



Winter Wheat Mapping Using Sentinel-2A/B NDPI Time-Series based on Enhanced Dynamic Time Warping Distance

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Winter wheat is one of the main grain crops in China as well as in the world, so accurate and timely mapping of winter wheat is essential for food security and sustainable agricultural management. However, accurate winter wheat mapping in large scale remains not well- resolved, for the phenological differences, soil and snow background noises as well as the remote sensing data limitations in spatial and temporal resolutions. Dynamic Time Warping (DTW) shows great performance in dealing with phenological differences in crop identification such as paddy rice yet it requires enhancement in winter wheat identification. And sentinel-2 images provide a new opportunity for accurate winter wheat mapping thanks to its high spatial-temporal resolution. So our study proposed a model to identify winter wheat based on a normalized differential phenology index (NDPI) time-series and enhanced dynamic time warping (EDTW) algorithm. We made a simulation experiment using samples generated by linear spectral mixing model, through the simulation experiment we determined the optimal enhancement strategy of DTW algorithm. Then the model was evaluated using the Sentinel-2A/B images of three study areas located in China Huanghuai wheat zone. The results show that the average f1-score of WDDTW algorithm is 0.87, higher than that of conventional DTW algorithm (0.80) and other existing winter wheat classification algorithm including CBAH indices (0.82) and KL-divergence (0.78). EDTW method shows potential for winter wheat identification over large regions and phenological detection in the future.