

EGU2020-16003

<https://doi.org/10.5194/egusphere-egu2020-16003>

EGU General Assembly 2020

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Wave-resonance fingerprint in the 2010 summer: a modelling experiment

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Summer 2010 was characterized by two contemporaneous extreme events: the Russian heat wave and the Pakistan flood. Several studies have shown a link between the two events, and Quasi-Resonant Amplification (QRA) has been suggested as an atmosphere-dynamic mechanism leading to the anomalous wavy circulation pattern which connected both extremes. Here, we aim at reproducing the 2010 circulation conditions in the Northern Hemisphere by obtaining a large ensemble of simulations from the Weather@home project within climateprediction.net (CPDN). We identify those ensemble members exhibiting a specific latitudinal temperature profile characterised by amplified high-latitude land warming (QRA - fingerprint) and investigate their surface temperature and upper level circulation properties. We show that when the QRA - fingerprint is present, the mid-latitude circulation bears similar characteristics to those observed in the 2010 summer: hot temperatures over European Russia and a wavy pattern in the upper-tropospheric meridional winds. As temperature profiles are projected to become increasingly similar to the QRA-fingerprint under future emission scenarios, these results provide further evidence that high latitude warming might favour persistent surface weather in the mid-latitudes.