Responses to Editor Comments

Black is quoted comment; Orange is a response, and Blue is quoted text from manuscript.

1. Title and scope
   Given that this is a first global SWAT set-up paper (with no calibration), please remove "impact studies" from the title. As presented, the model is not yet ready for impact assessment.

   The editor raises an important comment, and we agree that the title should not include "impact studies". We have changed the title to also include the Name and version of the current setup as follows:

   CoSWAT Model v1: A High-Resolution Global SWAT+ Hydrological Model.

2. Digital Elevation Model (DEM) — p. 8
   o Specify the spatial resolution of the DEM used.
   o In Figure 1, please remove the right panel (SRTM DEM). In the text, explain clearly why ASTER was chosen over SRTM (e.g., latitude/coverage limits, data quality), stating up to which latitude SRTM/ASTER are available.
   o Consider excluding low latitudes from Figures 1–2 if they are not included in your modelling/analysis and do not appear in your soil map.

   The resolution of the DEM is now clearer, apart from Section 2.3 where we discuss the actual setup and resolutions used, we also point out the native resolution and used resolution. We also have removed the SRTM panel and replaced it with a brief discussion why we chose ASTER DEM. Here is the final DEM section:

   2.1.1 Digital Elevation Model

   The Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) global DEM (Abrams, 2016) was preferred over the Shuttle Radar Topography Mission (SRTM) global DEM (Farr et al., 2007) primarily due to its more complete global spatial coverage (Fig. 1), which is essential for this study's domain. SRTM data only cover over 80% of the Earth's land surface (60°N–56°S), while ASTER goes further North and South covering 99% of land surface (Yue et al., 2017).

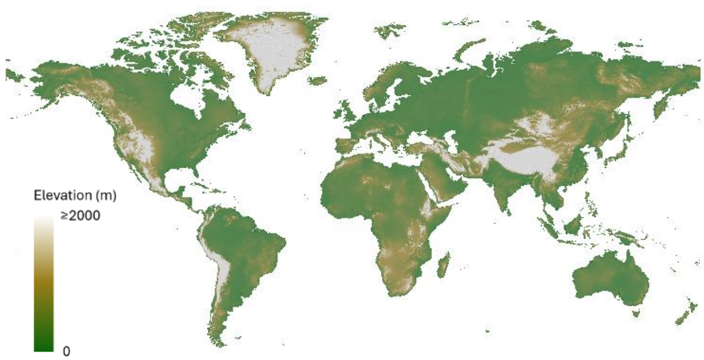

   Figure 1: Spatial coverage of ASTER Global DEM Excluding Antarctica (mapped at 2km resolution).

While potential differences in DEM quality exist between the datasets, particularly in mountainous regions at finer native resolutions of 30m, these differences are considered less critical at the 2km resolution used for deriving topographic parameters in this global model setup.

In addition, antarctica was removed from Figures 1 and 2 as suggested.

3. Data sourcing — p. 8, line ~211
   Replace "downloaded from" with a proper reference/citation to the data source.

   We have revised this section to include a proper reference for the land use product used. We also describe briefly the major land use classes.

   Line 161

   The land use data (Fig. 2) from the European Space Agency (ESA) is available at 300m resolution (Defourny et al., 2017). The 2007 ESA land use map used for this study indicates that, excluding Antarctica, barren and sparsely vegetated areas dominate, accounting for over 32% of the global land surface. Grasslands and shrublands cover approximately 27%, while forests account for about 31%. Cropland represents around 7% of the global landmass.

4. Land-use description — lines ~210–215
   Briefly describe the major land-use classes, their approximate percentages, and the spatial resolution of the land-use dataset.

   Please see response to comment 3

5. Figure captions (p. 9; Figs. 1–3)
   Replace "from …" with formal references (e.g., "Figure 3. Global extent of FAO soil types (FAO, YEAR)" rather than "from FAO soil map").

   The captions have been revised as recommended.

6. Resolution clarity — line ~228
   Clarify what 0.5° (decimal degrees) corresponds to in kilometres (at the equator for example), for reader clarity.

   We agree that including kilometres would improve reader clarity. We added this at the end of the sentence mentioning the 0.5 decimal degrees.

   Line 177:

   The dataset contains historical climate data including daily minimum and maximum air temperature (tasmin and tasmax, respectively), precipitation (pr), relative humidity (rhs), solar radiation (rlds), and near-surface wind speed (wind) at 0.5 decimal degrees which corresponds to about 55.66 km along the equator.

7. Acronyms — line ~233
   Define evapotranspiration (ET) at its first occurrence (not first at line ~352).
8. Section heading — line ~237
   Please delete "scripted workflow" from the subheading; the explanation appears later in the text.

Since section 2.2 discusses the CoSWAT Framework, we have revised the subheading for this section to read "Modelling Framework for Global SWAT+ Setup".

9. Figure 4
   The figure is not readable in its current form. Improve resolution, font sizes, and line weights so all elements are readable.
   We have recreated the schematic simplifying it while making sure it is legible.

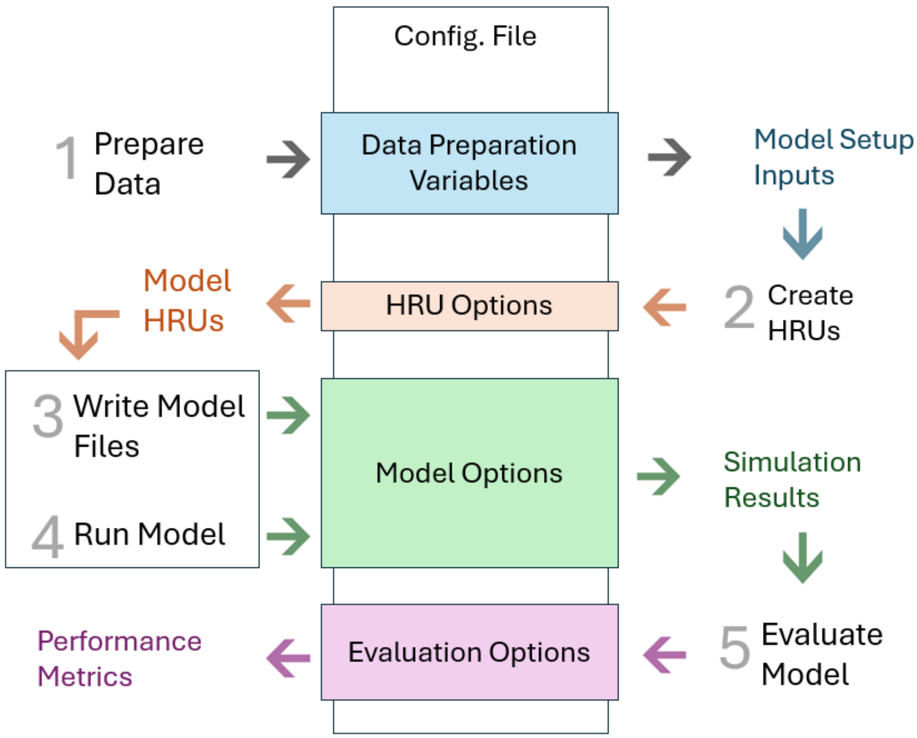

Figure 2: Schematic of the Community SWAT (CoSWAT) modelling framework. The flowchart illustrates the scripted workflow designed to automate the setup, execution, and evaluation of large-scale SWAT+ models. The entire process is controlled by a single configuration file, ensuring consistency and reproducibility.

10. FAO soil lookup — line ~258
    Add a reference for the FAO soil lookup table used.

The FAO soil database for use with SWAT+ was prepared for use with QSWAT+ and posted to the website. All FAO soil data formatted for SWAT+ can be downloaded there. When a user installs SWAT+ this database is also installed. We refer to the SWAT Data Page in the revised text.

Line 204:

The framework handles rasterization and reprojection to prepare the soil data into a format required by SWAT+. FAO soil lookup and soil properties database are readily available from the SWAT+ website (SWAT Global Data, 2025) through QSWAT+ Software and are used by the workflow.

11. Table 2
    Consider integrating the content of Table 2 into the text (concise description) and removing the table.

    We removed the table and integrated the text into the preceding paragraph.

    Line 241:

    Using the CoSWAT framework, data was prepared, and a model set up for each of these regions using the configuration file options. Slope classes were not considered in creation of HRUs. The Model Files were written with the following options: the Muskingum method was applied for channel routing, and Penman–Monteith was used for potential evapotranspiration estimation. A five-year warm-up period was set, and the model was run for the simulation period 1977–1990.

12. Figure consolidation
    Consider combining Figure 5 with an existing figure (e.g., Figure 1) if appropriate, to save space and reduce redundancy.

    Figure 5 was combined with Figure 7 as recommended (making Figure 5 in the revised manuscript)

Figure 3: Partitioning of the world land mass into regions based on main river basins. Highlighted region in Africa illustrating density of HRUs in the Save Region.

13. Figure 6
    Please move Figure 6 to the appendix/supplement and refer to it in the methods where you explain that sampling points are chosen randomly.

    Figure 6 was moved to Appendix 1.

14. Figure 9
    In the caption, "GLEAM" appears crossed out.

Judging by the line number, the tracked changes pdf was used. Unfortunately tracked changes when converted to PDFs may have rendering errors and this is one of those. we double checked in the non-tracked changes version and it is fine.

15. Figure 10
    Ensure ET has been introduced earlier; caption should read “evapotranspiration (ET)” consistently.

    ET is now introduced earlier at first mention (Line 93), and all captions now are consistent with this recommendation.

16. Minor typo — line ~445
    Correct “th is” → “this.”

    Please see response to comment 14.

References

Abrams, M.: ASTER GLOBAL DEM VERSION 3, AND NEW ASTER WATER BODY DATASET, Int. Arch. Photogramm. Remote Sens. Spat. Inf. Sci., XLI-B4, 107–110, https://doi.org/10.5194/isprs-archives-XLI-B4-107-2016, 2016.

SWAT Global Data: https://swat.tamu.edu/data/, last access: 23 September 2025.

Defourny, P., Lamarche, C., Bontemps, S., De Maet, T., Van Bogaert, E., Moreau, I., Brockmann, C., Boettcher, M., Kirches, G., Wevers, J., and Santoro, M.: Land Cover CCI: Product User Guide, Version 2.0, European Space Agency (ESA) and UCL-Geomatics, Louvain-la-Neuve, Belgium, 2017.

Farr, T. G., Rosen, P. A., Caro, E., Crippen, R., Duren, R., Hensley, S., Kobrick, M., Paller, M., Rodriguez, E., Roth, L., Seal, D., Shaffer, S., Shimada, J., Umland, J., Werner, M., Oskin, M., Burbank, D., and Alsdorf, D.: The Shuttle Radar Topography Mission, Rev. Geophys., 45, 2005RG000183, https://doi.org/10.1029/2005RG000183, 2007.