Geophysical Research Abstracts
Vol. 19, EGU2017-14329-1, 2017
EGU General Assembly 2017

Importance of the Western Oceanic Boundary Currents for the Northern Hemisphere Atmospheric Circulation

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The importance of the extra-tropical Western Ocean Boundary Currents for the Northern Hemisphere (NH) Climate is assessed using a set of model experiments. Here we show that Sea Surface Temperature (SST)-fronts associated with Gulf Stream and Kuroshio–Oyashio Systems play significant role in maintaining the wintertime strong mid-latitude NH tropospheric Eddy-driven Jet and the weaker stratospheric polar night Jet. The strong tropospheric Eddy-driven Jet is maintained mainly by the enhanced lower tropospheric baroclinicty induced by oceanic front and associated baroclinic wave activities. The reduced stratospheric polar night jet is maintained mainly by upward planetary wave propagation induced by tropospheric circulation change. The implications of our results for the leading mode of NH variability, atmospheric energy balance and ozone depletion are also discussed.