

## ***Interactive comment on “Climate-scale changes of the semidiurnal tide over the North Atlantic coasts from 1846 to 2018” by Lucia Pineau-Guillou et al.***

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Received and published: 14 July 2020

14 July 2020

I have some detailed, most technical comments on this draft with an editor hat on. The two formal reviews should be inspected for more on the science. There are rather a lot of them but many are trivial.

Philip Woodworth

Title - what does 'climate-scale' mean? At line 9 you refer to 'large-scale' which seems a more sensible description. Or 'basin-scale' maybe.

6 - The trends in M2 amplitude

7 - from one station to another

7 - 0.7 mm/yr in the period since 1910

10 - distribution of water level

14 - Tides have been changing .. factors since the XIXth century ..

22 - large-scale (cf. line 9)

31 - scale → scales

32 - ditto

43-44 - I would drop this sentence

45 - thus only an accounted for change in ...

47 - years of data

49 - On the east side of the North Atlantic

50 - due to too small an M2

52 - On the west side of the North Atlanticc

52 - due to too small a tidal

55 - in Figure

60 - synthesised → summarised

61 - in 1846 and 1896 respectively

64 - performed in order to compute

65 - similar to the

66 - I would drop 'largely .. community'. It may be true but its wide use is not relevant.

67 - of the yearly

69 - M2 correctly.

70 - seasonal variation of typically a few ..

A better reference for this would be:

Pugh, D. T. and Vassie, J. M. 1976. Tide and surge propagation off-shore in the Dowsing region of the North Sea. Deutsche Hydrographische Zeitschrift, 29, 163–213, doi:10.1007/BF02226659.

71 - instead of the 50% here

Table 1 caption line 1 - tide gauge records selected

Table 1 caption line 3 - .... modulation, estimated trends in M2 amplitude since

Table 1 - I don't see why you have column 5 (MSL average) which has no importance to this study, MSL being measured relative to an arbitrary datum at each site.

73 - lead to the exclusion of more years.

This is obvious isn't it? So how did your results change with 75%?

74 - retrieved → removed

(Simon, 2007,2013) as described briefly below.

Drop 'Here .. method'

75 - reword:

.. an 18.6 modulation, separated from a neighbouring line in the tidal potential (m2) whose Doodson number differs in its 5th frequency ... respectively) (cf. Doodson and Warburg, 1941; Pugh and Woodworth, 2014). This .., the negative of the ..

79 - but it is negligible, its amplitude in the tidal potential being ..

81 - .. and m2 cannot be separated by a yearly harmonic ..

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83 - expressed schematically

86 - are the amplitude and phase lag [not phase shift]

88 - shift → lags astronomic → astronomical is given by

93 - The negative of the mean ... is expressed simply

99 - from one station .. We added the default ..

103 - to this detrended

110 - drop the comma

113 - please replace the hyphen with a colon. A hyphen looks like a minus sign.

Fig 2 caption. This should better say:

(a) Estimation of the modulation of M2 amplitude (mean removed) at Newlyn, (b) Impact of M2 amplitude ...

123 - ... (NAM) (Hurrell reference). These climate ...

125 - stations) over long periods

127 - what does 'Variations in the NAO are essential' mean? You mean important?

132 - The normalization involves ..

drop 'long-term'

134 - what do you mean by 'with yearly values' when you have said you are using wintertime values? I would drop these 3 words

This section should mention the AMO also as you use it below.

143 - the eastern

146 - consistent with the temporal coverage of the tide gauge measurements.

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153 - Brest and Newlyn

154 - drop the brackets

155 - .. changes must be at least ..

159 - flattened

yet → already

161 - of the tidal

Fig 3 - nice plot

Fig 3 caption line 3 - The blue star in

164 - allow to confirm at larger timescale (?)

174 - in Figure

175 - into two groups

177 - ditto

179 - drop 'globally' (twice). They are not global which means 'worldwide' to most people

181 - ditto

increases overall

182 - decrease, and since 1990 only

183 - one station

191 - which provides some confirmation of the hypothesis

192 - from the Brest

196 - drop globally

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decreases overall

202 - synthesised → summarised

204 - one station

drop globally

positive overall

207 - found previously

214 - Lewes? You must mean Portland?

the latest → recent

and (2)

226 - in the tide

227 - mean sea level rise can result in an increase in M2 of .. of the MSL rise ... the same sign as mean ..

238 - define SONEL

240 - falling slightly

241 - give reference to GoM land movements

fig 6 caption - remove (see Table 1 column 5) and remove that column - it has no importance.

249 - catch → account for

when they are forced with a meteorological field. What does this mean?

250 - affect

254 - in long-term

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256 - and the Atlantic ..

The AMO is not referred to as an index in section 2.2.1. Also it is an SST index and not an air pressure one

Fig 7 caption line 1- you said before you used wintertime values not annual ones

271 - .. could be due to differences in the spatial

heights → level

273 - year → winter

276 - usual

278 distributed differently ... south

281 - height → level

287 - volume

288 -precipitation

289 - on the scale

Fig 8 caption line 1 - .. pressure over the NE Atlantic

297 - coldest → lowest sea surface temperatures were ..

Fig 9 line 1 - Changes in mean sea level due to the difference ... (NAO-) assuming an IB response of sea level.

307 - differences

calls for → indicates

311 - explain the variations alone.

314 - heights → level

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317 analysis of the phase lag

332 - right! See above. How does that change the results?

333 - deep → fuller

336 - tide gauges are obviously on the coast! Drop that. Harbours is relevant.

363 - the e20... refers to Haigh et al. This reference needs correcting.

Also you have some names with initials before the surname e.g. Trimble.

Finally, you might want to refer to Talke and Jay (Annu. Rev. Mar. Sci. 2020. 12:121–51) especially from the perspective of changing tides in estuaries such as Cuxhaven.

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Interactive comment on Ocean Sci. Discuss., <https://doi.org/10.5194/os-2020-56>, 2020.

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