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Varying horizontal resolution and land surface schemes in soil moisture – air temperature coupling, calculated with the WRF model for the MENA-CORDEX domain

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We study the effect of increased resolution and more elaborate representation of land surface on the soil moisture – air temperature coupling with the WRF climate downscaling model. Previous work indicated reduced winter/spring rainfall and enhanced summer heat. Two different land surface schemes (LSS) Noah and NoahMP with dynamic vegetation option turned on are incorporated in the WRF regional climate model in simulations at 50 and 16 km horizontal resolution over the region of Middle East and North Africa (MENA) for the period of 2000-2004. An analysis is performed for the summer season (June-July-August; JJA) for the four-year period, employing coupling metrics, i.e. associations between climatic variables related to the soil moisture – air temperature coupling. We calculate correlation coefficients between time-series consisting of 10-day averages, non-overlapping, for related surface climate variables from the WRF simulations and observational datasets. This assessment indicates that the NoahMP scheme simulates a stronger coupling than the Noah, irrespective of the resolution. The strength of this coupling varies at different areas around the MENA when considering mean or maximum 2-meter air temperature, with the NoahMP at 16-km producing the strongest effect over the western Asia part of the domain.