We deeply appreciate the detailed and constructive comments provided by the three anonymous reviewers. Following their suggestions and comments, we have extensively revised the manuscript and provided a point-to-point response to each comment. The original comments are in **bold** font, our response is in regular font, and the changes in the text are in blue.

Comment 1

Sang et al. studied the interprovincial connections of green water. They quantified this by calculate the precipitation of each province from the green water inside or outside the province. The work is based on the data generated from a previous particle tracking work. Authors connect the results with social-economic effects, which is very interesting and novel. The structure and writing of the paper are clear. However, I have some thoughts as follows:

Response: Thank you for taking your time to review our study and provide feedback and comments. In the revision, we added more introductions about the connections between green water and socio-economic indices, and moisture tracking dataset.

1. **I don't think authors have clear enough introduction about how they connect the green water with the social-economic value. The introduction is in lines 140-175, but not clear. There are even no dimensions of the variables, and it is hard to know the relationship between different variables in the equations.**

Response: Thank you for the comments.

We apologize for the confusion regarding the introduction about the connections between green water and socio-economic values.

The connection of green water with socio-economic value can be reflected in the cascade that green water from source region forms precipitation in sink region, then precipitation recharges water resources and sustain economic activities, human livelihood and crop growth. We estimated the green water contribution on social-economic values in terms of surface water resource volume, economic output (GDP), population and food production.

In the revision, we added a more detailed introduction about the connections between green water and socio-economic values in Figure 1 and section Method. Please see the revised texts and figure below.

Green water from upwind source provinces flows and precipitates downwind to recharge water resources, and therefore sustains socio-economic activities in sink provinces (Fig. 1). Consequently, precipitation, water resources, and socio-economic factors such as economy activities, human livelihood, and crop growth in sink provinces rely on green water exported from source provinces. Changes in green water may affect water resource volume, and then impacts the water supply for economy activities, livelihood and irrigation of crop growth.

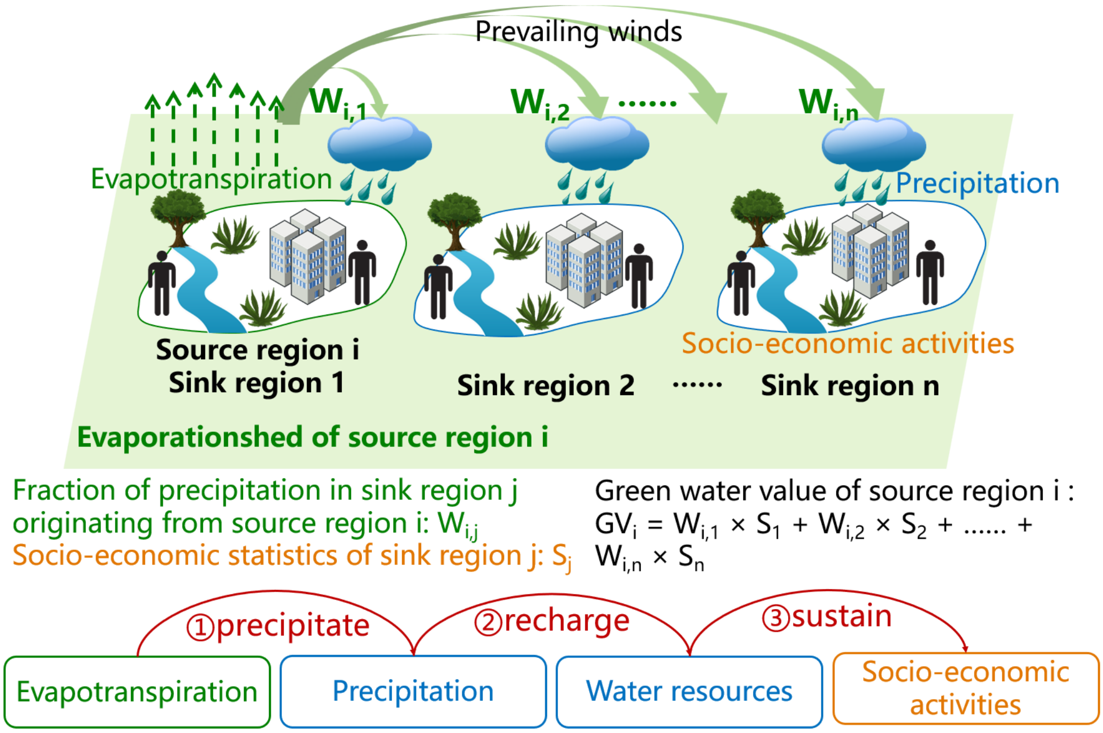

Figure 1. A conceptual diagram depicts the teleconnection of green water flows and their socioeconomic contributions in a cascade manner. Evapotranspiration (green dotted arrows) from source region i flows downwind with prevailing winds (green thick arrows) and precipitates in sink region n, which recharges water sources and sustains socioeconomic activities in sink regions.

2. **It looks like authors assume linear relationships between water and all the social-economic indices. I am not quite sure if this is rigorous. For example, whether the food productivity has the positive, linear relationship with water? Similar question to other social-economic indices.**

Response: Thank you for the comments.

We apologize for the confusion regarding the assumption about the relationships between green water and socio-economic indices.

In our assessment, we assume that all socio-economic indices (i.e. water resources volume, economic output, population and food production) are sustained by precipitation originating from green water from source regions. The socio-economic value of ET was calculated using the average values of various socio-economic indicators from 2008 to 2017 to match the climatological moisture trajectories from 2008 to 2017. Any temporal changes in water use efficiency per socio-economic variables are not included in this calculation. Therefore, the positive or negative relationship between socio-economic indicators and water use through time does not affect the value assessment of green water.

3. **For the sections of sources and sinks of green water (sections 3.1 and 3.2), it is hard to say they are really novel as it looks like some known results with a new wrapper. You are talking about the evapotranspiration circulation by adding the 'interprovincial' concept.**

Response: Thank you for the comments.

Sections 3.1 and 3.2 present the results of interprovincial green water transfer. Although many research analyzed the spatial pattern of moisture recycling in China from amphoteric and hydrological sciences, they identified moisture source and sinks at the grid (Zhang et al., 2023), river basins (Wang et al., 2023), and ecological regions scale (Xie et al., 2024). There is a clear understanding of the large-scale spatial pattern of moisture circulation, few studies focus on quantify moisture recycling at the administrative district scales, which is important for the water management. Therefore, this study applies moisture recycling techniques to inform green water transfer at among provinces, which is previously less known but important for regional water resources management.

With this purpose, Sections 3.1 and 3.2 can help water resources managers understand the moisture recycling and the network of interprovincial moisture recycling is the basis of the socio-economic contribution of green water in each province.

4. **Authors said the data are high quality data from previous studies. I think a bit more introduction is necessary.**

Response: Thank you for the comments.

In the revision, we added a more detailed introduction about the UTrack moisture tracking dataset. The revised texts are shown below:

This study used the moisture trajectory dataset generated by the Lagrangian moisture tracking model "UTrack-atmospheric-moisture" driven by ERA5 reanalysis data. The model is the state-of-the-art moisture tracking model, producing more detailed evaporation footprints due to the highest spatial resolution and reducing unnecessary complexity (Tuinenburg and Staal, 2020). The dataset provides monthly moisture flows at the global scale with a spatial resolution of 0.5° for 2008-2017, expressed as the fractions of evaporation from a source grid allocated to precipitation at a sink grid (Tuinenburg et al., 2020). It has been widely used in moisture recycling research with various spatial scales, such as precipitation source of grid (Staal et al., 2023; Wei et al., 2024; Zhang et al., 2023) and basin scale (Wang et al., 2023), and moisture transport between nations (Dirmeyer et al., 2009).

5. **It is a long-term dataset. So why not analyze the temporal variations of these teleconnections? I think this is more important to audience. The average state is also important, but they are the natural pattern which are caused by the long-term climatic conditions. We should know this basic pattern, but we cannot change it much. The more important thing is the temporal variations which represent the variations caused by some interannual variations of natural conditions or by man-made climate change. This is important to inform the future social-economic development, e.g., if such variations are good or bad and if we need actions to control or facilitate such variations.**

Response: Thank you for the comments.

We totally agree with that temporal variations of these teleconnections are very important for the social-economic development and water management. However, the available UTrack moisture tracking dataset only provides multi-year monthly mean state of moisture flow for 2008–2017, preventing us from analyzing interannual variations in moisture trajectory caused by natural or man-made factors. We hope analyze interannual variations of green water teleconnections in subsequent research.

In the revision, we added this point in the section Discussion and the revised texts are shown below.

Moreover, the resulting moisture trajectory data only represent the climatologically average moisture trajectories and ET (Li et al., 2023), neglecting the interannual variability in moisture flow trajectory, e.g., those induced by the influence of extreme weather events or ENSO (Zhao and Zhou, 2021). The interannual variations in green water flow may affect DPR and DSR in some provinces. Human adaptation tends to buffer impacts of interannual variations on socio-economy through water resource management such as reservoirs, dams and other infrastructure. Accounting for interannual variations in green water flows and their socio-economic contribution is worthy future investigation.

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