

Spatio-temporal characterisation of ecosystem functions based on macro habitats

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Analysis and forecasting of the spatial distribution and dynamics of ecosystem services is an important element of sustainable land management. Recent studies have noted that the most successful and promising approach to estimating such properties continuously over time and space should include a combination of remote sensing and modelling methods.

Remote sensing data provide information for spatially distributed variables across different spatiotemporal scales that can be used for eco-hydrological modelling, such as estimates of water and carbon stocks, climatic variables and information on land cover, forest and soil monitoring and modelling.

Methodology

The following indices were derived from MODIS (Moderate Resolution Imaging Spectroradiometer):

Enhanced Vegetation Index (EVI);

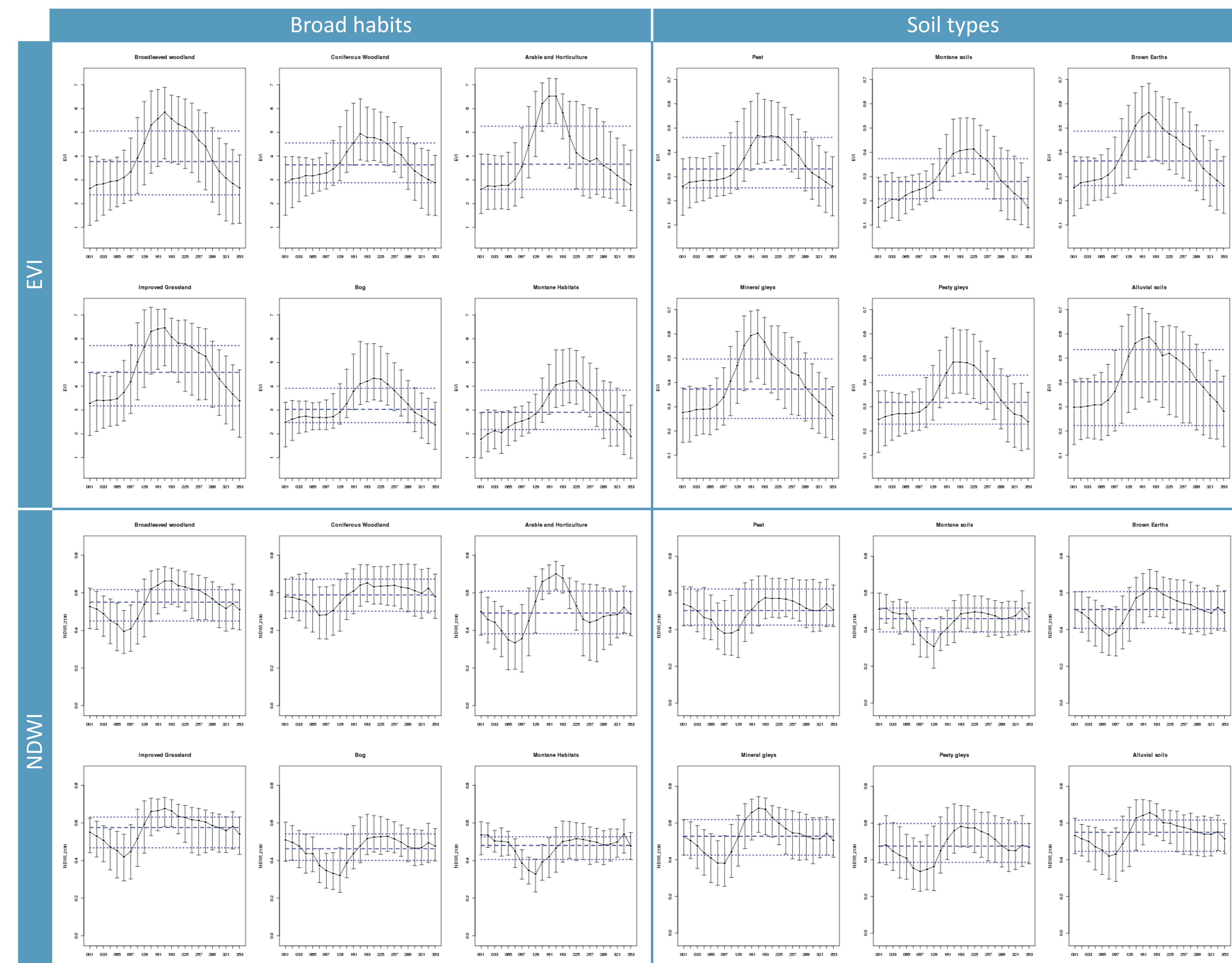
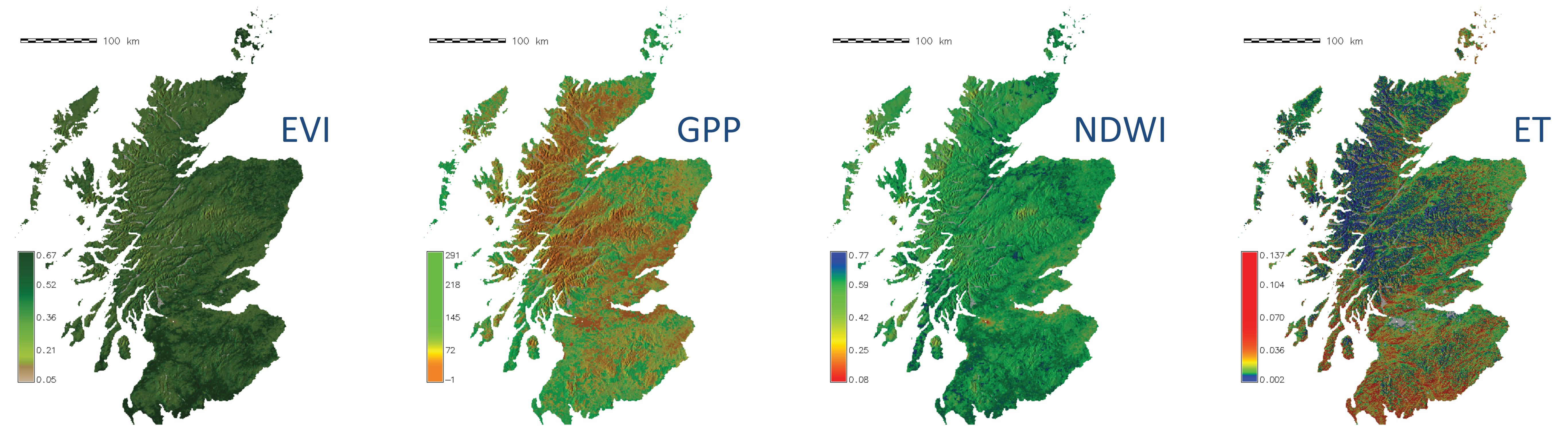
Normalised Difference Water Index (NDWI) between -1 (dry) and +1 (wet);

Gross Primary Productivity (GPP, kgC/m^2), a cumulative composite of GPP values based on the radiation-use efficiency concept;

Evaporative Fraction (EF) indicating the moisture status of land surface.

The indices were calculated every 8 or 16 days (Day of Year (DOY)) from 2000 to 2011. Various summary statistics were prepared, temporal (every year, over the considered period and per DOY over the considered period), by broad habitat and by soil type.

The results provided a spatio-temporal measure of ecosystem functions in Scotland with dynamic temporal modelling and estimation of confidence intervals. The delivery of some of the ecosystem functions depends on their spatial context. International initiatives have highlighted major scientific challenges in characterising, quantifying, monitoring and mapping stocks and flows of ecosystem functions accounting for both temporal and spatial variability. Only few studies approached the variability of provisioning of ecosystem functions over time.



EVI and NDWI summary by broad habitat and soil type for each DOY over 2000-2011 time period : median and variability . (95th percentile – 5th percentile)

Acknowledgements:

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