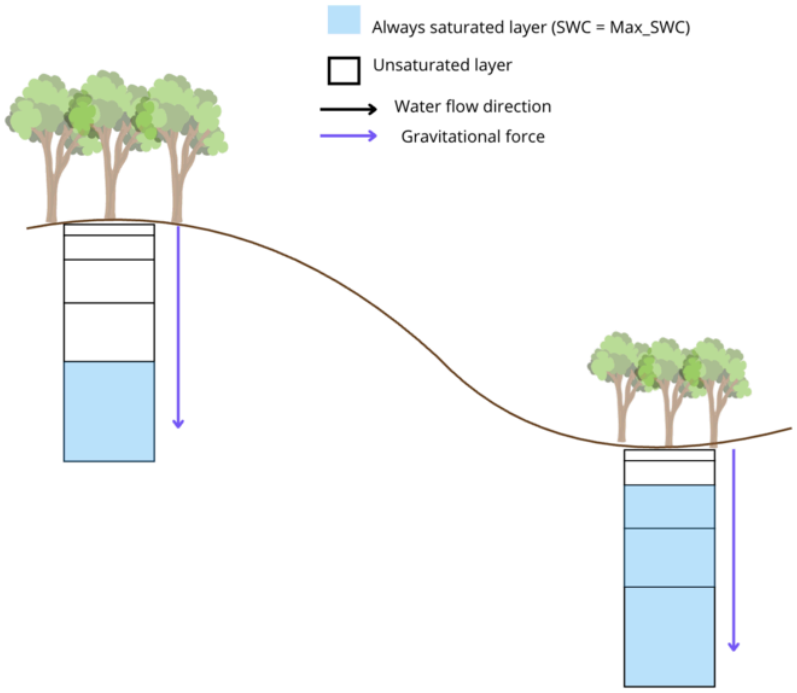
Water table depth - fixed values version

Description

This version of the model includes fixed values representing the water table depth (WTD). It supports three possible configuration modes:

1. No WTD – original soil water dynamics.
2. Shallow WTD (representing valleys): the last three soil layers are saturated.
3. Deep WTD (representing hills): only the last soil layer is saturated.



- Possible tests:
  - vary layers depths
  - vary layers soil composition

Value Definitions

Soil layers from surface to bottom:

Layer	Thickness (m)	Cumulative Depth (m)
1	0.1	0.1
2	0.23	0.33
3	0.4	0.73
4	0.8	1.53
5	0.97	2.5

Water table depth settings:

- Shallow WTD: below the top two layers → WTD = 0.33 m

- Deep WTD: below the top four layers → WTD = 1.53 m

Code implementations

1. WTD on and off

Control the water table feature via a parameter in the input_global file:

```
_WATER_TABLE = 0 // disables water table
_WATER_TABLE = 1 // enables water table
```

If _WATER_TABLE = 1, the model will simulate soil water content based on a fixed water table depth.

2. Soil water saturation depending on WTD

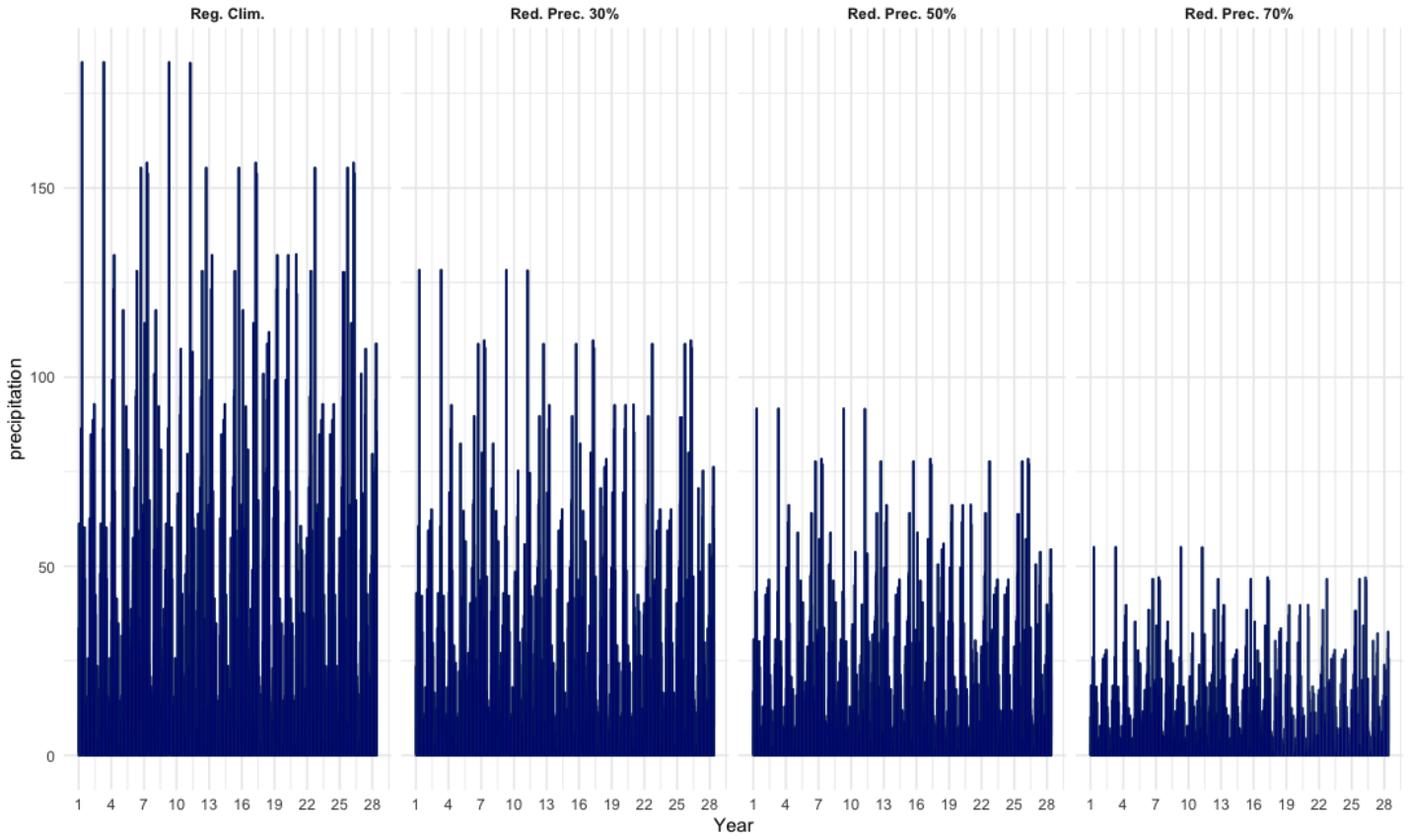
Inside bucket model:

```
if (_WATER_TABLE == 1){ /// WTD on
 int l=0; // layer counter
 while((l<nblayers_soil)) {
   //if the depth of the layer is higher than the WTD, the
amount of water in the layer (SWC3D) is = max of water the
soil layer can hold
   if(layer_depth[l]>WTD){
     SWC3D[l][d] = Max_SWC[l];
```

```
    }
      l++;
  }
}
```

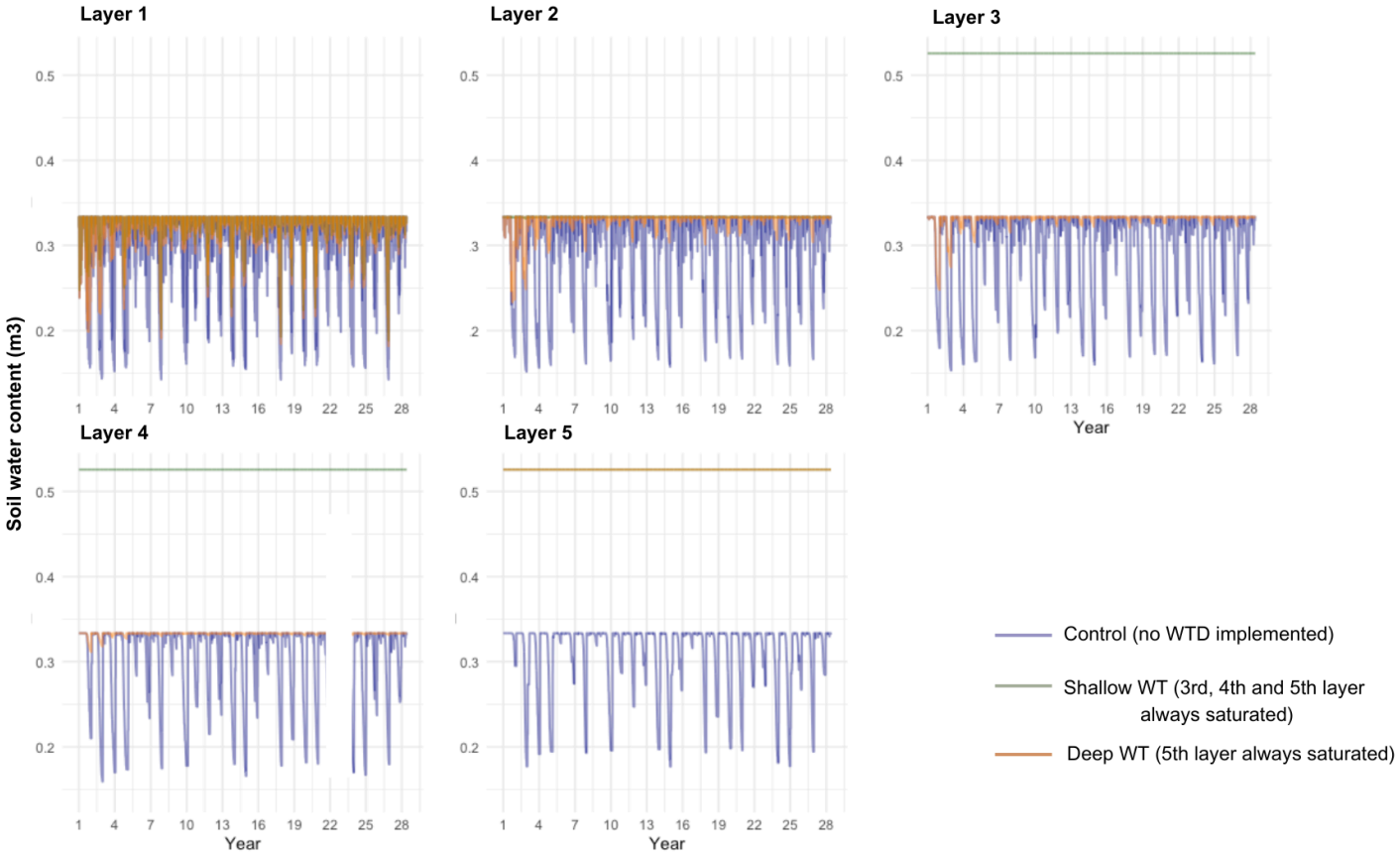
Reduced precipitation experiment

To understand the role of WTD in determining biogeochemical and water fluxes and properties under drier conditions, I simulated three WTD: no WTD (control), shallow, and deep. For each WTD, I applied four climatic conditions: a regular climate and reduced precipitation at three intensities—30%, 50%, and 70% (as TROLL input).
The model was run in a total of 10000 time steps (~28 years)



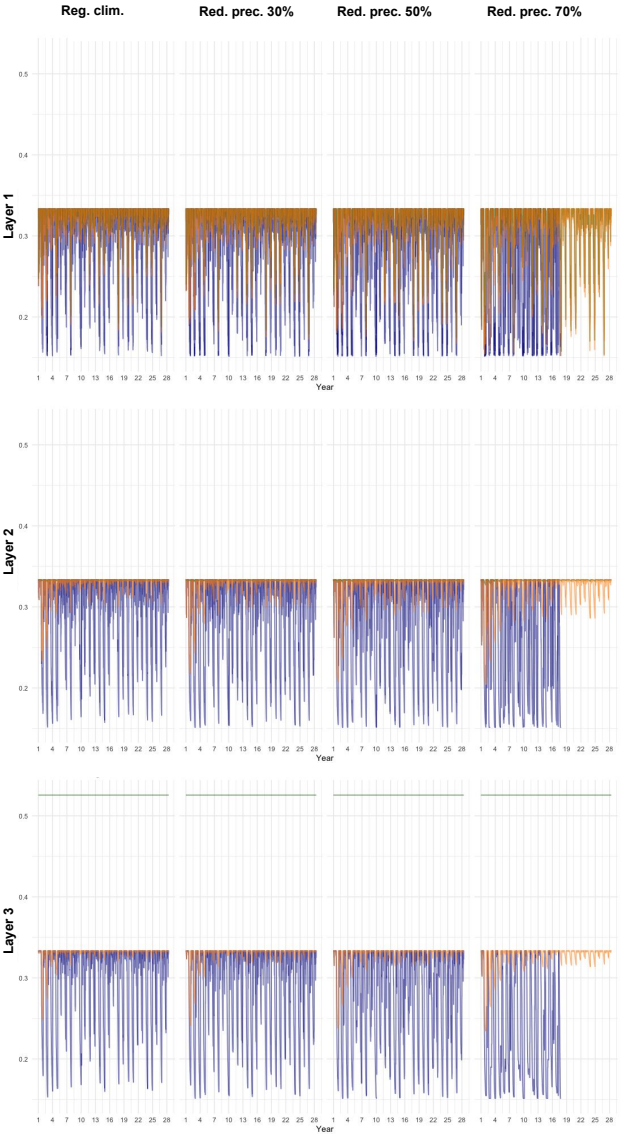
Results

1. Comparing soil water content with and without WTD implementation (regular climate)



2. Reduced precipitation experiment

2.a. Soil water content in each layer



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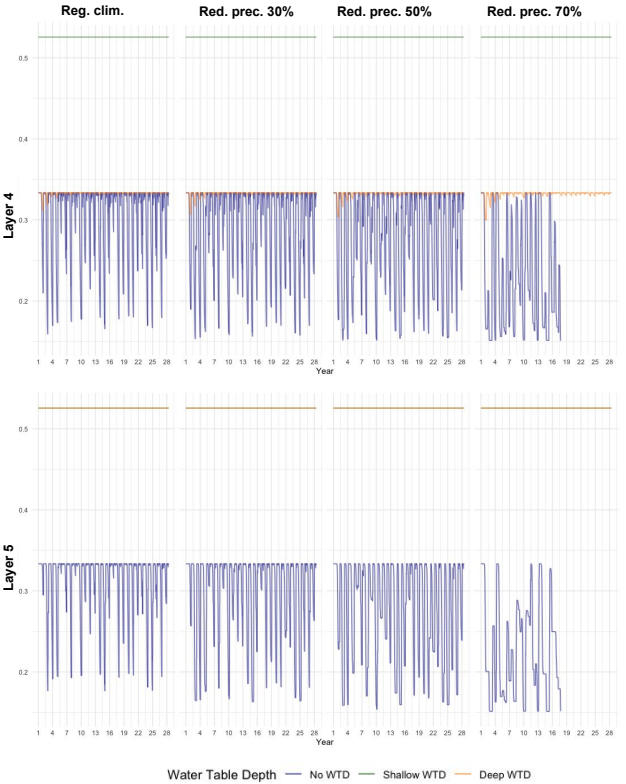
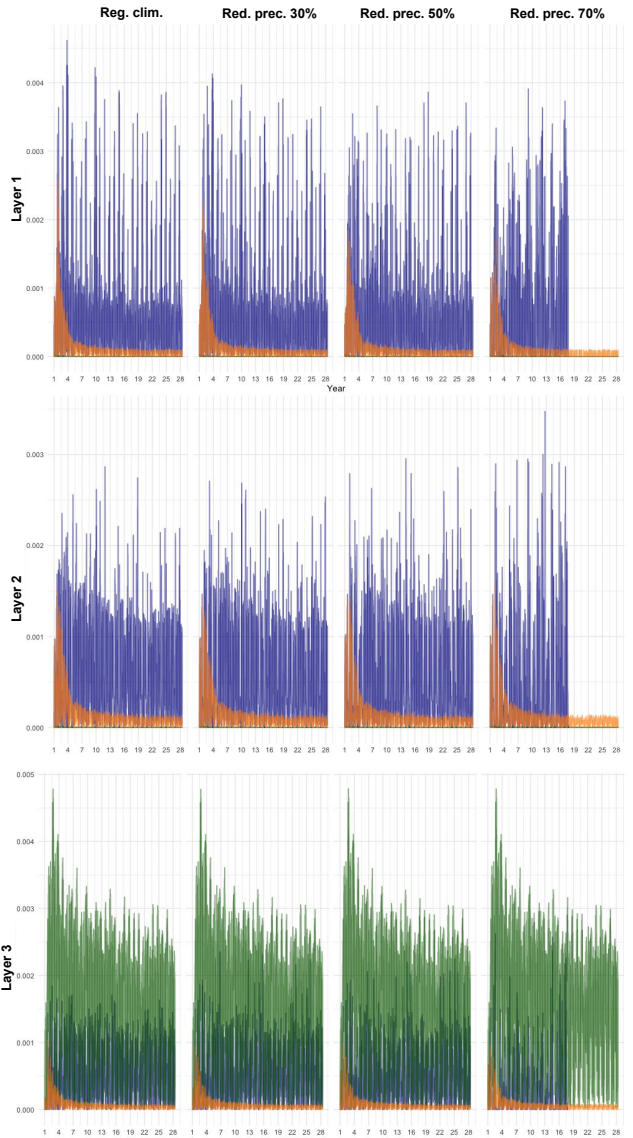


2.b. Transpiration in each layer



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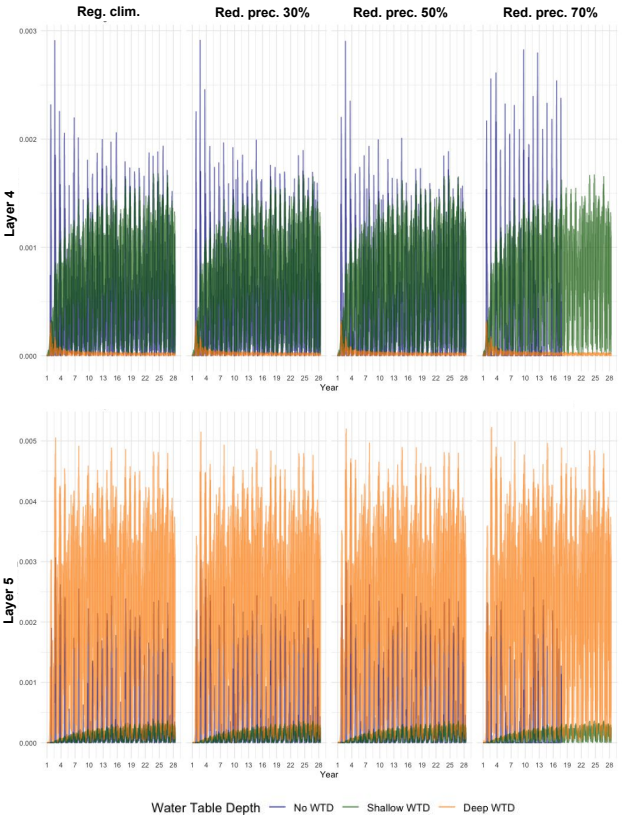
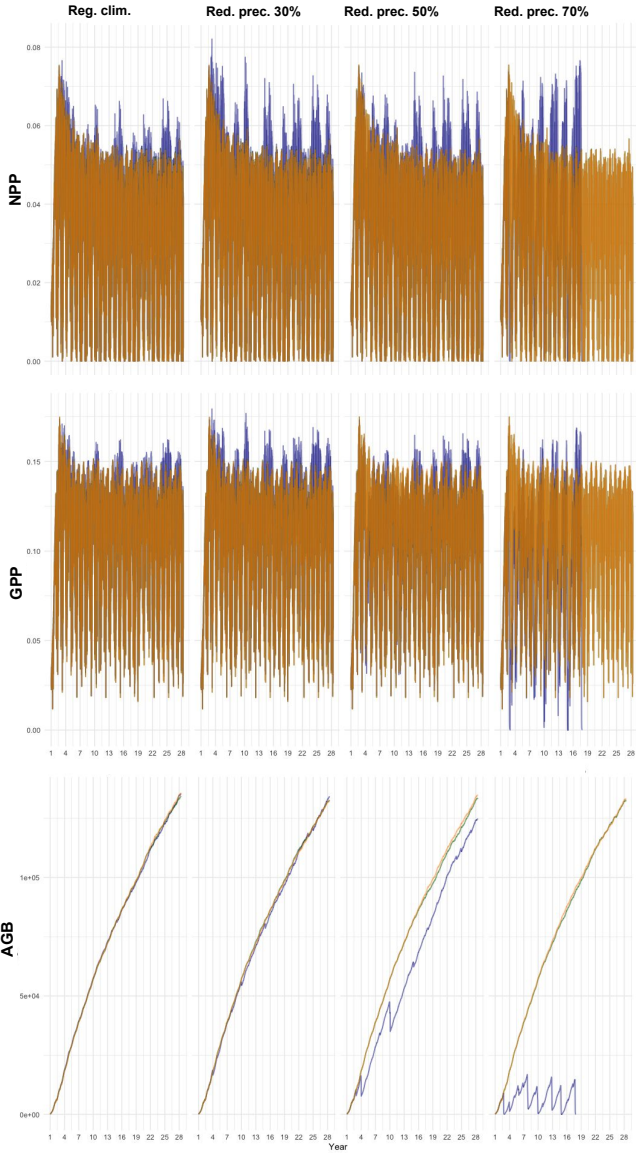


2.c. Biogeochemical and forest structure variables



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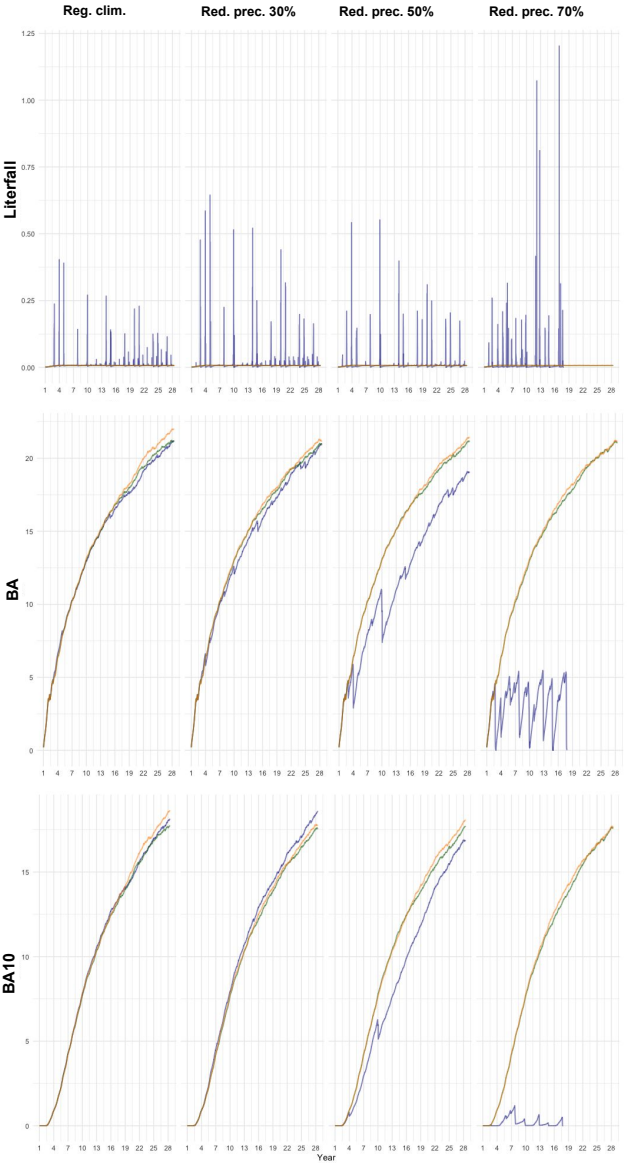

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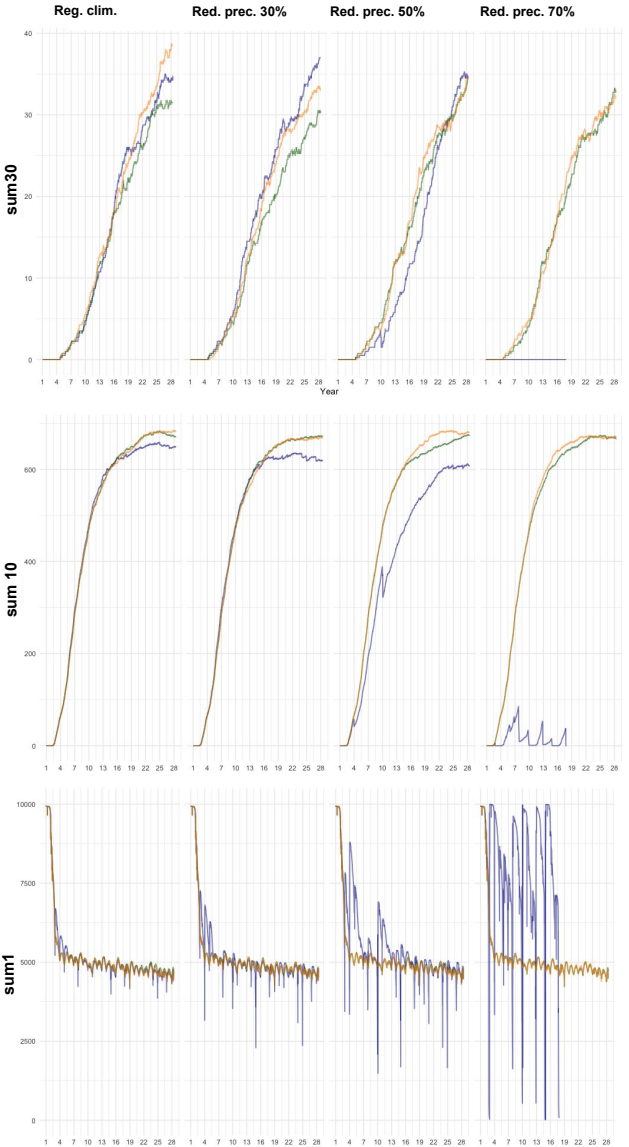
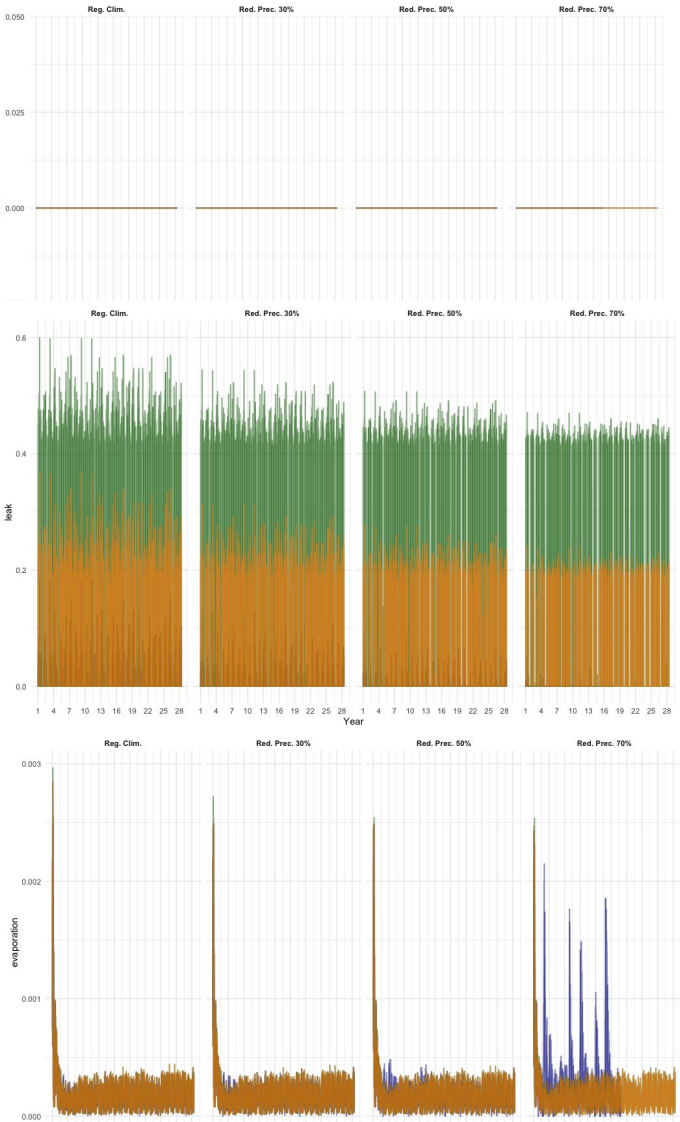
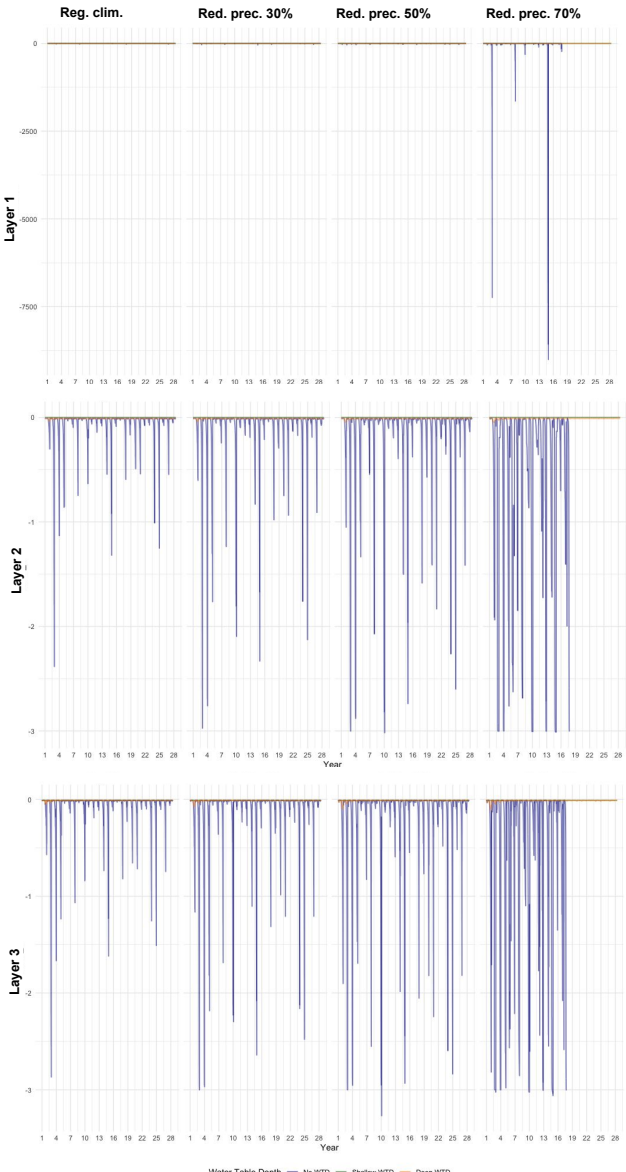


Supplementary



Soil water potential in each layer



Soil water potential in each layer