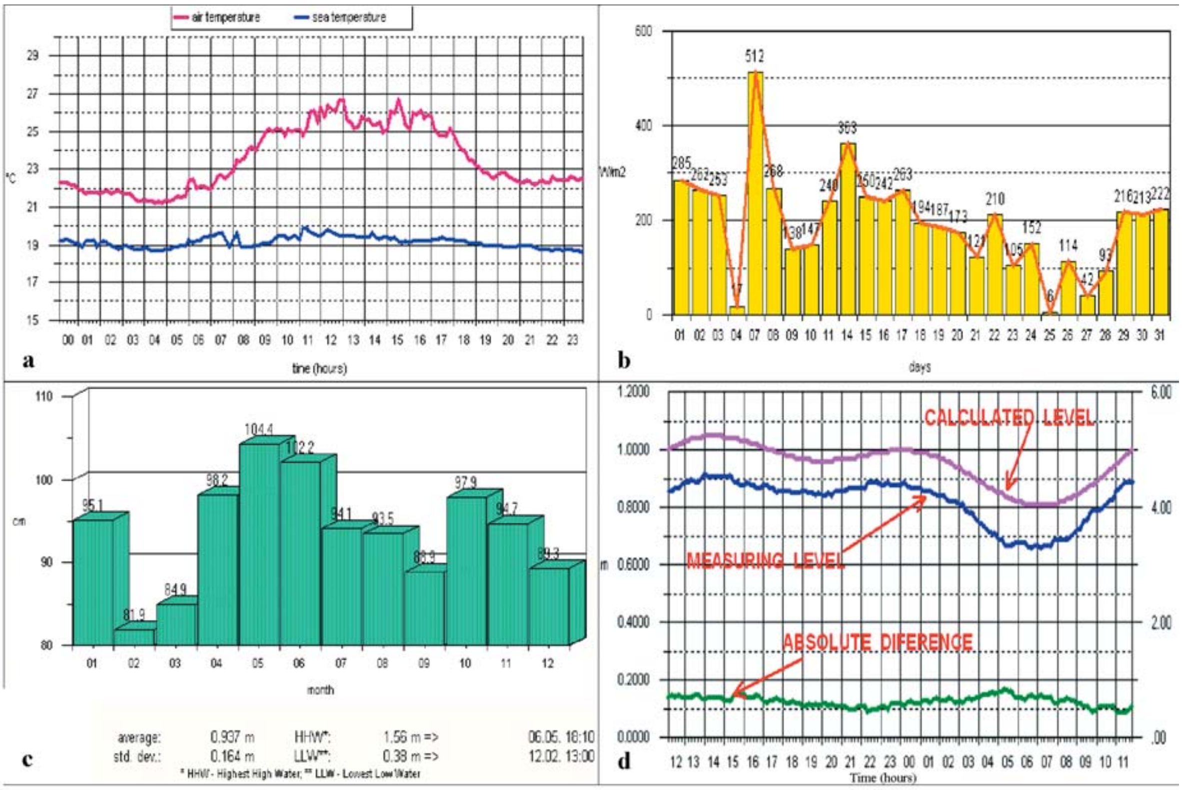


Fig.4. Some output results gathered from AMOS station: a) a graphic survey of 24 hour air and sea temperature fluctuations for 25 May 2005, b) mean daily solar radiations for March 2003, c) mean monthly sea levels for the year 2004, and d) measured and calculated sea level for 24 hours on 5 and 6 June 2005

Split-Marjan, owned by the Meteorological and Hydrological Service and located at 122 m on top of Marjan hill about three km eastward from station AMOS, was made. A comparison was made for the period from 1 January 2000 to 31 December 2001 in order to verify space and time variability of the meteorological parameters and to test acceptability of the AMOS measurements for the Kaštela Bay area. Comparison was made for temperature, humidity, air pressure and wind due to the lack of other parameters at the Split-Marjan station.

Daily averages of differences between temperature, humidity and pressure measured at the AMOS and Split-Marjan stations are shown in Fig. 6. Air pressure mean difference is 14.72 hPa and resulted from different altitudes of the stations (212 m). The mean difference obtained is in good agreement with the correction due to barotropic slope (14.84 hPa). Air temperatures mean difference (0.052 ^{o}C) is negligible. Adjacency of the sea at the AMOS station cause expected seasonal variability of air temperature differences. Temperatures measured at the AMOS station are lower in the warm period and higher during the cold period than temperatures measured at the Split-Marjan station. Air humidity is 3 % higher at the AMOS station mostly in the warm period due to the adjacency of the sea.

There is a significant difference in the wind speed obtained from the AMOS and Split-Marjan stations, because the anemograph at AMOS is on the leeside of Marjan hill for the two main winds (bora and sirocco) of the eastern Adriatic coast. The mean annual wind speed at AMOS is 1.68 ms^{-1} lower than at the Split-Marjan station. The greatest differences are obtained during bora (2.97 m ms^{-1}) and sirocco (4.79 ms^{-1}) episodes. Also, AMOS is sheltered from wind gusts, so it is impossible to measure high-frequency time variability of wind. This problem is illustrated in Fig. 7 with one episode of sirocco

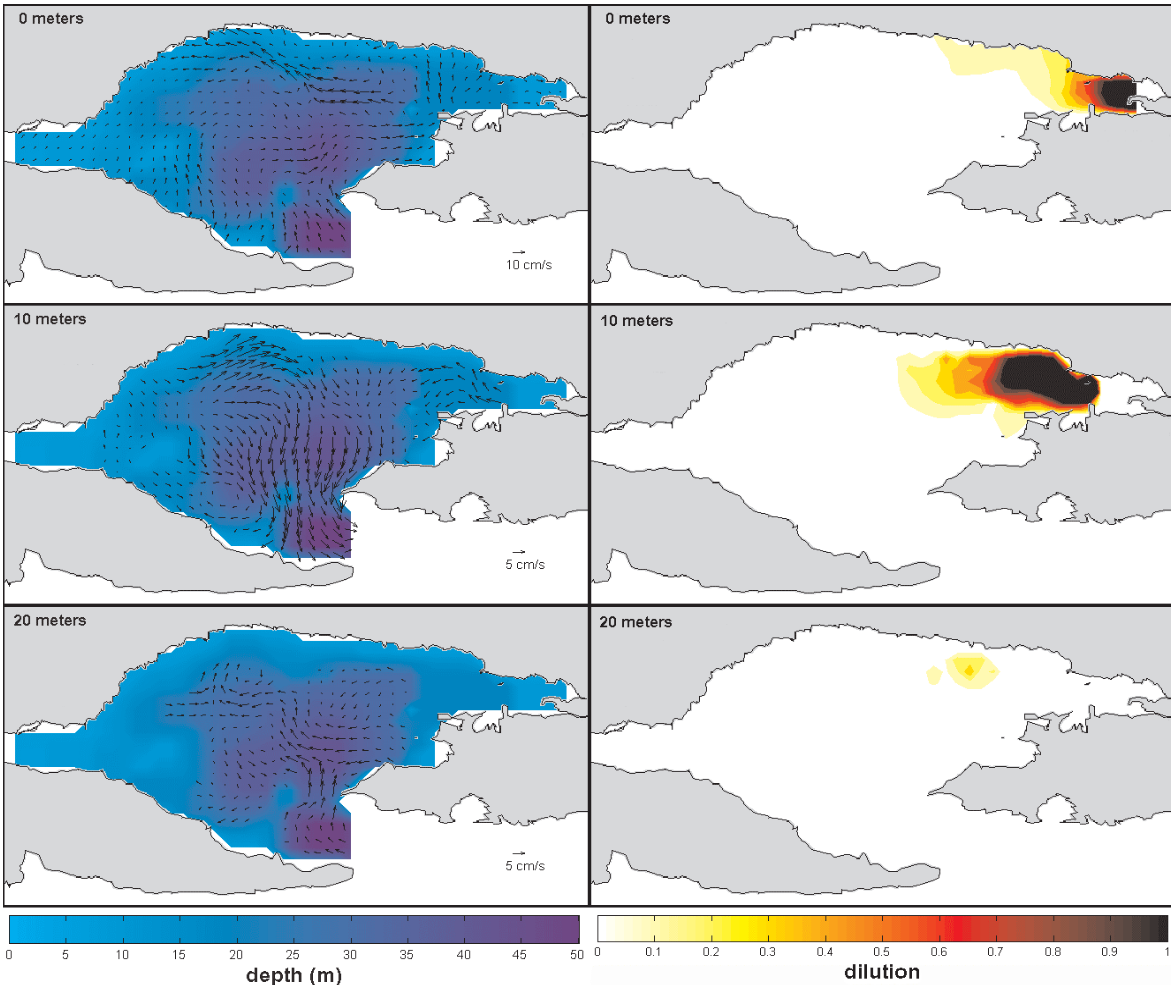


Fig. 5. Reconstruction of sea currents (left column) and faecal coliform (right column) fields in Kaštela Bay at the 3 levels obtained by the Z-model on 26 January 2005

(19 – 22 December 2000). AMOS is exposed to the winds from south to west and west to north quadrants and means annual wind speed differences for these directions are negligible (0.5 ms^{-1}).

Estimation of cloudiness from measured solar radiation

Since cloud cover information is not available at an automatic station, but it is necessary for calculating upward longwave radiation, a method for the estimation of cloudiness from measured solar radiation was developed. This method is described in detail by MATIĆ (2005). Using the mean daily clear sky index (CSI), i.e. ratio between values obtained from solar radiation sensor and clear sky radiation received at the sea surface, cloudiness in octas (C) could be estimated from (1):

$$CSI = 1 + a \cdot C + b \cdot C^2, \qquad (1)$$

where a = -0.2 ±0.01, b = -0.009 ± 0.001.

This equation allowed us to "recalculate" daily cloud fraction and compare these values with cloud cover obtained from regular observations at the Split-Marjan meteorological station. Observed and "recalculated" cloudiness and related differences for the period 2000 – 2001 are

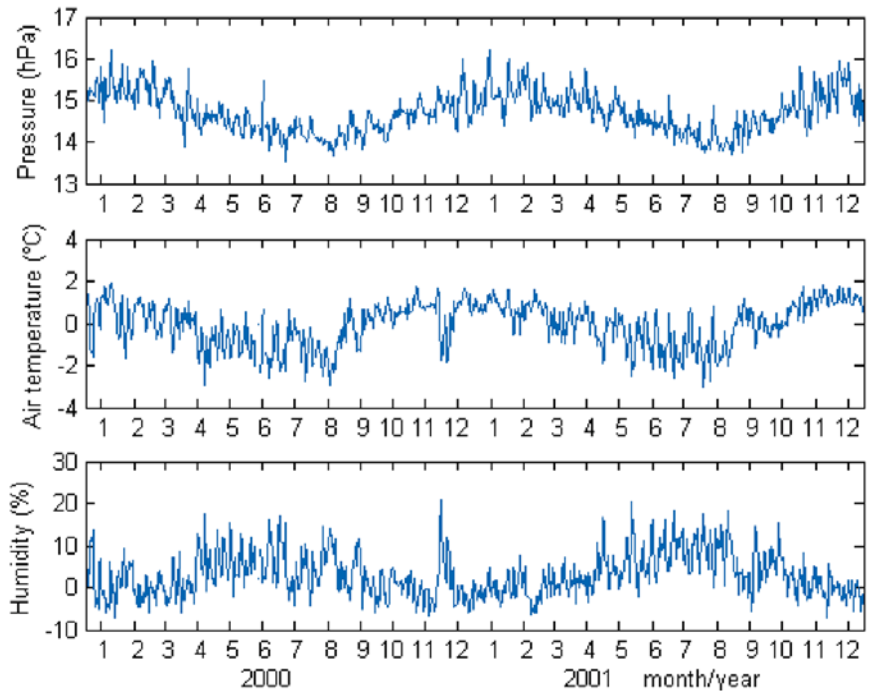


Fig. 6. Daily averaged differences between air temperature, humidity and pressure measured on AMOS and Split-Marjan stations during the period from 1 January 2000 to 31 December 2001

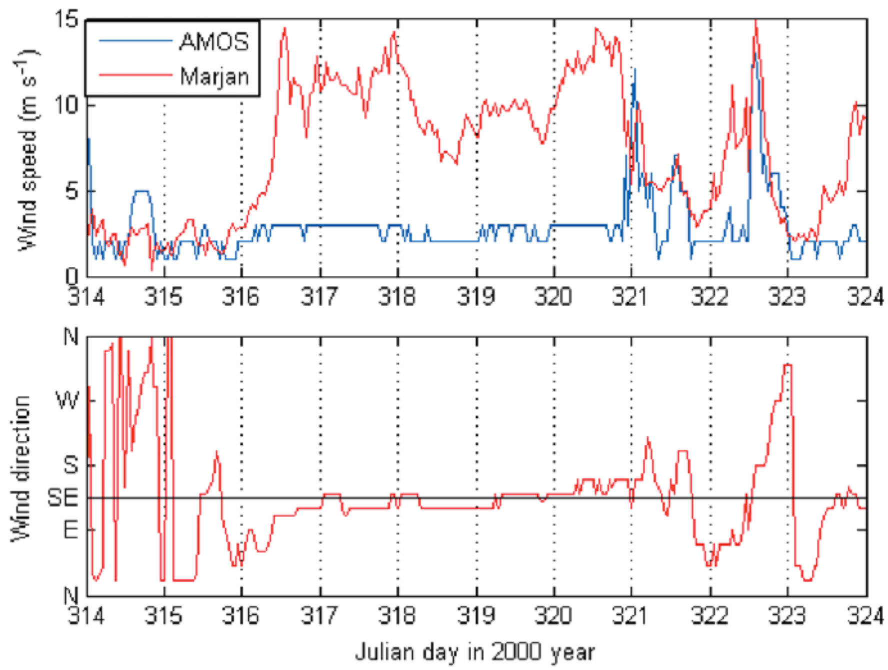


Fig. 7. Illustration of anemograph leeward position at AMOS station for one sirocco episode (19 - 22 December 2000). The blue line shows wind speed measured at the AMOS station and red at the Split-Marjan station

shown in Fig. 8. Differences between observed and estimated cloudiness are significant, although using the estimated cloudiness in the formula for calculating upward longwave radiation is advisable and results in a maximum error of 30 Wm^{-2}, which is less than the daily longwave radiation (Fig. 9). The mean annual value of longwave radiation is negligible (2 Wm^{-2}), and does not show seasonal or interannual variations, so the described method could be acceptable for near real time calculation of heat fluxes at oceanographic stations.

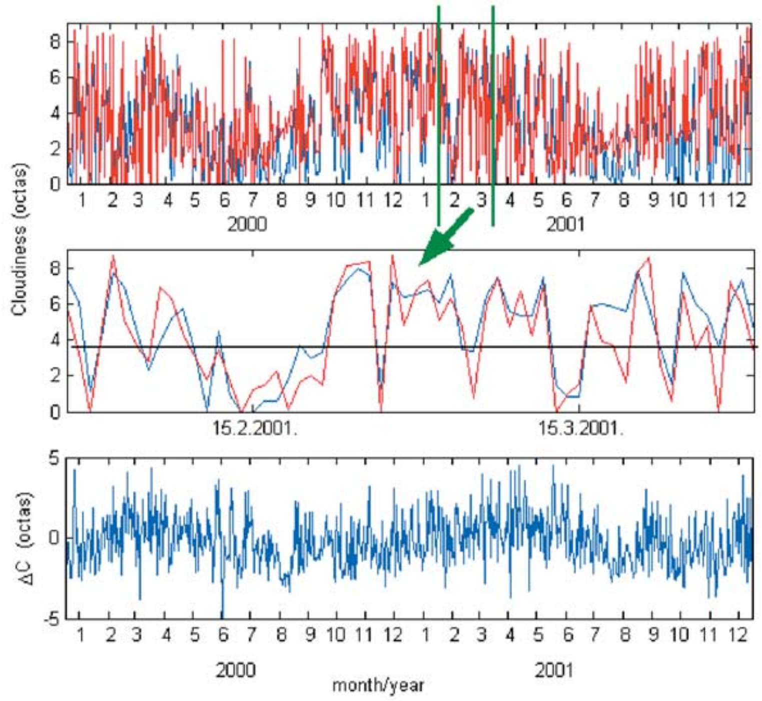


Fig. 8. Mean daily cloudiness observed at the Split-Marjan station (blue) and estimated (red) using mesured solar radiation for the period 2000 – 2001, with accompainying differences

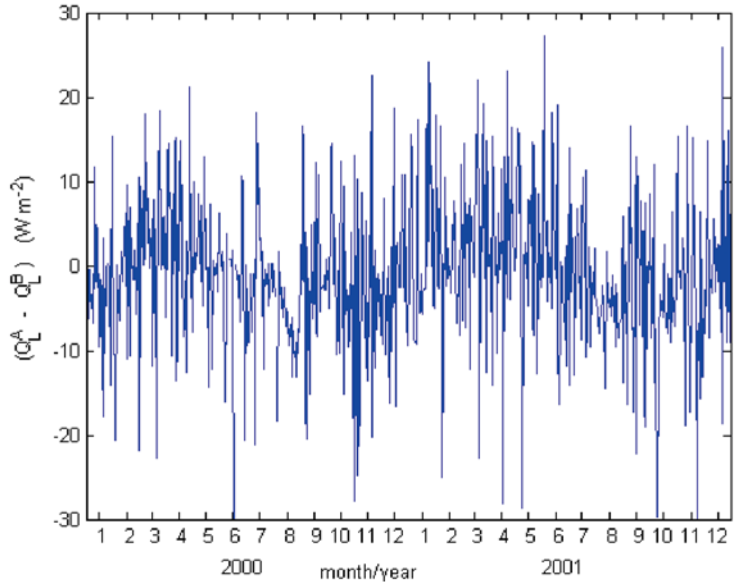


Fig. 9. Differences of upward longwave radiation calculated using estimated and observed cloudiness for the period 2000 – 2001

AMOS STATION AND NEAR-REAL TIME NUMERICAL MODELING

Two three-dimensional numerical models are set-up for Kaštela Bay using the real-time measurements at the AMOS station for initialisation, forcing and open boundary conditions. Simulated temperature, salinity and current fields at 0, 10, 20 and 30 meters depth are visualised and published on the Institute web site. Temperature and salinity profiles from the central Kaštela Bay station are also visualised. Visualisation is done using a MATLAB script with a specially developed C++ program for web publishing of the models results. The whole process, including simulations and visualisation, is designed to run automatically for both models. On each web page links are available for the previous and next day (for automatic day-by-day running mode) and also links to the upper and lower layer of the field.

Both models use almost the same equally spaced horizontal grid with 300 m resolution (Fig. 10), whereas their vertical coordinate formulations are different. Classical z and sigma (σ) coordinates are used. Both approaches have their own advantages and disadvantages, which are discussed in detail by GRIFFIES *et al.* (2000). Geopotential z models allow the simplest numerical discretisation approach, but have difficulties in the presentation of bottom topography with unnatural parameterisation in the bottom boundary layer. Terrain-following sigma coordinate models provide smooth representation of the topography, but suffer from pressure gradient errors (MESINGER *et al.,* 1988; MELLOR *et al*., 1994).

In near real-time runs, models are initialised with horizontally homogeneous temperature and salinity fields and real-time sea level measurements. Temperature and salinity profiles are obtained by adjusting climatological profiles from the MEDAS database to the real-time surface measurements. Forcing terms are wind stress, heat and water fluxes, Jadro River discharge and tides. Some of the atmospheric forcing terms are directly obtained from the AMOS station and some are calculated from the parameters measured there.

Wind stress is defined according to LARGE (1996) using the WRIGHT & THOMSON (1983) results in order to take into account large wind fluctuations during bora wind. Calculations are made using the wind vector measured at 10 minutes intervals and the corresponding wind gust. Wind variance required for use in the formulae is obtained as the squared difference of the wind gust and ten-minute measurement.

Surface heat flux Q is assumed to be (2):

$$Q = Q_s - Q_L - Q_T - Q_E \qquad (2)$$

and is introduced in the models as a surface boundary condition for the heat equation. Attenuation of the short-wave radiation Q_S with depth for a chosen 1B optic type water followed PAULSON & SIMPSON (1977) and attenuated values are added to the heat equation as a source term. Short-wave radiation is obtained directly from AMOS, whereas the longwave radiation Q_L is calculated as the difference between measured short-wave and net radiation. Sensible Q_T and latent Q_E heat fluxes are obtained from the bulk formulae according to LARGE (1996).

Water flux Q_w is defined as (3):

$$Q_W = E - P - R. \qquad (3)$$

Evaporation E is obtained from the latent heat flux, whereas precipitation P is directly measured. Climatological Jadro discharges R are also used in the calculations.

At the Kaštela Bay open boundary both models use measured sea levels and available temperature and salinities profiles. At the inflowing open boundary temperature and salinity values are prescribed from the measurements, whereas at the outflowing boundary values are locally upwinded.

Basic models characteristics and their comparison with thermohaline measurements

The first model is a z-coordinate non-linear geopotential levels model on the semi-staggered Arakawa E-grid. In many aspects it is similar to the η step mountain coordinate model (e.g., MESINGER *et al*., 1988). The numerical approach is described in the BONE (1993) paper. The

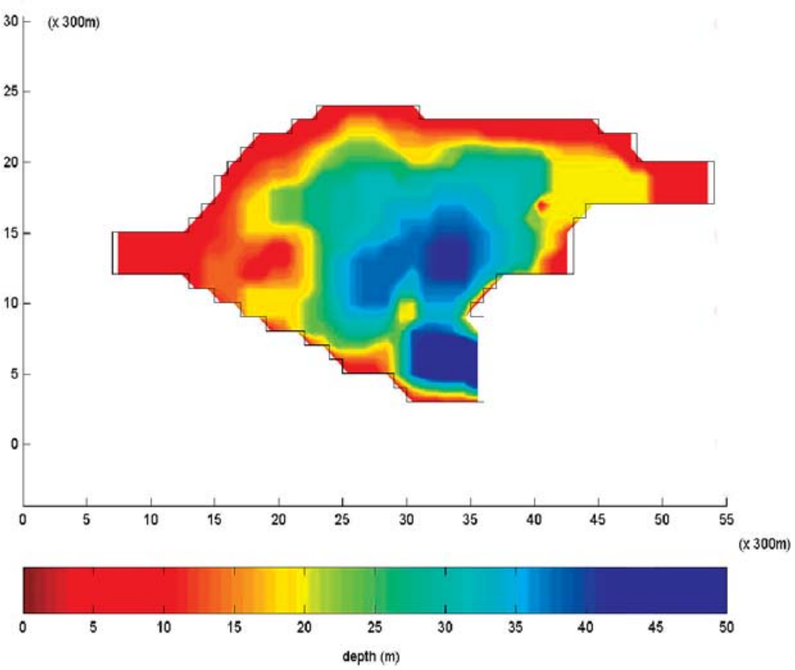


Fig. 10. Kaštela Bay bathymetry used in the numerical simulations

description of the model physics, numerical approach and source code in C with examples (BONE, 2006) may be found on web pages at http://www.math.izor.hr.

The Sigma model is a modification of the Princeton Ocean model (POM), whose physical and numerical properties are described in detail by BLUMBERG & MELLOR (1987). The equations, which capture the model physics, are the traditional equations for conservation of mass, momentum, temperature and salt coupled with the equation of state (MELLOR, 1991). For its application to Kaštela Bay three simplifying approximations are used: the hydrostatic, Boussinesq and 'f-plane' approximations. The model contains a second order turbulence closure submodel 'level 2 ½' described in the MELLOR & YAMADA (1982) review, which provides two prognostic differential equations for the turbulence kinetic energy and turbulence macroscale. The horizontal viscosity and diffusivity coefficients are obtained using the SMAGORINSKY horizontal diffusion formulation adapted to the sigma coordinate system (MELLOR & BLUMBERG, 1985). The model employs a staggered C-grid according to ARAKAWA and bottom following sigma coordinate in the vertical direction.

Although a detailed comparison between models and between model results and measurements is outside the scope of the paper presented here, we illustrate some of the results to show the problems that can arise from using different numerical approaches and to suggest some improvements in the measuring system that would result in more realistic modeled fields. Comparison of the two models results, as well as their comparison with respect to temperature and salinity measurements, was performed for two periods: the first one was from 15 to 22 July 2004 and the second one from 14 September to 4 October 2004. Unfortunately, current meter data for both periods are missing.

Surface currents obtained by the Sigma model are horizontally homogeneous and in the direction of the prevailing southeast wind everywhere except at the Bay entrance where the flow is eastward (Fig. 11). Surface currents obtained by the Z-model are northwestward in the deep areas of the Bay, whereas in the shallow areas topographically induced gyres can be noticed. Similar topographically controlled currents can be seen at the 10 m field from the Sigma model. Surface temperatures obtained by

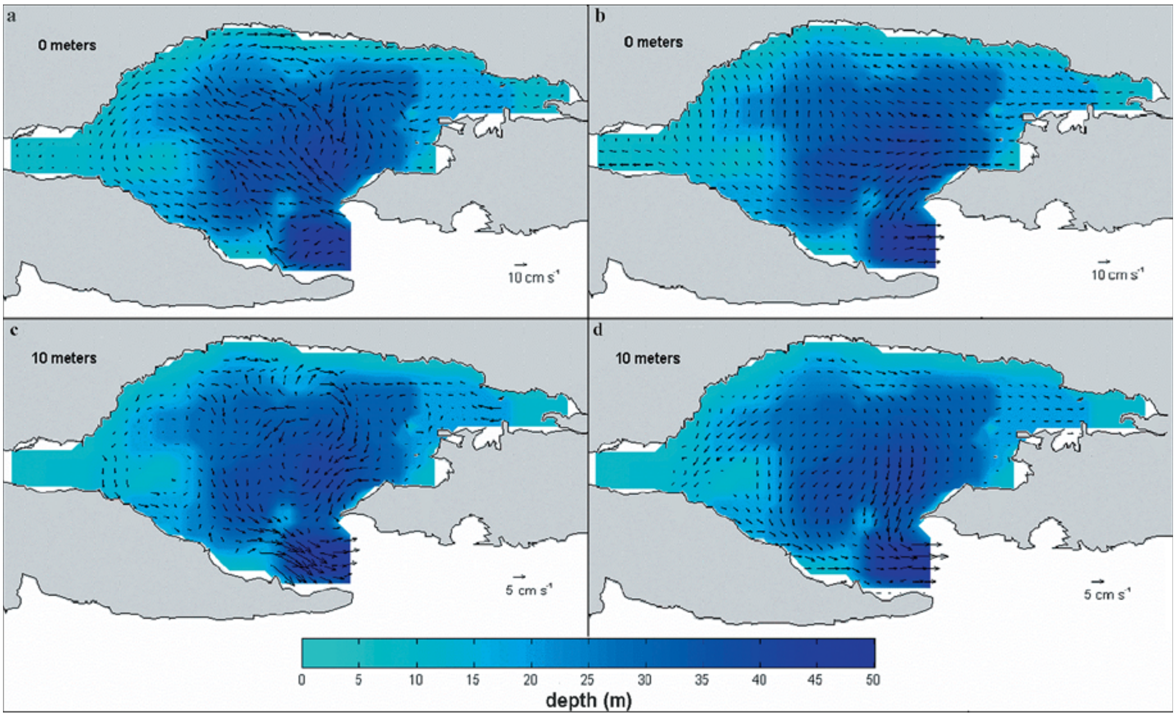


Fig. 11. Surface currents and currents at 10 m depth in Kaštela Bay on 22 July 2004 obtained by Z (a, c) and Sigma (b, d) models

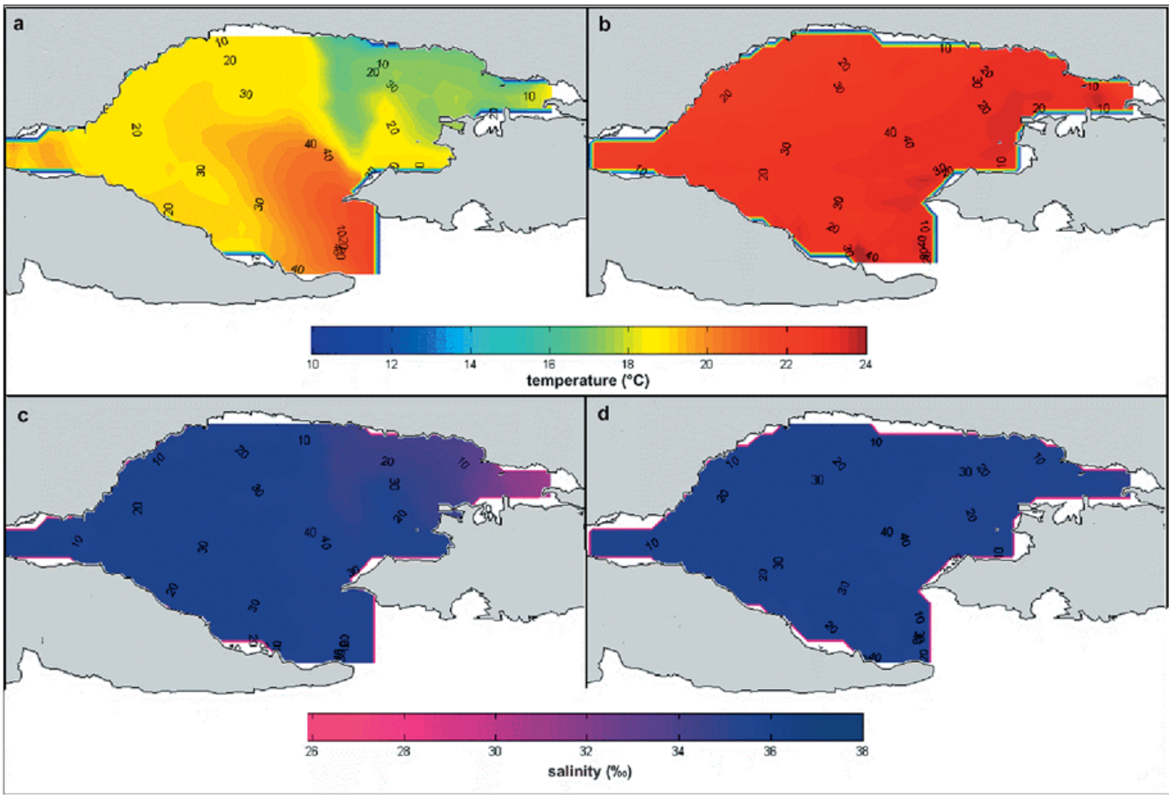


Fig. 12. Surface temperature and salinity fields in Kaštela Bay on 22 July 2004 obtained by Z (a, c) and Sigma (b, d) models

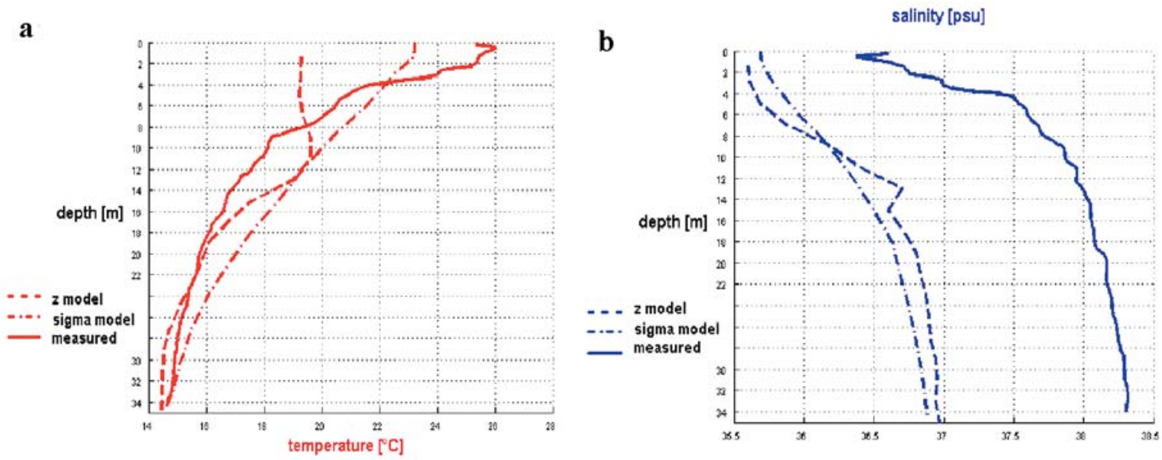


Fig. 13. Comparison of the modeled and measured temperature (a) and salinity (b) profiles at the central point of Kaštela Bay on 22 July 2004

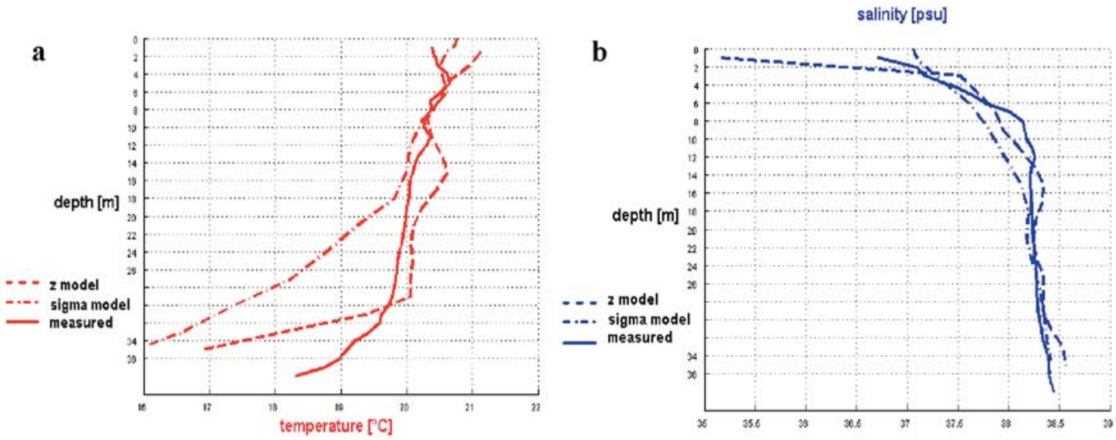


Fig. 14. Comparison of the modeled and measured temperature (a) and salinity (b) profiles at the central point of Kaštela Bay on 4 October 2004

the Z-model are significantly lower than those obtained by the Sigma model, whereas salinity fields show better agreement, although Jadro River influence is more conspicuous in the Z-model field (Fig. 12). Disagreements between measured and simulated salinity profiles can be partly ascribed to inappropriate initial fields obtained from the profile adjusted to the surface measurements near the Bay entrance, which points to the importance of the horizontal inhomogeneity in the salinity field (Fig. 13). Some disagreement between modeled and measured surface temperatures can be explained by the different time of the measurements and the end of the simulation, although the Z-model surface temperatures are too low. Measurements were made at 10 am, whereas model simulation stopped at 12 pm that day.

Current fields obtained for the second, longer period again show significant differences, but surface temperature and salinity fields are in better agreement than for the first period. Surface fields are horizontally homogeneous with similar values obtained by both models.

Simulated temperature profiles agree well for the surface layer, whereas deeper both models predicted values lower than measured (Fig. 14). Better agreement of the measured and modeled salinity profiles during the second period resulted from better initial conditions for the run in September. Real time surface salinity, to which we adjusted climatological profiles, was about 1 psu below the closest classical CTD salinity measurement in July, whereas during the second run these measurements gave almost the same value. Differences between real time and classical CTD measurements could come from the horizontal inhomogeneity, since the sampling points were not the same, or from inaccuracy in the real time measurements.

CONCLUSIONS

The automatic station AMOS, located at the Marjan Cape, Split, enables acquisition, validation and archiving of data for eleven meteorological and oceanographic parameters in real time, as well as calculation of some derived parameters, at the entrance of Kaštela Bay and their dissemination in graphic form on web pages of the Internet (http://www.izor.hr/eng/online).

The majority of the measured data have been compared during a two-year period with data obtained from the permanent meteorological station Split-Marjan, which is three kilometres away. Compared data are in good agreement with the exception of wind speed. Wind speeds, from directions ranging from south to northeast, are underestimated due to the AMOS location with respect to Marjan hill and surrounding buildings. Furthermore, on the basis of short-wave radiation measurements a new method for cloudiness estimation, suitable for automatic systems, is proposed.

At this phase daily data from the AMOS station have been used by two high-resolution numerical models (Z and Sigma coordinates) with the aim of achieving time-dependent spatial fields of more oceanographic parameters (currents, temperature, salinity, sea level, faecal bacteria, etc.) in Kaštela Bay. The current fields calculated by Z and Sigma models show significant disagreements, both for external and internal modes. Due to complicated basin topography, multiple forcing terms and nonlinearity of the models it is not easy to verify the fields without properly designed current measurements. Longer integration provides better agreement for the modeled temperature and salinity fields, as well as better agreement with measurements, indicating that the forcing terms, important for the thermohaline properties, obtained from the AMOS station are a suitable choice.

Finally, some recommendations may be given in order to improve automatic measurements and accompanying near-real time modeling. It is obviously advisable to move the AMOS anemometer from the present location to a new one that is less sheltered from the main Adriatic winds, whereas on the other hand the AMOS location seems to be suitable for the measurements of other meteorological parameters such as temperature, humidity and pressure. Comparison of the measured and modeled salinity profiles give rise to the question on acceptability of the present procedure for the models initialisation. Also, verification of the modeled current fields demands carefully designed current meter experiments.

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Automatska meteorološko-oceanografska postaja (AMOS): prihvat, provjera kvalitete i pohrana podataka u stvarnom vremenu i numeričko modeliranje

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SAŽETAK

U okviru hrvatskog nacionalnog programa neprekidnog praćenja stanja morskog okoliša razvija se automatski oceanografski mjerni sustav. Očekuje se da će mjerni sustav znatno doprinijeti poboljšanju praćenja i analize različitih fizikalnih procesa u Jadranskom moru jer će omogućavati mjerenja u svim vremenskim uvjetima. U sklopu prve faze razvijena je automatska mjerna postaja (AMOS) koja je postavljena na rtu poluotoka Marjan u Splitu. Ova postaja zajedno s ocenografskom bazom podataka Instituta (MEDAS) omogućava automatsko mjerenje, provjeru kvalitete i pohranu podataka jedanaest meteoroloških i oceanografskih parametara, izračun nekoliko izvedenih parametara, te njihov tablični i grafički prikaz u stvarnom vremenu preko Interneta (www.izor.hr/eng/online). Većina mjerenih podataka s postaje uspoređena je s podatcima stalne meteorološke postaje smještene na vrhu Marjana tri kilometra od postaje AMOS. Također, dva numerička hidrodinamička modela visoke rezlučivosti koriste podatke s AMOS postaje za izračun vremenski promjenjivih prostornih oceanografskih polja u Kaštelanskom zaljevu. Zbog kvalitete podataka AMOS postaja je uključena u projekt Integrirano upravljajnje obalnom zonom Jadranskoga mora (ADRICOSM) u sklopu kojega se mjerni podatci koriste za različite i vrlo korisne analize u području istraživanja Pelješac-Vis-Drvenik. Rezultati analiza podataka s AMOS postaje i rezultati numeričkih modela također će se koristiti u svrhu poboljšanja automatskog sustava praćenja stanja okoliša Jadranskoga mora.

Ključne riječi: mjerni sustav, prihvat podataka, provjera kvalitete, numeričko modeliranje