Supplement of Geosci. Model Dev., 10, 673–688, 2017
http://www.geosci-model-dev.net/10/673/2017/
doi:10.5194/gmd-10-673-2017-supplement

Geoscientific Model Development
Open Access
EGU

Supplement of

Source apportionment of atmospheric water over East Asia – a source tracer study in CAM5.1

C. Pan et al.

Correspondence to: Bin Zhu (binzhu@nuist.edu.cn)

S1. Comparisons between original water substances and the sum of corresponding tagged water substances in each physical process

In this section, we investigate the differences between the tendencies of original water substances (water vapour, cloud droplets and ice) and the sum of the tendencies of tagged water substances originated from 25 moisture source regions in deep convection, shallow convection, cloud processes (macrophysics and microphysics), advection and vertical diffusion, respectively. Note that the adjustment criteria in the Sect. 2.7 of the manuscript are not done here. The simulation is started in 01 January 1997 and then we investigate the results in January 1998.

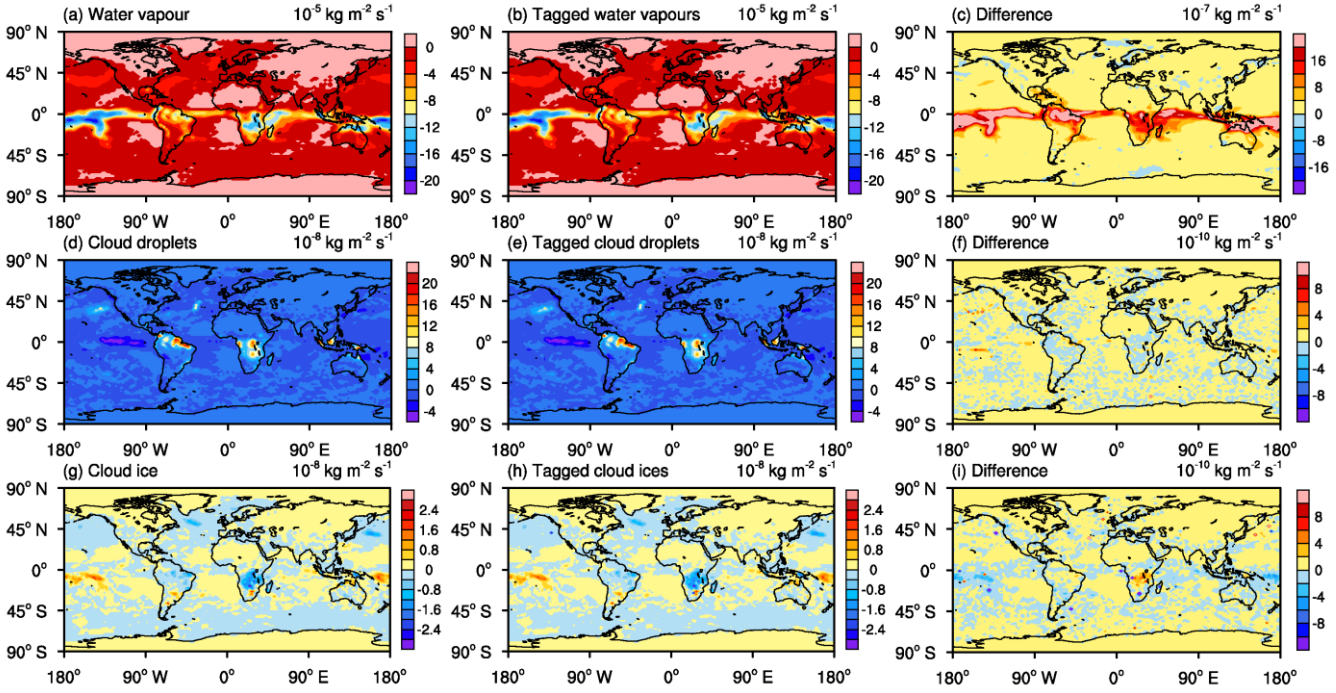

Figure S1. The distributions of the tendencies of (a) water vapour, (d) cloud droplets, and (g) ice and the distributions of the sum of the tendencies of (b) 25 tagged water vapours, (e) 25 tagged cloud droplets, and (h) 25 tagged cloud ices in deep convection in January 1998. The differences between tagged quantities and corresponding original quantities are shown in (c), (f) and (i), respectively. All these quantities are vertical integrated values from the surface to the tropopause.

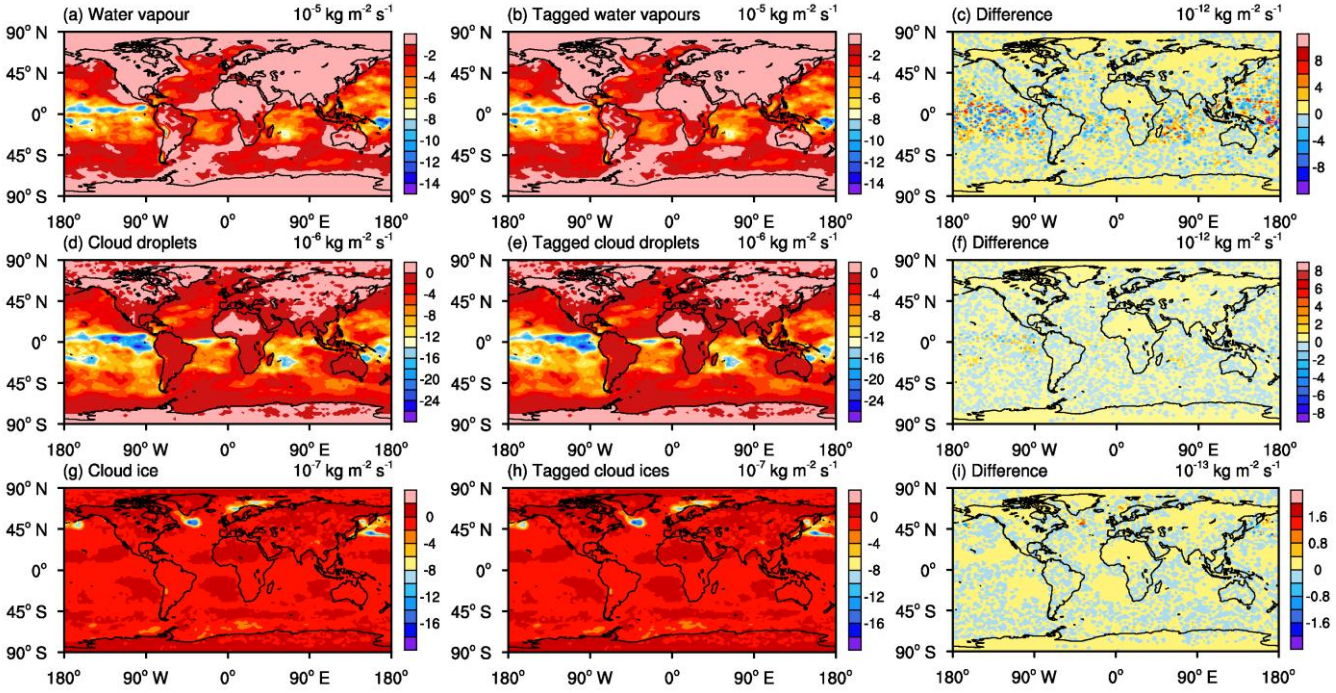

Figure S2. Same as **Fig. S1**, but for quantities in shallow convection.

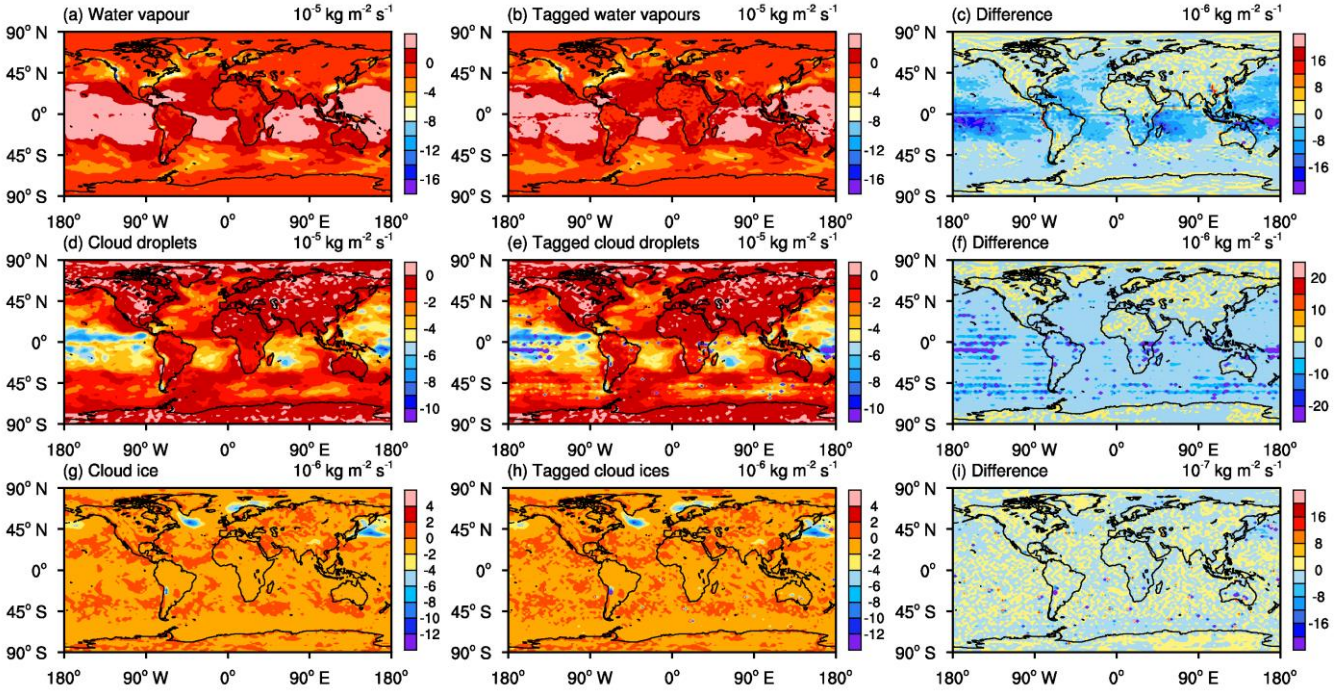

Figure S3. Same as **Fig. S1**, but for quantities in cloud processes.

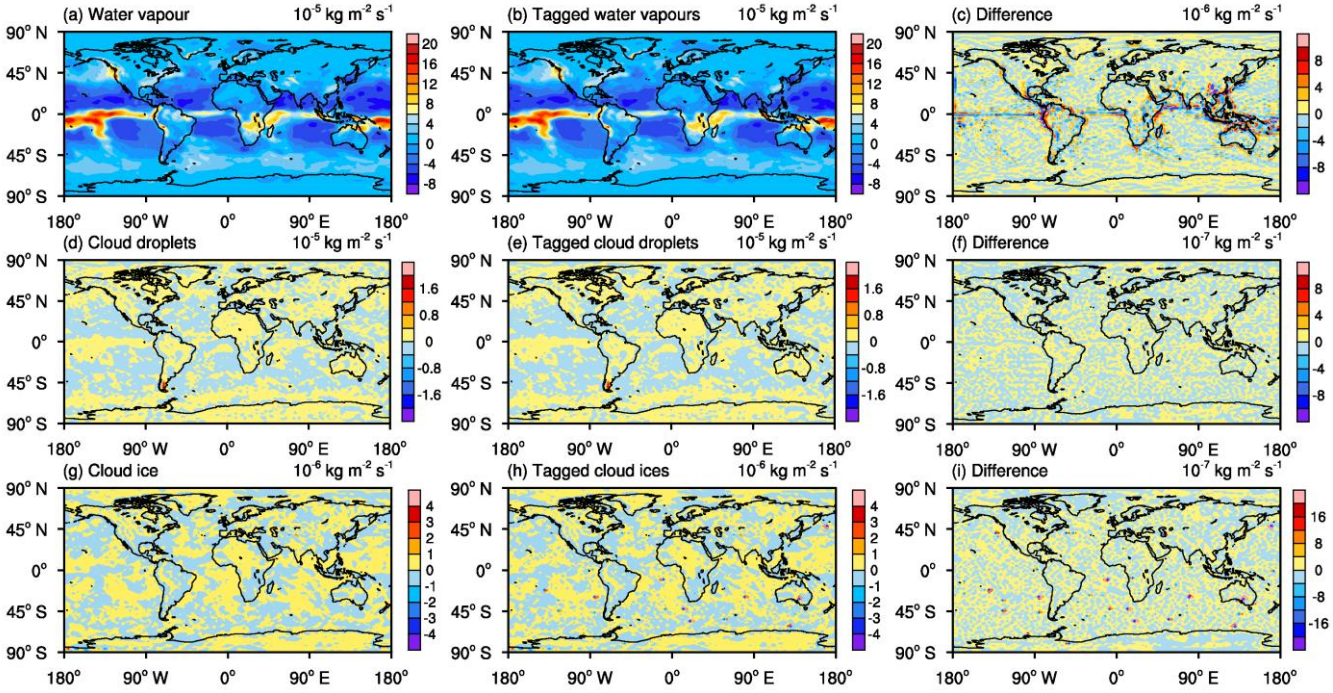

Figure S4. Same as **Fig. S1**, but for quantities in advection.

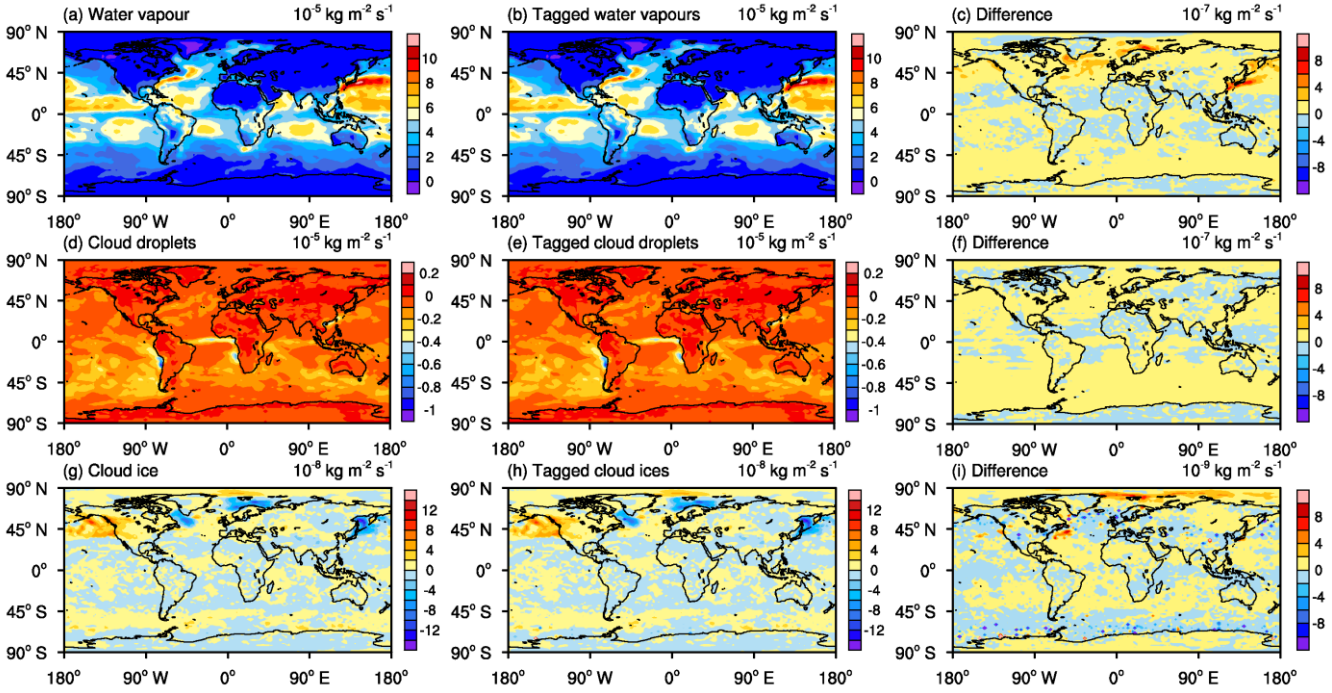

Figure S5. Same as **Fig. S1**, but for quantities in vertical diffusion.

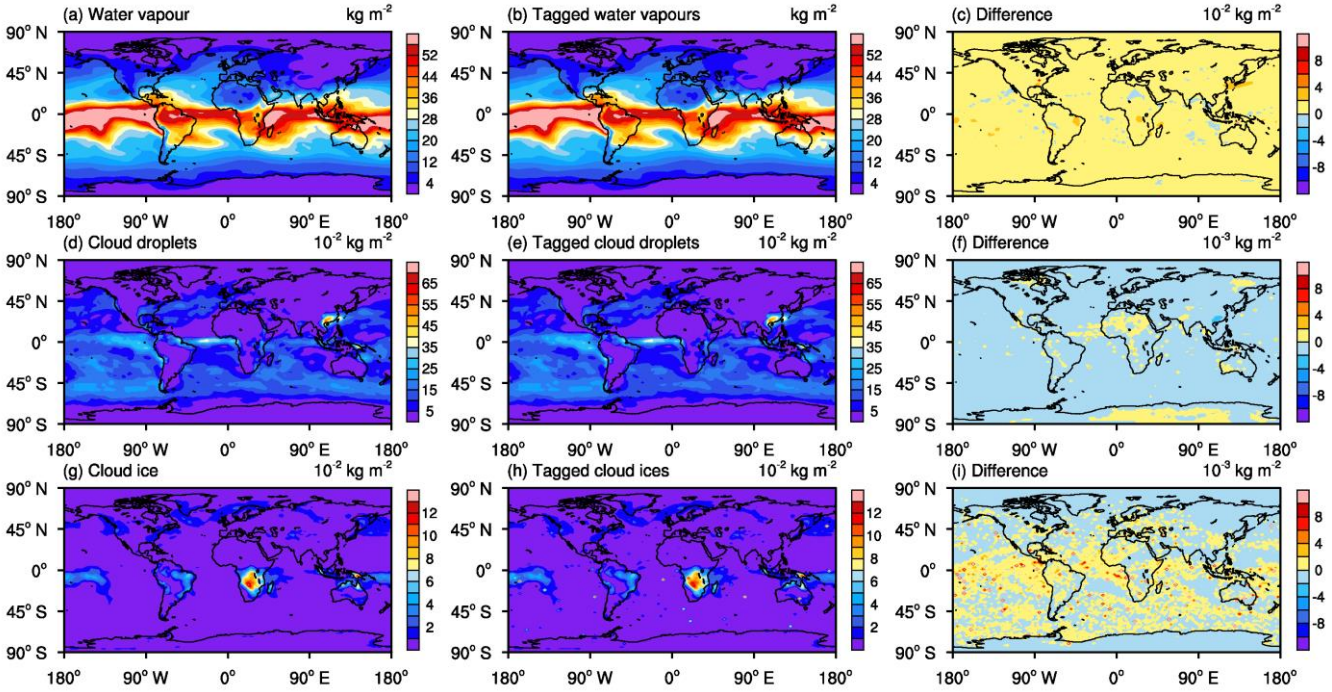

Figure S6. Same as **Fig. S1**, but for the distributions of the concentrations of (left) original water substances, (middle) the sum of the concentrations of tagged original water substances, and (right) their differences.

S2. Assessments of simulated water vapour and horizontal wind fields

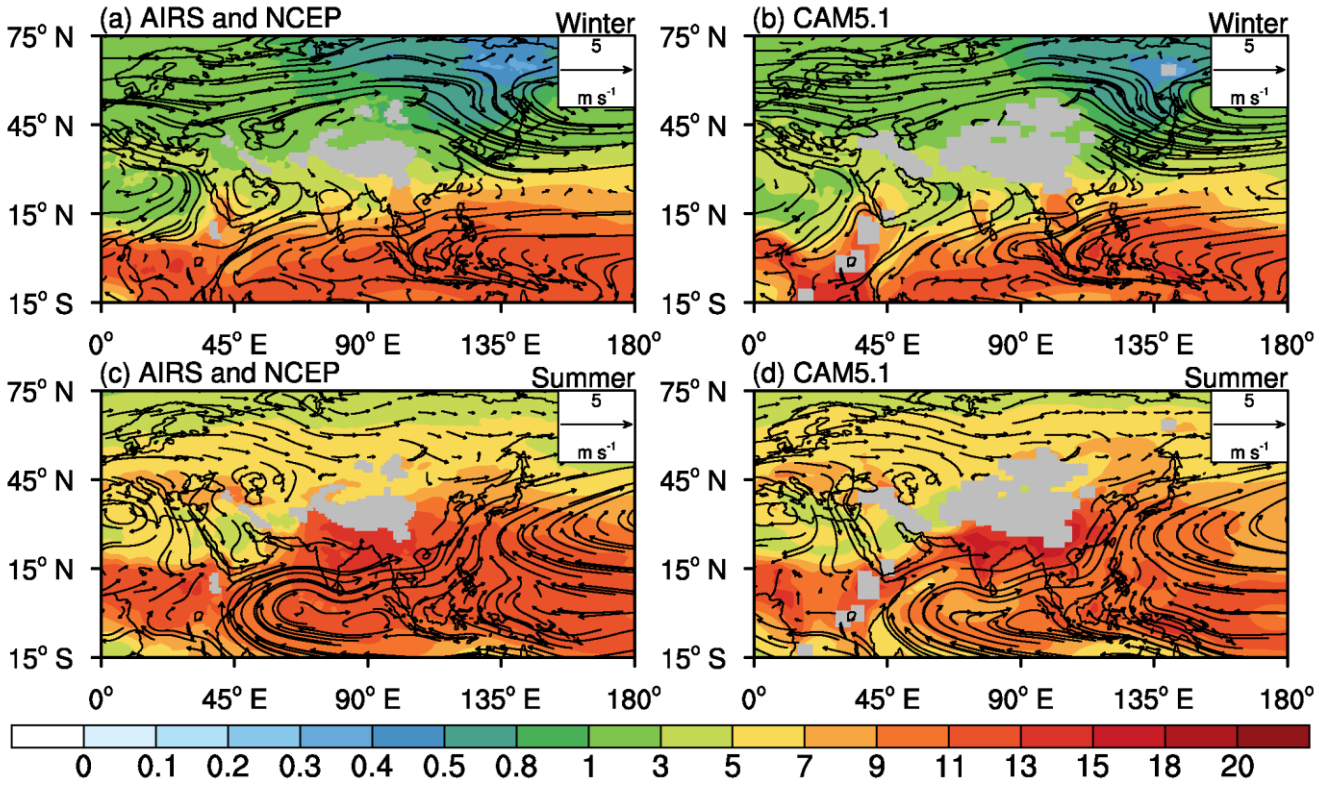

Figure S7. Comparisons between (left) AIRS observed and (right) CAM5.1 simulated water vapour (colours, unit: g kg^{-1}) at 850 hPa during (top) winter and (bottom) summer for 2003–2007. And comparisons between (left) NCEP and (right) CAM5.1 horizontal wind fields (vectors, unit: m s^{-1}) at 850 hPa during (top) winter and (bottom) summer for 1998–2007. Grey areas indicate where required data are not available.

S3. The stationary and transient components of water vapour transport

The water vapour flux can be divided into divided into the stationary and transient components:

$$\overline{q_v \mathbf{V}} = \overline{q_v} \cdot \overline{\mathbf{V}} + \overline{q_v' \mathbf{V}'} \quad \text{(S1)}$$

where q_v is the specific humidity, $\mathbf{V}$ is the wind vector. Here bar represents long term mean and prime represents the deviation from the mean.

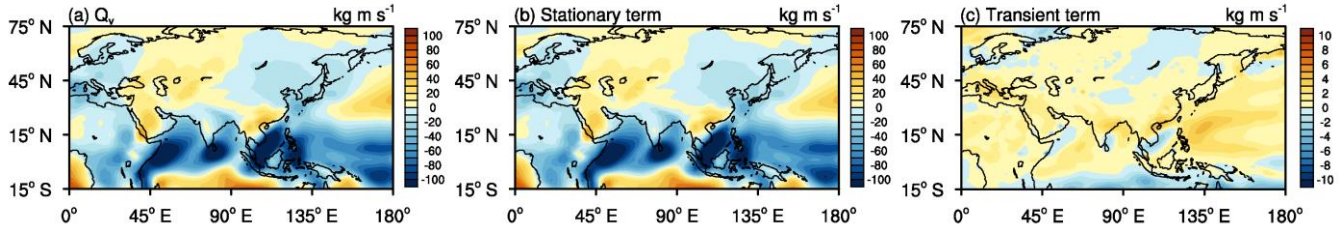

Figure S8. Distributions of (a) the meridional integrated tropospheric water vapour flux Q_v, and its (b) stationary and (c) transient terms during winter. All values (units: kg m s^{-1}) are ten-year averages for 1998–2007.

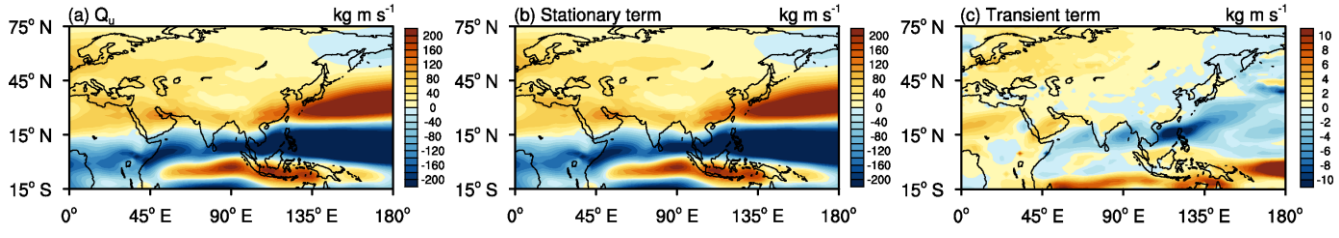

Figure S9. Distributions of (a) the zonal integrated tropospheric water vapour flux Q_u, and its (b) stationary and (c) transient terms during winter. All values (units: kg m s^{-1}) are ten-year averages for 1998–2007.

S4. The distributions of tagged water vapours and precipitations originated from each moisture source region over Eurasia and surrounding areas.

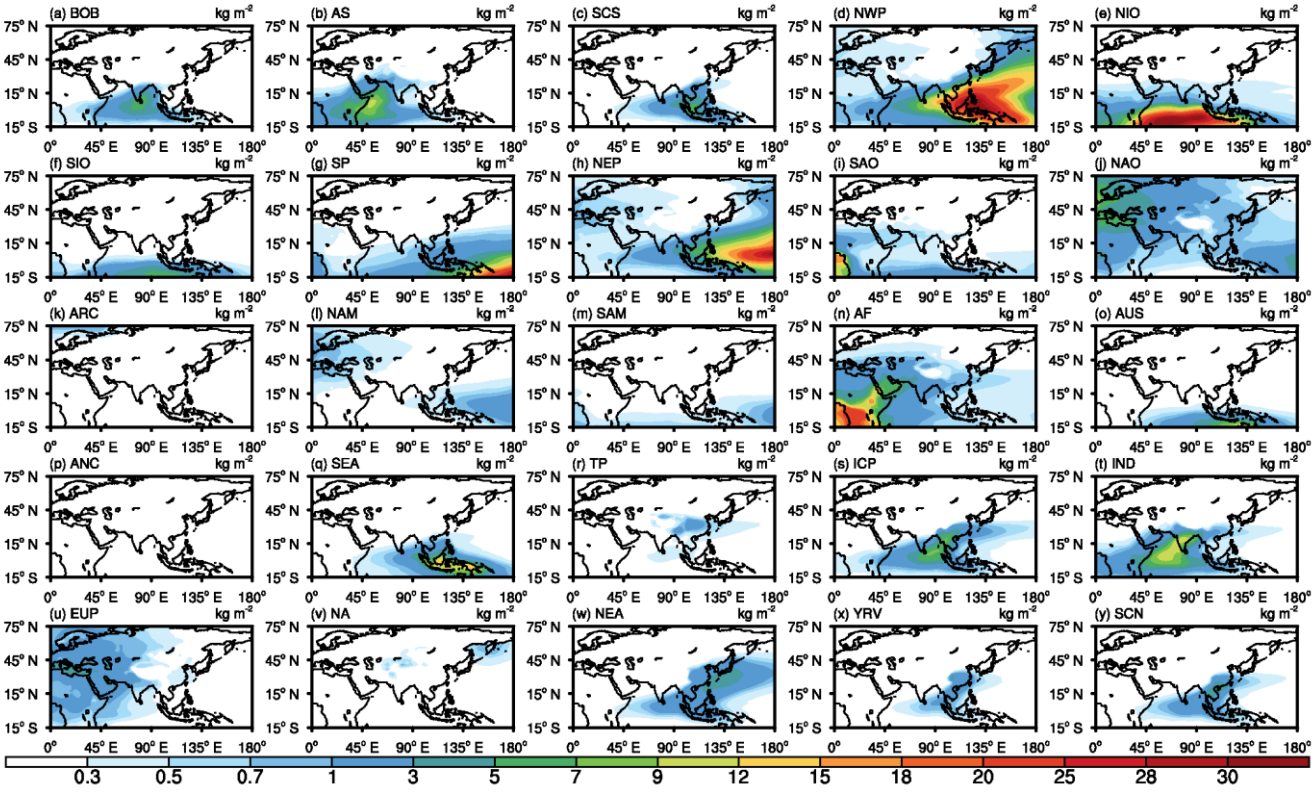

Figure S10. The contribution of tagged water vapour tracer from each moisture source region defined in **Fig. 1** to water vapour content over Eurasia and its surrounding areas in winter. Here, all the contents (units: kg m^{-2}) of tagged water vapour tracers are ten-year averaged values from 1998 to 2007.

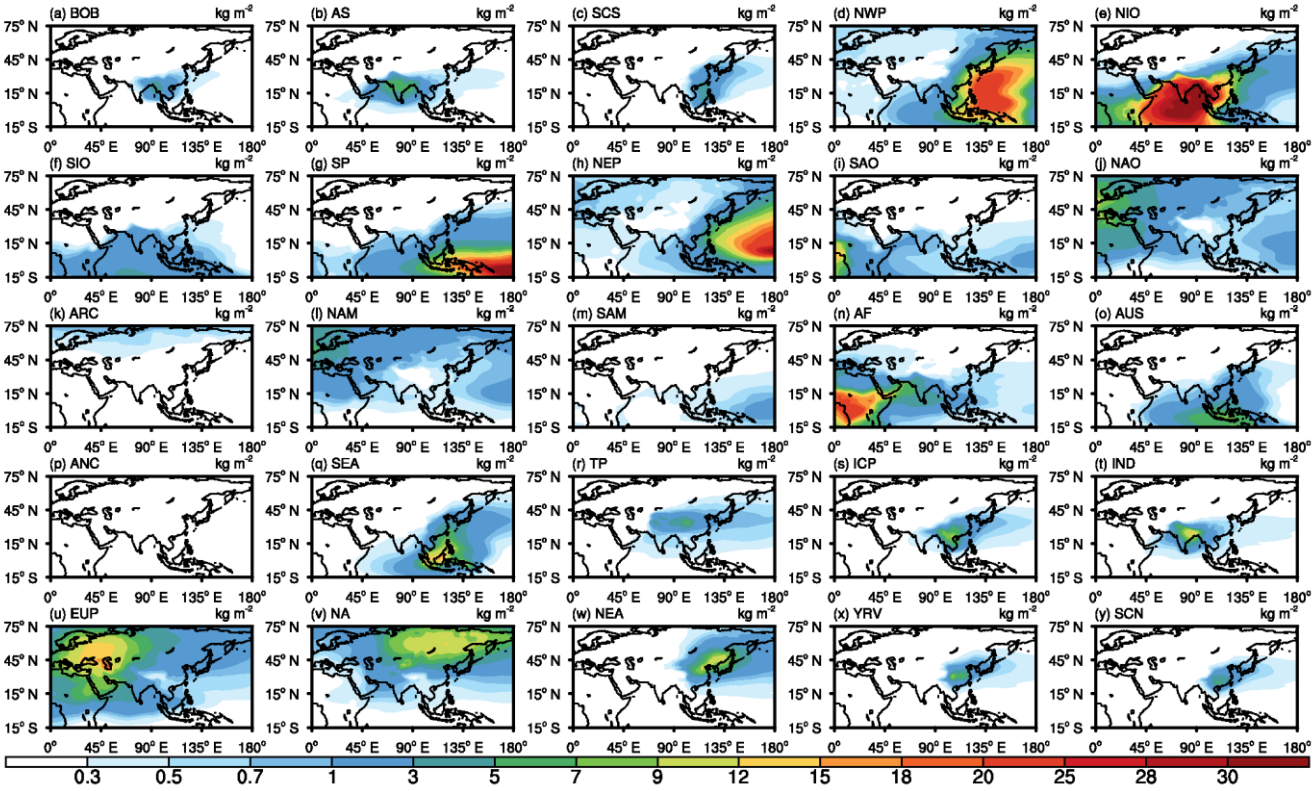

Figure S11. The contribution of tagged water vapour tracer from each moisture source region defined in **Fig. 1** to water vapour content over Eurasia and its surrounding areas in summer. Here, all the contents (units: kg m^{-2}) of tagged water vapour tracers are ten-year averaged values from 1998 to 2007.

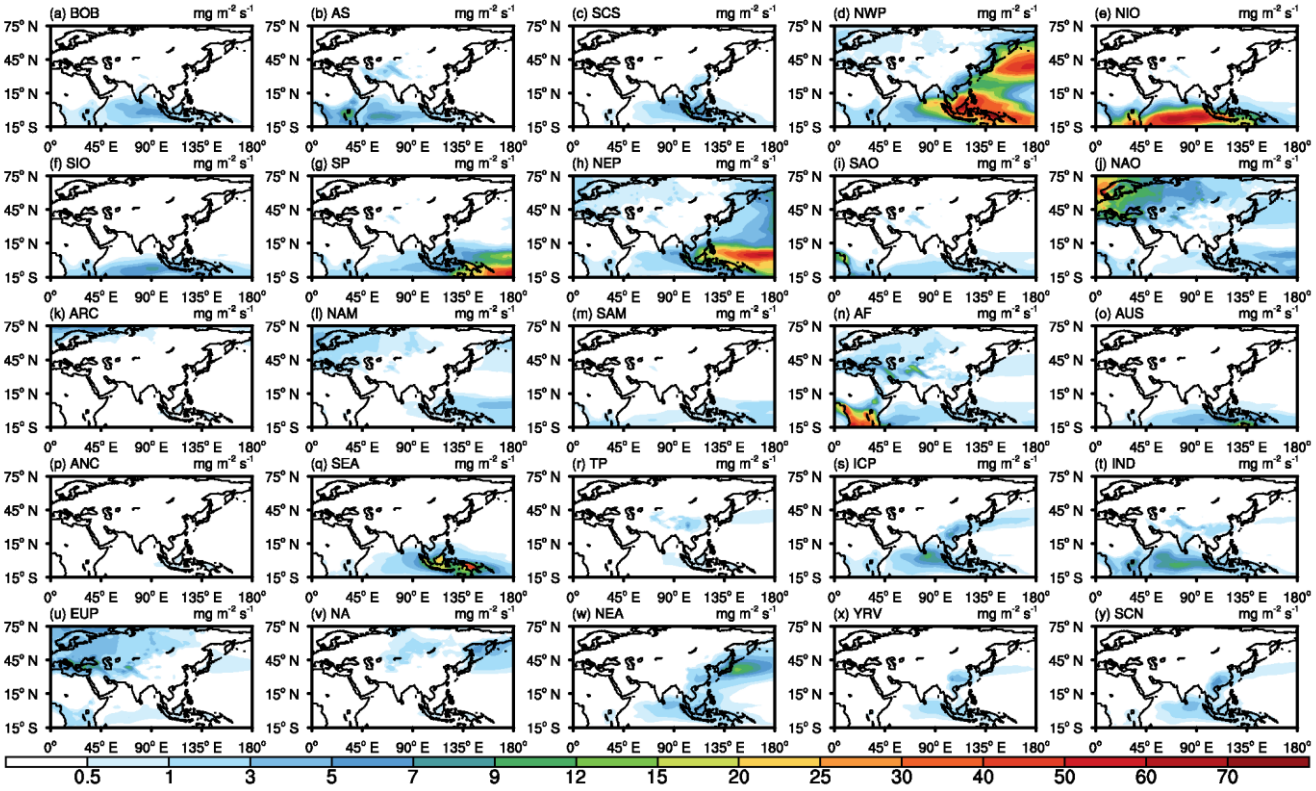

Figure S12. The contribution of tagged precipitation from each moisture source region defined in **Fig. 1** to precipitation over Eurasia and its surrounding areas in winter. Here, all the tagged precipitations (units: mg m^{-2} s^{-1}) are ten-year averaged values from 1998 to 2007.

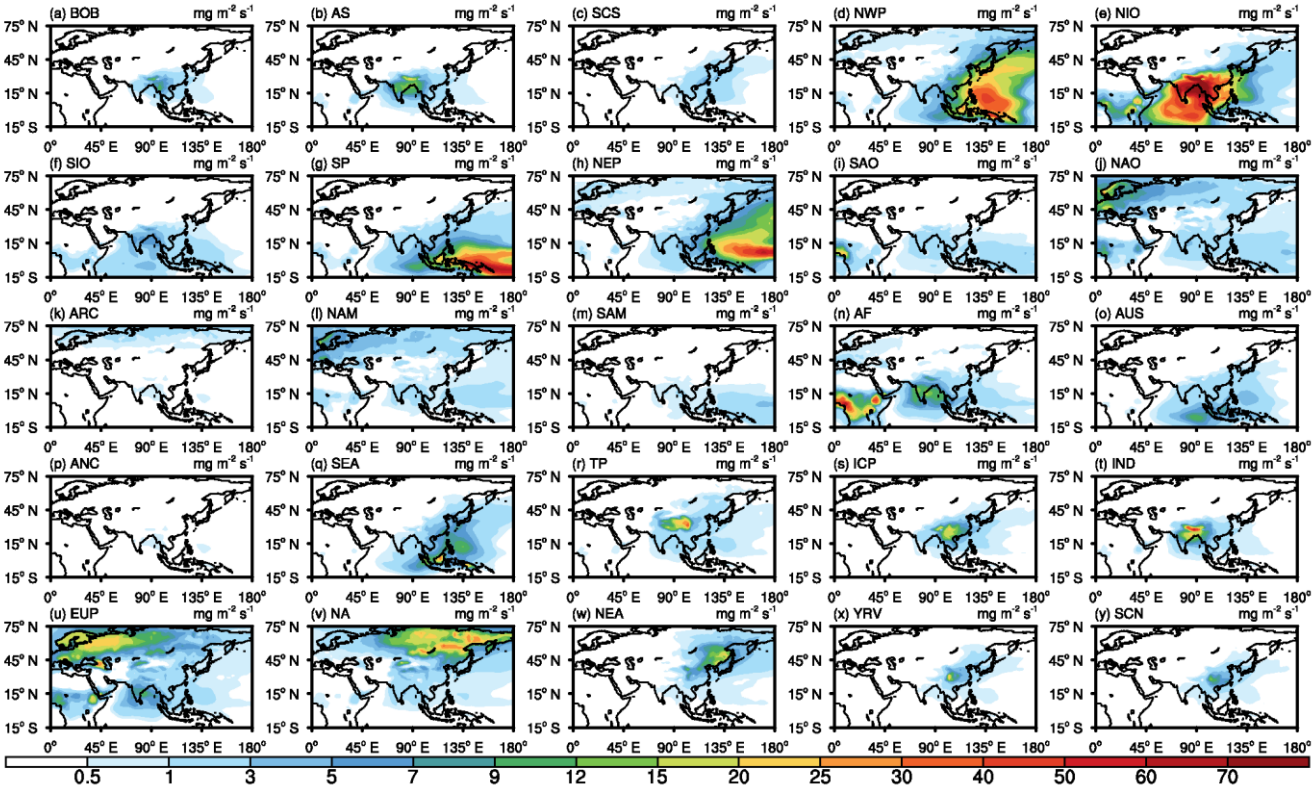

Figure S13. The contribution of tagged precipitation from each moisture source region defined in **Fig. 1** to precipitation over Eurasia and its surrounding areas in summer. Here, all the tagged precipitations (units: mg m^{-2} s^{-1}) are ten-year averaged values from 1998 to 2007.