Ocean Sci. Discuss., 10, C171–C174, 2013
www.ocean-sci-discuss.net/10/C171/2013/

Ocean Science
Discussions

Interactive comment on "Tidal variability of the motion in the Strait of Otranto" *by* L. Ursella et al.

Anonymous Referee #2

Received and published: 5 May 2013

GENERAL COMMENTS The present manuscript describes the variability of the tidal flow motion in the strait of Otranto by means of in situ data analysis during the period 1994-2007. The paper is fairly well organized and the use of the English language is generally appropriate and solid enough. On the side of scientific issues, the final findings are fairly interesting and rather new, especially those related to the intensification of the effects on the flow related to the diurnal K1 constituent. The authors address this intensification to the interaction between K1 tidal constituent and topographically trapped internal waves, which are generated over the shelf break in periods of stratification of the water column. I think the manuscript can be published on this Journal subject to some adjustments and clarifications, especially related to the aforementioned interpretation of the diurnal tidal effects enhancements.

SPECIFIC COMMENTS

- At page 447, lines 1 to3: it might be interesting to highlight analogies/differences to the intensification of tidal effects over the shelf break analyzed by Pereira et al., 2002, (Tidal Mixing in the Southern Weddell Sea: Results from a Three-Dimensional Model) related to mixing. Such a strong increase in current magnitude should also reflect in vertical mixing.

- In the last paragraph of page 450 the authors explain that in order to exclude the sea breeze origin of the diurnal intensification of the flow over the shelf brake they used ECMWF wind data and compared them with the Otranto station, with a particular attention on the daily cycle. However, it is known that, on one side ECMWF data tend to underestimate the real wind magnitude (Signell et al.) and on the other side the diurnal cycle is overestimated in this dataset, and presents a non-realistic shift by a few hours earlier in time, mainly due to the influence of the land in the assimilation process of the numerical model. Evidence of this is given by Simoncelli et al. (2011) for sea surface temperature and has probably a feed-back on wind intensity too. The use of ECMWF might then be misleading for your purposes, and not completely appropriate. Maybe it would be interesting to use the outputs of a Limited Area Model, if available.

- In the last paragraph of page 451, to add evidence of non-dependency of the diurnal flow intensification from the wind the authors state that, despite the stronger wind intensity analyzed in summer 1994, a higher intensification of the diurnal tidal current is appreciated in summer 1995. However, if it is true that the flow intensification is dependent from stratification conditions (as the authors suggest), the reason of this might be searched in the different stratification conditions (summer 1995 clearly presents a stronger stratification of the water column than summer 1994), and not in the apparent non-coherence between wind and current.

- At lines 5 to 8 of page 452 the authors address the shift between the coastal sea level and the currents at location of station St2 as an additional hint of the presence of an internal diurnal wave. Couldn't it also be related, instead, to the fact that in the Adriatic tides have the character of standing waves, thus flood and ebb currents are shifted with

respect to highs and lows of sea level?

- At page 472 at line 26: from figure 15c it seems that when the cross-shore current intensifies the sea level is falling, not rising.

- The most interesting aspect of this work is the interpretation of the tidal diurnal current intensification over the shelf break during stratified periods, due to the generation of the topographically trapped waves and the diurnal resonance in the tidal response. The authors draw this conclusion by exclusion of the possible origins of this intensification. When doing this they consider only two possible sources: the diurnal sea breeze excitation studied by Mihanović et al. (2009) and by Orlić et al. (2011), and he extension of the low-frequency limit of the internal wave spectrum, as suggested by Beckenbach and Terrill (2008). This approach is acceptable, but I believe it lacks to consider seiches: they are very important in this particular basin and their period is very close to that of diurnal tidal periods (approximately 22 and 24 hours respectively. As an example the plot of figure 12c and 12d does not clarify enough whether the peak of the intensification of the current corresponds to the 24 or the 22 hour period.). An interaction between them and the diurnal tidal constituents resulting in an intensification of the diurnal signal cannot be a-priori excluded. Some considerations regarding this, at least from a qualitative point of view, should be introduced.

Technical Comments

- Figures 4 and 5 represent the same quantities at different vertical levels: I believe they could be gathered in a single figure.

- Figure 6: I think it would be more logical to present P1 on top and P3 in the bottom of the figure. Moreover, the number "15" of the label of the y axis of the middle diurnal panel partially covers the "0" of the semi-diurnal panel.

- Figure 7: the fonts of the labels are a bit small, I would increase them.

- Figure 10: the grey line is a not very clear, especially in panels a and b.

- Figure 15 c: It is not very clear what the black thick line in the left of the plot represents. Could you explain in the text and caption?

- Page 437, line 15: replace Hendershot with Hendershott.

- Page 450, line 19-20: I would rephrase "...thus enabling establishment of correlations between series by comparing..." into "...thus enabling to establish the correlations between series by comparing...";

- Page 450, line 22: could the authors specify the spatial resolution and time frequency of the ECMWF data?

- Page 438, line 15: the word "possible" should be moved after the word "ellipses", in line 16.

- Page 438, lines 17-18: other works of 3-D tidal modeling in the Adriatic Basin, more recent then those listed are:

"Impact of tides in a baroclinic circulation model of the Adriatic Sea", (Guarnieri et al. 2013, Journal of Geophysical Research)

"Modeling the water exchanges between the Venice Lagoon and the Adriatic Sea" (Bellafiore et al. 2008, Ocean Dynamics)

"A finite element model for the Venice Lagoon. Development, set up, calibration and validation" (Umgiesser, 2004, Journal of Marine Systems)

could the authors add in the list of lines 17 and 18?

Interactive comment on Ocean Sci. Discuss., 10, 435, 2013.