

## ***Interactive comment on “Exceptional retreat of Novaya Zemlya’s marine-terminating outlet glaciers between 2000 and 2013” by J. Rachel Carr et al.***

### **Anonymous Referee #1**

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General comments. The paper describes marine-terminating glacier retreat on Novaya Zemlya (NVZ) between 1973/6 and 2015. That is, the content of the paper is much wider than its title, which rather reflects its main conclusion. This conclusion states (lines 680-682) that: “Retreat rates on marine-terminating glaciers were exceptional between 2000 and 2013, compared to previous decades. However, retreat slowed on the vast majority of ocean-terminating glaciers from 2013 onwards, and several glaciers advanced, particularly on the Barents Sea coast.” In this regard my general questions are: (1) What are the intra-annual variations of glacier retreat rates on NVZ? (2) Are they comparable with the scale of deceleration observed in 2013-2015? (3) What are the trends and pattern in the NVZ glacier recession between 1973/6 and 2015

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if evaluated not in linear measures but in area changes? It is highly desirable that data on the annual position of NVZ glacier fronts (presented now only in an unidentifiable form as different-color lines on Figure 5) will be available to readers as a separate tabular supplementary to the paper. The same is true for area changes if available.

Specific comments. line 57-58: Statement that "...the pattern of frontal position changes on NVZ prior to 1992 is uncertain and previous results indicate different trends. ..." seems to be too strong one, as all previous results indicate recession (Shumsky 1946, Chizov et al 1968, Koryakin 2013). line 90: It is not clear - does SER glacier belong to Sub 1 or to Northern ice mass? line 90: Total number of glaciers should be checked as data in the Table 1 (above the line 949) shows different number(s) - by terminus type:  $32+6+15 = 53$  and by ice mass:  $43+4+5 = 52$ . line 118: "...The northern island also has two smaller ice caps, Sub 1 and Sub 2..." - There are not real ice caps but better say ice fields (or compound glacier systems). line 139: "Due to the lack of Landsat imagery during the 1990s..." contradicts with line 130 which states that data were available annually ...between 1985 and 1998. line 163: E.K. Fedorova but not E.K. Fedrova. Im. is an abbreviation from Russian word "imeni" which means "named after". To avoid ambiguity it seems better to indicate (here and everywhere in the text) the weather stations by WMO ID (20744 and 20946), as another weather station also named after E.K.Fedorov (WMO ID 20292) is located in other arctic place - on Cape Chelyuskin. line 169: Please, specify the data gaps on the Station Fedorova RSM00020946 lines 315-318: As shown by (Koryakin 2013) for NVZ glaciers there is some relation of retreat with their altitude. Also considering only the linear change of glaciers does not give full picture of their fluctuations. Analysis of area change of glaciers might reveal different aspects in fluctuation pattern/behavior/environmental control. line 591-592: Observed reduction in retreat rates might be result from increased ice velocities. line 963: Strictly speaking the Northern ice cap is located to the north from INO. According the Russian nomenclature the Northern ice cap indicated on map is the Ice cap of Northern Island. line 973: it is not clear does the length of box "necks" mean something or not? Also there is no box at

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Fig 2B for Kara L. Is it right? line 1003: Figure 5 is very interesting and most important, but its informativity is severely affected, since it is impossible to correspond the lines of different colors with specific glaciers (their names, or some other indicators, for example, RGI ID). line 1018: Thick black line is not specified in the caption of Figure 7.

Technical corrections. line 163 (and everywhere through the text): “Fedrova” should be “Fedorova”. line 172 (and everywhere through the text, tables, figure captions, including text in supplementary file and title label placed on Supplementary Figure 1 B): “850 m” should be “850 mb”. line 374: “+0.8 °C” should be “+0.8°C” (no space required). line 381: “7 %” should be “7%” (no space required). line 437: “SRE” should be “SER”. line 992: title label at fig. 4C “Air Temperature: “Malaya Karmakuly” should be “Air Temperature: Malye Karmakuly”. line 1031: “1981” should be “1980” line 1032: “1991” should be “1990”. line 1036: label at vertical axes Fig. 10A “Relative frontal position (km)” should be “Relative frontal position (m)”. Koryakin, V.S.: Glaciers of the New Earth in the XX century and global warming // [Priroda] Nature, 1, 42-48, 2013 [in Russian]. Shumsky, P.L.: Modern glaciation of the Soviet Arctic [Sovremennoe oledenenie Sovetskoy Arktiki] // Moscow - Leningrad: 1949, 262 pp. [in Russian]. Chizhov, O.P., Koryakin, V.S, Davidovich, N.V., Kanevsky, Z.M., Zinger, E.M., Bazheva, V.Ya., Bazhev, A.B., and Khmelevskoy, I.F.: Glaciation of the New Earth [Oledenenie Novoy Zemli] // Moscow: Nauka, 1968, 338 pp. [in Russian].

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