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Projected changes in surface air temperature over the Indochina Peninsula from the regionally coupled model ROM

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Future changes of surface air temperature (SAT) over the Indochina Peninsula (ICP) under the two representative concentration pathways (RCP 4.5 and 8.5) are projected for the 21st century using the state-of-the-art regionally atmosphere-ocean coupled model ROM. Comparisons with the SA-OBS and CMIP5 models show that ROM capture well the present and future SAT changes over the ICP. The following results are obtained: (i) The mean, maximum and minimum temperatures increase slightly over 2011-2055 under the two scenarios. The projected temperature variations under the RCP 4.5 become relatively stable after 2056, whereas the RCP 8.5 projections of mean, maximum and minimum temperatures show robust warming trends of 0.54 °C decade-1, 0.52 °C decade-1 and 0.55 °C decade-1, respectively. (ii) In the period of 2011-2055, the increasing trends of temperatures are higher under the RCP 8.5 than RCP 4.5 for wet seasons, while both are relatively moderate for dry seasons. During 2056-2099, warming rates are more pronounced in both seasons under the RCP 8.5, whereas no significant warming trends are detected under the RCP 4.5. (iii) The more conspicuous warming after 2050s under the RCP 8.5 is predominately attributed to the increased downward longwave radiation. The higher CO_2 concentration enhances the greenhouse effect, intensifying the atmospheric counter radiation and subsequently increasing the SAT. (iv) Analysis against the extremes indicates that cold nights and days are decreasing with smaller rates under the RCP 4.5 than RCP 8.5. In contrast, the projected warm nights and days show apparent increasing under the two scenarios, and nights are generally warming faster than days. Evolutions of the extremes are more significant under the RCP 8.5 than RCP 4.5, suggesting that the heat extremes in the reference period of 1981-2005 would become rather normal over the ICP under a high concentration scenario in the late 21st century.