Responses to reviewer#1:

All the authors are extremely grateful to you for providing your excellent comments and valuable advices for this paper. Your major suggestions that the reliability of this datasets is not mentioned and the authors did not verify their results in spring season are very helpful for us. Based on your suggestions, we have made some revisions to on our paper. We have added the discussion of reliability of this datasets and the new results in spring season based on your specific comments.

Thank you again for your valuable comments to improve our submission. If there are still any problems on the method, diction, phrasing, grammar, and spelling, please do not hesitate to tell us and we'll try our best to improve them.

In the following, kind comments you suggested before are in black text with corresponding actions taken by us following in blue.

Specific comments:

1. The method used in this study is based on the statistic regression, which basically depends on the quality of observations. In section 2.1, although the authors claimed that the monthly average SST data from the UK Met Office Hadley Centre is adopted in this study, the reliability of this datasets is not mentioned. Besides, the verification of this datasets with in-situ observation is also strongly recommended by this reviewer.

Responses: Good suggestions. In the previous paper, we have neglected the discussion of reliability of this datasets. Now there are three main categories of SST

data. The gridded 2° × 2° NOAA Extended Reconstructed SST dataset (ERSST.v3b; Smith et al. 2008) includes in situ data (ships and buoys), but does not include satellite data. The gridded 1° ×1° Met Office Hadley Sea Ice and SST dataset (HadISST1; Rayner et al. 2003) includes both in situ and available satellite data. The gridded 1° ×1° NOAA Optimal Interpolation SST (OISST.v2; Reynolds et al. 2002) incorporates in situ and satellite data, but unlike the other two SST datasets, it is only available in the recent period from November 1981 to the present. Both HadISST1 and ERSST.v3b are available from the mid-to-late 1800s, but only monthly data from 1951 to 2010 was considered in this study.

Considering comprehensively, the gridded 1° ×1° Met Office Hadley Sea Ice and SST dataset data, no matter from data quality or data length, is the most appropriate to used.

The specific revision can be seen from line118 to line120 in page6.

We sincerely hope for your satisfaction with our revision. Thank you again for your kind suggestion.

References:

Smith TM, Reynolds RW, Peterson TC, Lawrimore J (2008) Improvements to NOAA's historical merged land–ocean surface temperature analysis (1880–2006). J Clim 21:2283–2296.

Rayner NA, Parker DE, Horton EB, Folland CK, Alexander LV, Rowell DP, Kent EC, Kaplan A (2003) Global analyses of sea surface temperature, sea ice, and night marine air temperature since the late nineteenth century. J Geophys Res 108(D14):4407.

doi:10.1029/2002JD002670

Reynolds RW, Rayner NA, Smith TM, Stokes DC, Wang W (2002) An improved in situ and satellite SST analysis for climate. J Clim 15:1609–1625

2. One important conclusion of this study is "The difference between forecast results in summer and those in winter is not high, indicating that the improved model can overcome the spring predictability barrier to some extent". This conclusion is vague and lack of rigorous verification because the authors did not verify their results in spring season.

Responses: Good suggestions. The skill of forecasts that start in February or May drops faster than that of forecasts that start in August or November. This behavior, often termed the spring predictability barrier, is in part because predictions starting from February or May contain more events in the decaying phase of ENSO (Jin et al., 2008). Based on the reviewer's suggestion, we have added the experiments in the spring and in the autumn in Table4. From the table, we can see the forecast result in spring of our model is also good, indicating that the improved model can overcome the spring predictability barrier to some extent. The specific revision can be seen in from page66.

We sincerely hope for your satisfaction with our revision. Thank you again for your kind suggestion.

Table. 4. Temporal correlation(TC) and the mean absolute percentage error (MAPE) between model forecasts and observations within 12 months for Nov.–Jan., Dec.–Feb., and Jan.–Mar. as lead time of winter, for Feb.–Apr. , Mar.–May and Apr.–June as lead time of spring, for May-July, June-August and July-Sep. as lead time of summer and for August-Oct., Sep.-Nov. and Oct.-Dec.

as lead time of autumn.

Forecast events	Lead time of all seasons combined		Lead time of summer (MJJ-JJA-JAS)		Lead time of autumn (ASO-SON-OND)		Lead time of winter (NDJ-DJF-JFM)		Lead time of spring (FMA-MAM-AMJ)	
	TC	MAPE	TC	MAPE	TC	MAPE	TC	MAPE	TC	MAPE
The average of 18 El Niño examples	0.604	9.70%	0.569	10.33%	0.632	8.85%	0.677	8.02%	0.538	11.6%
The average of 22 La Niña examples	0.625	8.97%	0.581	9.82%	0.645	8.41%	0.695	7.83%	0.579	9.82%
The average of 20 Neutral examples	0.798	5.96%	0.752	6.86%	0.831	5.31%	0.844	4.60%	0.765	7.07%
The average of total 60 examples	0.712	7.62%	0.633	8.51%	0.786	6.88%	0.776	6.52%	0.653	8.03%

3. Lines 42-44, Compared with six mature models published previously, the present model has an advantage in prediction precision and length, and is a novel exploration of the ENSO forecast method". The major concerns of this reviewer are: what is the sample size in comparing the forecast results? Are those samples really representative?

Responses: Good suggestions. As shown in Table 4, our ENSO forecast is a total of 60 experiments, including 18 ElNino examples, 22 La Ni n a examples, and 20 Neutral examples, and each experiment contains lead time of four seasons. Finally, it is the equivalent of 240 experiments. Figure 11 and Figure 12 is the average TC and RMSE of the 240 experiments of compared with six mature models, covers a variety of different types of ENSO and different lead time. So those samples should be really

representative . We haven't explained it in previous paper, and now we explain it from line564 to 567 on page27.

We sincerely hope for your satisfaction with our revision. Thank you again for your kind suggestion.

Minor comments:

1.Line 122, give the full name of “SOI”.

Responses：Good suggestions. Now we have given the full name of “SOI” as the Southern Oscillation Index (SOI) in line128 in page6.

We sincerely hope for your satisfaction with our revision. Thank you again for your kind suggestion.

2. Line 549, “mode” should be “model”.

Responses：Good suggestions. Now we have revised “mode” as “model” in line545 in page26.

We sincerely hope for your satisfaction with our revision. Thank you again for your kind suggestion.