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Surprising relationship between sensible and latent air-sea turbulent heat fluxes in CMIP5 (and other) climate model simulations

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Surface turbulent heat fluxes are critically important for diagnostics of the climate model experiments. However, being relatively well assessed and validated in reanalyses, surface turbulent heat fluxes always were of a lesser attention in diagnostics of climate model experiments. We analyze long-term variability of sensible and latent heat fluxes in reanalyses, buoy data and in the ensemble of CMIP5 simulations (control, historical, RCP) with a focus on the consistency of changes in sensible and latent fluxes on different time scales. Generally, sensible and latent surface turbulent heat fluxes at ocean surface computed using modern bulk parameterizations should be well correlated on most time scales. This holds in reanalyses and the other observational data sets. However, we find that many models (e.g. ECHAM, IPSL, INM) surprisingly demonstrate large regions with significantly negative correlations between sensible and latent heat fluxes. Remarkably, this holds on both interdecadal to centennial scales and on interannual scale. Interestingly, variability in air temperature and surface humidity (which could be potentially considered as the reason for anti-correlation between sensible and latent fluxes) demonstrates consistency with each other at most scales. In search of potential reasons for the discovered phenomenon we considered frequency of coupling in climate models (for which special simulations with coupled model were performed) as well as other factors.