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Comparing start and end of season dates by ground observations and NOAA AVHRR NDVI data in Germany

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Understanding and monitoring plant phenology is important in the context of studies of climate change. Vegetation phenology, such as the dates of onset of greening up and leaf senescence, are often determined by remote sensing using the normalized difference vegetation index (NDVI). The aim of this study was to check the accuracy of these results gained by satellite data using ground truth phenological observations throughout Germany. In addition we identified which plants correlated best with the start of season (SOS) and end of season (EOS) data derived by the NDVI data (July 1981 - December 1999). Phenological data have been recorded by the German Weather Service and were quality checked. The selected species and phases comprised beginning of flowering of snowdrop, leaf unfolding of horse chestnut, silver birch, beech, oak, lilac, beginning of shooting of winter wheat as well as in autumn fruit ripening of horse chestnut, leaf colouring and leaf fall of beech, oak, silver birch, horse chestnut, beginning of yellow ripeness of winter rye and winter wheat. The satellite data were entire level-1b daily 4-km global data record from the Advanced Very High Resolution Radiometer instruments (AVHRR) carried by the National Oceanic and Atmospheric Administration's polar-orbiting satellites (NOAA-7, NOAA-9, NOAA-11 and NOAA-14) processed by the Goddard Space Flight Center (GSFC). Data from channel 1 (0.55-0.68 μm) and channel 2 (0.73-1.1μm) were used to calculate the NDVI as (2-1)/(2+1). The data set used in this analysis is the standard 8-km continental product of the Global Inventory Mapping and Monitoring System (GIMMS) group. All data were mapped as two composite images (MVC, maximum-value composite) per month with a grid cell size of 8 km, formed from day 1 to day 15 and from day 16 to end of month. The time series were smoothed after Chen et al. (2001) in order to reduce the remaining noise. Fixed thresholds (0.300, 0.325, 0.350, 0.375,

0.400, 0.450 and 0.500) of NDVI were used to determine SOS and EOS (after Myneni et al. 1997) for each pixel in Germany. First results of the comparison of SOS and EOS data by these two different approaches indicated distinct differences among different thresholds and phases.