

# ***Interactive comment on “Responses of atmospheric circulation to sea surface temperature anomalies in the South China Sea” by M. Zhou and G. Wang***

## **Anonymous Referee #2**

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The study of M. Zhou and G. Wang addresses the question of how local SST anomalies in the South China Sea (SCS) can influence the global atmospheric circulation. Using a very simple two layer model to represent atmospheric dynamics the author carried out a set of 6 idealized sensitivity experiments with varying prescribed warming anomalies in the SCSs surface temperature. The authors identify 3 regions of atmospheric influence far remote from the perturbation source (namely North America, high latitudes of the Southern Hemisphere and the Mediterranean). In general the paper is build up well and easy to follow. However, due to the simplicity of the applied atmospheric model it is difficult to draw any general conclusions since it also neglects interactive feedbacks with the ocean dynamics which is not represented at all. I am also not sure if Ocean

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Science is the right platform for this article as ocean processes are not considered at all. According to the Aims and Scope of Ocean Science this article appears rather displaced. So an atmospheric or meteorological journal might be more appropriate.

General comments.

Simply speaking, in a highly stochastic system like the atmosphere it is not very surprising that a local change in the surface boundary condition can have far reaching influences elsewhere. Such teleconnections are well known and were frequently reported in the literature even with more advanced and complex models (e.g. GCMs ENSO etc). Before any publication should be considered the following major points should be addressed.

1) It is clear that in a changing climate SSTs won't change solely in the SCS but also at any other location in the world ocean. So the question should be discussed if the described teleconnections would operate in the real world. Unfortunately, no attempt was made to validate the teleconnections. On page 1700 line 20ff the authors note that in boreal winter in the northern SCS, SST anomalies are independent from the atmospheric conditions. This gives the opportunity to look in the used observational data sets find support for the described teleconnections. If on the other hand, as the authors state the SCS most of the time only responds passively responds to atmospheric forcing, then it would be better to choose another shelf sea which is less dependent for these sensitivity experiments. The article would clearly benefit from that.

2) The model basically predicts anomalies in the baroclinic and barotropic streamfunctions. It is not clear if any of these changes are of any climatic or physical relevance at all in the remote regions (Mediterranean, North America etc.). Hence, the authors should briefly introduce to the local climatic conditions in the remote regions and give hints why and how atmospheric circulation changes might be important in these regions (the frequent heavy rain events in the northern Mediterranean might be an example, etc). The scientific relevance would benefit from that.

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## Specific comments

### Introduction

It should be introduced in more detail to the phenomenon of global teleconnections. What is the role of the ocean, the atmosphere and their interaction. And why is the SCS of special interest for this specific phenomenon. Does the SCS warm faster than other ocean regions (because it is a flat shelf sea)? Also it would be interesting to know more about the seasonal cycle of the air-sea temperature difference in order to estimate how energy is distributed in the model (either by reduced heat loss to the ocean or by increases heat flux from the ocean).

page 1695, Line 8: which positive SST anomaly are you talking of?

page 1699, line 5: “The results support...”. Don’t understand this sentence. Be more verbose. What is meant by asymmetric heating sources? The reference to Fu et al. (1980) in Chinese language is not sufficient here.

page 1699, line 9: what is meant by “atmospheric circulation in the zonal direction”? Circulation is by its nature neither strictly zonal nor meridional. Or do you mean that the overwhelming wind field over the SCS is mostly in E-W direction during summer and winter? Or do you have E-W gradients in the SST anomaly applied?

page 1700, line 18: “For example, we may forecast climate related events based on SCS SST anomalies”. This is a zero statement. Please give examples for the kind of events you might forecast or remove the sentence.

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