Cover letter

Dear Editor:

We thank you very much for the comments on the paper 'The sensitivity of landfast sea ice to atmospheric forcing in single-column model simulations: a case study at Zhongshan Station, Antarctica' submitted to *the Cryosphere*. They are very valuable for improving our manuscript. We revised the abstract according to your suggestions. We have quoted the text from the paper and displayed in bold the changes/additions.

Qinghua Yang and Bo Han

On behalf of all the authors

Responses to Editor

Editor

Comments to the author:
Dear Authors,

Thank you for your revised manuscript. You addressed the comments made by the referees adequately. You also decided to shorten and simplify abstract and conclusions. However, for model developers it is a crucial result of your paper to hightlight shortcomings of existing sea ice models. This is done in the Shortcoming sections, but I wonder you might want to add one or two sentences to abstract and/or conclusions summarising the section.

Kind regards,
David

Response:
Thank you for your constructive comments. We added as suggested the shortcomings at the end of the abstract:

‘Single-column sea ice models are used to focus on the thermodynamic evolution of the ice. Generally, these models are forced by atmospheric reanalysis in the absence of atmospheric *in situ* observations. Here we assess the sea ice thickness (SIT) simulated by a single-column model (ICEPACK) with *in situ* observations obtained off Zhongshan Station for the austral winter of 2016. In the reanalysis, the surface air temperature is about 1 °C lower, the total precipitation is about 2 mm day^{-1} larger, and the surface wind speed is about 2 m s^{-1} higher compared to the *in situ* observations, respectively. We designed sensitivity experiments to evaluate the simulation bias in sea ice thickness due to the uncertainty in the individual atmospheric forcing variables. Our results show that the unrealistic precipitation in the reanalysis leads to a bias of 14.5 cm in sea ice thickness and 17.3 cm in snow depth. In addition, our data show that increasing snow depth works to gradually inhibit the growth of sea ice associated with thermal blanketing by the snow due to changing the vertical heat flux. Conversely, given suitable conditions, the sea ice thickness may grow suddenly when the snow load gives rise to flooding and leads to snow-ice formation. **However, there are still uncertainties related to the model results, because superimposed ice and snowdrift are not implemented in the used version of the ice model and because snow-ice formation might be overestimated at locations with landfast sea ice.**