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Measuring the age structure and NEE of plantation forests using satellite radar

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Chronosequenced flux tower observations of atmospheric carbon Exchange (NEE) for managed forest have identified a strong relationship with forest age [1]. For a typical UK coniferous forest this relationship varies from a strong carbon source during establishment to a strong carbon sink for mature forest.

Here we illustrate the combination of CO_2 flux data with satellite SAR remote sensing of forest age, throughout mainland Britain, in order to estimate NEE on large regional scales. These estimates are compared to calculations based on forest inventory data and also estimates from the UK greenhouse gas inventory [2]. The ERS-tandem coherence estimates of age developed in this study are calibrated using an extensive GIS database of publicly managed forest. Coherence data is found to provide quantitative estimates of forest age in the range of zero to over 15 years, after which sensitivity to the increased biomass is greatly reduced. CO_2 flux observations in the UK indicate that NEE becomes constant for forest ages over 15 years, and hence the estimation of NEE based on the restricted range of the remote sensing data is expected to be an effective approach. Coherence based NEE calculations provide explicit high resolution mapping of forest carbon fluxes, which result in significantly different CO_2 flux estimations to those reported in the greenhouse gas inventory. In addition, for certain regions, disagreements in inventory based age structure estimates and satellite derived estimates highlight systematic discrepancies in the forest inventory data, which can have a significant effect on NEE calculations.

The UK's forest inventory data is a valuable asset for forest carbon accounting purposes, but can be greatly enhanced using remote sensing data. This improvement is a consequence of the increased spatial detail and coverage possible and also because

of the opportunity to overcome anomalies in operational forestry data. Using satellite data the 1995 UK forest carbon budget is calculated to sequester over 4 times more carbon compared to the greenhouse gas inventory figure. This significant difference may in part be a result of the method of applying the flux data to an overly wide range of forest types. However the difference is also greatly influenced by the improved coverage and age structure information that satellite data provides.

References

[1] M. Mencuccini, M. Rayment, and J. Grace. Personal communication, 2004.

[2] R. Milne, K. Hargreaves, and M. Murray. Carbon stocks and sinks in forestry for the United Kingdom greenhouse gas inventory. *Biotechnol. Agron. Soc. Environ.*, 4(4):290–293, 2000.