

EGU, May 23<sup>rd</sup> 2022

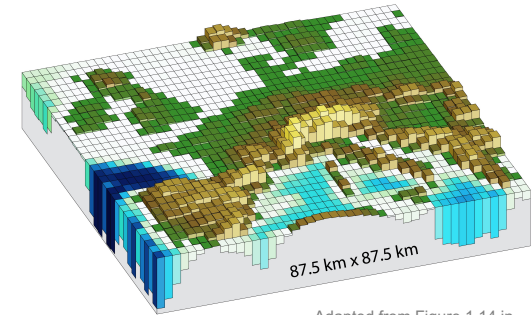
# The role of the Laurentide ice-sheet topography in the Alpine hydro-climate at glacial times

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[www.britannica.com/science/glacier](http://www.britannica.com/science/glacier)

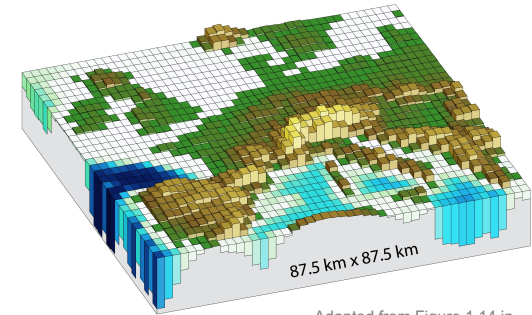


Adapted from Figure 1.14 in  
IPCC (2013)

How does the the Laurentide ice-sheet topography influence the  
Alpine hydro-climate at glacial times?



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### **The role of ice-sheet topography in the Alpine hydro-climate at glacial times**

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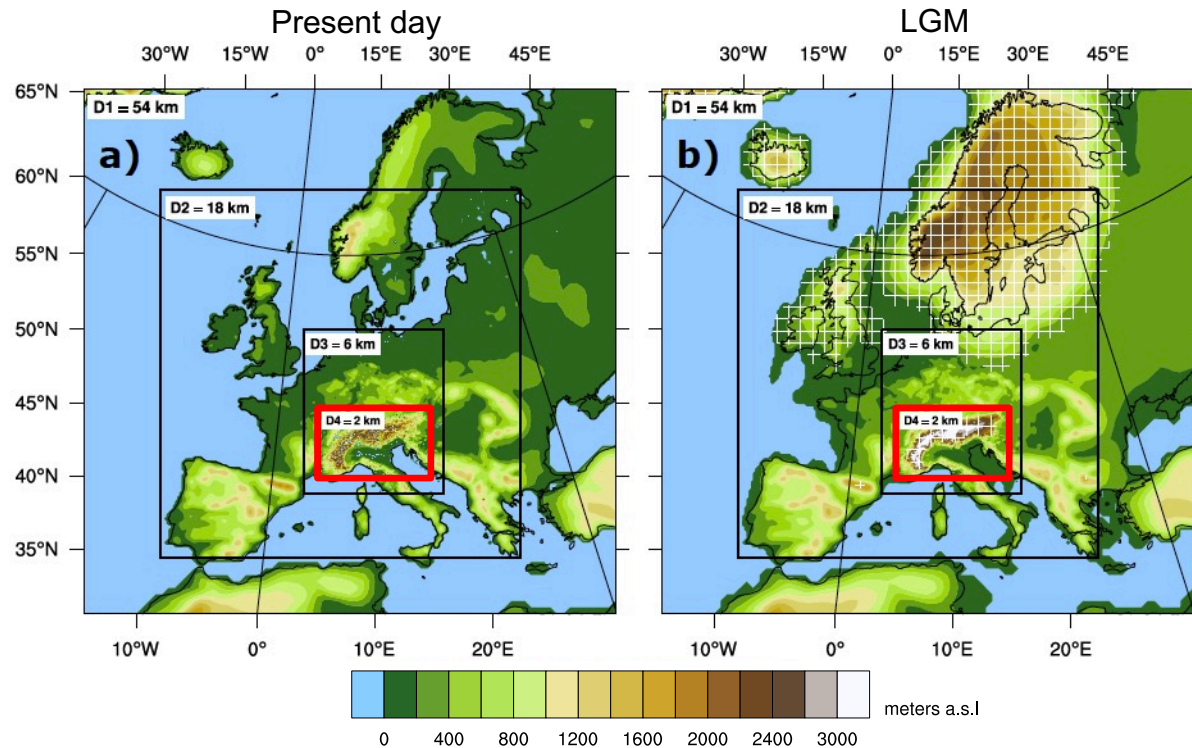
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# Present day and LGM

Name	Perpetual conditions	North Hemis. ice sheets	Fennoscandian ice sheets	Alpine glaciers	Land cover
PD <sub>PD</sub>	1990	1990	1990	1990	1990
LGM <sub>LGM</sub>	LGM	LGM	LGM	LGM	LGM

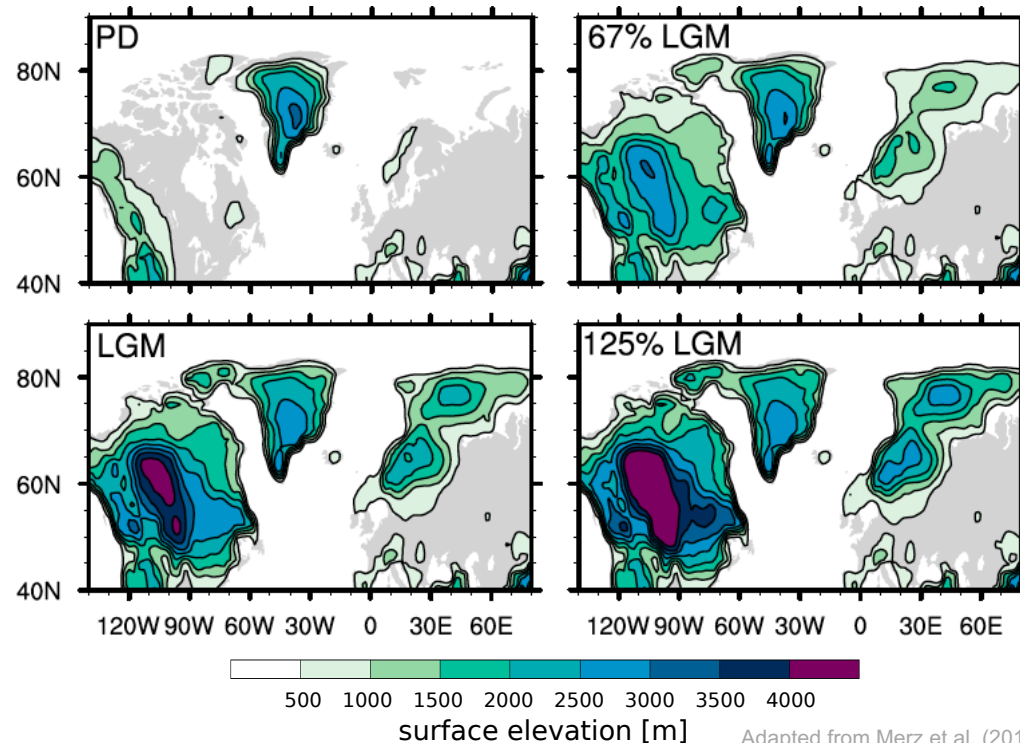
Other forcing factors  
 ↑  
 LGM XX LGM  
 ↓  
 Surface conditions



# MIS4 and different northern hemispheric ice sheets

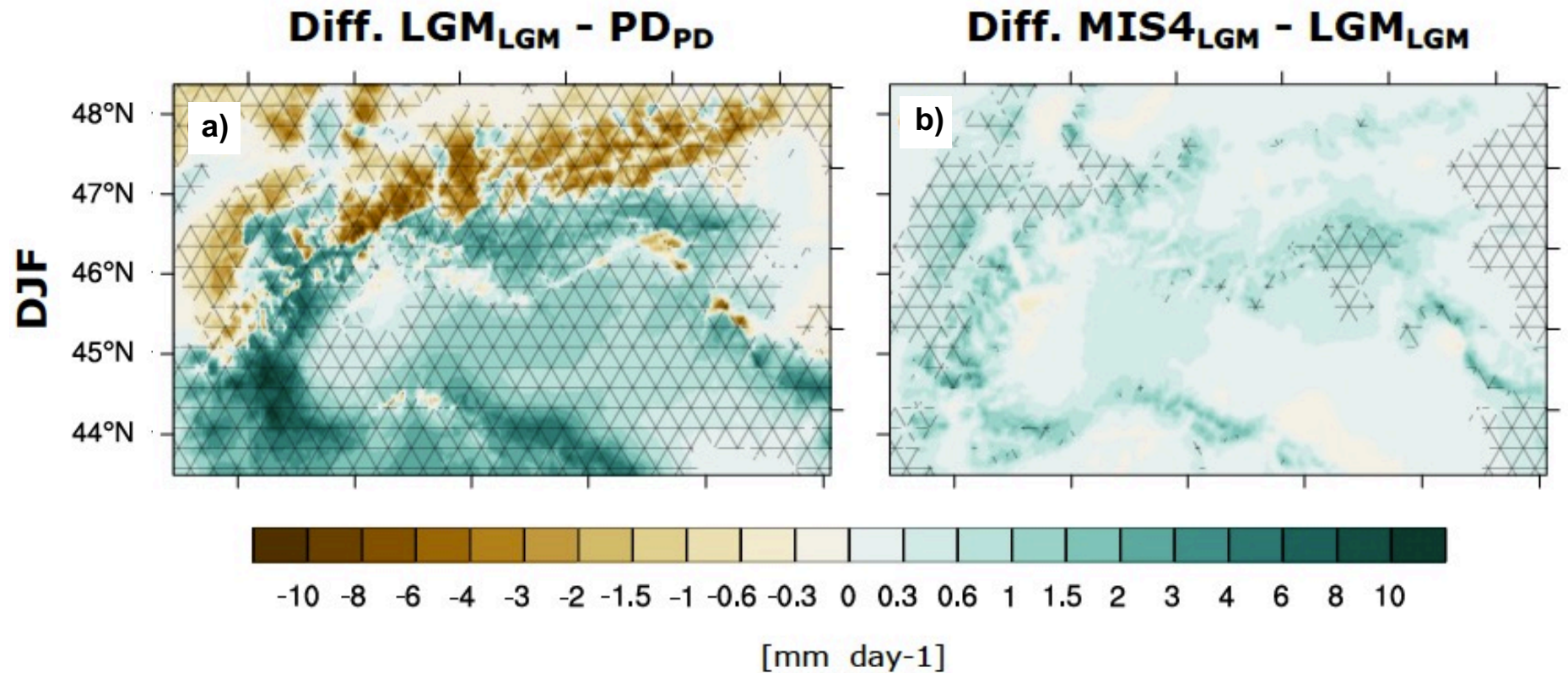
Name	Perpetual conditions	North Hemis. ice sheets	Fennoscandian ice sheets	Alpine glaciers	Land cover
MIS4 <sub>LGM66</sub>	MIS4	66 % LGM	66 % LGM	LGM	LGM
MIS4 <sub>LGM</sub>	MIS4	100 % LGM	100 % LGM	LGM	LGM
MIS4 <sub>LGM125</sub>	MIS4	125 % LGM	125 % LGM	LGM	LGM

Other forcing factors  
 ↑  
 MIS4 XX% LGM  
 ↓  
 Surface conditions





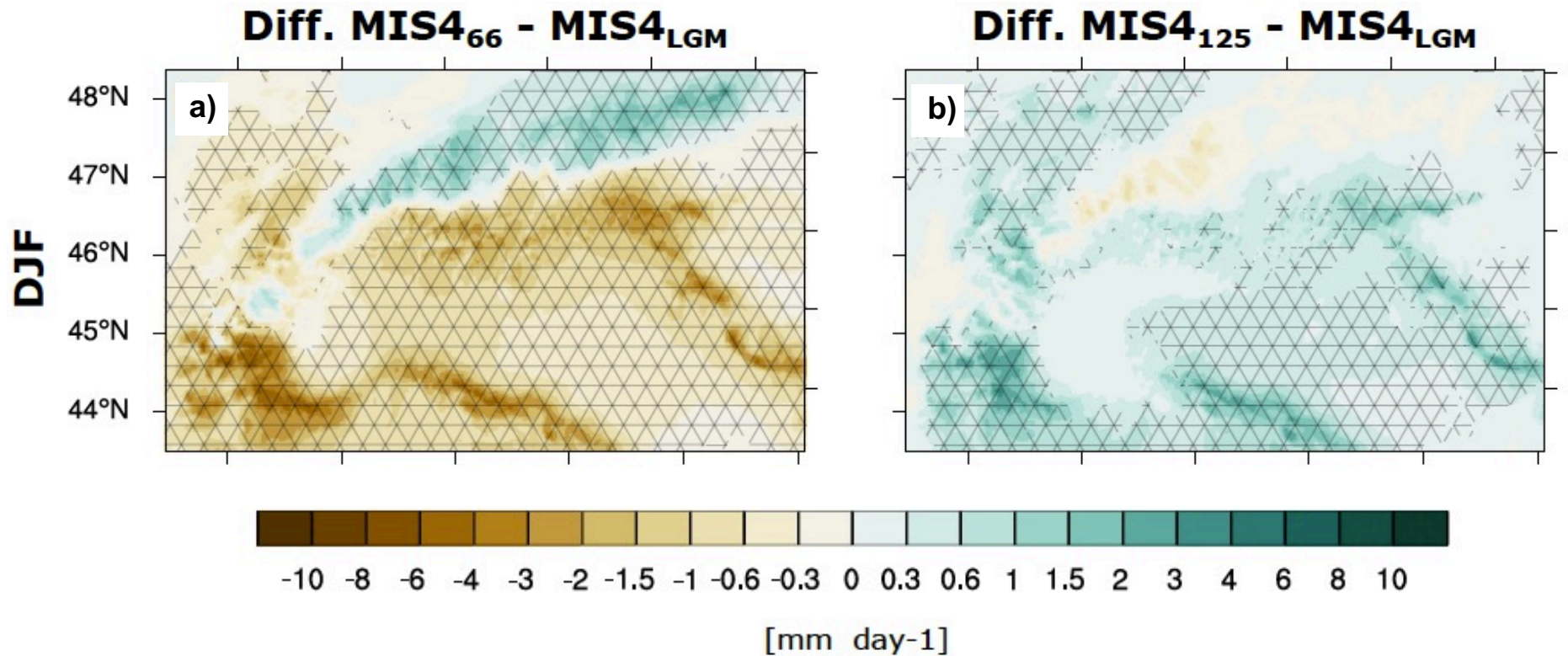
# Daily precipitation intensity



Other forcing factors  
↑  
 $LGM_{LGM}$   
↓  
Surface conditions

crosshatched areas = significant values

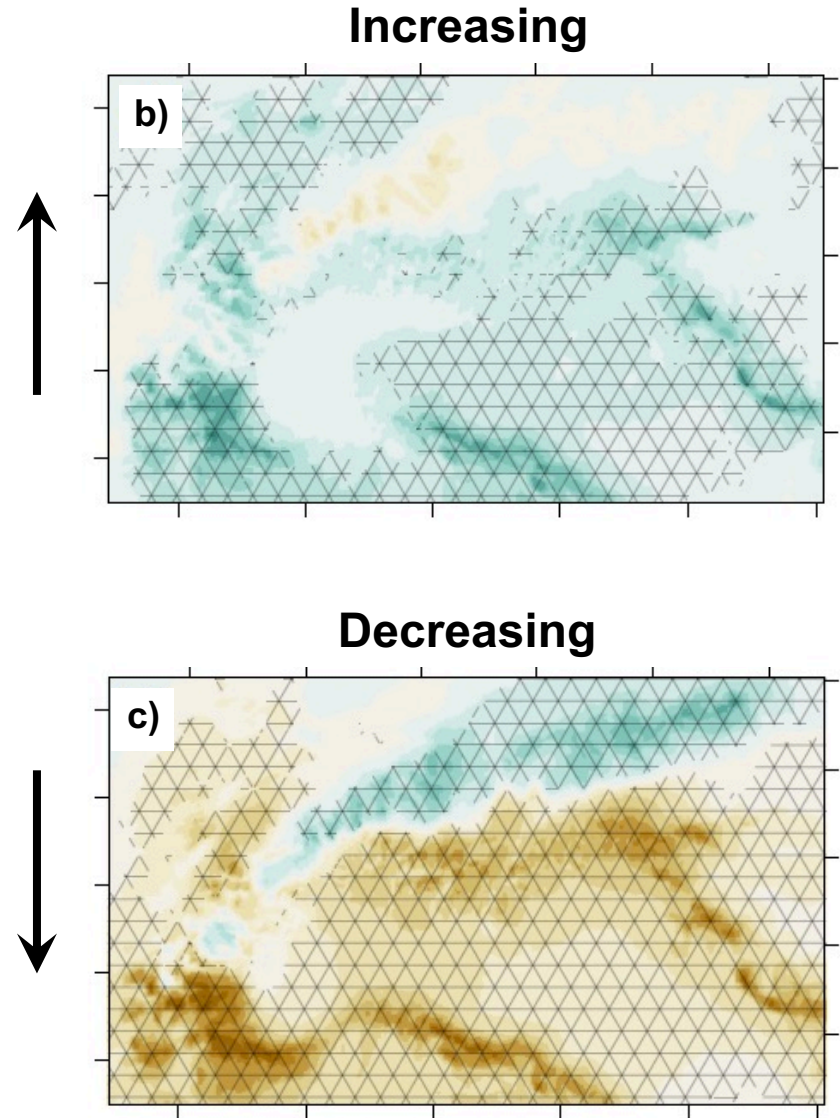
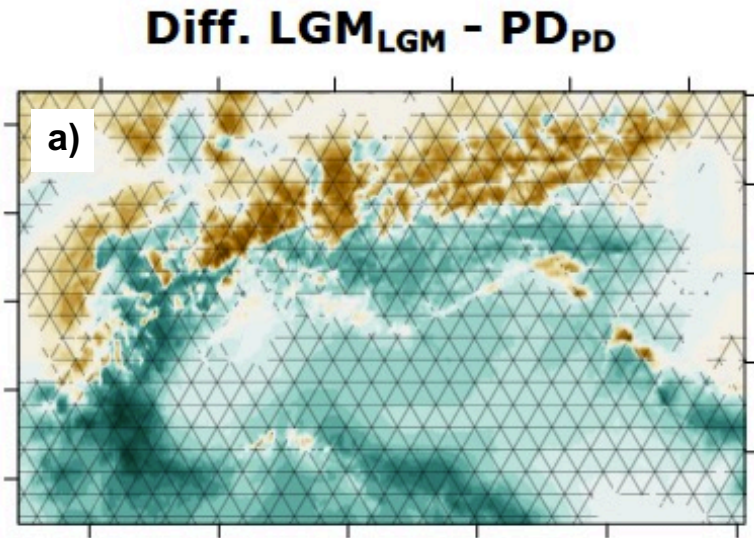
# Daily precipitation intensity – MIS4 experiments



Other forcing factors  
↑  
MIS4 XX% LGM  
↓  
Surface conditions

crosshatched areas = significant values

# Winter precipitation patterns



crosshatched areas = significant values



# Conclusions

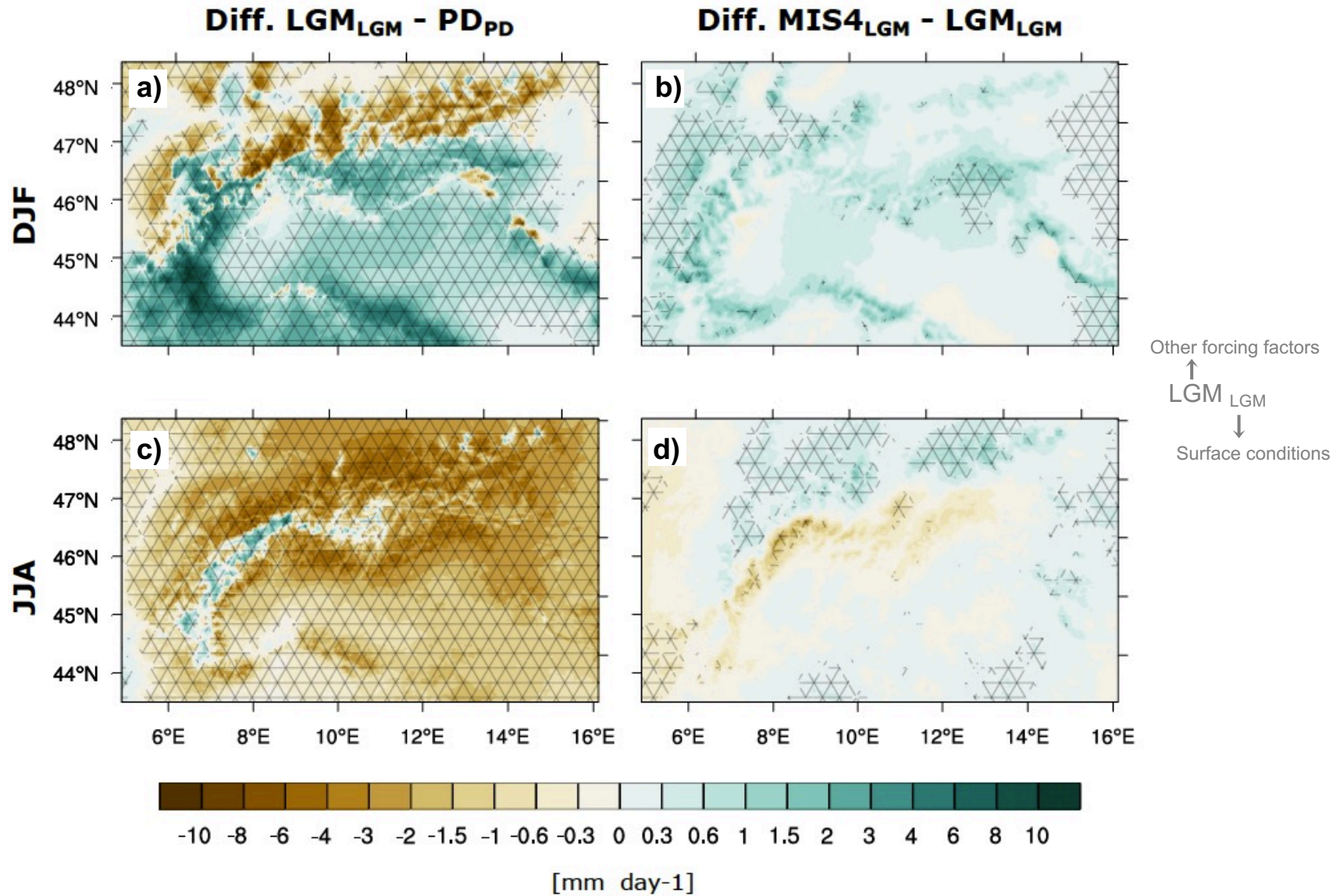
- LGM climate presents significant changes in precipitation patterns over the Alpine region compared to present day.

## **How does the ice-sheet topography influence the Alpine climate at glacial times?**

- Increasing the thickness of ice-sheets leads to an intensification of glacial conditions over the Alpine region. (spoiler: Mainly explained by dynamical processes, e.g. winds)
- A future work would be to make the results more robust. For example using a model ensemble where one uses different GCM and RCM.

Thank you for your attention

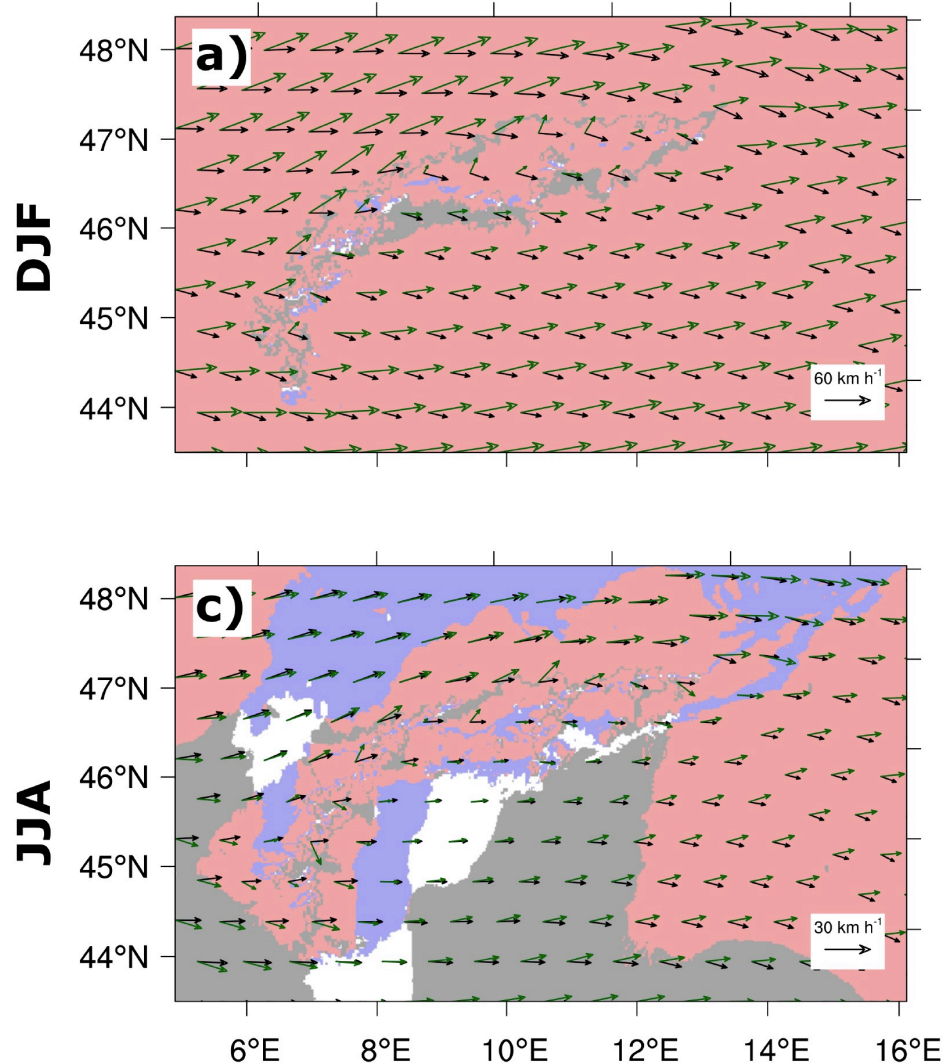
# Daily precipitation intensity



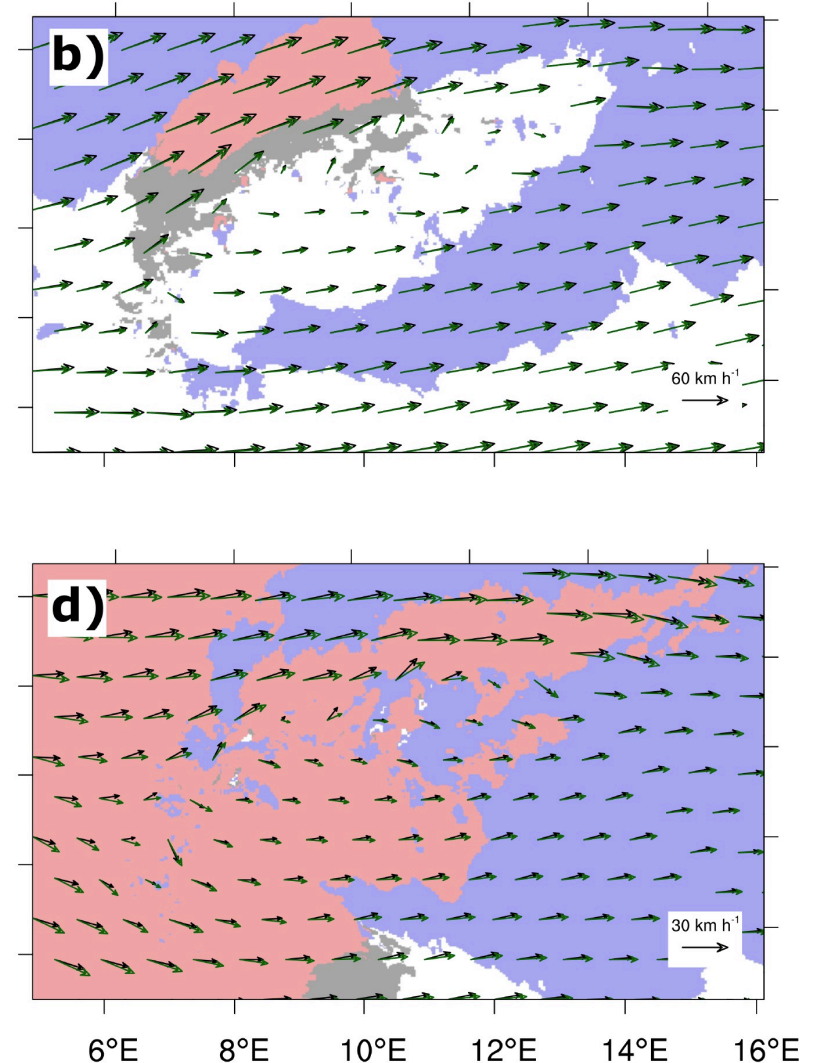
crosshatched areas = significant values

# Wind vectors at 700 hPa

PD and LGM



LGM and MIS4<sub>LGM</sub>



Significant (0.05)

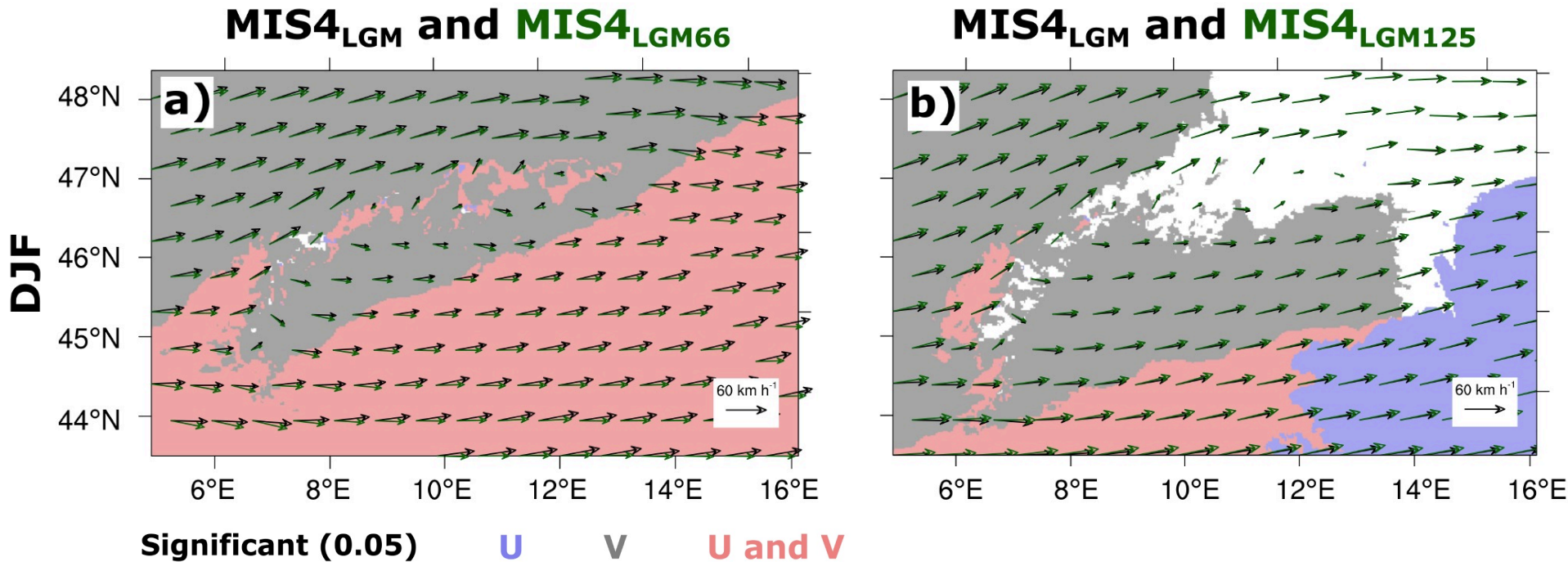
U

V

U and V



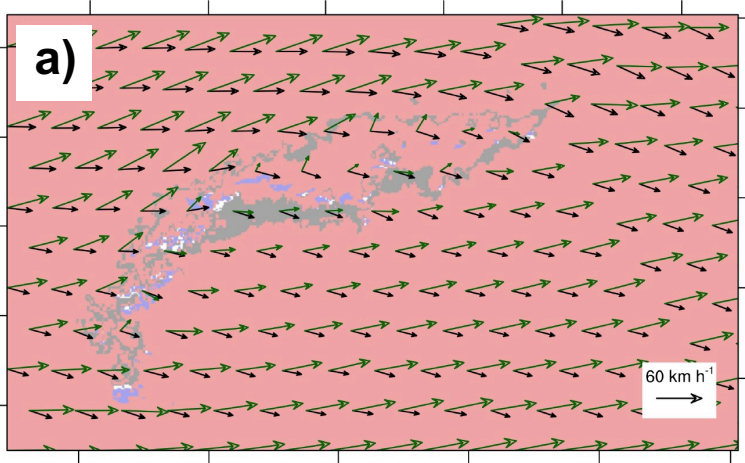
# Wind vectors at 700 hPa – MIS4 experiments



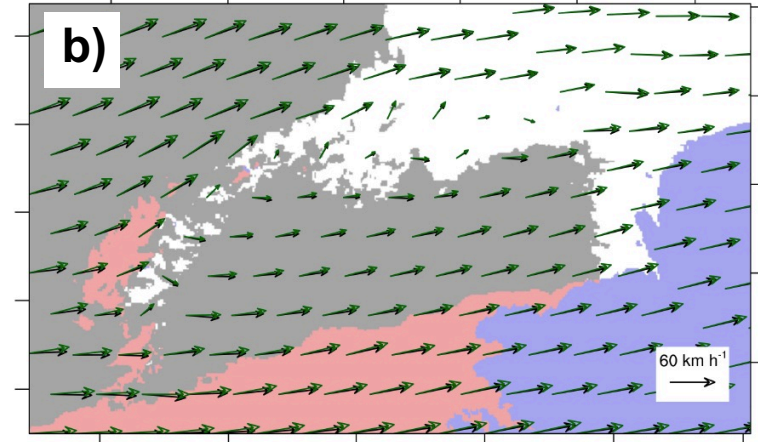
Other forcing factors  
↑  
MIS4 XX% LGM  
↓  
Surface conditions

# Winter wind patterns

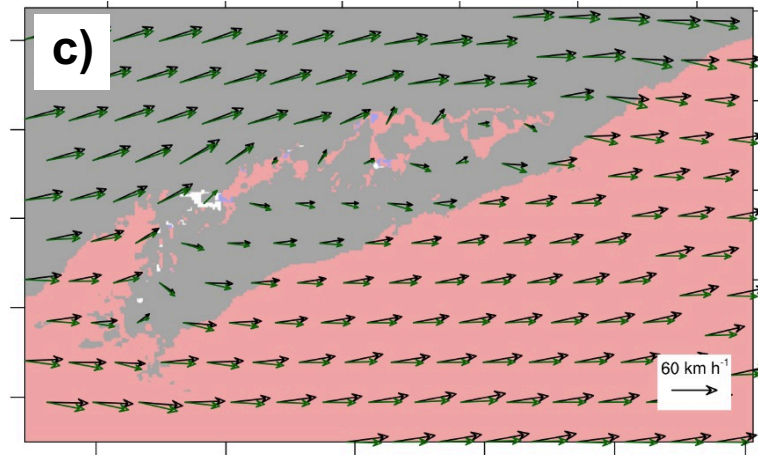
PD and LGM



Increasing



Decreasing



Significant (0.05)    U    V    U and V