EMS Annual Meeting Abstracts
Vol. 13, EMS2016-638, 2016
16th EMS / 11th ECAC

Do tropical sea surface temperatures affect polewards moisture transport and precipitation in the extra-tropics?

Victoria Sinclair (1) and Jennifer Catto (2)

(1) University of Helsinki, Division of Atmospheric Sciences, Department of Physics, Helsinki, Finland (victoria.sinclair@helsinki.fi), (2) Monash University, School of Earth, Atmosphere and Environment

The poleward transport of moisture and precipitation in mid-latitudes and polar regions is tightly connected to the dynamics of Rossby waves and extra-tropical cyclones. Previous studies have shown that perturbations in the tropics, for example enhanced deep convection, can affect the position of the mid-latitude storm tracks and the intensity and location of Rossby waves. We investigate how tropical sea surface temperatures (SSTs) affect both the amount of moisture transported polewards and precipitation in the extra-tropics in both hemispheres. A particular aim of this study is to determine if tropical SSTs affect moisture transport and precipitation through changes to the circulation patterns, or via changes to the atmospheric moisture content, or due to a combination of both. This aim is addressed by conducting two 10-year atmosphere-only simulations with OpenIFS at T255 (0.7 degree) resolution. The control simulation has climatological, annually repeating SSTs and sea-ice concentration whereas in the second experiment the tropical SSTs are increased by 1°C in the tropics with the anomaly decreasing to zero at 30 degrees. The zonal mean polewards moisture transport increases when the tropical SSTs are increased primarily due to the increasing moisture content of the atmosphere. However, the magnitude and sign of the change in the poleward moisture flux, and also precipitation, varies considerably in longitude with some areas experiencing an increase while others a decrease. This high spatial variability is related to anomalous Rossby wave trains caused by enhanced deep convection, diabatic heating, and upper level divergence in the tropics.