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Bibliometric analysis of the Adriatic-related oceanography and meteorology publications

Ivica Vilibić

Institute of Oceanography and Fisheries, Split, Croatia

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This paper aims to quantify the productivity of research concerning the Adriatic Sea, with a focus on oceanography and meteorology. Productivity and impact were measured by analysing articles and citations from the Thomson Reuters Web of Science database, spanning the period 1994–2008. The most productive country was Italy but the highest number of citations was achieved by articles from Germany (all Adriatic publications) and Spain ("Oceanography" and "Meteorology and atmospheric sciences", only). By contrast, the second-most productive country, Croatia, had the lowest citation rate. Collaborations between Adriatic researchers were driven not only by the geographical position of a country (e.g., Italy vs. Croatia), but also by investment rates in Adriatic research (e.g., Italy vs. USA and Croatia vs. USA). Such collaborations substantially improved the impact of the research, especially from transitional countries such as Croatia.

Keywords: bibliometrics, Adriatic, oceanography, meteorology

1. Introduction

The Adriatic Sea, because of its geographical position and history, has been studied extensively for a long time (Buljan and Zore-Armanda, 1976). Modern history has shaped the countries surrounding the Adriatic Sea differently. The influence of various political and economic regimes has resulted in different approaches to science in these countries. Except for Italy, Adriatic countries can be classified as transitional countries coming out of a socialistic economy, which has greatly impacted the quantity and quality of their scientific production in the last decade (Prpić, 2007). Some effort has been made to change the philosophy concerning research and development activities in these countries (Primorac, 2008; Žagrović and Đikić, 2008), but still they lag behind developed countries in terms of money invested to fund such activities (Eurostat, 2008).

A similar situation persisted in Adriatic oceanography and meteorology up until the end of 20th century (Cushman-Roisin et al., 2001). The situation has

changed rapidly since then, with the recent initiation of several large, collaborative research projects (Lee et al., 2007). This initiative comes from Italy (ADRICOSM project, Castellari et al., 2006) and the USA, whose funding agencies have financed a number of collaborative international projects. This has led the way for novel approaches and new research findings published in a large number of peer-reviewed journals (Orlić and Pasarić, 2008). International collaboration has been rather important for improving the visibility and impact of the research (Glänzel, 2001; De Fillipo et al., 2008; Katsouyanni, 2008), and results in increased citations over a longer span of time (Beaver, 2004). Apart from pure impact, the quality of international articles is usually better than that of national papers (Klaić and Klaić, 2004; Olmeda-Gómez et al., 2009), especially for contributors affiliated with less developed countries (Russel, 1998; Bouabib and Martin, 2009).

This paper will attempt to analyse some basic aspects of scientific productivity dealing with the Adriatic, particularly with Adriatic oceanography and meteorology. The investigated period will be 1994–2008, and the data source will be the Thomson Reuters Web of Science (WoS) database. The number of articles and their citations will be assessed for various countries, research fields, and institutions. Finally, the impact (citations) of multinational collaborative publications will be analysed with regards to their increased perceptibility in the research community and their impact on Adriatic research activities.

2. Material and methods

The mapping of research articles and citations was done using the Web of Science (WoS) database (Thomson Reuters). The survey was restricted to the articles found by the Advanced Search tool under the topic "Adriatic". This sub-database was analysed to determine the countries, institutions, and research fields that were the most productive from 1994 to 2008. Particular publication is attributed to a country or an institution if any of its authors is coming from that country or institution, respectively. The impact of published articles was investigated using the available citations, but self-citing articles from all authors were not taken into account in the analysis. More precisely, citing articles were used instead of the citations themselves, in order to minimize the effect of one-author citations in a paper. Self-citations refer to cited references that contain an author name that matches the name of the author of a citing article.

The number of articles cited was standardized by the number of years between the publication year and 2009, designated the citing years (e.g., the number of citing years of an article published in 2002 is 7). Such an approach allowed for the comparison of article citations published in the early stages of the investigated period (in the 1990s) with those published in the later stages (in the 2000s). For this purpose, the cumulative citing years' parameter EY_{cum}

was set equal to the sum of citing years for all articles within a class. It should be noted that EY_{cum} couldn't normalize the citations over a period, as citations are a non-linear function of time. However, it may allow for comparisons between the subsets of research papers that possess similar mean citing periods (that is, EY_{cum} over number of articles).

Furthermore, the survey has been restricted to articles containing the topic "Adriatic" and published within the research fields "Oceanography" (O) and "Meteorology and atmospheric sciences" (MAS). This sub-analysis allowed for comparison between the entire bibliography on the Adriatic Sea in general, and the more specific bibliography on Adriatic oceanography and meteorology. The quantity and quality of international collaborations between different countries was analysed as well for the research fields "Adriatic", "O", and "MAS".

3. Scientific productivity concerning the Adriatic

The annual number of published articles on the topic "Adriatic", both in total and as percentages for the five most productive countries, is displayed in Figure 1. One can see that the number of published articles has increased noticeably, from around 100 in 1994, to 480 in 2008. Most of the publications (about 45 %) were produced by Italian scientists. An increase in the total number of publications can be seen for the most productive countries. The percentage of total publications from Croatian investigators was at a minimum in the late 1990s through early 2000s, and again in 2008. USA and UK publication percentages behave oppositely after 2004: the former increased steadily, whilst the latter decreased over time. It is interesting to note that three non-Adriatic countries, USA, France and UK, follow Italy and Croatia in the number of published papers. This fact denotes the worldwide interests and large development levels of the non-Adriatic countries. Croatia trailed Italy (Figure 2) in the percentage of total published articles (about 25 %), while the remaining countries did not surpass 10 % of the published articles. Nevertheless, the number of citing articles (without self-citing) over EY_{cum} was lowest for Croatia, Italy, and Slovenia, denoting the low impact of these papers in both the Adriatic and the wider research communities. These results are not a surprise, as both Croatia and Slovenia are still emerging from a period of political and economic transition (see Vinkler, 2008). This has a large impact on the research and development sectors, which are not at a satisfactory level, both in infrastructure and human capacity (Žagrović and Đikić, 2008). In addition, research and development expenditures have been very low in these countries (0.9–1.5 % of Gross Domestic Product – GDP, Eurostat, 2008); but this is also true of Italy (around 1.1 % of GDP), which differs from the USA (about 2.6 % of GDP), UK (2.8 % of GDP) and France (2.1 % of GDP).

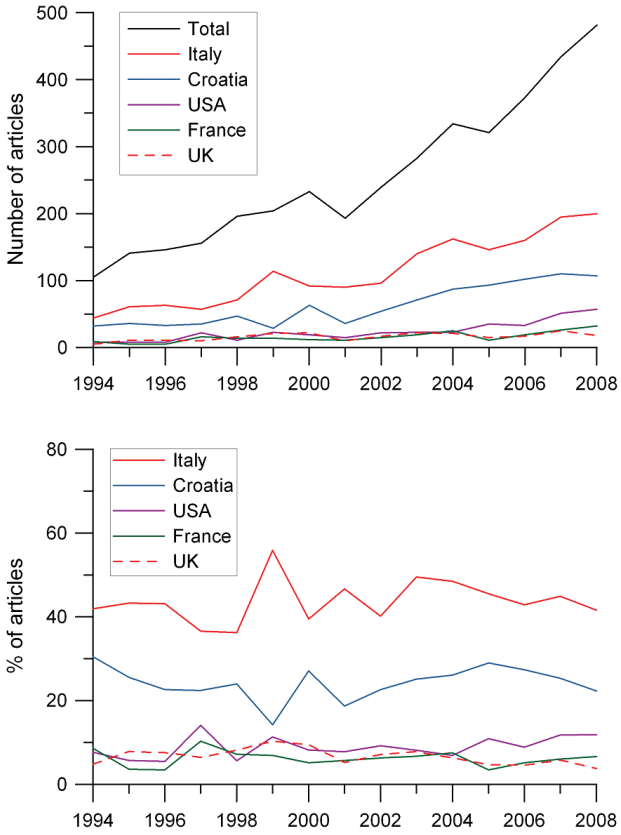

Figure 1. Number of published articles per year from 1994 to 2008, total, and of the five most productive countries on the topic "Adriatic" (top), with the percentage of countries over total "Adriatic" publications (bottom).

Most of these articles are attributed to the "Marine and freshwater biology" research field, followed by "Oceanography", "Environmental sciences", "Geosciences, multidisciplinary" and others (Figure 3). Publications in "Ecology" are cited frequently, while "Zoology" has the least number of citations. The high interdisciplinarity of "Ecology" and the low impact of specific research fields such as "Zoology" provide reasons for this observation, as publications that are more interdisciplinary in nature usually receive more citations (Skilton, 2009).

The most productive institution in terms of publications was the Italian Consiglio Nazionale delle Ricerche (CNR), followed by three Croatian institutions (Figure 4). Such ranking is primarily determined by a number of researchers researching Adriatic in the institutions (for example, CNR – Institute for Marine Research has about 150 permanent staff, while IOF has about

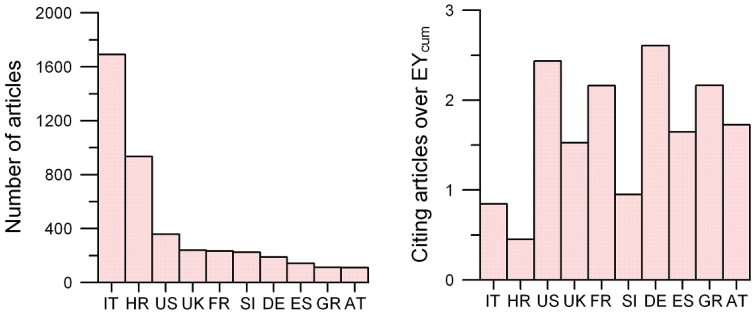

Figure 2. Total number of published articles (left), and the ratio between total number of citing articles and EY_{cum} (right), for the ten most productive countries on the topic »Adriatic« (IT – Italy, HR – Croatia, US – USA, UK – United Kingdom, FR – France, SI – Slovenia, DE – Germany, ES – Spain, GR – Greece, AT – Austria).

90 permanent staff). The next four institutions were Italian universities. Two Slovenian institutions rounded out the top ten most productive institutions on the topic "Adriatic". However, all Croatian institutions received low citations of published articles, having a number of citing articles that was about two times lower than publications from Italian and Slovenian institutions. As the number of "Adriatic" researchers in Croatia is not negligible (about 400 in all fields of geosciences, according to the Croatian Bibliographic Database – http://bib.irb.hr), such a low publication impact may be the result of the following factors: (i) low interdisciplinarity combined with an absence of collaboration between scientists; (ii) low participation in international research activities and projects; (iii) the absence of substantial research funds, which substantially decreases both the quality of research in the field and the related ar-

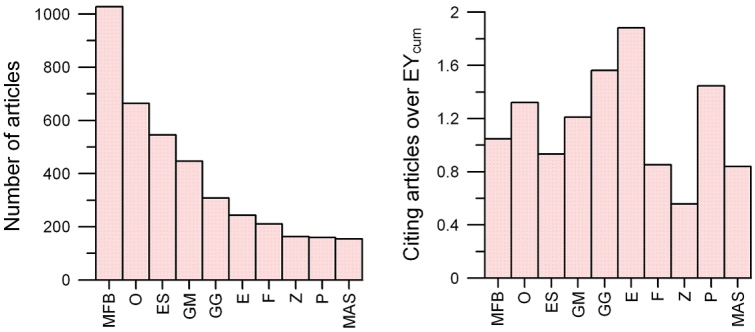

Figure 3. Total number of published articles (left), and the ratio between total number of citing articles and EY_{cum} (right), for the ten most productive research fields (MFB – Marine and freshwater biology, O – Oceanography, ES – Environmental sciences, GM – Geosciences, multidisciplinary, GG – Geochemistry and geophysics, E – Ecology, F – Fisheries, Z – Zoology, P – Palaeontology, MAS – Meteorology and atmospheric sciences).

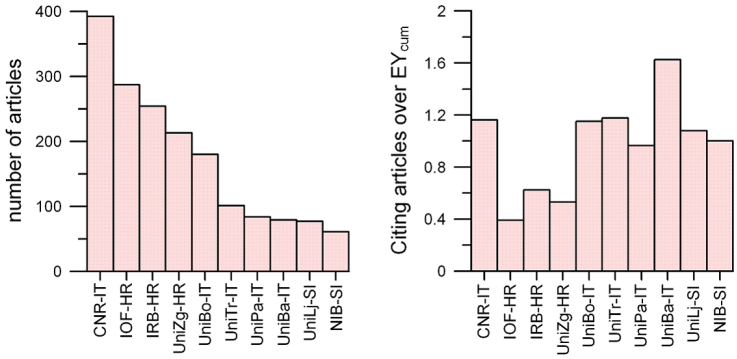

Figure 4. Total number of published articles (left), and the ratio between total number of citing articles and EY_{cum} (right), for the ten most productive institutions (CNR – Consiglio nazionale delle ricerce, IOF – Institute of Oceanography and Fisheries, IRB – Institute Ruđer Bošković, UniZg – University of Zagreb, UniBo – University of Bologna, UniTr – University of Trieste, UniPa – University of Padova, UniBa – University of Bari, UniLj – University of Ljubljana, NIB – National Institute of Biology).

ticles, as noted in earlier studies (Klaić and Klaić, 2004); and (iv) the fact that research and academic promotion in Croatia has been largely driven by the quantity, not quality, of published papers. Some of the above factors will be evaluated in the following analyses.

4. Scientific productivity in the fields of Adriatic oceanography and meteorology

Hereafter, we will restrict our dataset to "Adriatic" articles published within the O and MAS research fields. The number and percentages of annual publications, in total and of the five most productive countries, are given in Figure 5. Apart from a general increase of publications and interannual fluctuations, two distinct periods are noticeable: (i) 1994–2001, when a weak increase in overall publication quantity can be observed, and (ii) 2001–2008, when a rapid increase in the number of publications occurred. However, the trend in Croatia was strongly negative during the first period. It is interesting that the number of Croatian publications in 1994 and 1995 surpassed the number of Italian publications, but the Croatian percentage then dropped by a factor of three to four within just a few years. After that, the Croatian percentage increased steadily until 2008. Again, the USA publication percentage increased after 2002, whilst the UK publication percentage decreased.

These publication trends may be attributed to a reduction in research activities during the 1990s due to the unstable political situation in the Adriatic region and the war in the Balkans. This situation rapidly changed in the early 2000s, when a large number of collaborative projects were launched in the

northern and middle Adriatic, with significant funds raised for field experiments (DOLCEVITA, ACE, EACE, ADRIA0203, WISE, MAT, ADRICOSM and other projects, see Lee et al., 2007). In addition, other large field experiments were conducted in the middle and south Adriatic, through the DART collaboration (Dynamics of the Adriatic in Real Time, Martin et al., 2009). All of these research activities resulted in an increased number of publications in affiliation with American, Italian, and Croatian scientists. Simultaneously, research activities in meteorology were boosted, primarily through the ALADIN consortium, which encompassed a large number of national meteorological agencies (Ivatek Šahdan and Tudor, 2004).

The total number of publications in Adriatic oceanography and meteorology between 1994 and 2008 was 805. Most publications included Italian scientists (Figure 6), followed by Croats, Americans, and others. There was a difference in the bottom five countries in the top ten list compared to the overall

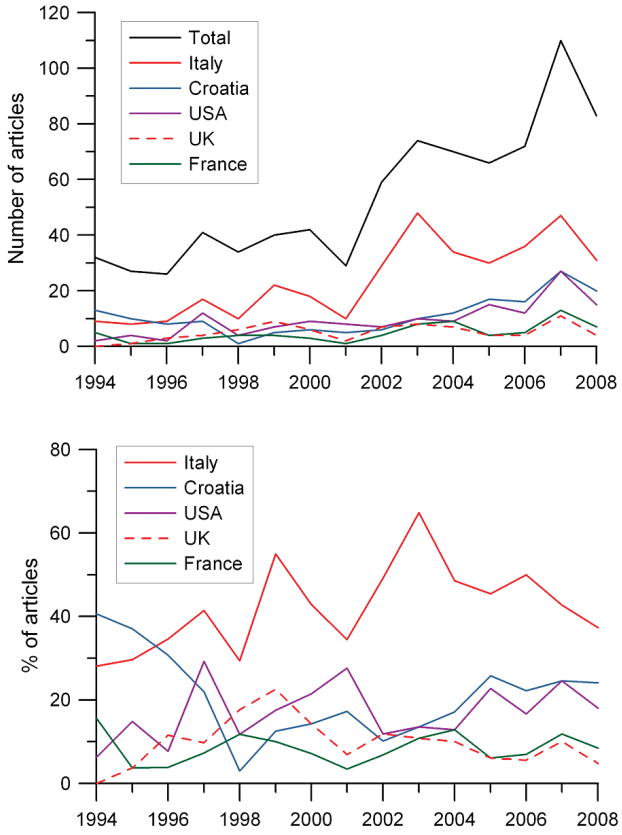

Figure 5. As in Figure 1, but for the "Oceanography" and "Meteorology and atmospheric sciences" research fields.

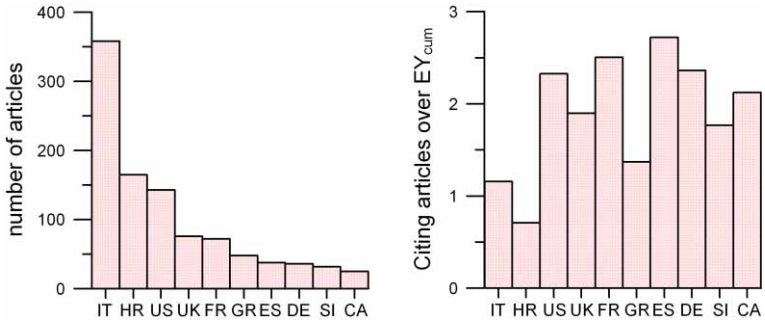

Figure 6. Total number of published articles (left), and the ratio between total number of citing articles and EY_{cum} (right), for the "Oceanography" and "Meteorology and atmospheric sciences" research fields (IT – Italy, HR – Croatia, US – USA, UK – United Kingdom, FR – France, GR – Greece, ES – Spain, DE – Germany, SI – Slovenia, CA – Canada).

Adriatic list (Figure 1). Some countries changed their rank (e.g., Slovenia increased in rank from 9th to 6th place), while some new countries were introduced (Canada at 10th place instead of Austria). Also, the number of citing articles over EY_{cum} was notably larger for O and MAS publications, increasing by an average of 15 % versus overall Adriatic publications. However, Croatian publications again had the lowest impact, although the normalized citations increased by 57 % versus overall Adriatic publications. In contrast, publications in Adriatic oceanography and meteorology from Germany and the USA were less cited (about 9 % and 4 %, respectively) than in overall Adriatic topics.

Again, the five most productive institutions in Adriatic oceanography and meteorology (Figure 7) were the same as those in the overall Adriatic sciences (Figure 4), being ranked due to their number of researchers and their research activities in the Adriatic. Nevertheless, some changes occurred between the fifth and tenth positions, where Italian, British, and two American institutions, replaced Slovenian and three other Italian institutions. This is obviously correlated with the aforementioned research activities and projects that are, in fact, largely driven and stimulated by USA funding agencies. Publications coming out of this research were mostly published after 2004. The publications done by Croatian institutions were poorly cited, while larger inter-institutional differences may be observed in Italian and American institutions. Apart from USA and UK global interests and available funds for such a research, Croatian institutes substantially lack the appropriate funding, especially from the international sources (e.g. EU Framework Programme) which are, by contract, largely used by the Italian institutes.

Finally, we list the 10 most-frequently cited articles classified in O and MAS. Figure 8 displays annual citations over the citing period for the 10 most cited articles listed in Table 1, where the time scale is initiated with the pub-

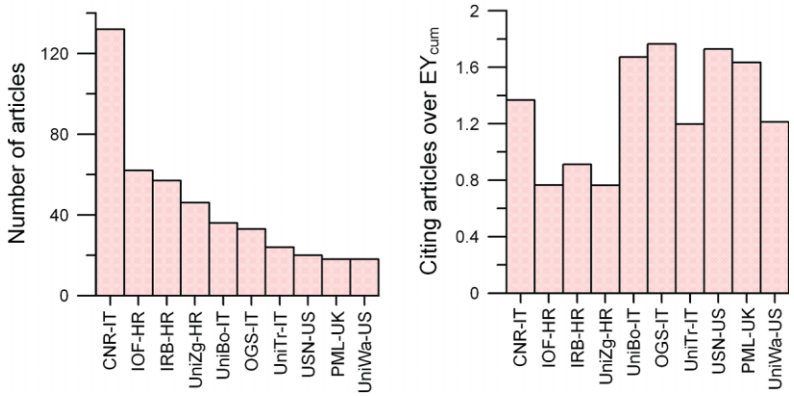

Figure 7. Total number of published articles (left), and the ratio between total number of citing articles and EY_{cum} (right), for the "Oceanography" and "Meteorology and atmospheric sciences" research fields (CNR – Consiglio nazionale delle ricerce, IOF – Institute of Oceanography and Fisheries, IRB – Institute Ruđer Bošković, UniZg – University of Zagreb, UniBo – University of Bologna, OGS – Osservatorio Geofisico Sperimentale, UniTr – University of Trieste, USN – United States Navy, PML – Plymouth Marine Laboratory, UniWa – University of Washington).

lishing of the article (zero year). One can see that a rapid increase in citations appears during the first two to four years for most articles, which are then cited quasi-steadily till the end of the investigated period. Some papers regained a substantial number of citations after some time, indicating a renewed interest in their results. Generally, the ageing of citations was much slower in these research fields (Glänzel et al., 2004), as the immediacy of oceanographic sciences is not as great as in some rapidly developing research fields (see Journal Citation Reports by Thomson Reuters).

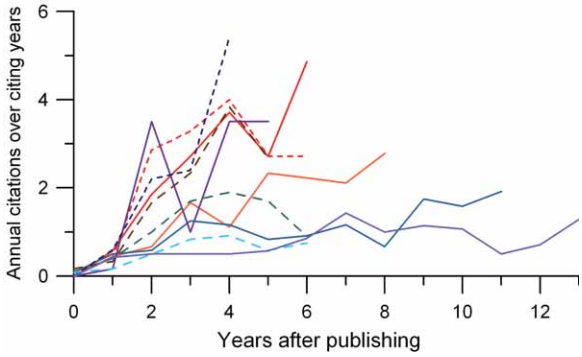

Figure 8. Annual number of citations over the citing period achieved for the 10 most cited articles between 1994 and 2008 on the topic "Adriatic" and for the "Oceanography" and "Meteorology and atmospheric sciences" research fields.

It can be observed that interdisciplinary articles (i.e., those that are not restricted to, or are only marginally covering, O and MAS research fields) and general articles (i.e., those that are not focused on the geographic area, but to the process regardless of the region), as well as the review articles, are gaining more citations than "pure" Adriatic O and MAS research articles. In fact, the last listed paper (by Poulain) is the only one research article that is focused entirely on physical oceanography, and exclusively covers the Adriatic.

5. Collaborative articles

In general, it is known that papers authored by international collaborators have more citations and increased visibility compared to single-nationality publications (Glänzel, 2001; Katsouyanni, 2008; Vilibić, 2009). They are not only used by a larger research community, but also have better visibility and a better impact on the research. In this section, we will explore whether such trends apply to Adriatic research. Collaborative publications will be defined as

Table 1. Full references of ten "Adriatic" O and MAS publications with the highest value of citation rate over citing years (C/EY).

No.	Reference	*C/EY*
1	Gray, J.S. et al. (2002): Effects of hypoxia and organic enrichment on the coastal marine environment, *Marine Ecology Progress Series, 238, 249–279.*	16.4
2	Passow, U. (2002): Transparent exopolymer particles (TEP) in aquatic environments, *Progress in Oceanography, 55, 287–333.*	16.0
3	Artegiani, A., et al. (1997): The Adriatic sea general circulation: 1. Air-sea interactions and water mass structure, *Journal of Physical Oceanography, 27, 1492–1514.*	12.4
4	Cattaneo, A., et al. (2003): The late-Holocene Gargano subaqueous delta, Adriatic shelf: Sediment pathways and supply fluctuations, *Marine Geology, 193, 61–91.*	11.7
5	Klein, B., et al. (1999): The large deep water transient in the Eastern Mediterranean, *Deep Sea Research I*, 46, 371–414.	11.2
6	Artegiani, A., et al. (1997): The Adriatic Sea general circulation: 2. Baroclinic circulation structure, *Journal of Physical Oceanography, 27, 1515–1532.*	10.9
7	Babin, M. et al. (2003): Variations in the light absorption coefficients of phytoplankton, nonalgal particles, and dissolved organic matter in coastal waters around Europe, *Journal of Geophysical Research – Oceans*, 108, C7, doi: 10.1029/2001JC000882.	10.8
8	Canals, M. et al. (2005): Slope failure dynamics and impacts from seafloor and shallow sub-seafloor geophysical data: case studies from the COSTA project, *Marine Geology, 213, 9–72.*	10.6
9	Justić, D., et al. (1995): Changes in nutrient structure of river-dominated coastal waters – stoichiometric nutrient balance and its consequences, *Estuarine Coastal and Shelf Science, 40, 339–356.*	10.5
10	Poulain, P-.M. (2001): Adriatic Sea surface circulation as derived from drifter data between 1990 and 1999, *Journal of Marine Systems, 29, 3–32.*	9.9

publications that have authors working in at least two countries, regardless of author position in the paper and of the authors' nationality.

Figure 9 shows the number of articles and citing articles over EY_{cum} written as an international collaboration between Italian or Croatian scientists (about 70 % of all publications), and others, on the topic "Adriatic". One can see that, although Italian and Croatian scientists are authors in most of these publications, they do not collaborate much with each other. Indeed, Italian scientists published twice as many articles with American scientists than with their Croatian colleagues. Moreover, the number of collaborative publications between Italian and British or French researchers was greater than those with Croatian researchers. Croatian researchers appear to prefer collaboration with Slovenian researchers, despite the fact that Italian researchers produced eight times more articles than Slovenian researchers. When restricting the results to the O and MAS research fields (Figure 10), the disproportionate number of collaborations between Italian and Croatian researchers, versus Italian and American researchers, is even more pronounced. The percentage of Italian--American and Italian-Croatian collaboration in all Italian articles was 15 % and 3 %, respectively. At the same time, the percentage of Croatian-American

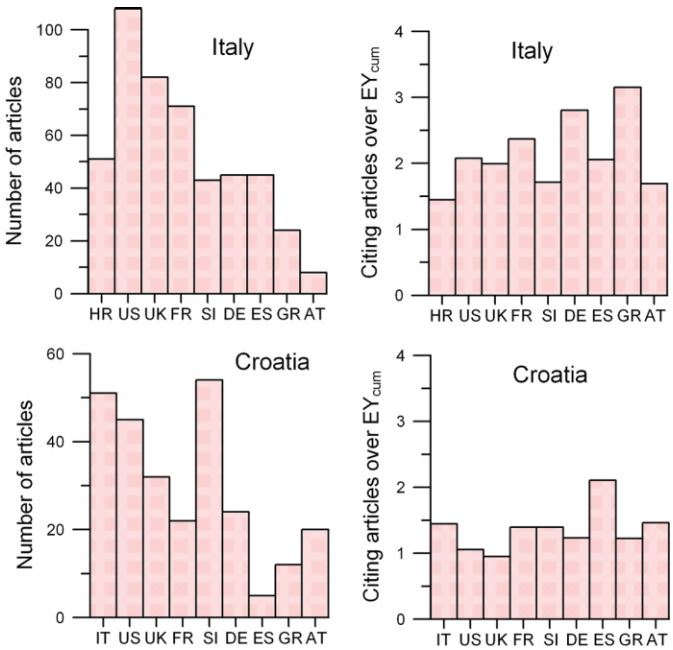

Figure 9. Number of published collaborative articles, with the ratio between total number of citing articles and $EY_{cum,}$ produced by the collaboration of Italian (upper plots) and Croatian (bottom plots) researchers, with researchers in other countries on the topic "Adriatic".

and Croatian-Italian collaborations in all Croatian articles was 10 % and 6 %, respectively. This leads to the following sad conclusion: although Italy and Croatia share the Adriatic Sea and its resources, they have had better success in collaborating with non-Adriatic countries than with their Adriatic neighbours.

The number of citing articles increased substantially when published as an international collaboration. For example, Italian "Adriatic" articles done in collaboration with the other nine most productive countries attracted 153 % more citing articles over EY_{cum} than all other Italian articles (Figure 9). The improvement in impact of Croatian "Adriatic" articles done internationally was even greater, as expected for the less developed country (Vilibić, 2009). These articles attracted 202 % more standardized citations than the overall "Adriatic" articles. An attenuated increase in citations was achieved for O and MAS research fields (Figure 10). Collaborative Italian and Croatian papers attracted 85 % and 174 % more standardized citations than the overall Italian and Croatian papers, respectively. The highest impact of Italian "Adriatic" articles was achieved through collaboration with Greek and German researchers (Figure 9), while the worst was through collaboration with Croatian researchers. Croatian "Adriatic" articles were nicely visible when done with Spanish researchers, but unfortunately, few papers were published from such collabora-

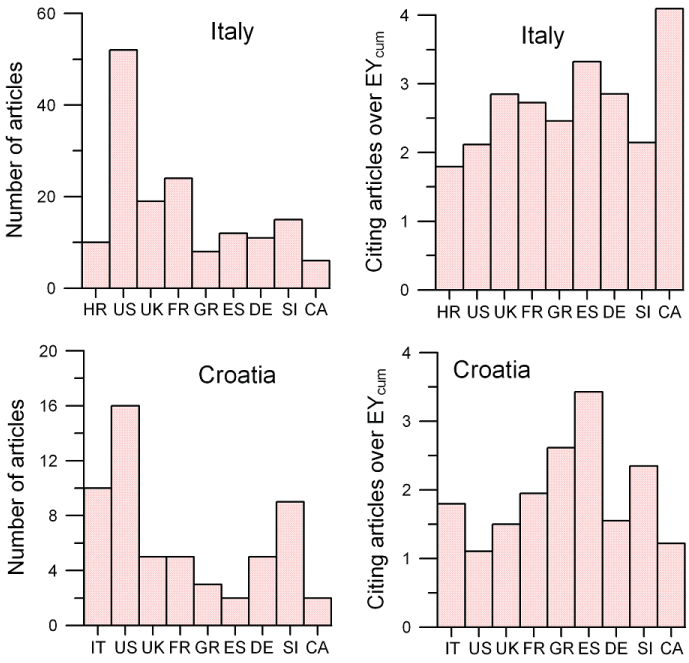

Figure 10. As in Figure 9, but for the »Oceanography« and »Meteorology and atmospheric sciences« research fields.

tions. The latter was also true of articles in the O and MAS research fields (Figure 10), where Croatian articles done collaboratively with American and Canadian scientists attracted the lowest citation rate. By contrast, Italian articles were highly cited when done in collaboration with Canadian scientists.

6. Summary and conclusions

The purpose of this study was to examine, quantitatively and qualitatively, scientific productivity on general Adriatic research, as well as on Adriatic oceanography and meteorology, between 1994 and 2008. The following facts and conclusion have been reached:

- The overall number of articles on the topic "Adriatic" increased quasi-linearly between 1994 and 2008, while the number of O and MAS articles increased additionally after 2001.
- Italy and Croatia produced the greatest number of publications, but their articles were the least cited. However, the Italian major Adriatic institutions receive better citations then overall Italian publications, as getting significant funding from the European funding agencies.
- Although Italy and Croatia dominate the Adriatic region geographically and are the most productive, they have had a rather poor collaboration history. Instead, Italians preferred to collaborate with other developed countries (USA, UK, France), while Croatian O and MAS researchers collaborated largely with Slovenia (an ex-Yugoslavian country) and the USA (the world's leading research country). The latter collaboration has been favoured due to the large research investment the USA has spent on Adriatic oceanography in the last decade.
- Articles produced by an international team of authors are much more cited than mono-national articles. This is especially true of developing countries such as Croatia.

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References

Beaver, D.D. (2004): Does collaborative research have greater epistemic authority?, *Scientometrics*, **60**, 399–408.

Bouabib, H. and Martin, B.R. (2009): Evaluation of Moroccan research using a bibliometric-based approach: investigation of the validity of the h-index. *Scientometrics*, **78**, 203–217.

Buljan, B. and Zore-Armanda, M. (1976): Oceanographic properties of the Adriatic Sea. *Oceanogr. Mar. Biol.*, **14**, 11–98.

Castellari, S., Pinardi, N., and Coluccelli, A. (2006): The ADRICOSM Pilot Project: a coastal and river basin prediction system for the Adriatic Sea, *Acta Adriatica*, **47 (Suppl.)**, 5–18.

Cushman-Roisin, B., Gačić, M., Poulain, P.-M. and Artegiani, A. (Editors) (2001): *Physical Oceanography of the Adriatic Sea*. Kluwer Academic Publishers, Dordrecht, 304 pp.

De Fillipo, D., Morillo, F. and Fernandez, M.T. (2008): Indicators of scientific collaboration between CSIC and Latin America through international databases. *Rev. Esp. Doc. Cient.*, **33**(1), 66–84.

Eurostat (2008): Research and development expenditure, by sectors of performance – % of GDP. http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsc00001.

Glänzel, W. (2001): National characteristics in international scientific co-authorship relations. *Scientometrics*, **51**, 69–115.

Glänzel, W., Thijs, B. and Schlemmer, B. (2004): A bibliometric approach to the role of author self-citations in scientific communication. *Scientometrics*, **59**, 63–77.

Ivatek Šahdan, S. and Tudor, M. (2004): Use of high-resolution dynamical adaptation in operational suite and research impact studies. *Meteorol. Z.*, **13**(2), 1–10.

Katsouyanni, K. (2008): Collaborative research: accomplishments & potential. *Environ. Health*, **7**(3): doi:10.1186/1476–069X–7–3.

Klaić, Z.B. and Klaić, B. (2004): Croatian scientific publications in top journals according to the Science Citation Index for the 1980–2000 period. *Scientometrics*, **61**, 221–251.

Lee, C.M., Orlić, M., Poulain, P.-M. and Cushman-Roisin, B. (2007): Introduction to special section: Recent advances in oceanography and marine meteorology of the Adriatic Sea. *J. Geophys. Res.*, **112**, C03S01, doi:10.1029/ 2007JC004115.

Martin, P.J., Book, J.W., Burrage, D.M., Rowley, C.D. and Tudor, M. (2009): Comparison of model-simulated and observed currents in the central Adriatic during DART. *J. Geophys. Res.*, **114**, C01S05, doi:10.1029/2008JC004842.

Olmeda-Gómez, C., Perianes-Rodriguez, A., Ovalle-Perandones, A., Guerrero-Bote, V.P. and Anegón, F.D. (2009): Visualization of scientific co-authorship in Spanish universities. *Aslib Proceedings: New Information Perspectives,* **61**(1), 83–100.

Orlić, M. and Pasarić, M. (Editors) (2008): *Recent Advances in Adriatic Oceanography and Marine Meteorology: Book of Abstracts*, Andrija Mohorovičić Geophysical Institute, Zagreb, 70 pp.

Primorac, D. (2008): Back into the fold: Modernizing Croatian science and education. *EMBO Reports,* **9**, 596–599.

Prpić, K. (2007): Changes of scientific knowledge production and research productivity in a transitional society. *Scientometrics*, **72**, 487–511.

Russel, J.M. (1998): Publishing patterns of Mexican scientists: differences between national and international papers. *Scientometrics*, **41**, 113–124.

Sambunjak, D., Ivaniš, A. Marušić, A. and Marušić, M. (2008): Representation of journals from five neighboring European countries in the Journal Citation Reports. *Scientometrics*, **76**, 261–271.

Skilton, P.F. (2009): Does the human capital of teams of natural science authors predict citation frequency?. *Scientometrics*, **78**, 525–542.

Vilibić, I. (2009): How much the shared ocean or lake basins connect the researchers in neighbouring countries?. *Scientometrics*, doi: 10.1007/s11192–009–0010–5.

Vinkler, P. (2008): Correlation between the structure of scientific research, scientometric indicators and GDP in EU and non-EU countries. *Scientometrics*, **74**, 237–254.

Žagrović, B. and Đikić, I. (2008): Childhood of a phoenix: modern biology in Eastern and South-Eastern Europe. *Nat. Rev.*, **9**, 333–336.

SAŽETAK

Bibliometrijska analiza publikacija o Jadranu te jadranskoj oceanografiji i meteorologiji

Ivica Vilibić

U radu se analizira znanstvena produkcija o Jadranu, sa naglaskom na jadransku oceanografiju i meteorologiju. Znanstvena produktivnost mjerena je analizom objavljenih publikacija i njihovih citata u bazi publikacija Thomson Reuters Web of Science u razdoblju 1994–2008. Najproduktivnija zemlja je Italija, no najbolju citiranost su postigle publikacije iz Njemačke (sve jadranske publikacije) i Španjolske (publikacije iz jadranske oceanografije i meteorologije). Druga zemlja po znanstvenoj produkciji, Hrvatska, ima najslabije citirane publikacije. Suradnja jadranskih istraživača u smislu zajedničkih publikacija nije posljedica geografskog položaja pojedinih zemalja (npr. Italija i Hrvatska), već je prvenstveno posljedica uloženih investicija u istraživanje Jadrana (npr. Italija i SAD, Hrvatska i SAD). Zajedničke publikacije su značajno poboljšale vidljivost (citiranost) provedenih istraživanja, naročito publikacija tranzicijskih zemalja kao što je Hrvatska.

Ključne riječi: bibliometrija, Jadran, oceanografija, meteorologija.

Author's address: Ivica Vilibić, Institute of Oceanography and Fisheries, Šetalište I. Meštrovića 63, 21000 Split, Croatia, e-mail: vilibic@izor.hr