



Regional attribution of geographic sectors in the observed interannual variability of Hadley circulation in boreal winter

Yong Sun (1,2), Laurent Z. X. Li (3), Gilles Ramstein (2), Tianjun Zhou (1), Ning Tan (4), Masa Kageyama (2), and Shaoyin Wang (5)

(1) Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing, China (sunyong@mail.iap.ac.cn), (2) Laboratoire des Sciences du Climat et de l'Environnement, Gif-sur-Yvette, France, (3) Laboratoire de Météorologie Dynamique, Paris, France, (4) Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing, China, (5) Institute of Meteorology and Climate Research, Karlsruhe Institute of Technology, Karlsruhe, Germany

Hadley circulation (HC) is a globally zonal mean conceptual model under the mass conservation constraint, and it inevitably obscures the regional diversity of the meridional circulation in the tropics. This study using ERA-Interim reanalysis data revealed the climatological diversity of tropical meridional circulation within global monsoon sectors, including thermally direct Hadleywise regional meridional cell (RMC) and anti-Hadleywise RMC in the presence of diabatic heating and indirect RMC in the absence of diabatic heating. More importantly, this study disentangled the geographic sectors that determine the interannual variability of HC strength from those responsible for its southern and northern edges. By further assessing the relative role of ENSO and mid-latitude eddies in the variability of HC strength in Northern Hemisphere and its edges in both Hemispheres, we found that mid-latitude eddies explain large fraction of interannual variances of HC and the secondary is explained by ENSO. Furthermore, we separate geographic sectors where dominant role played by mid-latitude eddies from those by ENSO.