WP2 update

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WP2 update

- Downscaling
  - Ilya and Jonathan's `mesoclim` `R` package is ready to go and being tested on Jasmin
  - Ivis will take about GMRF-based methods generating other RCPs later

Pest and disease risk

- Dan has started work on a draft paper on using the Plant Health Risk Register (PHRR) to estimate risk to UK trees
  - its working title is *Potential impacts of plant pests and diseases on trees and forests in the UK*
- These data will be coupled for the simple generic infection model of Magarey et al. (2005) [1]
- R code to implement the model in the form of `R` package `infect` is up on GitHub
- Jonathan has considered how we'll drive it with UKCP18 data
- We still need to decide on how we'll take PHRR's semi-quantitative data (e.g. likelihood of arrival in next five years taking values 1, 2, 3, 4, 5) and make it fully-quantitative (e.g. probability of arrival in next five years), which is non-trivial!
- The simple generic infection model also wants hourly data, but ADD-TREES is currently on daily scale, so might need to temporally downscale

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[1] Magarey, R. D., T. B. Sutton, and C. L. Thayer. (2005). A simple generic infection model for foliar fungal plant pathogens. Phytopathology 95 (1): 92–100. https://doi:10.1094/PHYTO-95-0092.

Driving the simple generic infection model with UKCP18 I

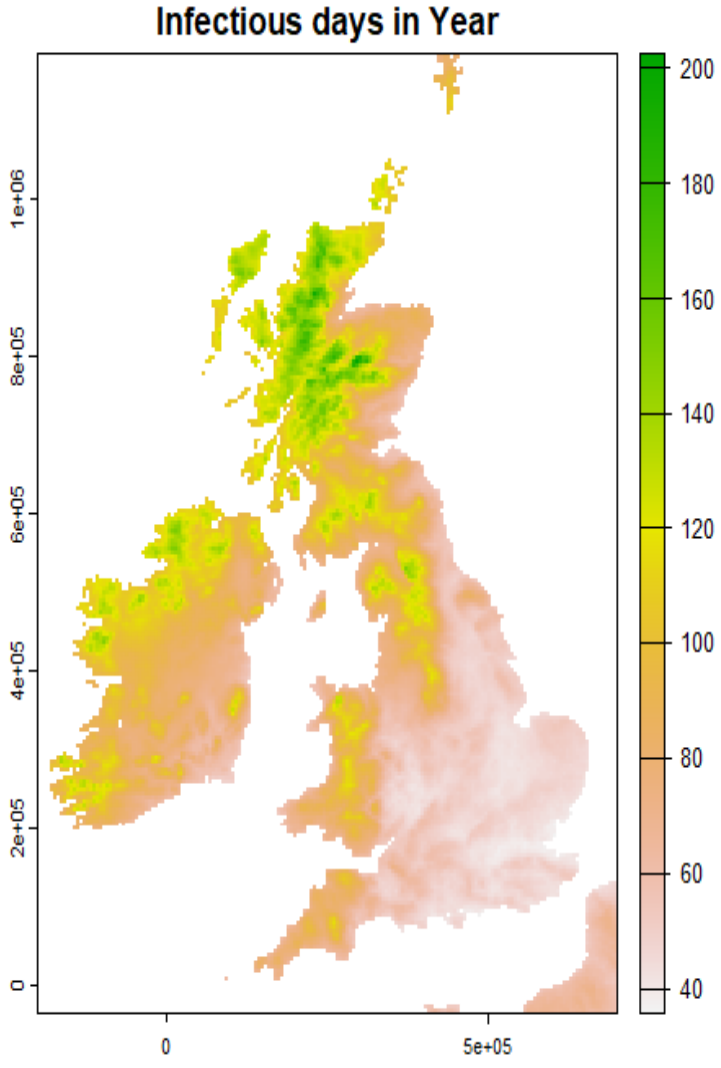

Figure 1: Jonathan's plot identifying disease prone days I

Driving the simple generic infection model with UKCP18 II

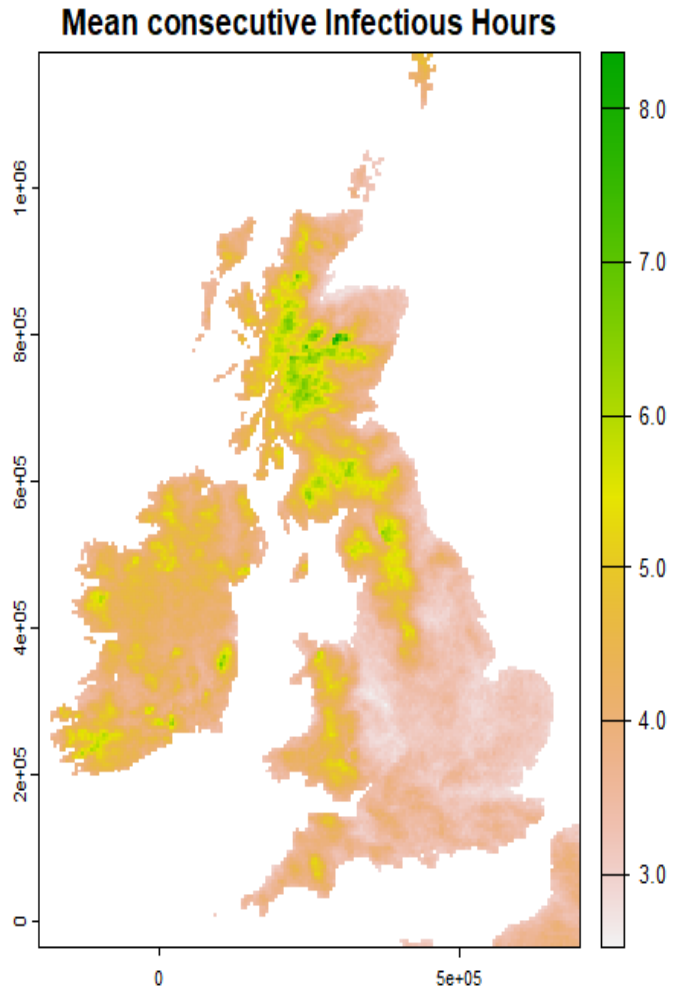

Figure 2: Jonathan's plot identifying disease prone days II

Driving the simple generic infection model with UKCP18 III

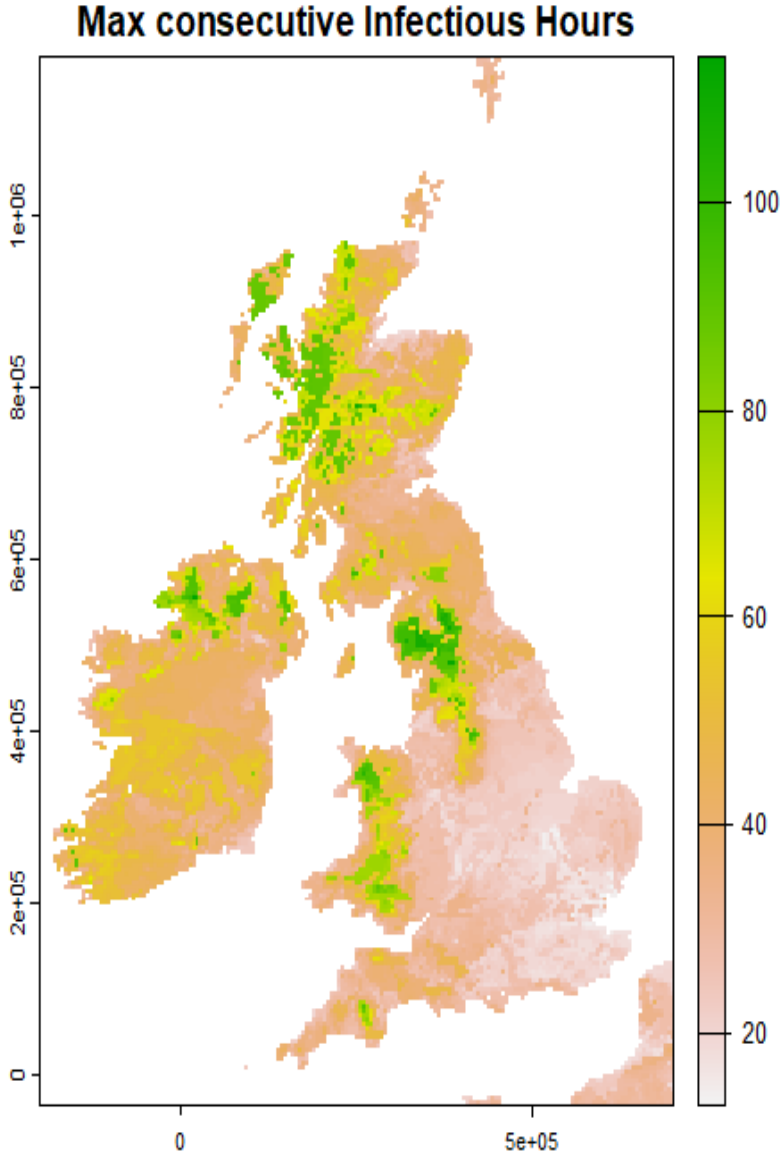

Figure 3: Jonathan's plot identifying disease prone days III

Other risks

- Next task is fire risk
  - due to time frames, incorporating this into JULES-RED has been ruled out
  - works exists that we can use to allow for trends in fire risk (Perry et al., 2022)[2]
  - scope to try and link fire risk approach to that of pest and disease risk
    - e.g. post-processing the JULES output via a fire risk index
- Heat wave risk and flood risk
  - possibly partially covered by downscaled climate data going in to JULES

[2] Perry, M. C., Vanvyve, E., Betts, R. A., and Palin, E. J.: Past and future trends in fire weather for the UK, Nat. Hazards Earth Syst. Sci., 22, 559–575, https://doi.org/10.5194/nhess-22-559-2022, 2022.

Wind risk

- Hoping to use `fgr` `R` package, which implements the ForestGALES model (Hale et al., 2015)[3]
  - takes wind speed, tree height, and a few other things, to calculate force on tree at arbitrary height
  - then calculates moments and critical wind speeds for 'damage'
  - damage is the stem breaking or the tree uprooting
  - does JULES give us what we need to use this?
  - if it does, how do we link tree damage to carbon loss?

[3]Hale, S.E., Gardiner B., Peace, A., Nicoll, B., Taylor, P. and Pizzirani, S., 2015. Comparison and validation of three versions of a forest wind risk model. Environmental Modelling and Software 68, 27-41.

The bigger picture

- Calculations for multi-species planting seem tricky
  - but that's probably what's going to happen?