Quantifying flood-mitigation and water-quality benefits provided by pasture interventions within the Leith, Lowther and Petteril catchments (Eden Catchment, Cumbria, UK).

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1) Introduction

As part of agri-environmental payment schemes, British livestock farmers are being asked to incorporate pasture interventions into their farming systems in an effort to reduce downstream flood-risk and water-quality degradation.

Very little data exists regarding the effectiveness of these interventions, which makes hydrological modelling highly uncertain.

2) Aim and objectives

Aim: To quantify runoff reduction (overland flow and streamflow) caused by the following interventions:

Objectives
1) Grassland aeration
2) Rough-grazing
3) Stone-walls
4) Hedgerow buffer-strips
5) Channel re-alignment

All objectives involve field monitoring, with interventions contrasted against neighbouring pasture. Results are statistically analysed and modelled at plot, sub-catchment and full-catchment scales using systems engineering and physics-based modelling tools to quantify flood-risk and water-quality improvements.

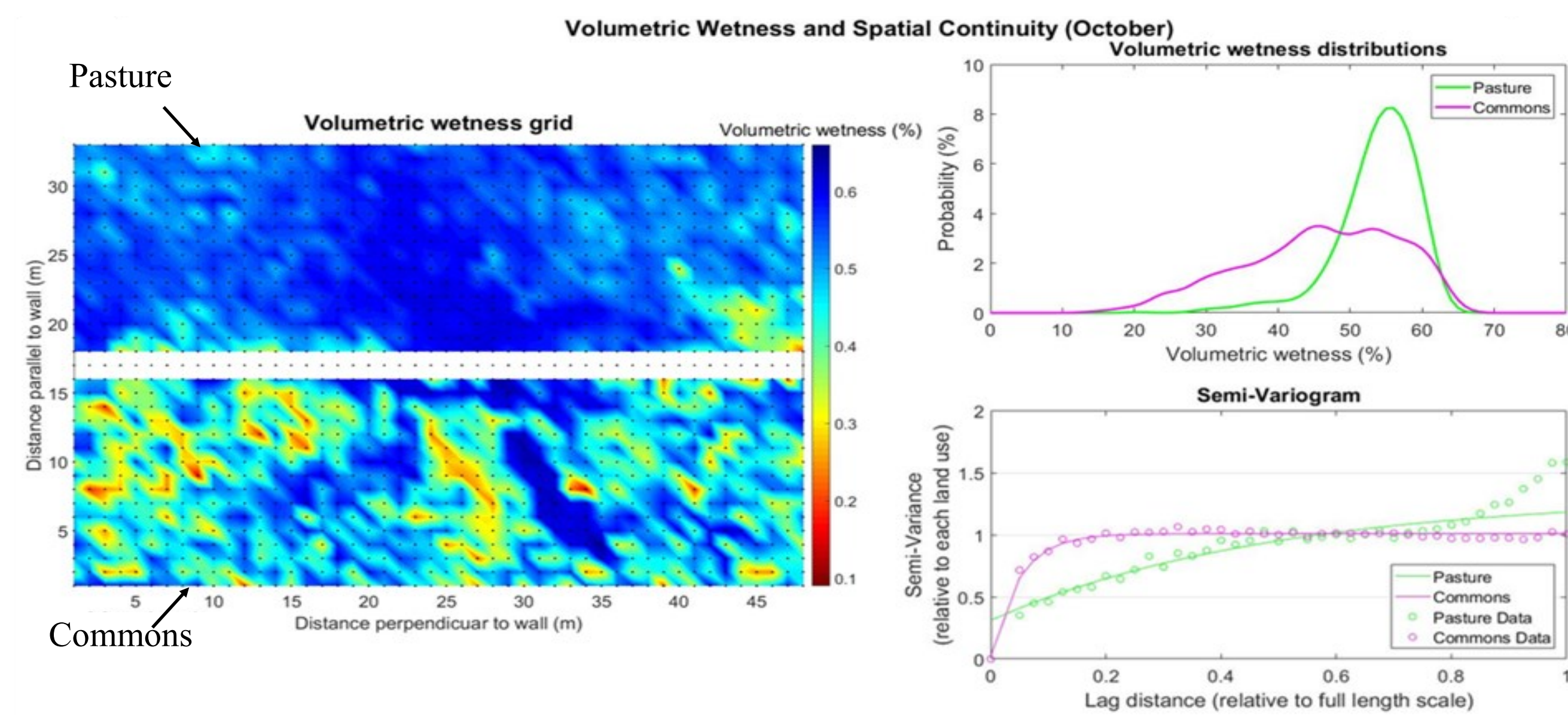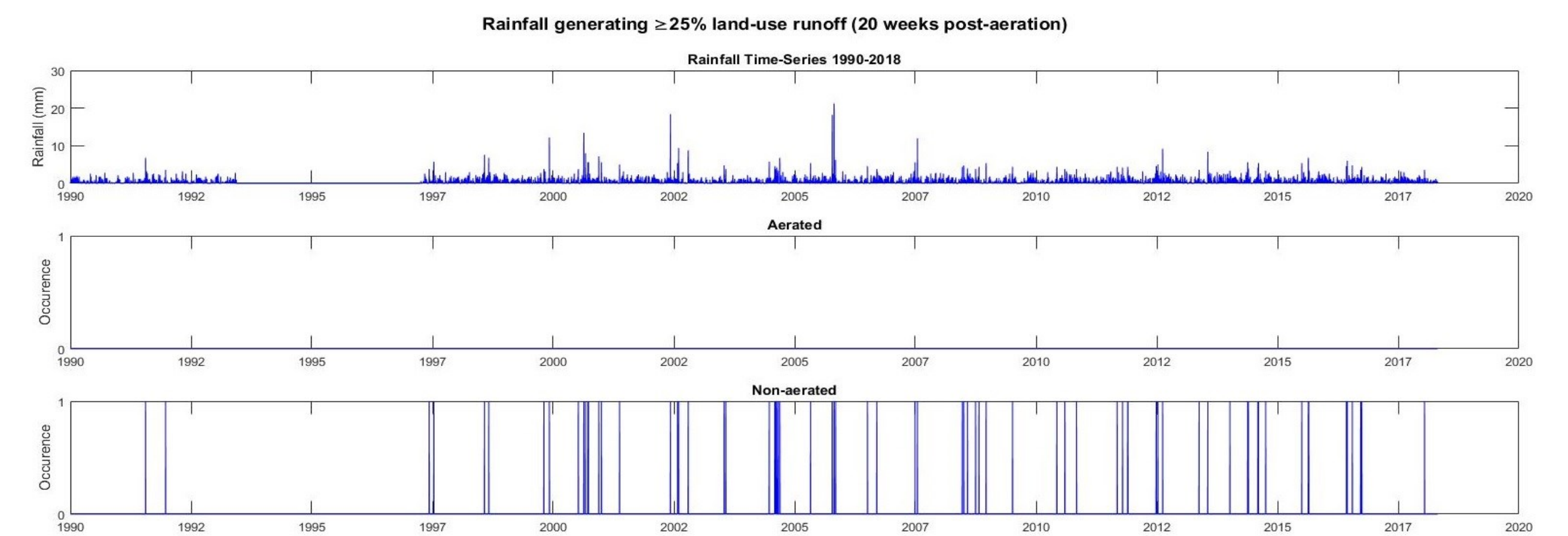## 3) Current results and discussion

3.1 Grassland aeration

· Aeration improved permeability for at least 20 weeks, and reduced simulated overland flow by up to 100%.

3.2 Rough-grazing

· During early storm season prior to saturation (late Oct), grazed commons had significantly reduced (p<0.001) soil volumetric moisture content ($\tilde{x}$=46.6%) compared to permanent pasture ($\tilde{x}$=53.6%).

3.3 Stone-walls

· 33% of sampled stone walls significantly (p<0.05) held up soil moisture during saturated conditions, when measuring over 1/4 miles of stone-walls at one meter resolution (16 meters above and below the wall).

A (broken) stone-wall slowing flow at Gaythorne Hall in a neighbouring catchment of the Lowther.