

Interactive comment on “Residual circulation and fresh-water transport in the Dutch Wadden Sea: a numerical modeling study” by M. Duran-Matute et al.

Anonymous Referee #2

Received and published: 17 March 2014

Minor revisions

This paper investigates residual circulation in the Wadden Sea, using numerical model. The paper highlights the importance of considering wind driven residuals impacting on freshwater pathways. Separately tracking water from the two sluices effectively highlights the different flushing routes these water masses take to leave the Wadden Sea. The section describing the histograms (line 551 - 561) is very good. The methods are clearly explained, and the model well validated. Most figures are clear and helpful in explaining the scientific 'story' and the paper is generally well written. I would suggest this paper is accepted for publication, following some minor revisions, detailed below.

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Major comments: (1) The methods section is overly long, perhaps the description of GETM in section 2.1 could be moved to an appendix?

(2) The final discussion of flushing times / residence times (lines 704-718) could be cut, using different reference salinities to come to different values for the times seems to only confuse the message, and doesn't add much

(3) Figure 13 is unclear, it is difficult to understand what is being shown, and colouring panel (b) by wind direction does not show clearly what is happening. Perhaps a time series of directional arrows might be better? Panel (a) might be improved by splitting it into 3, so Marsdiep, Vlie and the Watershed transport are presented separately?

Minor corrections

Line 36: reword "How is the residual circulation"

Lines 39-43 and 51-53: When defining tidal prisms in each inlet, please could you refer back to the labels defined in Figure (1) here, this would help readers who do not know the geography of your study area.

Line 56: Where is the Marsdiep basin? please could you also mark the extents of basins on the map in Figure 1.

Line 89: Consider replacing 'Like for...' with "As for the residual..."

Line 93: Does this suggest that flushing rate was enhanced through the Texel inlet at this time?

Line 94: replace 'questions have remained' with "questions remain"

Line 96: replace 'from measurements or numerical' with "from measurements or numerical models"

Lines 98 - 100 : rephrase this sentence, or cut into 2 shorter, it is unclear

Line 184 (Equation 10). Is there no surface freshwater input (evaporation minus precip-

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itation?) it is worth mentioning in the text, if this is not being considered. (see comment re line 256)

Line 200: I haven't heard of the Rijksdriehoek projection, perhaps you could explain why this is used? Is this standard with GETM / in this region?

Line 207: space inserted before the comma

Line 216: Did the datums for the 2 different bathymetry data sets match-up OK?

Line 225: I was initially concerned about the use of the vertical wall at the Eastern edge of the domain, but the model seems to be well validated away from here in your study area, so I think the concerns are unfounded.

Line 244: What was the frequency for forcing at the boundaries? e.g. hourly tides? daily T&S?

Line 256: Here you say that freshwater fluxes are included in the model, yet not included in Equation 10 (see comment re line 184)

Line 299: What is 'internal pressure' is this relevant to include? Line 300-301 'In addition, background horizontal momentum diffusion of $5\text{m}^2\text{s}^{-1}$ '. Fragment sentence, please rephrase.

Line 304-308 is this necessary?

Line 355 change 'dubitable'.

Line 355 so the model output contains wind forcing, is it still OK to perform a harmonic analysis on this rather than a tide-only run?

Line 368: please mark the position of the NIOZ jetty on the map

Line 380: extra full stop after variability

Line 382: PSS?

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Line 465: 'Table C' do you mean "Table 2"?

Line 483: Average over what period of time? Similarly line 484: Average maximum, how is this defined?

Line 494: These can be attributed to storm surges = can you back this up with meteorological data?

Line 528: 'It can be seen that all periods..' This is not clear in the figure. Perhaps a time series of wind arrows would help clarify this figure?

Line 549: Table C = Table 3?

Line 579-582: Don't understand this section, are you proposing future work?

Line 655: consider replacing 'freshness' with "fresh water"

Line 665-666: Rephrase "For the outflow of freshness through..."

Line 695: replace 'associated to' with "associated with"

Line 705 replace 'higher' with "longer"

Line 721: November 2009 not 2010?

Line 735: replace 'includes' with "include"

Line 752 - 754: restate the importance of the median values here.

Figure 6. Is this figure necessary? It is a nice agreement, but the content is covered by the discussion in the text.

Figures 10 and 11 can be combined into 2 panels of a single figure

Figure 12: please state in the caption over which period the average maximum and minimum volumes are defined.

Figure 13 is not helpful, and needs clarifying / replotting

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Figure 14 could also plot the mean value, to further highlight the skewness

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