

Supplementary

Mapping the Dynamics of Winter Wheat in the North China Plain from Dense Landsat Time Series (1999 to 2019)

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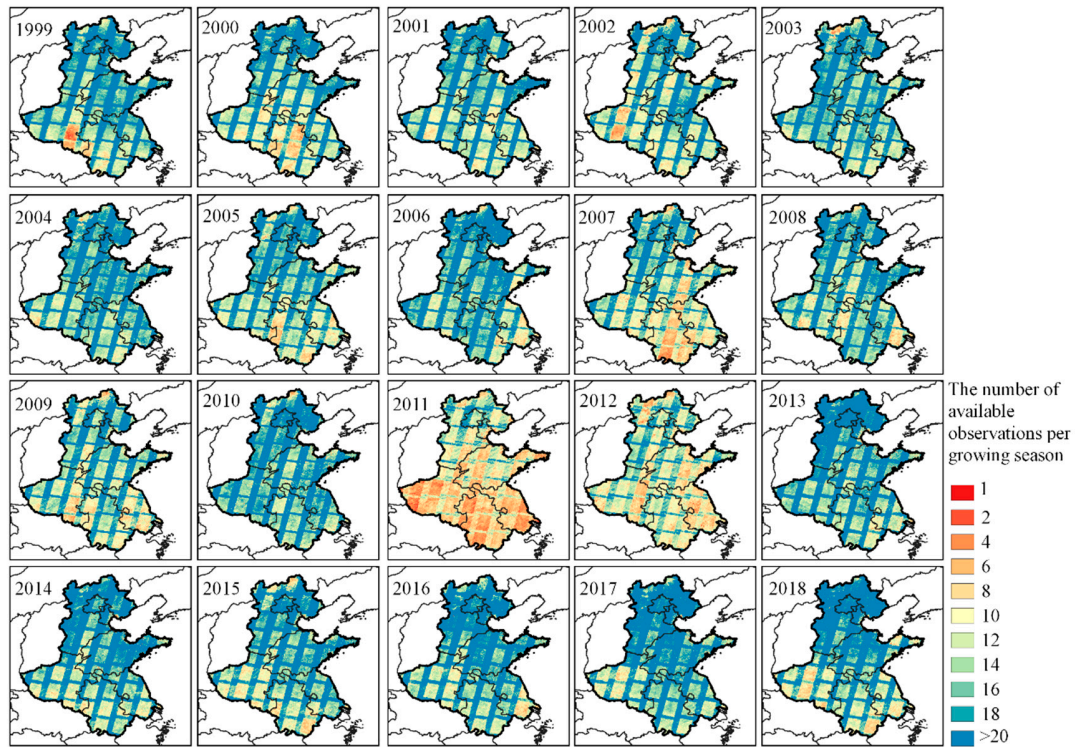


Figure S1 The number of available observations based on Landsat images per growing season of winter wheat during 1999–2019. Here the growing season of winter wheat covering 1999–2000 is labeled as 1999, and the same applies to the rest. Years of 2011–2012 are excluded from further analyses, whereas for the years of 1999, 2002, 2005–2007, 2009 and 2015, an uncertainty measure is estimated from the unobserved component of the maximum extent of wheat during the full period (see methods section).

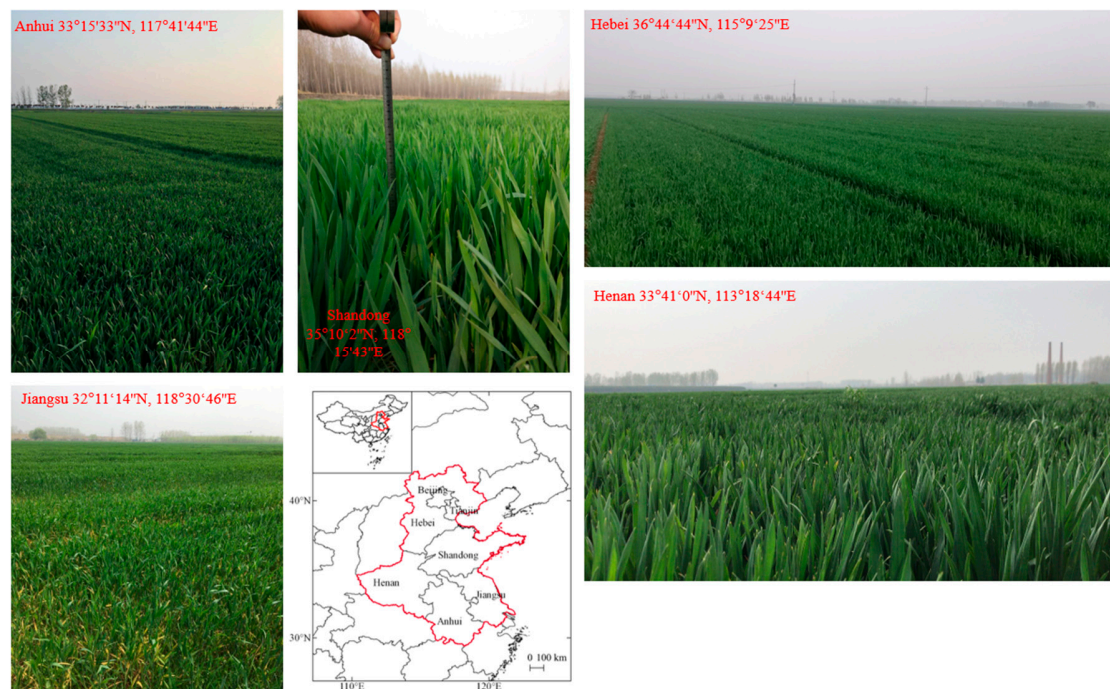


Figure S2 Winter wheat photos taken during field campaign in April, 2019.

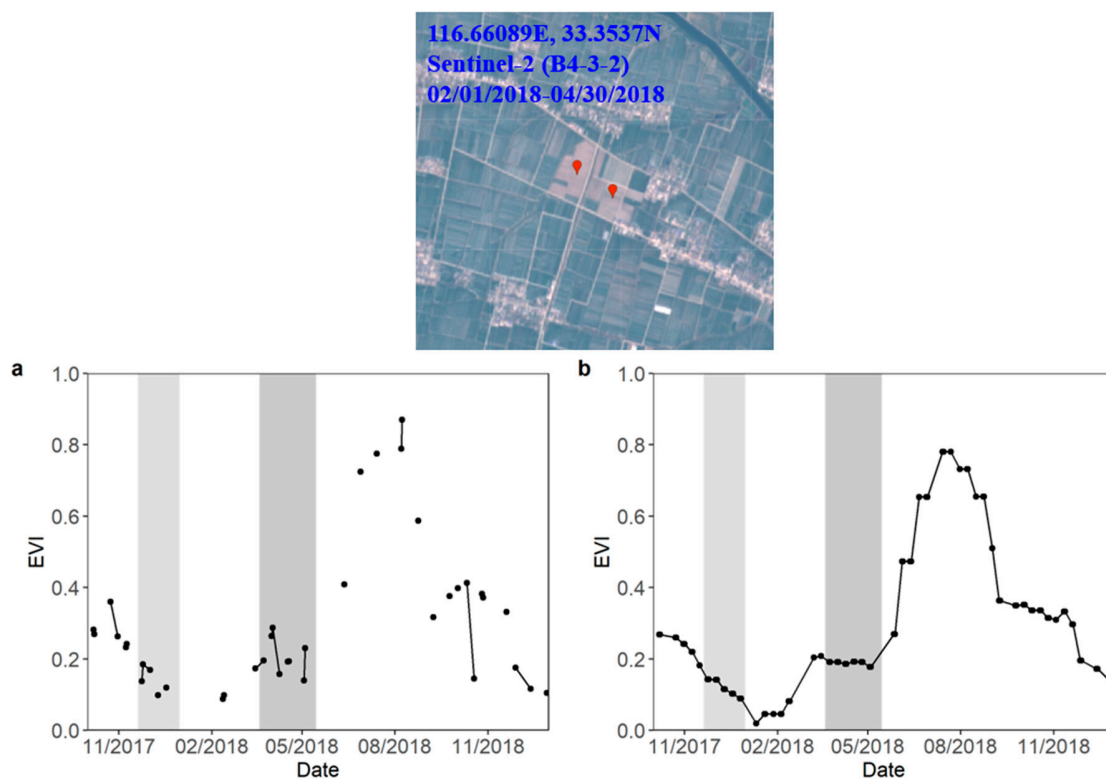


Figure S3 Illustration of temporal profiles of other crop types (Location: 116.66089E, 33.3537 N).

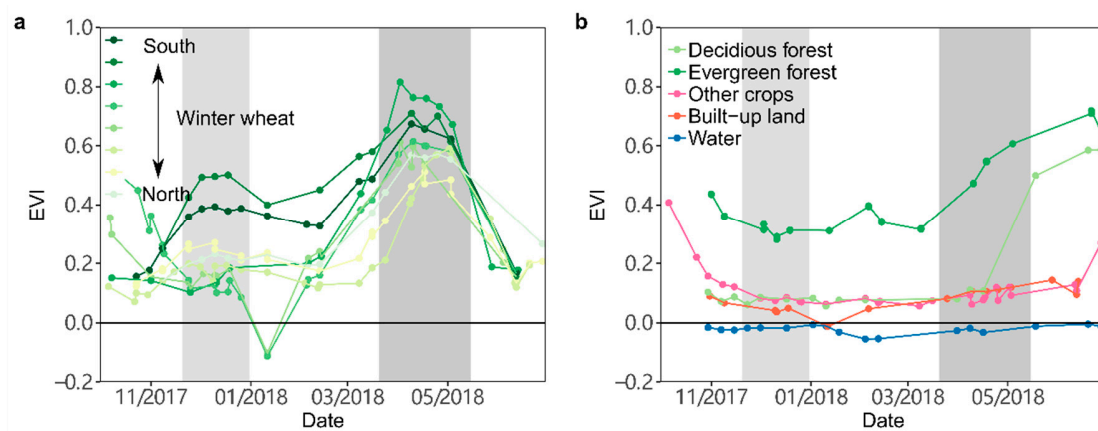


Figure S4 Temporal EVI of (a) winter wheat and (b) other land cover types in the study area

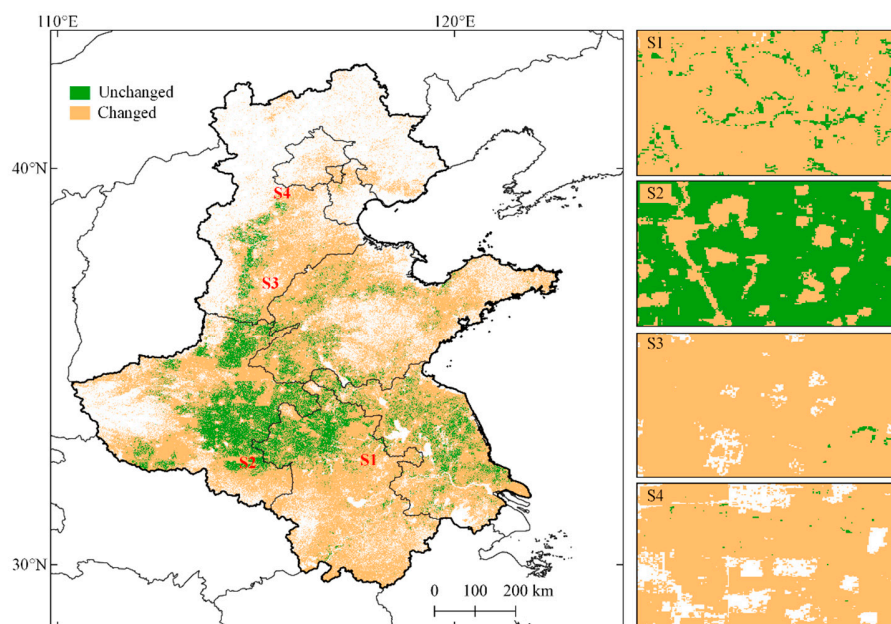


Figure S5 Map of stable and changed winter wheat planting areas for the period 1999-2019.

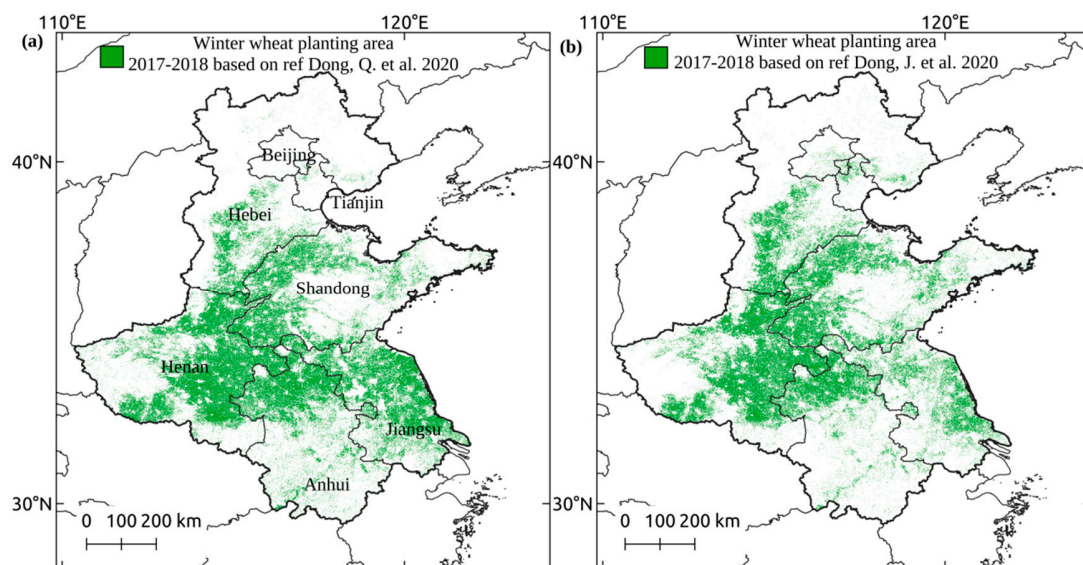


Figure S6 Maps of winter wheat planting areas for the period 2017-2018 based on the reference studies [1-2].

Table S1 Accuracy error matrix. Note: The reference sample include 5 classes additional to the winter wheat class and comprise all the collected sample used for training the RF classifier, making it possible to classify the other land cover types of the different years (in the end the ability to accurately separate between the different non-winter wheat classes is less important as compared to winter wheat vs non-winter wheat).

Epodes	Winter wheat	Non-winter wheat
	Reference (mapped)	Reference (mapped)
1999–2000	712(685)	0(27)
2004–2005	246(245)	0(1)
2009–2010	382(359)	0(23)
2013–2014	709(1)	0(1)
2014–2015	275(274)	556(486)
2015–2016	171(168)	530(492)
2016–2017	338(331)	1141(887)
2017–2018	127(126)	691(624)

Table S2 Confusion matrix of land cover validation based on the remaining sample pixels (Test 1) from GE, Sentinel-2 and Landsat. Since other land-cover types were not sampled, calculation of the user's accuracy for winter wheat and the user's accuracy/producer's accuracy for non-winter wheat were not conducted prior to the growing season of 2014–2015. Overall accuracy and Kappa coefficients are provided.

Epodes	Winter wheat	Non-winter wheat	Overall	Kappa
	User's accuracy/ Producer's accuracy	User's accuracy/ Producer's accuracy	accuracy	
1999–2000	-/0.962	-	0.962	-
2004–2005	-/0.996	-	0.996	-
2009–2010	-/0.940	-	0.940	-
2013–2014	-/0.999	-	0.999	-

References:

- 1, Dong, Q., Chen, X., Chen, J., Zhang, C., Liu, L., Cao, X., Zang, Y., Zhu, X., & Cui, X. (2020). Mapping Winter Wheat in North China Using Sentinel 2A/B Data: A Method Based on Phenology-Time Weighted Dynamic Time Warping. *Remote Sensing*, 12(8), 1274. <https://doi.org/10.3390/rs12081274>
- 2, Dong, J., Fu, Y., Wang, J., Tian, H., Fu, S., Niu, Z., Han, W., Zheng, Y., Huang, J., & Yuan, W. (2020). Early-season mapping of winter wheat in China based on Landsat and Sentinel images. *Earth System Science Data*, 12(4), 3081–3095. <https://doi.org/10.5194/essd-12-3081-2020>