

# ***Interactive comment on “Simulation of observed climate changes in 1850–2014 with climate model INM-CM5” by Evgeny Volodin and Andrey Gritsun***

**Anonymous Referee #1**

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The paper presents the results of seven historical experiments with the observed external forcings on the climate system for the period 1850–2014, which were performed with the climate model INM-CM5 within the framework of the international project CMIP6. The main attention is paid to the simulation of the observed evolution of the global mean surface temperature (GMST). Also discussed are the changes in the sea ice cover in the Arctic, the temperature decrease in the stratosphere, and the spatial structure of the surface temperature trend in the last 30 years. The INM climate model has proved itself in the previous stages of the CMIP project, and the results of simulations with the new version of the model (INM-CM5) are of undoubted interest.

The authors use the term “Solar Constant”, which is the amount of total solar energy received by unit time and unit area at the mean sun-earth distance. This term is some-

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what misleading, because the irradiance is varying in time and hence the majority of contemporary papers (see Kopp and Lean (2011), Kopp (2016), etc.) use “Total Solar Irradiance” or TSI. I would recommend the authors to do the same.

One of the important results of the study is a good ensemble mean reproduction of the observed slowdown in global warming in 2000-2014. The authors attribute this result to more accurate description of the TSI variability in the CMIP6 protocol. It should be noted that this conclusion should be treated with caution. The slowdown in warming begins in 2000, when the discrepancy in the TSI values between the CMIP5 and CMIP6 protocols is still very small (Fig. 2). It is difficult to expect that such a small value can have a significant effect on the change in GMST. Moreover, there is a general agreement in the literature (see Yan et al. (2016) and references in it) that the slowdown of GMST increase in 1998-2013 was a result of the increased uptake of heat energy by the global ocean during these years. Although the slowdown in warming in the model simulations, are obtained when the AMO and PDO indices are incorrectly reproduced in the experiments, it does not indicate that the redistribution of heat in the global ocean could not be the main cause of the slowdown in global warming.

Kopp, G., and J.L. Lean. *Geophys. Res. Lett.*, 38, L01706, 2011, DOI: 10.1029/2010GL045777. Kopp G. *J. Space Weather Space Clim.*, 6, A30, 2016, DOI: 10.1051/swsc/2016025. Yan, X.-H. et al., 2016, *Earth's Future*, 4, 472-482, doi:10.1002/2016EF000417.

The article clearly lacks punctuation marks, for example in the expression "et al." in references to literature.

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