OS-2019 -69

The long term spatio-temporal variability of sea surface temperature in the NW Pacific and near China Sea

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General Comments

This paper describes the analysis of trends in a long SST time series in the NW Pacific and relates this sub-regions near the Chinese mainland and other sub –regions in NW Pacific. Furthermore it relates the SST to some climate indices. This should have potential interest among many people in the climate community. However in its present form it will need a substantial revision before it is accepted for publication.   I have detailed below my comments on the paper. In your reply please give specific answers to each major comment.


Major comments

Line 134-136 I am not convinced this statement is correct as it stands. HADISST is a long term data set 1850-present.  Need to say more about your reasons for using the data set you used.

Line 162 The ECMWF produces 10 day global forecasts and it certainly doesn't focus on mesoscale weather forecasting ( very high resolution regional forecasts).

Line 229 -230 This sentence is not clear. What does the curve trend is very gentle mean. ? What does oscillated gradually mean ?  Also the SST is the valley of nearly 164 years should be expressed perhaps as the SST is at a minimum over the 164 years.

Line 243 – 244 You do not explain why ±0.4 °C is used for discriminating anomalies. Is it 1 standard deviation of the time series or is it the tercile value?  Your statistics could be biased if you did not use the correct boundary.

Line 253-258 You use a term " mutation" which is not used in European oceanography or meteorology because it is widely term used in biological sciences. You need to replace it with a more appropriate word or words throughout your paper.

Line 281-288 A correlation coefficient (with significance level) with ENSO index should be given here.

A figure reference should also be added in this paragraph.

Line 321-323You need to explain how high temperature water can be transferred from the NE Pacific to NW Pacific. It may not necessarily be transferred by the ocean circulation. The atmosphere circulation does play a role by ocean-air transfer from the ENSO region.

Line 333-339 A linear regression has been used throughout the paper. But clearly the time series is non-linear in the later part of the data set. This would suggest either non-linear regression or a low order polynomial may be  more suitable to describe the series. ?

Line p341-360 The correlation maps shown in Figure 9 are very interesting but the discussion of these maps needs to improved. For example there is a brief mention of significance when discussing SST and T2 but not in any other of the  correlations shown in figure 9. In particular the SST and ENSO doesn't give a significance level for the correlation map.

A further point about this discussion is the mention that PDO and ENSO are significantly correlated but this map is not shown in figure 9. If it is well known they are correlated then a reference is needed.

This section of the paper needs to be revised carefully to discuss each correlation map in Figure 9 with levels of significance given.

Line 362 Figure 9 The abbreviations such as TCC, TCW and PRCP have not been defined in the methods section on p4 and p5. They should **all** be defined e.g. precipitation (PRCP) in the methods section.

Line 426-428 Not convinced this has been demonstrated in Section 3.3 ( p341-360).

Line 429-435 The description of seasonal temperature distribution ( May to October) refers to ocean circulation being the cause of the tilted distribution but again no evidence is supplied or a reference given. It could be result of upwelling at the coastal boundary.


Minor Comments

Line 19-20 The sentence should be made clearer. A slow decreasing trend period does not make any sense to me. Also a trough in the time series is not appropriate scientific language in this context. You should state " 1910-1930 was the lowest  minimum in the 164 year record. "

Line 24 Should be "The change in trend"

Line 43 Should this be "Ocean heat content" …and dynamic processes.

Line 59 add a comma after " droughts" and remove " and"

Line 92  Replace "space " by "research"

Line 116 Replace " are " by "is"

Line 153 Replace "in the north" by " to the north"

Line 189 Replace "Perform a significance test"  by "A significance test is performed…"

Line 210 Figure 3 (top graph) I was surprised that the domain covers 0-60N with temperatures ranging from 3-6C in the north to 26 to 28 C but the mean is about 26 C ? Need to check this is correct.

Line 213 Legend " All the trends are significant" not " is  siginificant.

Line 218 Should be North Western Pacific"

Line 225 Should be " 95% significance test "

Line 238 Should be " red lines are their trends"

Line 239 -240 I suggest removing "The same as the annual pattern, seasonal pattern" replacing by " The seasonal pattern for the latest 30 years shows a more significant warming trend than that over the 164 year period."

Line 243 Insert " is" after anomaly.

Line 251 Delete " curve"

Line 252 Replace "was" by " is"

Line 266 Figure 4 Insert (c) for lower part of figure

Line 285 Remove " basically"

Line 287 Remove " basically"

Line 289-296 Need a figure reference in this section ( ie Figure 6 and/or 7)

Line 305 I suggest replacing "getting closer to the main land coast line" by " it approaches the coast"

Line 333 Remove "relatively nearly" as it confuses the meaning of the sentence.

Line 335 Replace " anomaly" by " anomalies"

Line 338 You need show the significance level for the 10 year period. This is important because there is variability in the climate record at the decadal time scale.

Line 366-368 Sentence is confusing. Suggest adding a full stop after South China Sea. And Starting a new sentence "The Kuroshio Extension …, is defined as the offshore region…"

Line 377 Replace "SST gradient increases as getting closer to the mainland coast line" by "SST gradient increases as it approaches the mainland coast"

Line 379 Year needed for Bao et al reference

Line 388 Should be " Near China Sea" in brackets to be consistent.

Line 440 –line 441 Should be " PDO and Nino 3.4"