**Supplementary**

**Table S1.** 10 different selected dates that represent convective precipitation occurred during the warm seasons in between 2011 and 2020.

| Selected Dates |
|---|
| 2014-06-19 |
| 2015-09-12 |
| 2017-07-27 |
| 2018-06-27 |
| 2018-07-24 |
| 2018-08-17 |
| 2018-09-13 |
| 2019-08-17 |
| 2020-06-23 |
| 2020-09-29 |

In Figure S1, both CCLM12 and CCLM2.5 models exhibit a similar daily temperature variation with each other. However, the coarse-resolution model simulates a colder diurnal cycle in both warm and cold seasons compared to TSMS stations.

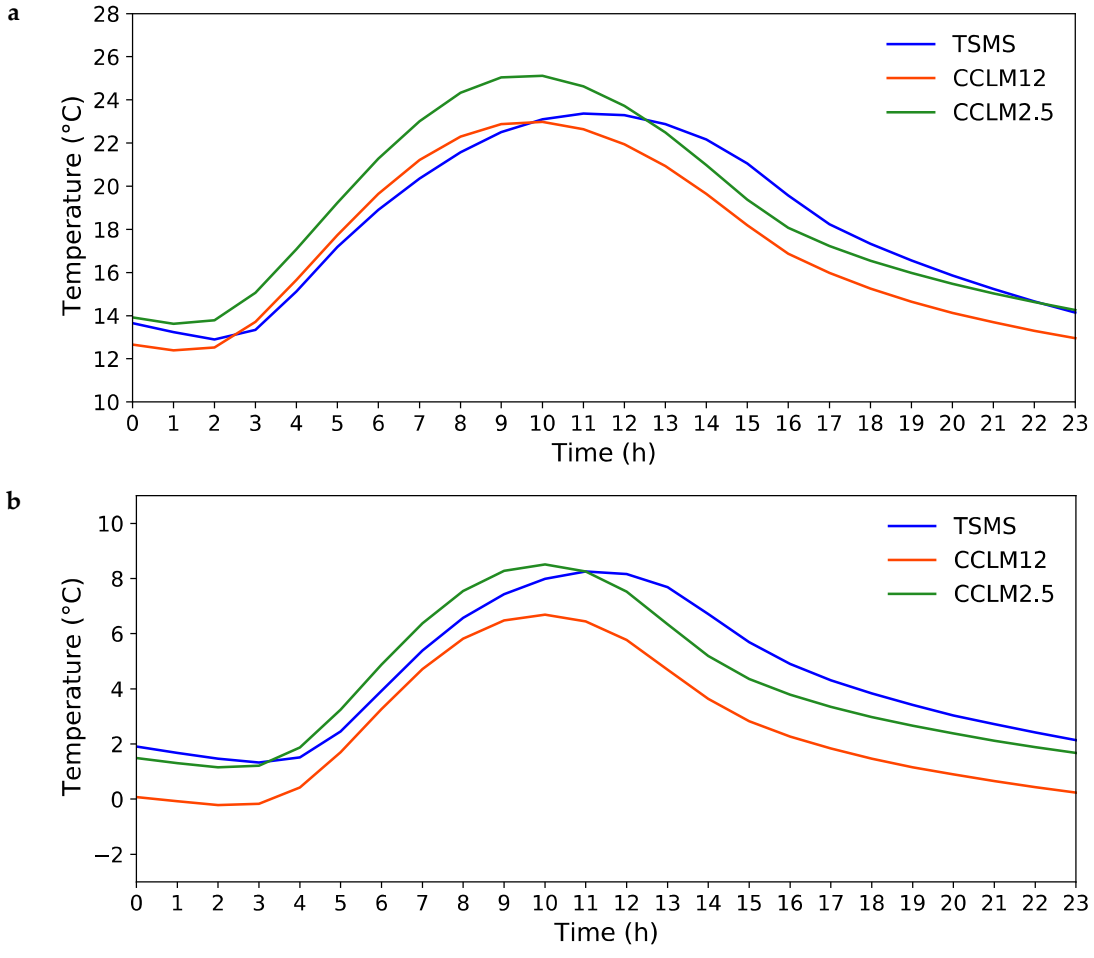



**Figure S1.** The diurnal cycle of 2-m temperature for TSMS stations (blue), CCLM12 (orange) and CCLM2.5 (green) for a) warm and b) cold seasons.

In order to better elucidate boundary layer processes, Figure S2 and Figure S3 present the spatial distributions of mean precipitation at 3-hour intervals from 06:00 to 21:00 UTC in warm and cold seasons, respectively. In the warm season, CCLM12 produces more precipitation at 09:00 and 12:00 UTC especially over northeast part of the domain whereas CCLM2.5 simulates more precipitation at 12:00 and 15:00 UTC particularly over high elevated regions, where mid-level cloud cover significantly higher in CCLM2.5 than CCLM12 especially at these hours.

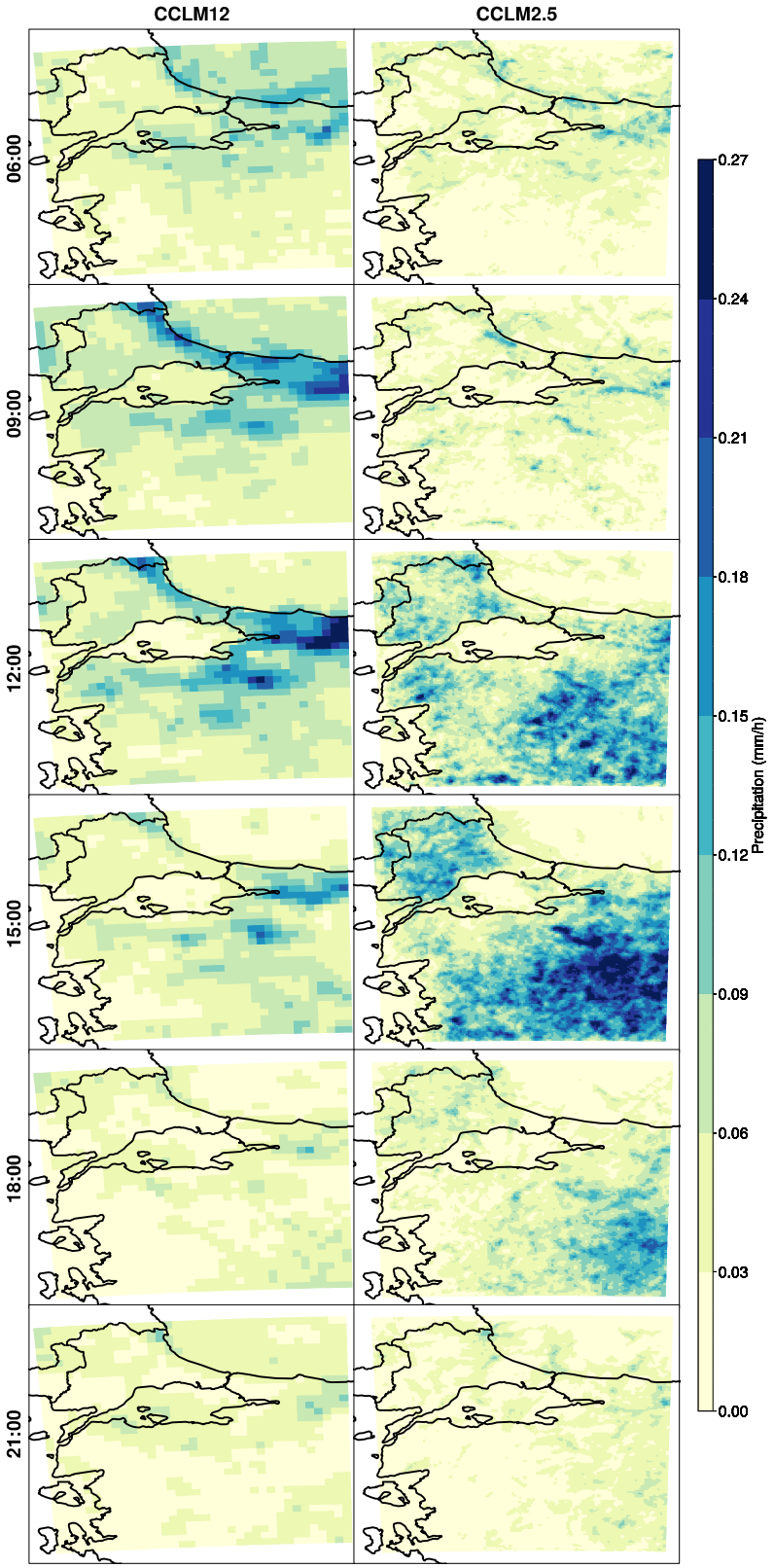



**Figure S2.** Spatial distribution of mean hourly precipitation from 09:00 to 21:00 UTC for CCLM12 (left) and CCLM2.5 (right) in warm season.

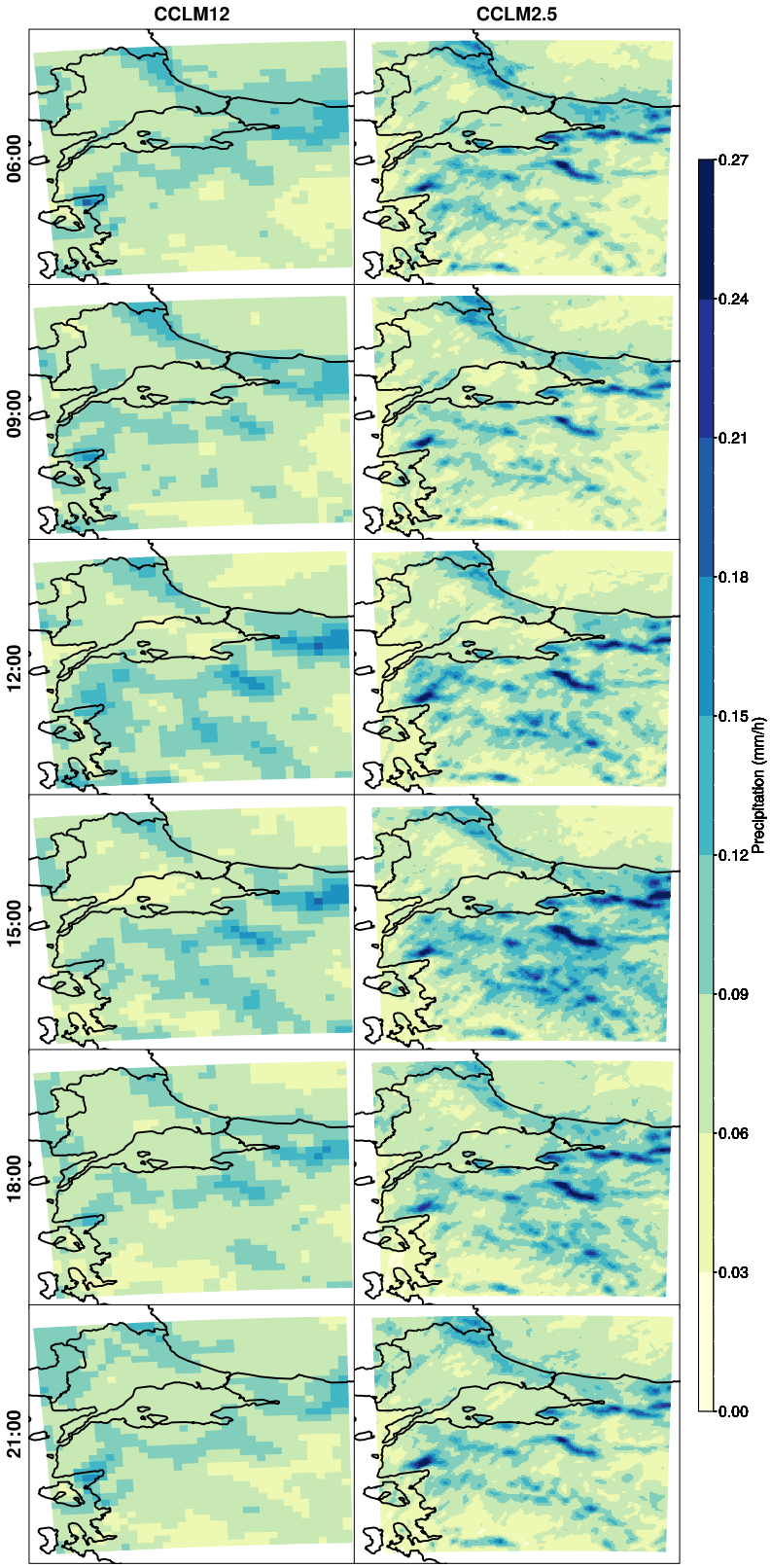



**Figure S3.** Spatial distribution of mean hourly precipitation from 09:00 to 21:00 UTC for CCLM12 (left) and CCLM2.5 (right) in cold season.

Figure S4 indicates the intensity of wet hours at 12 UTC on warm seasons between 2011 and 2020. It is seen that CCLM2.5 produces less frequent but higher intensity precipitation compared to CCLM12.

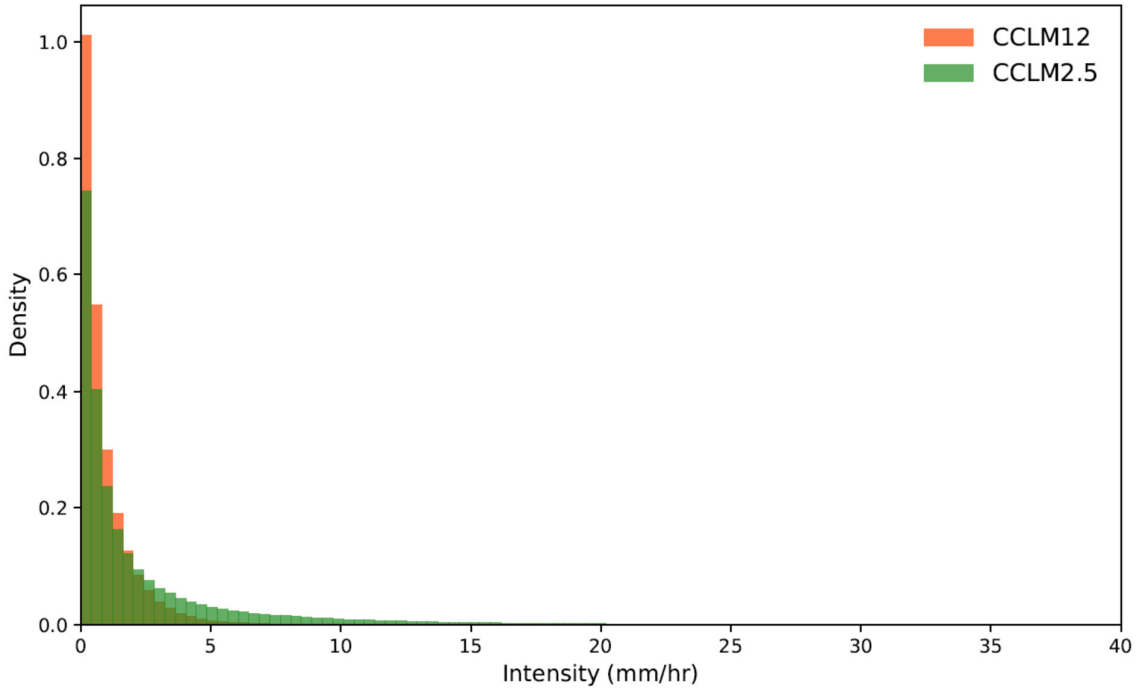



**Figure S4.** Intensity of wet hours with precipitation ≥ 0.1mm at 12 UTC on warm seasons between the 2011-2020 period.