The challenges of modelling mixed management grasslands in North Spain under climate change

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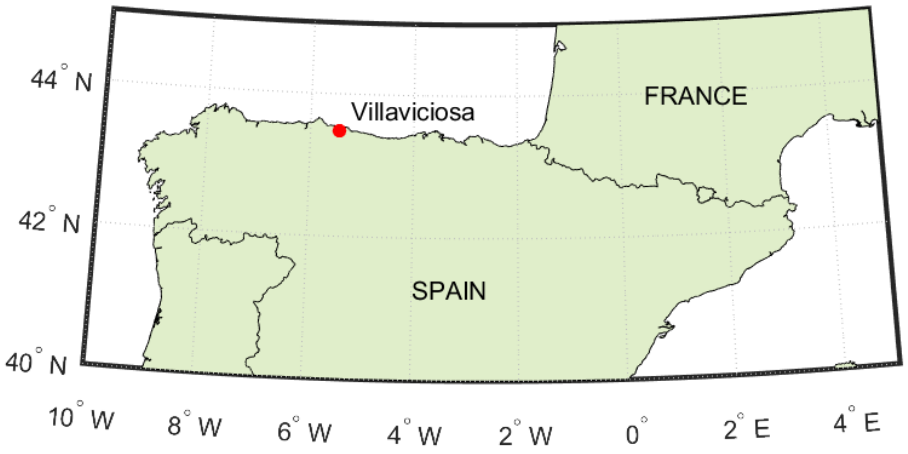
Introduction

- Permanent **grasslands** are a relevant agricultural system in the **North of Spain**
- Management: **mixture of cuts and grazing**
- **Adaptation** to climate change (CC) is required due to environmental changes affecting grassland productivity (e.g., rising CO2 and temperature, altered precipitation pattern).
- **Calibrated/validated** **simulation models** for these systems based on long-term experimental data are needed to assess CC projections
  - PaSim (Riedo et al. 1998) process-based grassland ecosystem model

Objective: To assess PaSim's ability to simulate grasslands in Northwestern Iberia and their evolution under projected CC conditions

Methodology



- PaSim model
  - **Calibrated** with experimental data from 12 years (18 plots) in Villaviciosa (Maritime temperate climate/ oceanic climate: Cfb according to Köppen-Geiger classification). Martínez-Fernández (2008)
  - Dynamic management: Optimal **management routine** (mowing and nitrogen fertilisation). Vuichard et al. (2007)
- Grassland locations along **Cantabrian Sea Coast**
- **Soil** information
  - Georeferenced Spanish Soil Profile Database (SODES; Trueba et al.,2000)
  - 98 soil profiles
- Climate projections from **CORDEX-EUR11**
  - Historical, RCP4.5 and RCP.8.5
  - 1976-2005 and 2030-2059 periods
  - Bias adjusted (Quantile mapping) with respect to EOBS database

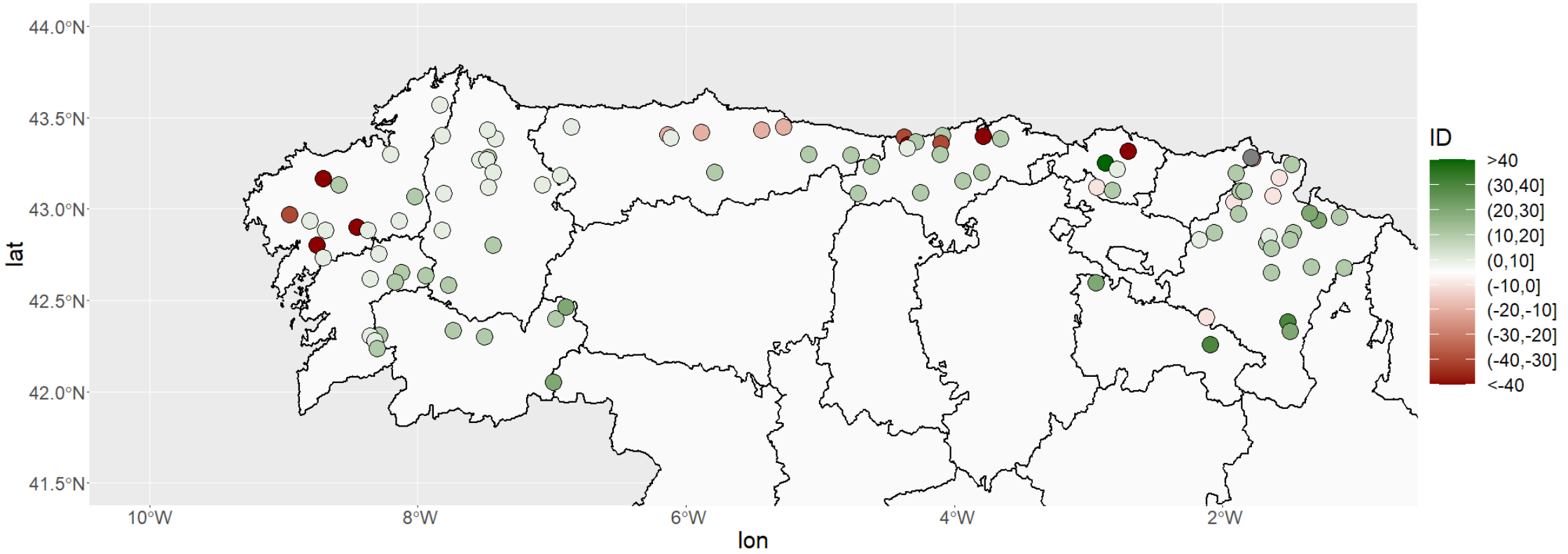
Preliminary results

(with only one climate model)

- Overall, future conditions would benefit yields across all the northern Spanish coast

RCP8.5 - Yield C change (%)

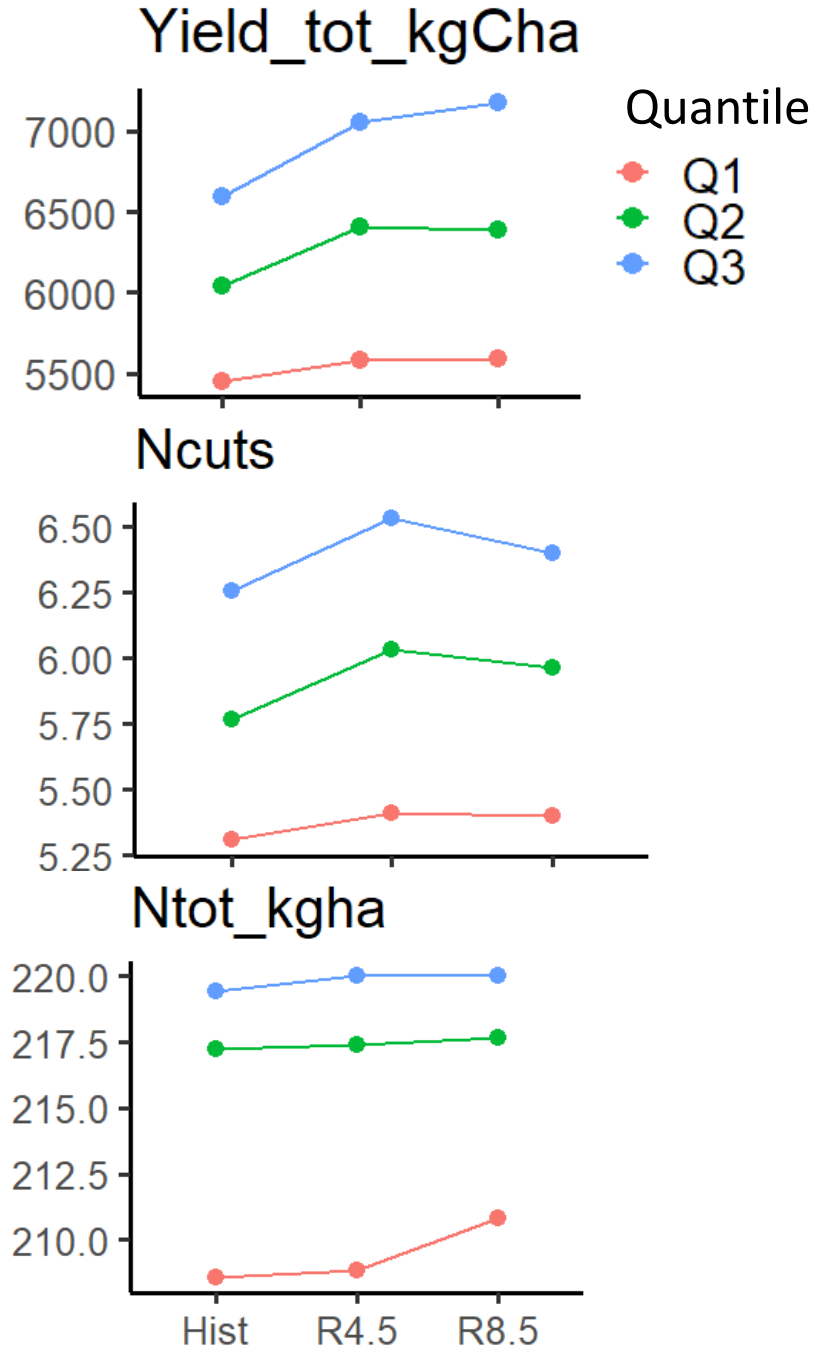
2030-2059 with respect to 1975-2005



Preliminary results

(with only one climate model)

- **Yields** are expected to increase significantly for RCP4.5 in some locations and even more for RCP8.5
  - Milder winter, more radiation throughout the year but still enough water
  - CO2 effect
- The **number of cuts** (optimal cutting management) would increase in the future, similarly in both scenarios
- The **N fertilisation** applied in the automatic management remains around the maximum



Conclusions

- Calibrated PaSim stands as a **satisfactory option** for simulating grasslands in northwest Spain
- Our preliminary results point to a potential **increase in grasslands yield production** in a wide range of locations along Northern Spain
- Simulations with a climate model ensemble (to reduce climate uncertainty) and a deeper analysis are still to do.

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Thank you!

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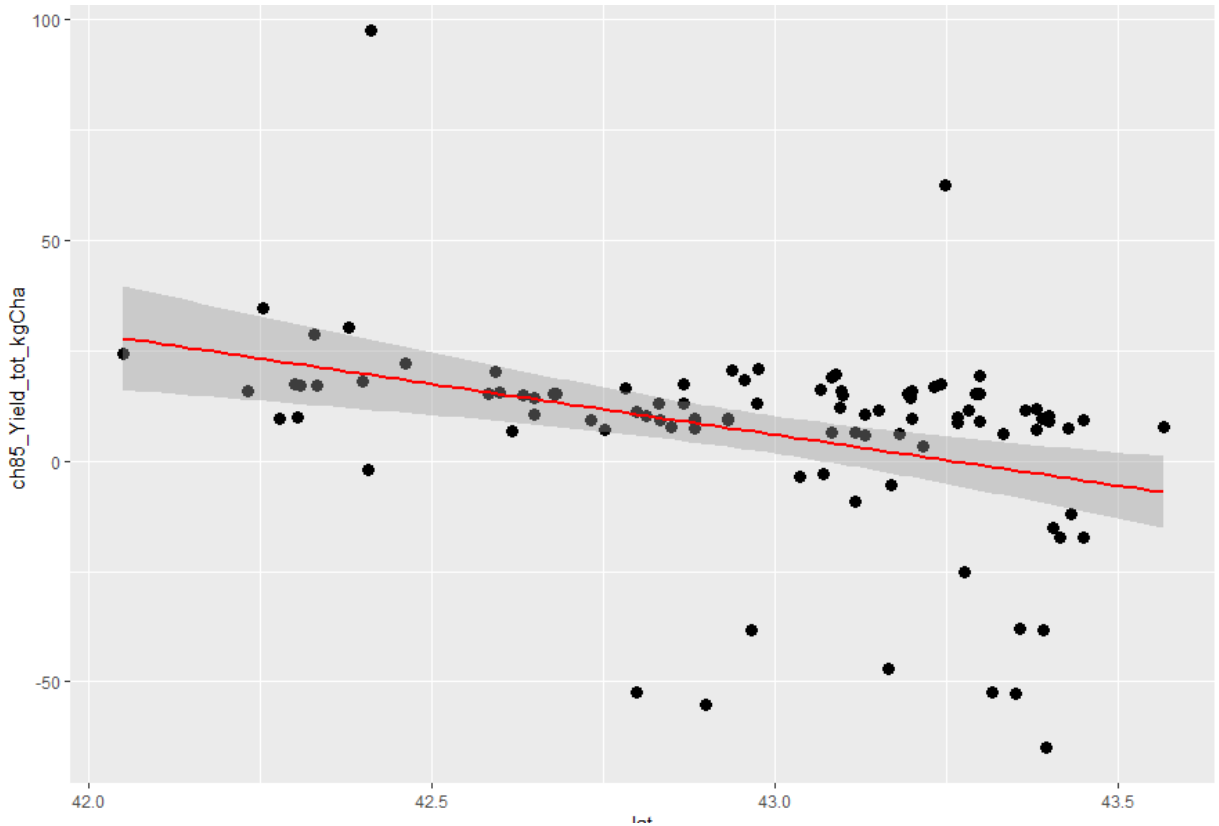

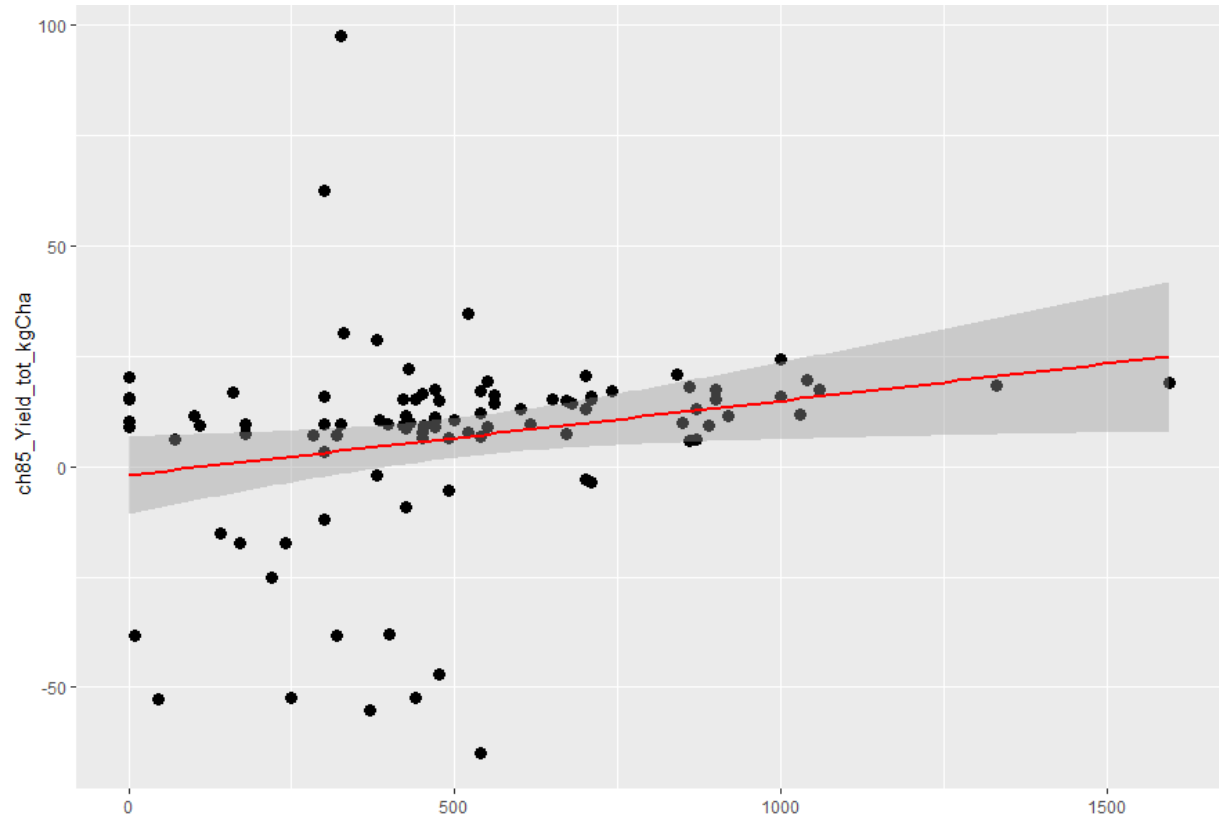

Some relationship between yield changes and latitude and height