

Interactive comment on “The gyre-scale circulation of the North Atlantic and sea level at Brest” by P. L. Woodworth et al.

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After submitting the previous comment, it occurred to me that there is a way to test, at least partially, the idea that the agreement shown by Woodworth et al. could possibly be caused by broad longshore currents. There are data available for three pseudo-forcing mechanisms: first, atmospheric pressure at the center of the gyre, an analog of the broad wind-stress curl (hence the circulation of the full gyre); second, atmospheric pressure near Brest, an analog of the longshore wind stress (suggestive of nearshore currents); and third, the difference in pressure between these two (suggestive of a very broad longshore flow). Therefore I have computed the coherence between the three variables just listed with sea level at Brest, beginning in 1846, using data kindly supplied by P. Woodworth. The record is longer than that but the large gaps prior to

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1846 make it questionable for this purpose. There are about a dozen years missing in the later record and those were filled in with a cubic spline and checked for overshoots, etc. The figure below shows the result of the three comparisons. The only reliable coherence at long periods is found between Brest sea level and atmospheric pressure at the center of the gyre. Better coherence with atmospheric pressure near Brest is found at the shorter periods, as might be expected. In fact, the appearance of some slight coherence at very long periods with the other two variables is an artifact of the calculation, because there is a low in spectral power there with both variables. Thus the original implication of Woodworth et al., that the remarkable agreement they find between sea level at Brest and atmospheric pressure at the center of the gyre as an indication of an effect of changes in the large scale-circulation of the North Atlantic gyre is strongly supported, at least to the extent that these coherence calculations are a valid test of their idea.

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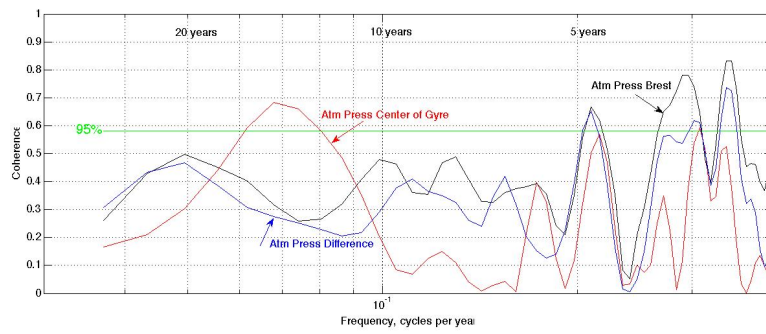


Fig. 1. Coherence between Brest yearly sea level and atm. press at the center of the N Atlantic gyre, atm press near Brest, and their difference, using 162 years of data. Data kindly provided by Woodworth.