## **Uncertainty of water balance simulations** related to soil parameterization in Alpine forests under climate change conditions

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**KEY MESSAGES** Soil parameterization determines uncertainty of water balance modelling

**Transpiration deficit increases** under future climate conditions





50 1 MPI-ESM-LR RCP4.5 2 MPI-ESM-LR RCP8.5 [mm/yr] median 125 3 ICHEC-EC-EARTH RCP8.5 PINE 100 -**SPRUCE** of BEECH 75 Uncertainty annual T<sub>def</sub> 50 25





NOW MID END	NOW MID EN	$D \qquad NOW \twoheadrightarrow MID \qquad MID \twoheadrightarrow END \qquad NOW \twoheadrightarrow END$
<ul> <li>Depends on CC model/RCP scenario and vegetation parameterization</li> <li>Non-linear increase suggested</li> </ul>	<ul> <li>Can mask the climate change sign</li> <li>But: linear increase suggested, resin END period are more robust</li> </ul>	al sults $>50\% \text{ MID} \rightarrow \text{END}$ $>73\% \text{ NOW} \rightarrow \text{END}$ $>73\% \text{ NOW} \rightarrow \text{END}$ > 1991 - 2020 MID 2036 - 2065 END 2071 - 2100
COOD NEWS: model is yery consitive to sail and vegetation RUT: sail parameterization is key to resulting uncertainty		

GOOD NEWS: model is very sensitive to soll and vegetation parameterization – and hence useful for climate change studies

BUI: soil parameterization is key to resulting uncertainty, which must be considered for deriving robust results

## **OBJECTIVES**

- **Climate-change-induced stress** in forest ecosystems will have consequences for society worldwide. A major impact of climate change is the gradual shift in water balance which can lead to drought stress in forest stands. In this light, the objectives of the present study, focussing on Tyrol and Vorarlberg (Austria) are:
- Investigate future water balance using a SVAT model
- **Consider uncertainty** introduced by soil parameterization
- Analyse water balance changes at >2.000 forested sites



## **MATERIALS & METHODS**





## **RESULTING TRANSPIRATION DEFICIT**

- Transpiration deficit ( $T_{def} = T_{pot} T_{act}$ ) derived with systematically sampled soil parameterizations
- Resulting uncertainty of transpiration deficit depends on vegetation parameterization, considered climate model and RCP scenario



- In many cases, the soil parameterization determines, if there is a transpiration deficit
- $\rightarrow$  Soil parameterization is crucial for the validity of the resulting transpiration deficit

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**FUTURE RESEARCH WILL FOCUS ON**  Investigating the impact of humus depth on the water balance

 Upscaling point-based results to area-wide maps

Identifying suitable tree species under future climate conditions



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