

Assessment of uncertainties in projected temperature and precipitation over the Arabian Peninsula a comparison between different categories of CMIP3 models

ABSTRACT

Background: This paper examined the level of uncertainties in precipitation and temperature simulations by Coupled Model Intercomparison Project Phase 3 (CMIP3) over the Arabian Peninsula. Purpose: Different techniques are employed to assess the ranges of uncertainties in projected temperature and precipitation over the Arabian Peninsula. Methods: For the present climate (1970–1999), the 22 CMIP3 models are grouped into four out of which two main categories, i) all models ensemble and ii) best performing models ensemble, are used to assess the uncertainties in the future temperature and precipitation over the Arabian Peninsula. Results: The CMIP3 ensemble projections for the above two main categories revealed a continuous increase in temperature over the peninsula during the 21st century. For the period 2070–2099, the all (best performing) models ensemble revealed an increase in temperature by 2.32 ± 2.45 (3.85 ± 1.54), 3.49 ± 2.49 (4.91 ± 1.61), and 3.28 ± 1.47 (5.36 ± 1.47) C, relative to the present climate, under the B1, A1B, and A2 scenario, respectively, while the intermodel ranges are projected to be from -3.36 to 6.08 (0.84 to 5.96), -2.26 to 7.68 (1.94 to 7.29), and -1.79 to 7.40 (2.75 to 7.10) C, respectively. Meanwhile, for the same period, the annual precipitation is projected to increase by 5.16 ± 30 (3.2 ± 25), 10.48 ± 34 (1.82 ± 28), and 15.29 ± 43 (5.3 ± 32)%, relative to the present climate under the B1, A1B, and A2 scenario, while the intermodel ranges are projected to be from -94 to 265 (-71 to 175), -95 to 322 (-74 to 205), and -95 to 375 (-75 to 235)%, respectively, for all (best performing) models ensemble. Conclusion The uncertainty of projected temperature and precipitation is reduced in the best performing models ensemble compared to the all models. At annual scale, surplus (deficit) precipitation pattern is projected across southern and southwestern (northern and northwestern) parts of the peninsula. The above results indicate that a better choice of models from the CMIP3 database could reduce the uncertainty range associated with future projections over the Arabian Peninsula.