ISSN: 2148-9173 Vol: 4 Issue:1 January 2017

International Journal of Environment and Geoinformatics (IJEGEO) is an international, multidisciplinary, peer reviewed, open access journal.

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www.ijegeo.org Since: 2009

IJEGEO

Vol: 4 Issue:1 January 2017

ISSN: 2148-9173

Dear colleagues;

We are very glad to meet you with “International Journal of Environment and Geoinformatics” special issue which is a compilation of proceedings presented in “SELÇUK INTERNATIONAL SCIENTIFIC CONFERENCE ON APPLIED SCIENCES” held on 27-30 September in Antalya/Turkey.

Besides Turkish scientists, The Selçuk ISCAS 2016 brought together Russian, Ukrainian, Kazakhstan, Azerbaijani, Persian, Algerian, Nigerian, Netherlander, Scottish, Liberian, Philippines and Czech Republican scientists. Turkey General Directorate of Land Registry and Cadastre, Republic of Turkey Ministry of Food, Agriculture and Livestock Undersecretary, International Federal of Surveyors (FIG) and International Society for Photogrammetry and Remote Sensing (ISPRS) contribute to The Selçuk ISCAS 2016 at board of director’s level.

The Selçuk International Scientific Conference on Applied Sciences (The Selçuk ISCAS 2016) held in Antalya on 27-30, September 2016. The Selçuk ISCAS 2016 is a candidate of one of the most important event in the scientific schedule and tenders a possibility for researchers and academicians who researches on applied sciences. You can find a first class programme of plenary speakers, technical sessions, exhibitions and social events in this book. You will be able to catch up with the developments in Geographical Information Sciences, Information Technology, Environmental Management and Resources, Sustainable Agriculture, Surveying, Photogrammetry and Remote Sensing, meet friends and experience the traditional and fascinating culture of TURKIYE. As an international conference in the field of geo-spatial information and remote sensing, The Selçuk ISCAS 2016 is devoted to promote the advancement of knowledge, research, development, education and training in Geographical Information Sciences, Information Technology, Environmental Management and Resources, Sustainable Agriculture, Surveying, Photogrammetry and Remote Sensing, their integration and applications, as to contribute to the well-being of humanity and the sustainability of the environment. The Conference of Selçuk ISCAS 2016 will provide us an opportunity to examine the challenges facing us, discuss how to support Future Earth with global geo-information, and formulate the future research agenda.

195 scientists from 13 countries attended to the symposium. 105 oral presentations, 40 fast oral presentations and 50 poster presentations are presented during the symposium. 145 oral and fast oral presentations take place in 24 technical sessions in two days. On the other hand, 5 invited speaker presentations held in the plenary session in the first day.

The conference is carried out with the support of the organizations as the Selçuk University, General Directorate of Land Registry and Cadastre, General Directorate Of Agricultural Reform, Turkish Cooperation and Development Agency (TIKA), International Federation of Surveyors (FIG) and International Society for Photogrammetry and Remote Sensing (ISPRS). In addition, the symposium is also supported by the commercial organizations of Paksoyteknik, Mescioğlu, Geogis, Körfez, Tümaş, 4B Ölçüm, GNSS Teknik, Arbiotek ve Anıt Hospital.

Best wishes.

Assoc. Prof. Dr. Ekrem Tuşat

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IJEGEO International Journal of Environment and Geoinformatics 4(1) 1-7 (2017)

Combination of Satellite Images and Numerical Model for the State Followed the Coast of the Bay of Bejaia-Jijel

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Received: 01 November 2016
Accepted: 27 December 2016

Abstract

Bay of Bejaia-Jijel extends over a length of 100 km with the presence of the ports, the beaches of rivers that discharge of the bay. This area characterized by strong economic activity, namely tourism and fisheries. However, severe erosion, high hydrodynamic activity and significant silting of ports affect this bay. Hence, the interest of this study, which tries to explain these phenomena, based on multisource data with multitasking models. First, we developed an algorithm that can convert satellite images in coastline vector. This technique applied to three images LANDSAT TM and OLI sensed in 1987, 2011; 2015. The multi-temporal monitoring coastlines show that the region suffered severe erosion. This erosion is 4.6 m / year for the period of 1987/2011 and 1.5 m / year for the period 2011/2015. To explain this phenomenon we interested to do a study of hydrodynamics using the SWAN software. We used a long time series of wind speed and direction to discern extreme cases in the region. For maximum wind, the significant wave height recorded very high values and a very active orbital current with a speed that exceeds 0.7 m / s. Numerical modelling has allowed us to explain the erosion but does not explain the speed difference coastline. To find the explanation of erosion speed difference between the two periods we consulted the administrative archive of the region. In the archive, the number of authorized hourglasses is, 12 in the 90s, but 36 quarries operate haphazardly. In this period the balance of suspended matter is completely unbalanced which promotes erosion. After 2008, these quarries were closed therefore the balance of the suspended material has improved and consequently coastal erosion has decreased.

Keywords: Numerical modeling, image processing, hydrodynamics, Coastline.

Introduction

Coastline is a dynamic morphological entity, which responds to the external forces exerted by waves, tides, nearshore currents and the resultant sediment transport. Coastal regions reach to a dynamic stability regarding sediment transport that occur in thousands of years under the influence of external factors such as winds, currents and waves together with streams feeding the system. Therefore, it is not common to observe significant erosion and accumulation in such regions. This balance is maintained for a long time unless it is disturbed by a factor somehow. The important factors that might affect the symmetry of the coastal regions are of either nature like great winds occurring due to irregular seasonal variations or else of anthropogenic origins such as constructing coastal structures, opening of coasts to settlement, and sand and gravel withdrawals from sea (Görmüş et al., 2014). Accurate mapping of the instantaneous coastline position has as a result been always associated with significant uncertainty (Crowell and Leatherman, 1999). This situation arises because at any particular time the short-term effects of tide and long term relative sea level rise influence the coastline position. It is also controlled by the actions of rip and longshore currents, which results in cross-shore and alongshore sediment movement respectively in the littoral zone (Alesheikh, et al. 2007; Musaoğlu et al., 2004; Simav, et al., 2013). This affects the accuracy of computed historic rates of change and therefore the reliability of any identified erosion 'hotspots'. The science of coastline mapping has changed over the past 70 years due to advances in technology and the need to reduce uncertainty (Chen and Rau,

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1998; Şeker et al., 2016). Although the changes have resulted in improvement in coastal data processing and storage capabilities, the frequent change in technology has prevented the emergence of a standard method of coastline mapping (Gazioğlu, et al. 1997; Moore, 2000; Şeker, et al., 2008). Remote sensing data could be used effectively to monitor the changes along the coastal zone including shoreline with reasonable accuracy (Kannan,et al., 2016; Gazioğlu et al., 2016). The Landsat image data helps and replaces the conventional survey by its repetitive and less cost-effectiveness (Thieler, et al., 2009; Gazioğlu, et al., 2010).

We have already developed a methodology for monitoring the coastline from satellite images. In this methodology the coastline is achieved using a GIS for digitizing the coastline (Bachari and Houma 2010).

Since we are interested in finding an answer to this question: can we develop an automatic system that turns a satellite image coastline. In the case of decrease of the coastline is that hydrodynamic models can explain this variation in speed erosion by year.

Database: Study Zone

Bay Bejaia- Jijel is located east of the city of Algiers. It extends over a length of 100 km with the presence of ports, beaches and rivers across the bay. The coast is composed of 40% of beaches for the bay Bejaia and Jijel 65% bay. This zone is characterized by strong economic activity, namely agriculture, tourism and fishing. (Figure 1) Google Earth captured in June 2016 shows this area.

Figure.1 Bejai bay

Satellite Image

The satellite images used for this study are the images seen by the Landsat observation system. For multi-temporal followed booked three satellite images LANDASAT TM , TM + and OLI respectively and are taken for dates in 1987 , 2011 and 2015. It is important to note that these images are canopy builds in favorable conditions cloudless images.

For numerical modeling data used to enter are: the speed and direction of wind measured every three hours for 50 years for two stations based one in Bejaia and the other jijel. Also measuring the level of seawater measured in two ports and a bathymetric map of bay.

Linecoast Extraction: Model Developed

Landsat images are georeferenced multispectral images. For our application, we are interested to develop an automatic method for processing satellite images in vector coastline. The following figure shows the algorithm results in software that makes possible this concern.

With the simulated blue band and existing green and red bands, a natural-color image can segmented. However, the synthesized natural-color image is always too dark or too bright owing to the effect of abnormal pixels. Additionally, the image pixel values are always concentrated in a relatively narrow range, which leads to lower contrast in the image. The radiometric correction realized using the simulation software of satellite data SDDS (Meherrar and Bachari 2014). Secondly, these images are georeferenced used projection lat / long WGS 84 Datum.

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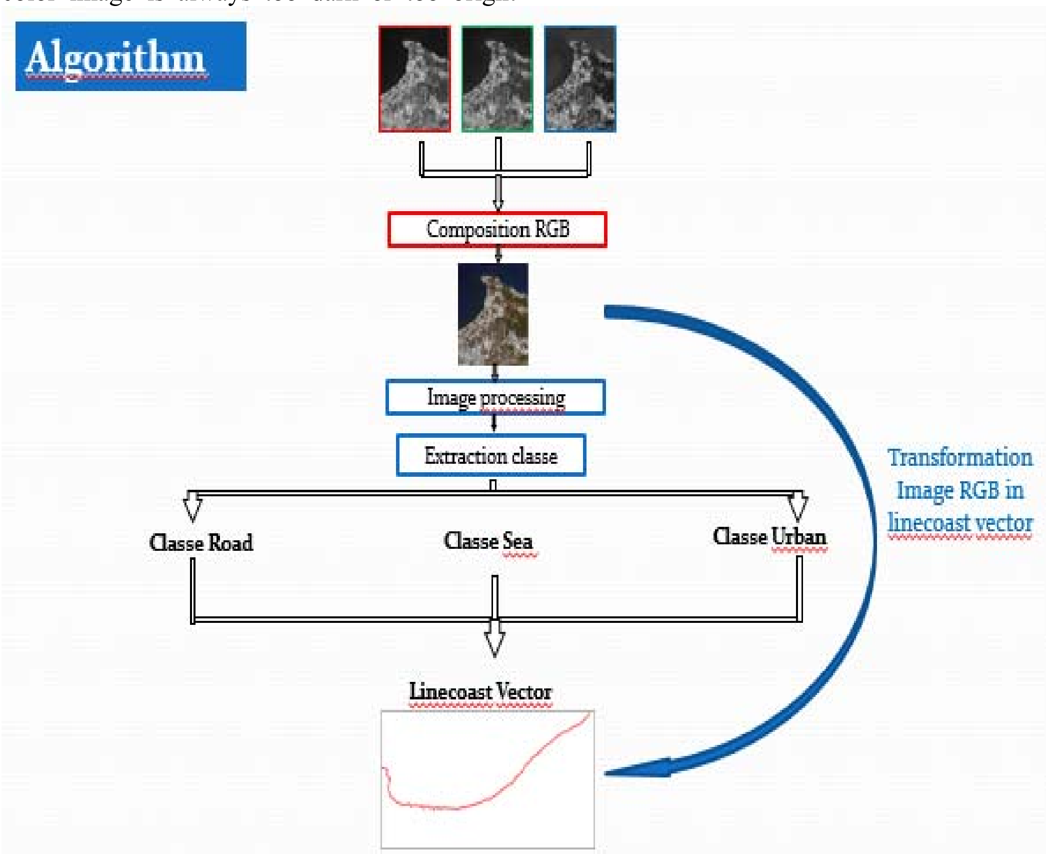

Figure.2 Algorithm general developed

Image Color Segmented

The second step consists in segmenting color image. For this, we use fuzzy logic. This technic combined RGB images and fuzzy logic for digitalized automatically image (Fadli and Bachari 2014 and 2016). In first step, we transform image in principal component analysis. We combine CP3 CP2 and CP3 in RGB presentation figure.3

The problem is the determination of the segmentation thresholds. The choice of threshold is semi-automatic. The segmented image is classified by unsupervised classifier (Fadhli and Bachari., 2015 and 2016). The result is a stroke of georeferenced linecoast figure.4.

Figure.3 False color RGB CP3 CP2 CP1

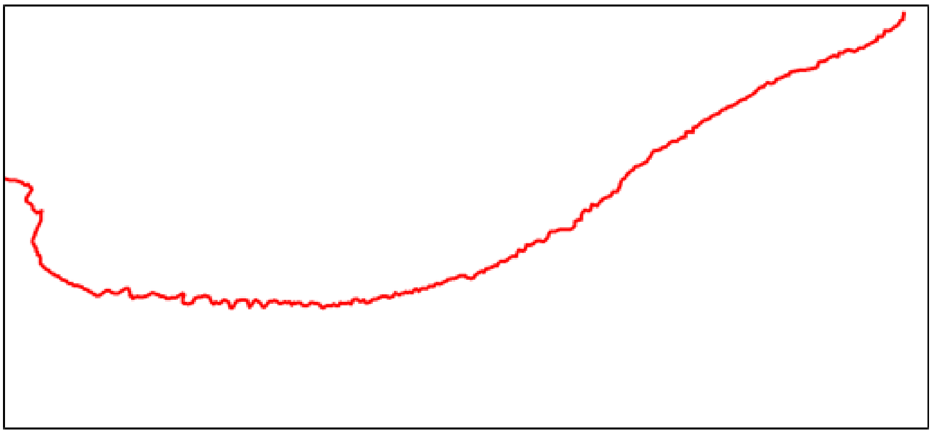

Figure.4 Linecoast vector georeferenced

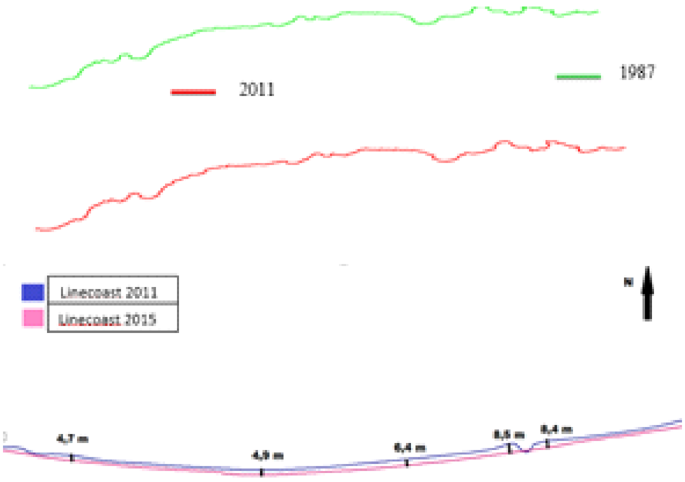

Figure.5 Evolution line-coast

Evolution Linecoast Study

After realized line-coast, we have calculated the distance between three line-coasts. In the figure.5 we present the evolution line-coast for two dates 1987/2011 and 2011/ 2015.

The figure shows that the area has suffered severe erosion. This erosion for the 1987/2011 period is an average of 4.6 m / year by cons for the period 2011/2015 it is 1.5 m / year. This erosion is presented by the figure.6 shows an irrigation well, which is now fully in the sea

The erosion in this area has made damage on the beaches and surface agricultural. But note that a significant port harbor has been a phenomenon of silting.

Hydrodynamic Study

There is no theoretical method expressed for a study of wave propagation mesoscale. The methods commonly used without the continuous observations of the swell by institute instruments, and digital projections based on wind data and other power generating and modifying the swell. View the absence of measuring instruments swell (holographs), the use of digital models is the only way for this study.

Hydrodynamical Model

The SWAN model (Simulating Waves Nearshore) (Holthuijsen and al 1993) (version4041) is a numerical model that provides estimates of wave characteristics in coastal areas for wind conditions, current and bathymetry known. The model based on the conservation equation for the density of wave action. SWAN run in third generation mode, and two-dimensional stationary. (Hervouet, 2007) The output parameters SWAN used in this work are the significant height, orbital current and wave power.

Collection and Processing of Data

From synoptic wind data recorded by the coastal forecasting station Bejaia between 1998 and 2010. We measure the averages and monthly frequencies winds could generate waves that exceed 0.5 m height, used the Manual wave-forecasting diagram. The winds should blow classified for more than three hours with speeds exceeding 5 m/s. to generate waves with significant heights that exceed 0.5m.

Actual general data and sea level

Other than the wind (generating force of the waves), we before also treated two amending force are the current general circulation and anomalies of sea level these data were processed by the (CMEMS) the Copernicus Marine and Environment monitoring Service and distributed by Aviso + (Aviso gridded datasets). Understand the hydrodynamic behaviour in the Bay of Bejaia, we have developed a numerical code. From the SWAN data output (Hs, T, L, ϕ) and other morphological given the numerical code allows the calculation of: littoral drift speed, energy wave (J / m2), energy transmitted to shore in KW per linear meter peak, average speed of propagation of energy (m / s), speed and group speed (m / s), raising of the average level of osculation (m), speed of propagation of energy and speed.

Results and Discussion

View the large number of results obtained, including 300 cards of different hydrodynamic characteristics, we will in this part referred to the most relevant results of our work. The results of the monthly modelling the behavior of the swell in the bay have shown that variation significant heights of waves follows a seasonal pattern with maximum intensity in winter and very low intensity noticed in the season of summer. From the graphic results of the three radial, East, Centre and West, we noticed that with westerly winds, the attenuation of the swell is progressive in the western part of the Bay of Bejaia, and this situation reversed inside the bay with easterly winds, the significant wave heights are generally lower. In the eastern parts of the bay, the waves reached the coast with maximum amplitude in the case of a westerly wind.

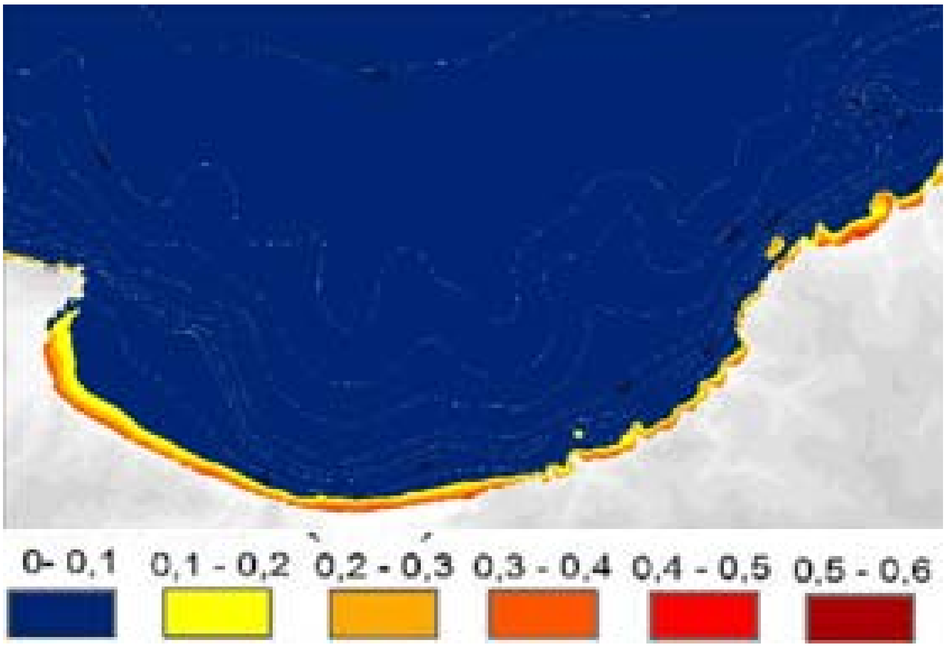

Fig. 7: Maps of the current orbital speed

The maximum wave heights in the ribs, without recording in March, with a westerly win. The swell reaches the central part of the bay with 70 cm of height with energy of 1.4 KW per meter peak. Other than the orbital current we also realize littoral drift velocity map showing that area marked by significant drift velocity are also marked by the speed of the orbital current, this makes the area is too dynamic and we can considered as a vulnerable zone. Numerical modelling has allowed us to explain the erosion but does not explain the speed difference coastline. To find the explanation of erosion speed difference between the two periods we consulted the administrative archive of the region. In the archive, in the 90s, the number of authorized hourglasses is, 12 but 36 quarries operate haphazardly. In this period the balance of suspended matter is completely unbalanced which promotes erosion. After 2008, these quarries were closed therefore the balance of the suspended material has improved and consequently coastal erosion has decreased.

Conclusion

Landsat satellite images have a significant interest for the study of land use change given the current archive on the one hand and the availability of the data. We are interested in developing a new algorithm for processing satellite images coastline. We made three line-coast 1987, 2011 and 2015 for Bejaia bay. It is evident that the area suffers from erosion. To explain the erosion we made use of hydrodynamic model SWAN. Using weather data and a bathymetric map, many physical parameters are calculated. Numerical modelling explained coastal erosion but not explains the variation in the speed of this erosion. For this, we consulted local government archives. In the archives is mentioned that in the 90 quarries operating an illegal manner is important, which explains the negative balance of the suspended matter. After 2008 these pits have closed and therefore the suspension for improved balance sheet which explains the erosion rate moderation.

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