Referee #2

We thank very much to the referee 2 for his/her constructive suggestion to the manuscript. Following are responses to the referee's queries:

- 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.

**REPLY:** The paper of Pereira et al. describes a modelling study of tidal effects at the shelf break in the zone of critical latitude for that tidal constituents analyzed (in their case M2-S2). The vicinity of the critical latitude is crucial for the resonance and the tidal current and mixing enhancement. We are not close to the critical latitude for K1, that is 30°, and therefore the comparison between these two situations is somewhat difficult.
Although the mechanisms of the origin of the internal waves in our zone are different from those exposed in Pereira et al., 2002, they state that "internal tides are expected to be generated at the shelf break …. because of the cross-slope barotropic velocities are strongest in that region. Besides the strength of the barotropic currents, the generation of internal tides also depends on the stratification and the steepness of the slope." These general ideas match very well to the conditions that we actually observed at the shelf break of the section in the Strait of Otranto. They estimated that, in general, the tidally induced mixing is important phenomenon on the shelf and on the continental shelf break, and discerned its seasonal variability. Nevertheless, they report that there exist additional mechanisms which increase friction, and, therefore mixing. Some of them are definitely present in our case, such as diurnal continental shelf waves, internal tides, and waves trapped to the pycnocline. Although we are not able to quantify the vertical viscosity coefficients in our conditions, the effects on the mixing might be very similar. These considerations will be enclosed in Chapter 5.
Moreover, we will also specify in Chapter 5 of the manuscript that K1 tidal ellipses during summer at St2 show increase of both across-shelf and along-shelf components, especially in the bottom layer. This fact, as stated by Pereira et al. (2002), results in the more vigorous displacement of the stratified fluid up and down the slope.

- 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.

**REPLY:** Unfortunately, the Limited Area Model data were not available for 1995. In addition, the comparison of the observed and ECMWF winds in 2007 was quite satisfactory. Therefore, the ECMWF winds were kept for a reference.

- 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.

**REPLY:** The wind and tidal signals in summer 1994 and in summer 1995 are discussed only to give another evidence for the exclusion of wind as possible cause of intensification at the diurnal frequency. The paragraph will be rewritten in order to clarify this point.

- 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?

**REPLY:** This point has been clarified in answer to point III of referee #1

- 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.

**REPLY:** Corrected.

- 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 Mihanovi´c et al. (2009) and by Orli´c et al. (2011), and the 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.

**REPLY:** This point has been addressed in details in the answer to point I of the referee #1

Technical Comments

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

**REPLY:** We will try to do it but we think that when reducing dimensions of panels, different lines in the plot will be difficult to distinguish.

- 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.

**REPLY:** Good point. Anyway the figure will be re-done as suggested by referee #1 and taking also into account your suggestions.

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

**REPLY:** Done

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

**REPLY:** Figure re-done.

- 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?

**REPLY:** Do you mean Fig.15 a? The line represents the coastal Italian shoreline. It will be specified in the caption.

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

**REPLY:** Done

- 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...";

**REPLY:** Done

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

**REPLY:** ECMWF data have a spatial resolution of 0.25 degrees in both latitude and longitude, and a temporal resolution of 6 hours. This will be included in the text in Chapter 2.

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

**REPLY:** Done

- 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?

**REPLY:** References reported at page 438 refer to the entire Adriatic tidal models that can have relation with the observations at Otranto. Modelling of the Venice lagoon is a specific study of the local coastal environment, that can hardly be related to the tides at Otranto. However, we included the suggested reference of Guarnieri et al. to illustrate efforts in modelling basin-wide tides in the Adriatic.