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Tropical cyclone activity in a warmer climate as simulated by a high-resolution coupled general circulation model: changes in frequency and air-sea interaction.

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This study investigates the possible changes that the greenhouse global warming might generate in the characteristics of the tropical cyclones (TCs).
The analysis has been performed using climate scenario simulations carried out with a fully coupled high–resolution global general circulation model (INGV-SXG) with a T106 atmospheric resolution. The capability of the model to reproduce a reasonably realistic TC climatology has been assessed by comparing the model results from a simulation of the XX Century with observations. The model appears to be able to simulate tropical cyclone-like vortices with many features similar to the observed TCs. The simulated TC activity exhibits realistic geographical distribution, seasonal modulation and interannual variability, suggesting that the model is able to reproduce the major basic mechanisms that link the TC occurrence with the large scale circulation.
The results from the climate scenarios reveal a substantial general reduction of the TC frequency when the atmospheric CO2 concentration is doubled and quadrupled. The reduction appears particularly evident for the tropical north west Pacific (NWP) and north Atlantic (ATL). In the NWP the weaker TC activity seems to be associated with a reduced amount of convective instabilities. In the ATL region the weaker TC activity seems to be due to both the increased stability of the atmosphere and a stronger vertical wind shear. Despite the generally reduced TC activity, there is evidence of increased rainfall associated with the simulated cyclones.
Using the new fully coupled CMCC model (CMCC_MED), with a T159 atmospheric resolution, we found a significant modulation of the Ocean Heat Transport (OHT) induced by the TC activity. Thus the possible changes that greenhouse induced global warming during 21st century might generate in the characteristics of the TC-induced OHT have been analyzed.