

A three-year survey of traffic intensity in Adenstedt, Lower Saxony

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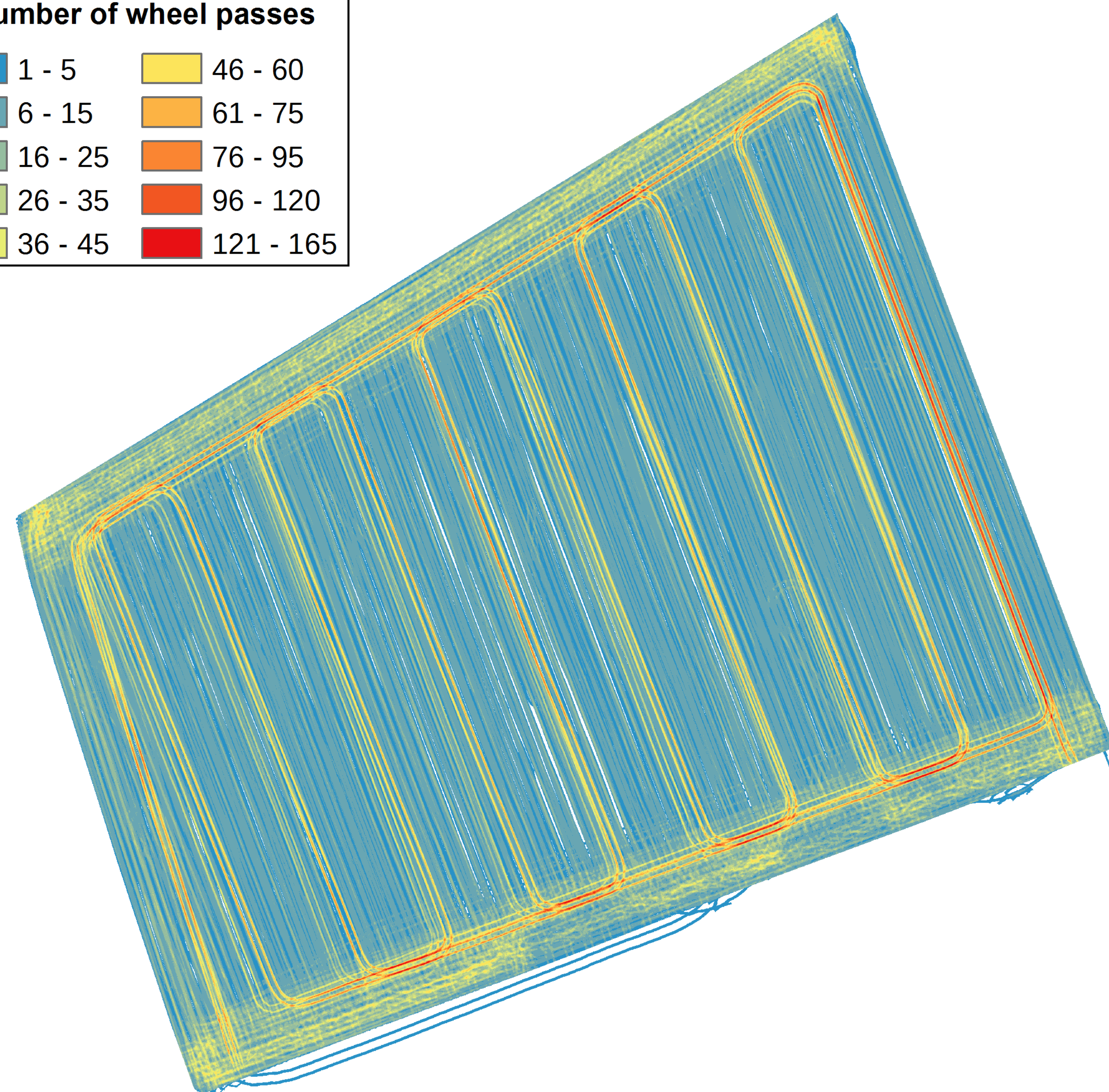
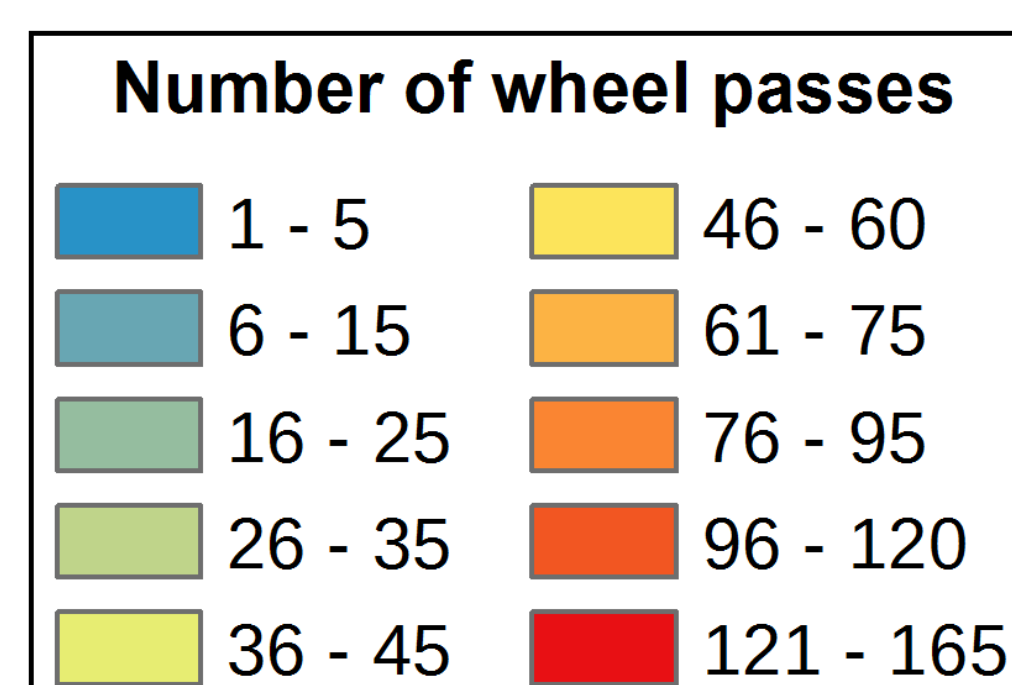
Objectives

It is relatively unknown how often and how intensively agricultural fields are covered and stressed by agricultural machinery and what this means for the soil. This concerns wheel load, soil stress and wheel pass frequency. Therefore, this study investigates the traffic intensity of:

- i) field traffic during one year
- ii) field traffic over three years
- iii) individual work processes on the field

In order to answer these questions, all rides on a field in Lower Saxony were recorded over 3 years. The intensities of the rides were spatially modelled with the FiTraM (Augustin et al. 2019).

3-year intensity



Cumulative traffic intensities

After three years of modelling the traffic intensities, results show that only 0.71 % of the total area was not frequented by agricultural machines. The maximum number of rollovers is 165. Though, even after one year only 14.85 to 6.77 % are not passed by machines. After one year, however, the number of rollovers is lower at 50 to 66. The areas with the most intensive traffic are in the headlands. The majority of wheel passes in the headlands are between 1 and 40 times, while the main part of passes in the crop zone is between 1 and 20 times. In the headlands, some spots were trafficked up to twenty times with a wheel load of over 5 tons. In the crop zone a maximum of 10 rollovers with wheel loads of over 5 tons occurred.

Intensity of single processes during a year (examples)

season 2014/2015 (winter wheat)		season 2015/2016 (maize)		season 2016/2017 (winter wheat)		% of crossed area
fertilization 3x	5,55	soil tillage	57,87	sowing	63,45	
spraying (wide tire) 3x	6,25	harrow		soil tillage	53,49	
spraying (narrow) 3x	6,07	cultivator		harrow		
sowing	52,22	plough		cultivator		
soil tillage:	49,37	secondary tillage	45,31	plough		
plough		harvest	56,06	fertilization 2x	4,46	
harvest	37,10	silage harvester	36,68	spraying (wide tire) 3x	6,26	
		transport	45,19	spraying (narrow tire) 3x	6,01	
		sowing	35,64	mulching	34,74	
		spraying	5,89	harvest	39,90	

load and stress

season	crop	prozess	wheel load in tons					contact area stress* in kPa				
			min	max	25-quantile	50-quantile	75-quantile	min	max	25-quantile	50-quantile	75-quantile
2015-2016	M	drilling of seed	0,90	4,08	1,14	1,28	2,55	66,24	180,04	75,52	116,30	123,00
2016-2017	WW	drilling of seed	0,83	5,25	1,02	1,80	1,80	56,90	128,83	62,02	62,02	67,21
2016-2017	WW	cultivator	0,98	4,89	2,28	2,51	2,51	61,79	164,02	111,88	111,88	114,64
2016-2017	WW	harrow	0,99	4,58	1,94	2,52	2,52	62,30	158,72	103,00	112,15	112,15
2015-2016	M	harvest chopper	2,69	7,11	2,69	7,11	7,11	129,52	192,74	129,52	192,74	192,74
2016-2017	WW	manuring	0,88	2,32	0,90	2,26	2,29	64,36	103,48	65,26	101,85	102,62
2016-2017	WW	mulching	1,36	2,40	1,36	2,40	2,40	83,83	114,67	83,83	114,67	114,67
2016-2017	WW	ploughing	1,43	4,18	2,40	2,48	2,48	82,88	151,38	111,00	111,00	118,46
2016-2017	WW	spraying, narrow tires	0,59	1,12	0,60	0,85	1,07	42,80	111,91	43,52	53,10	54,89
2016-2017	WW	spraying, width tires	0,59	1,12	0,60	0,85	1,06	39,33	55,32	43,28	44,69	53,20

M = maize, WW = winter wheat,

* by Diserens 2002,2009