The Siberian High behavior against a background of extremely increase and following decrease anthropogenic load

Поведение Сибирского антициклона на фоне экстремального увеличения и последующего снижения антропогенной нагрузки

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ABSTRACT

The Siberian High (SH) determines the winter atmospheric conditions for the most part of Asia. Moreover, it interacts with main atmospheric centers of action of Northern Hemisphere such as Arctic High, Icelandic Low, the Azores High. Global climate change affects different climate system compounds, generally, and SH, particularly. The SH intensity (SHI) standard deviation increase against the atmospheric CO2 concentration raise according to RCP 8.5 has been shown by Fei L.I. and G. A. O. Yong-Qi in 2015 (till 2100 the CO2 concentration exceeds pre-industrial value 2.6 times). But the mean SHI doesn't significantly changed. However, it is still unknown the SH behavior against the further anthropogenic load raise. And there is nothing information about reversibility of this SH behavior.

Сибирский антициклон (СА) определяет атмосферные условия в течение зимнего сезона почти на всей территории Азии. Кроме того, данное барическое образование находится в тесном взаимодействии с основными центрами действия атмосферы Северного полушария: Арктическим антициклоном, Исландским минимумом, Азорским максимумом (Морозова С.В., 2013). Глобальные климатические изменения оказывают существенное влияние на различные компоненты климатической системы. Однако, остается неясным, как будет вести себя СА при дальнейшем нарастании антропогенной нагрузки, и кроме того немаловажно знать насколько обратимыми будут произошедшие с СА изменения.

GOAL:

to determine and estimate of the potential the SH response to the extremely intensive global climate change.
(определить и оценить потенциальный отклик СА на экстремально интенсивные глобальные климатические изменения.)

EXPERIMENTAL DESIGN

Model
"Planet Simulator" – Global large-scale climate system model of intermediate complexity (Fraedrich K. et al., 2005).

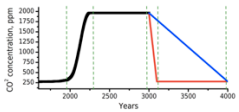

Figure 1. *Concentration of the carbon dioxide in the atmosphere.*

Scenario (Figure 1)
1700 - 2005: «Historical simulations» CMIP5;
XXI - XXIII: RCP 8.5;
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red line - during first 100 years:
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The Siberian High Intensity (Fig. 2)
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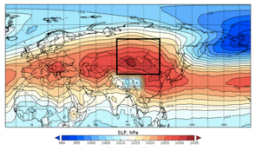

Figure 2. *SLP, 1971-2000, mean seasonal (DJF) Planet Simulator.*

RESULTS

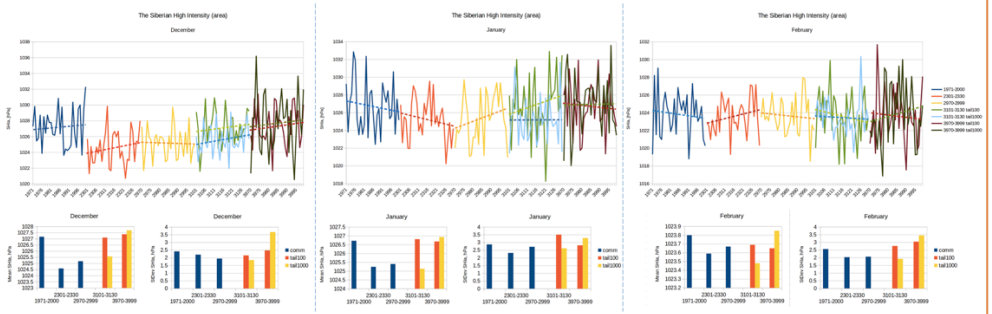

Figure 3. *The Siberian High intensity (SHIa) for the winter months for 5 time periods: 1971-2000, 2301-2330, 2970-2999, 3101-3130 (both decrease ways: fast and slow), 3970-3999 (both decrease ways: fast and slow).*
1st figure row*: 30-years SHIa variations and trends;* ***2nd figure row****: SHIa mean value and standard deviation for each separated time period.*

To estimate surface temperature change Boltzmann formula was used. To estimate the Siberian High intensity change equation of state was used.
The contribution of the CO2 radiative forcing to the surface temperature and the Siberian High intensity change was defined as determination coefficients of the corresponding regression equation.

Table 1. *Determination coefficients* ***ΔP*** *depending on* ***ΔTco₂***

	1971-2000	2301-2330	2970-2999	3101-3130 Fast / Slow	3970-3999 Fast / Slow
December	0,06	0,25	0,00	0,03 / 0,19	0,00 / 0,03
January	0,18	2,41	0,45	3,10 / 0,28	0,60 / 0,05
February	0,00	0,11	0,13	0,34 / 0,1	0,58 / 0,03

Table 2. *Determination coefficients* ***ΔT*** *depending on* ***ΔTco₂***

	1971-2000	2301-2330	2970-2999	3101-3130 Fast / Slow	3970-3999 Fast / Slow
December	0,03	1,34	0,91	0,24 / 0,01	0,02 / 7,77
January	5,39	1,32	**35,15**	**33,75 / 25,14**	4,10 / 19,63
February	5,84	4,69	6,72	0,60 / 2,27	12,97 / 0,20

CONCLUSION

- **The response of the Siberian High intensity on global climate change was obtained (Figure 3).**
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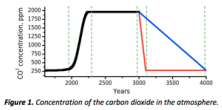

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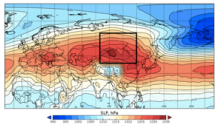

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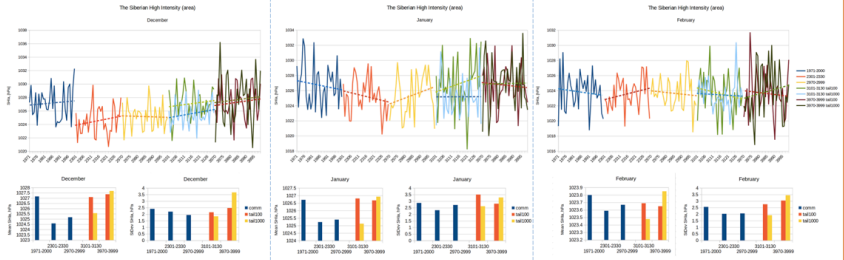

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