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Interactive comment on "Statistical Analysis of Wave Energy Resources Available for Conversion at Natural Caves of Cape-Verde Islands" *by* W. M. L. Monteiro et al.

Anonymous Referee #2

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The paper describes the statistical analysis of a 30 year time series of wave data for the purpose of evaluating the theoretical resource available for conversion using natural caves in the Cape Verde Islands. This is a useful subject for research, but it is less clear that it could be suitable to report in an Ocean Science journal even if conducted perfectly. It is not obvious to me that it gives any useful new insight to wave climate or surface wave physics (either of which would make it eligible). Furthermore, it is written with an emphasis on statistical analysis and some engineering details, but without very much on the science of surface wind waves and swell. It is also fairly poorly written both in respect to structure and style and grammar. I find it difficult to foresee this paper reaching a suitable standard either in terms of relevance or technical

quality sufficient for publication in Ocean Science.

The introduction starts poorly be giving an absurd value for the global wave resource. Boyle (2004) in fact gives a similar value to most other sources, i.e. an average power of 2TW which equates to 17 500 TWh/year. This error is not relevant to the rest of the paper but makes a very poor impression.

The simplest - but most important - technical deficiency of the paper is its failure to identify the original data sufficiently. We are told the data is obtained from the SOWFIA project, but as I understand it, SOWFIA was a conduit to gather data rather than responsible for any original data collection. We have a position and dates, but there is no clear indication whether this "data" is from a wave buoy (what type? whose?) or from a wave model (which?). If the data is from a buoy then 30 year time series are sufficiently rare that the data is intrinsically interesting in terms of wave climate. If it is a wave model output then there is little scientific reason to analyze at a single location in isolation, but there might be a case from relevance to Cape Verde Islands. In any case, the data requires an adequate "provenance".

The data is in the form of significant wave heights and peak periods at 3 hour intervals. The authors correctly point out that calculation of the wave power ideally requires an energy period rather than a peak period. The authors discuss methods to estimate an energy period, but fail to make a clear statement of the method that they adopt (e.g. "In this study, we estimate an energy period by Te = 0.86 Tp". Other than this there is a reasonable analysis of the distribution of the data and monthly and annually-averaged time series are constructed.

There are some interesting and wholly credible features in the data. Notably (1) a simple seasonal variation with a single maximum in January and a single minimum in July, (2) an apparent decline in wave power over the 3 decades. I can say these are reasonable observations since the seasonal pattern is very similar to most northern hemisphere wave data and the scientific literature contains many reports and discus-

sion of trends or multi-decadal variation in wave climate. The authors cannot make any such assessment since they appear oblivious to that literature, or at least have not cited any papers on wave climate. I will not criticize not giving a reason for the decline, since this largely eludes all of us, but some reference to causes of longterm variation e.g. behavior of the North Atlantic Oscillation over those decades would have been useful.

I found the discussion of the time series analysis opaque in places, but as I understood, simple analyses of the annually-averaged power suggests a decline, but analysis of each calendar month shows no obvious departure from stationarity in any calendar month. These two statements might appear contradictory, but I think are not surprising given that monthly values will be massively variable. The observation (Figure 7) that the variability is generally greater in the winter months is consistent with other studies that have observed very high inter-annual variability in North Atlantic wave climate in winter months.

I will not go into every statistical analysis in detail, but I am skeptical whether the ARIMA projections are useful. I think it is sufficient to state that we can do no better than "take the past as a guide to the future" and describe the average and variation of wave powers within the 30 year time series.

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