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Using MODIS vegetation index data to test land cover parameterisation in a global vegetation model across Europe

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The uncertainties associated with assigning a prescribed vegetation fraction from satellite derived land cover data are explored here by conducting three simulations across Europe using the Sheffield Dynamic Global Vegetation Model (SDGVM). There were two aims; the first was to demonstrate the importance of specific crop representation in SDGVM, the second was to address the effects of assigning different proportions of crops and grasses to the plant functional types used as inputs to SDGVM. This was tested by first running a simulation where crops were treated as natural grasses; then two further simulations were run using different translations of the mosaic land cover classes of the GLC2000 product into the plant functional types used by SDGVM. These land cover classes contain a mixture of crops and natural grasses. Validation of SDGVM outputs of the fraction of absorbed photosynthetically active radiation (fPAR) took place using satellite observations of the normalized difference vegetation index (NDVI) from MODIS (moderate resolution imaging spectroradiometer) during the period 2001-2005. The results revealed that overall the representation of seasonal phenology across Europe is good. However there are exceptions where the crop model in SDGVM provides an inadequate representation of phenology and also areas where prescribed crop cover is too high. The Iberian Peninsula is poorly represented by current crop parameterisations in SDGVM. This is attributed to the use of a single plant functional type in SDGVM to represent all crop types which appears to be inappropriate in this instance. The differences between the highest and lowest crop fractional coverages result in large differences in vegetation productivity of 0.7 Pg C yr^{-1} for GPP (gross primary productivity) and 0.16 Pg C yr^{-1} for NEP (net ecosystem productivity). When crops were not included these differences were as high as 30%. This illustrates the need to represent vegetation cover, in terms of type and spatial distribution, as accurately as possible in global scale models.