

Weather Clim. Dynam. Discuss., community comment CC1  
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## Comment on wcd-2022-32

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Community comment on "Reconciling conflicting evidence for the cause of the observed early 21st century Eurasian cooling" by Stephen Outten et al., Weather Clim. Dynam. Discuss., <https://doi.org/10.5194/wcd-2022-32-CC1>, 2022

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Dear Dr. Outten

Sorry for interrupting you

Recently, I have been reading your paper "Reconciling conflicting evidence for the cause of the observed early 21st century Eurasian cooling" submitted to WCD. Your paper is an important paper.

About the role of Arctic sea ice decline or Arctic warming in Eurasian cooling, here I present some thinkings about your priprint from my group.

(1) At first, I think that Arctic sea ice decline or Arctic warming is not important for Eurasian cooling as indicated in previous studies. In fact, the early 21st century Eurasian cooling during 1998-2012 can be reflected by the increased frequency of quasi-stationary Ural blocking (Chen et al. 2018, JC, pp2267, their Fig.4). However, this Ural blocking is not produced by Arctic warming. Instead, it can be formed from the propagation of upstream wave trains from the North Atlantic (Luo et al. 2016b, JC, pp.3949) even in the absence of Arctic warming or sea ice decline. Thus, to some extent, the Eurasian cooling does not need Arctic warming or sea ice decline or the Arctic warming is not a necessary condition of Eurasian cooling. For example, the 1965-1976 Eurasian cooling does not correspond to Arctic warming. Instead, it corresponds to Arctic cooling. Why the 1965-1976 (1998-2012) Eurasian cooling corresponds to Arctic cooling (warming) cannot be explained using previous studies. This problem has been examined in our recent paper (B. Luo, 2022, CD,

59:127–150). Please read it if possible. The warm Arctic-cold Eurasia relation is also modulated by PDO and AMO (B. Luo, 2022, Earth's future).

(2) The main viewpoint of our group is that the Arctic warming or sea ice decline is only a background factor (e.g., the magnitude of meridional PV gradient) of atmospheric circulation patterns such as Ural blocking. Arctic warming or sea ice decline does not play large role in the Eurasian cold anomaly if Eurasian atmospheric circulation patterns are absent. This is because the Eurasian cold anomaly is mainly produced by Eurasian atmospheric circulation patterns (or more exactly Ural blocking). Arctic warming or sea ice decline as a background condition like a non-dipersion medium can increase the persistence and quasi-stationarity of Ural blocking to result in a strong Eurasian cooling through reducing energy dispersion and enhancing nonlinearity once when a Ural blocking appears (Luo et al. 2018, JC, page 7661). Thus, the role of Arctic warming or sea ice decline in the Eurasian cooling is limited.

Please read the attached files for three papers from our group if you like them.

Best regards

Dehai