Geophysical Research Abstracts
Vol. 19, EGU2017-9738, 2017
EGU General Assembly 2017

Inter-hemispheric differences in energy budgets and surface temperature anomalies during the 20th Century: the role of cross-equatorial transport anomalies

Valerio Lembo (1,4), Doris Folini (2), Martin Wild (2), Piero Lionello (1,3)

(1) Di.S.Te.B.A., Università del Salento, Lecce, Italy, (2) I.A.C., Eidgenössische Technische Hochschule, Zürich, Switzerland, (3) Centro Euro-Mediterraneo sui Cambiamenti Climatici, Lecce, Italy, (4) Meteorological Institute, University of Hamburg, Hamburg, Germany

Two different ensembles of the CMIP5 simulations for the historical period (1850-2005) have been analysed, either including solely the spatially homogeneous GHG forcing (GHG) or the mix of all forcings representative of the period (ALL). We focus our attention on the TOA energy budget (B_t) anomalies, near-surface temperature anomalies (T2m) anomalies and cross-equatorial energy transport (CET) anomalies. We find that B_t anomalies are evidently hemispherically asymmetric in the ALL scenario, whereas in GHG T2m anomalies are asymmetric. The larger warming ratio of the NH compared to the SH in GHG is likely attributable to the different heat capacity of land and oceans, being the forcing homogeneous. Looking at the shortwave (SW) and longwave (LW) components (St and Lt respectively) of B_t, the increasing SW absorption is largely compensated by increasing LW emission in GHG, whereas in ALL it is combined to a decreasing LW emission, particularly in the SH. CET anomalies have a positive trend in the ALL scenario, implying an increased northward total heat transport, mainly by means of the oceans. The trend is negative in the GHG scenario, mainly by means of the atmosphere, implying either a decreased northward heat transport or an increased southward transport, depending on the model. The model spread critically affects the capability to relate CET anomalies to either Bt or T2m inter-hemispheric difference anomalies.