EGU22-6509, updated on 14 Aug 2022
https://doi.org/10.5194/egusphere-egu22-6509
EGU General Assembly 2022

Lack of Change in Atmospheric Blocking Duration in a Warming Climate

Ebrahim Nabizadeh[1], Sandro Lubis[2], and Pedram Hassanzadeh[3]
[1]Rice University, Houston, United States of America (en10@rice.edu)
[2]Rice University, Houston, United States of America (slubis@rice.edu)
[3]Rice University, Houston, United States of America (pedram@rice.edu)

Most studies on blocking events have so far focused on changes in the frequency of blocking events and the resulting weather extremes. The duration of blocking events and its potential changes under climate change have received much less attention. Previous studies are uncertain and show slightly different changes in the duration of blocking events. Using three large-ensemble, fully coupled general circulation model simulations, and two different blocking indices, we show no noticeable change in the duration of blocks under future climate change. Based on the results from the 1D traffic jam, proposed by Nakamura and Huang in 2018, we have found that an increase in the mean flow (speed of the jet) or transient eddy forcing independently, cause a reduction in the duration of blocking events. However, in reality, the transient eddy forcing and the speed of the jet are varied dependently, and they are likely to covary through shear. To address this issue, we diagnosed the relationship between transient forcing and the meridional temperature gradient in the GFDL dry dynamical core. By substituting this relationship in the 1D model, we show no changes in the duration of blocking events consistent with a constant duration in the GFDL dry dynamical core simulations. The responses of transient forcing and mean flow under climate change in a comprehensive GCM explain the insignificant change in the duration of blocks. It is worth mentioning that we only focus on the duration of blocking events as one of the important factors in driving extreme weather events, however, the impacts of other essential factors such as thermodynamics and soil moisture are needed to be further investigated.