

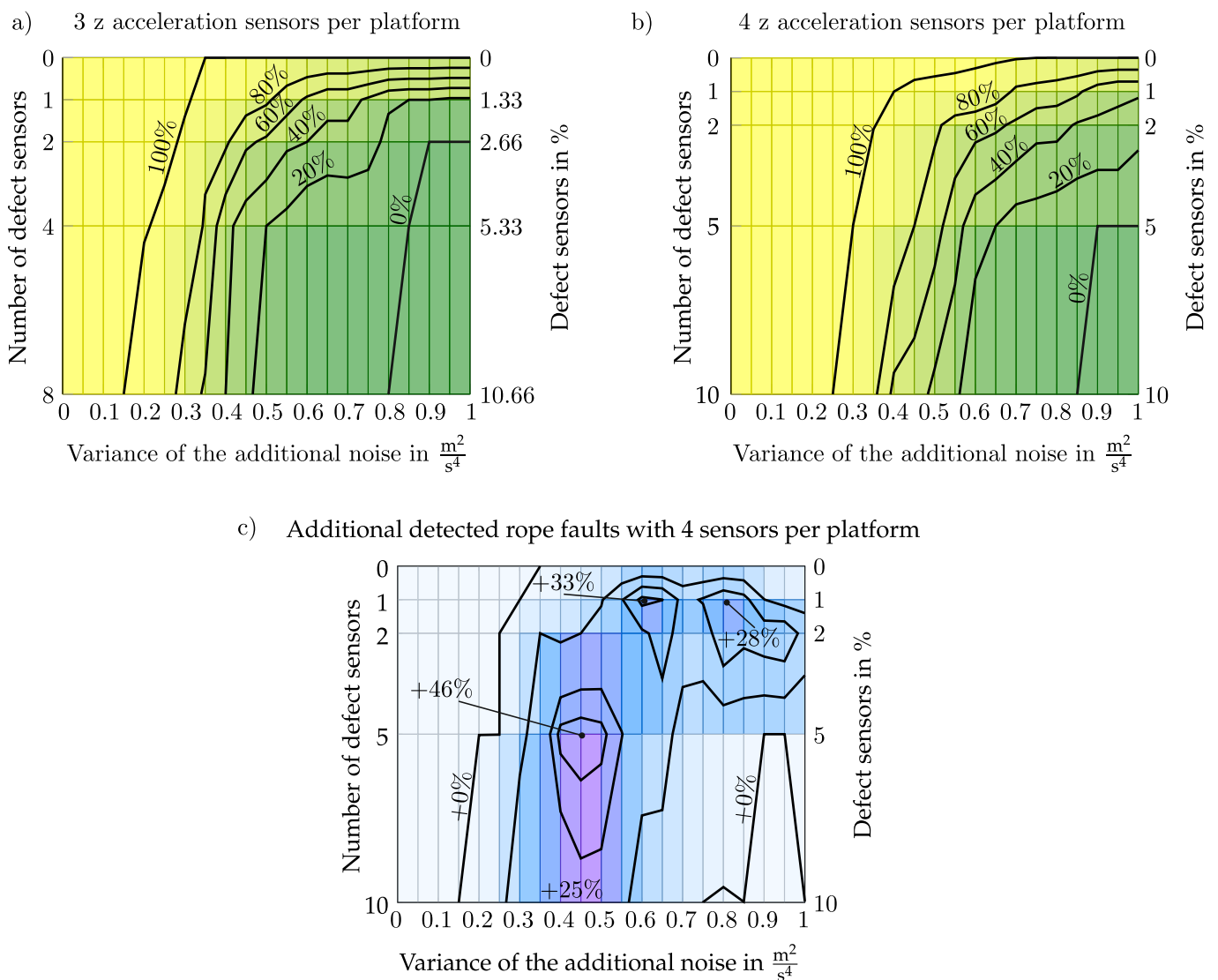
## Supplementary Materials:

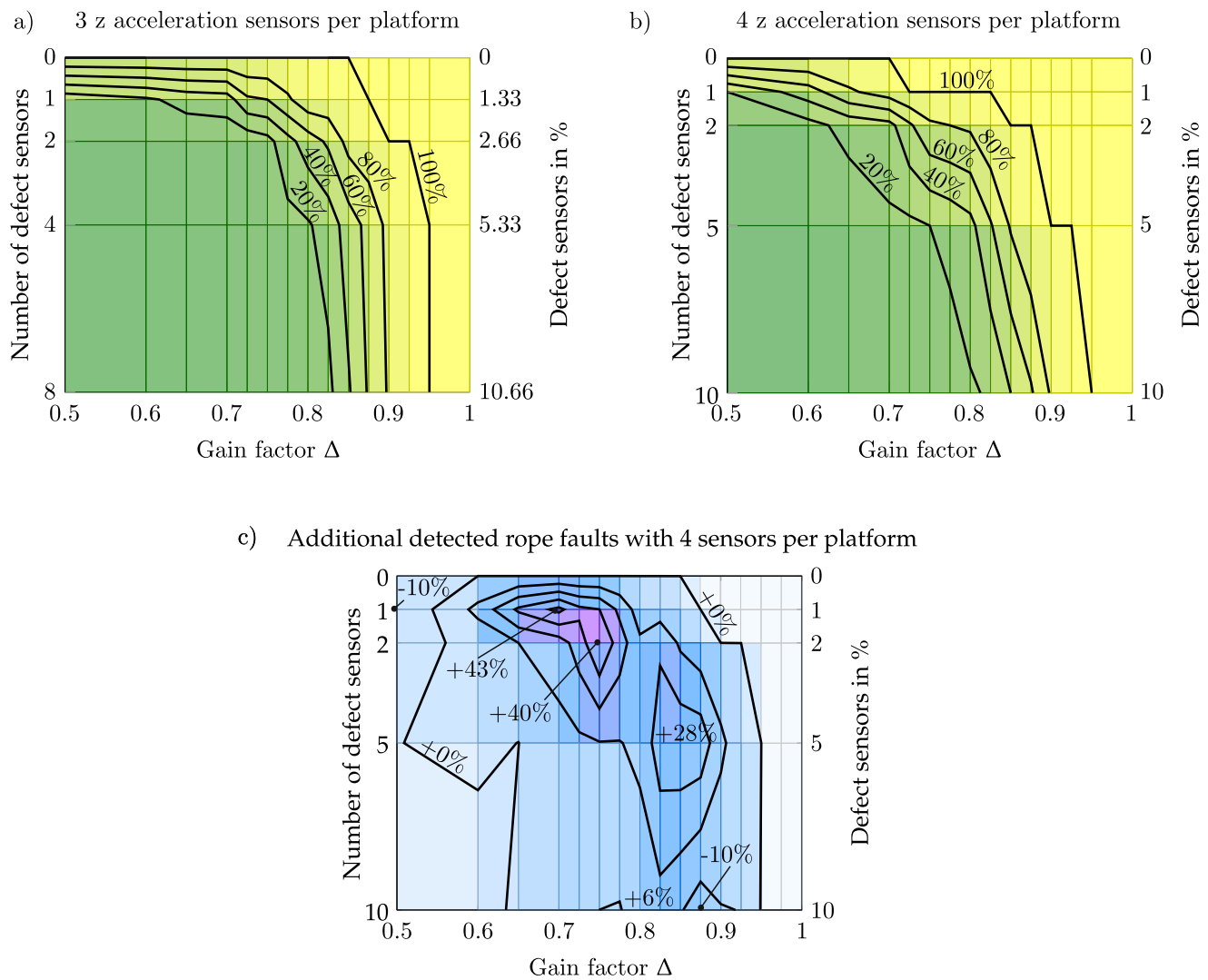
**Table S1.** Locations of defect sensors for rope fault in rope number 8 and 1.

Number of defect sensors:			1	2	4	5	8	10
Defect sensors version B in %:			1.3	2.6	5.3	-	10.7	-
Defect sensors version F in %:			1	2	-	5	-	10
Platform number with defect sensor	Rope fault in rope number 8	dist-0*:	3 13	3, 13 18, 23	3, 8, 18, 23	3, 8, 13, 18, 23	3, 8, 13, 23, 18, 2, 12, 24	3, 8, 13, 18, 23, 2, 12, 22, 9, 19
		dist-1:	2 17	2, 12 7, 19	2, 7, 17, 22 2, 4, 22, 24	2, 12, 22, 4, 24 7, 17, 4, 14, 19	2, 7, 17, 22, 4, 9, 19, 24	2, 7, 12, 17, 22, 4, 9, 14, 19, 24
		dist-2:	1 11	1, 11 1, 5	1, 11, 5, 20 1, 21, 5, 25	1, 11, 21, 10, 20 6, 16, 5, 15, 25	1, 6, 16, 21, 5, 10, 20, 25	1, 6, 11, 16, 21, 5, 10, 15, 20, 25
		dist-var:	-	-	15, 12, 1, 9 5, 20, 8, 15	15, 12, 1, 9, 3 5, 20, 8, 15, 17	5, 16, 7, 17, 18, 19, 12, 3 6, 23, 4, 21, 14, 25, 2, 12	3, 25, 1, 20, 21, 22, 3, 10, 7, 21 6, 9, 21, 1, 2, 5, 17, 19, 10, 12
		dist-com-0:	-	-	18 <sub>3</sub> , 13	18 <sub>4</sub> , 13	3 <sub>3</sub> , 8 <sub>3</sub> , 13 <sub>2</sub>	3 <sub>4</sub> , 8 <sub>4</sub> , 13 <sub>2</sub>
		dist-com-1:	-	-	7 <sub>3</sub> , 12	7 <sub>4</sub> , 12	9 <sub>3</sub> , 14 <sub>3</sub> , 19, 4	9 <sub>4</sub> , 14 <sub>4</sub> , 19 <sub>2</sub>
		dist-com-2:	-	-	1 <sub>3</sub> , 6	1 <sub>4</sub> , 6	10 <sub>3</sub> , 15 <sub>3</sub> , 20, 5	10 <sub>4</sub> , 15 <sub>4</sub> , 20 <sub>2</sub>
	Rope fault in rope number 1	dist-0*:	1 11	1, 6 11, 21	1, 6, 11, 16	1, 6, 11, 16, 21	1, 6, 11, 16, 21, 2, 12, 22	1, 6, 11, 16, 21, 2, 7, 12, 17, 22
		dist-1*:	2 17	2, 12 7, 22	2, 7, 17, 22	2, 7, 12, 17, 22	2, 7, 17, 22, 12, 1, 3, 18	2, 7, 12, 17, 22, 1, 3, 21, 23, 18
		dist-2*:	3 18	3, 13 8, 23	3, 8, 18, 23	3, 8, 13, 18, 23	3, 8, 18, 23, 13, 2, 4, 19	3, 8, 13, 18, 23, 2, 4, 22, 24, 19
		dist-3*:	4 19	4, 14 9, 19	4, 9, 19, 24	4, 9, 14, 19, 24	4, 9, 19, 24, 14, 3, 5, 20	4, 9, 14, 19, 24, 3, 5, 23, 25, 20
		dist-4*:	5 20	5, 15 5, 20	5, 10, 20, 25	5, 10, 15, 20, 25	5, 10, 15, 20, 25, 4, 14, 24	5, 10, 15, 20, 25, 4, 9, 14, 24, 19
		dist-var:	-	-	15, 12, 1, 9 5, 20, 8, 15	3, 8, 13, 18, 23 21, 7, 14, 20, 5	5, 16, 7, 17, 18, 19, 12, 3 6, 23, 4, 21, 14, 25, 2, 12	5, 25, 1, 20, 21, 22, 3, 10, 7, 21 6, 9, 21, 1, 2, 5, 17, 19, 10, 12
		dist-com-0:	-	-	6 <sub>3</sub> , 1	6 <sub>4</sub> , 11	6 <sub>3</sub> , 11 <sub>3</sub> , 16 <sub>2</sub>	6 <sub>4</sub> , 11 <sub>4</sub> , 16 <sub>2</sub>
		dist-com-2:	-	-	8 <sub>3</sub> , 13	8 <sub>4</sub> , 13	8 <sub>3</sub> , 13 <sub>3</sub> , 18 <sub>2</sub>	8 <sub>4</sub> , 13 <sub>4</sub> , 18 <sub>2</sub>
		dist-com-4:	-	-	10 <sub>3</sub> , 5	10 <sub>4</sub> , 5	10 <sub>3</sub> , 5 <sub>3</sub> , 15 <sub>2</sub>	10 <sub>4</sub> , 5 <sub>4</sub> , 15 <sub>2</sub>

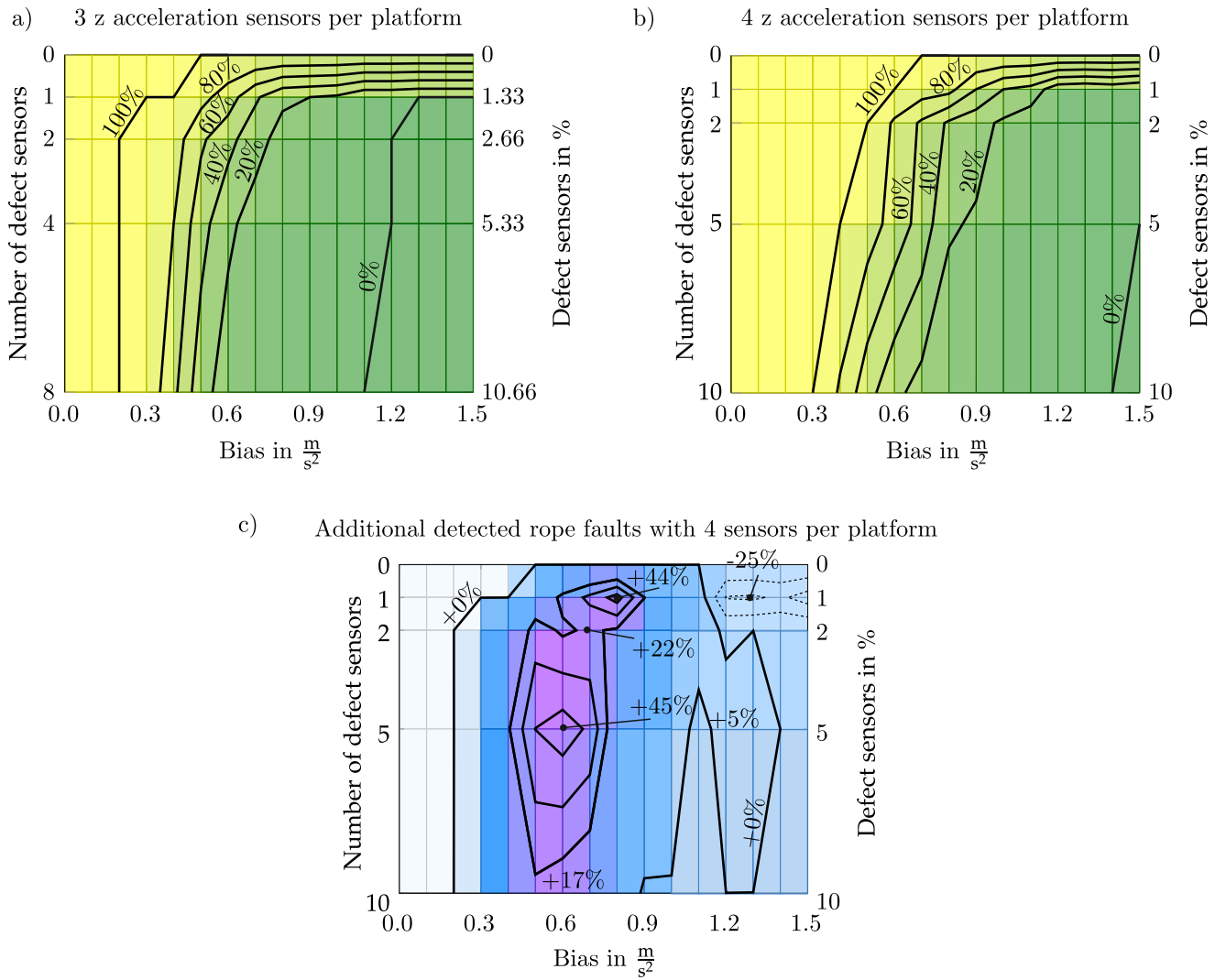
**Table S2.** Number of defect sensors per platform arrangement and number of simulations calculated for the respective number of defect sensors executed for rope fault detection in rope number 8.

	Number of defect sensors			
	1	2	4	8
Sensors setting B	1	2	4	8
Sensors setting F	1	2	5	10
	Number of simulations			
	2	2	1	1
dist-0*	2	2	1	1
dist-1	2	2	2	1
dist-2	2	2	2	1
dist-var	-	-	2	2
dist-com-0	-	-	1	1
dist-com-1	-	-	1	1
dist-com-2	-	-	1	1

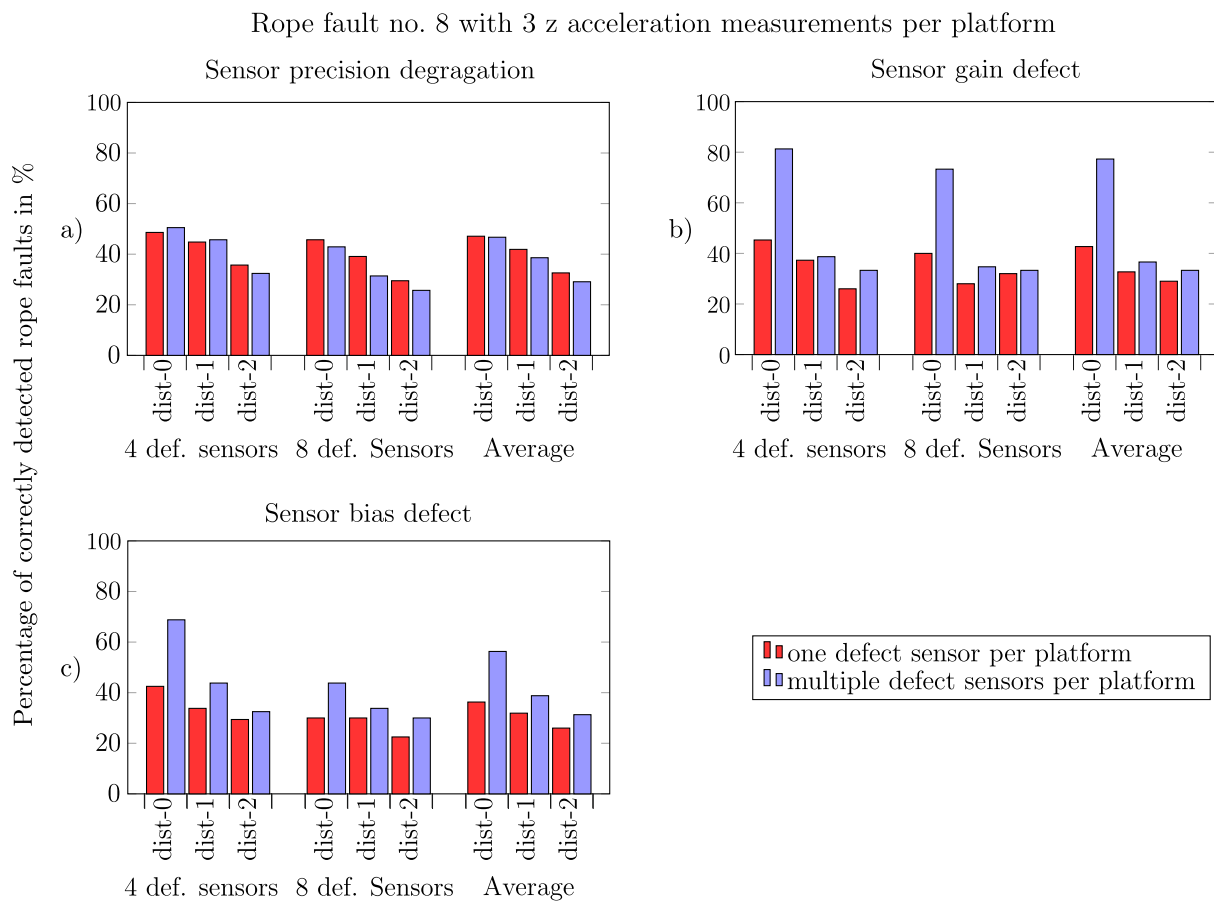
**Figure S1.** Impact of sensor precision degradation on the percentage of correct detected rope faults by the EKF rope fault estimation for a rope fault in rope number 8. (a) 3 z acceleration sensors and (b) 4 z acceleration sensors per platform are used. (c) Improvement of fault detection using 4 z acceleration sensors.



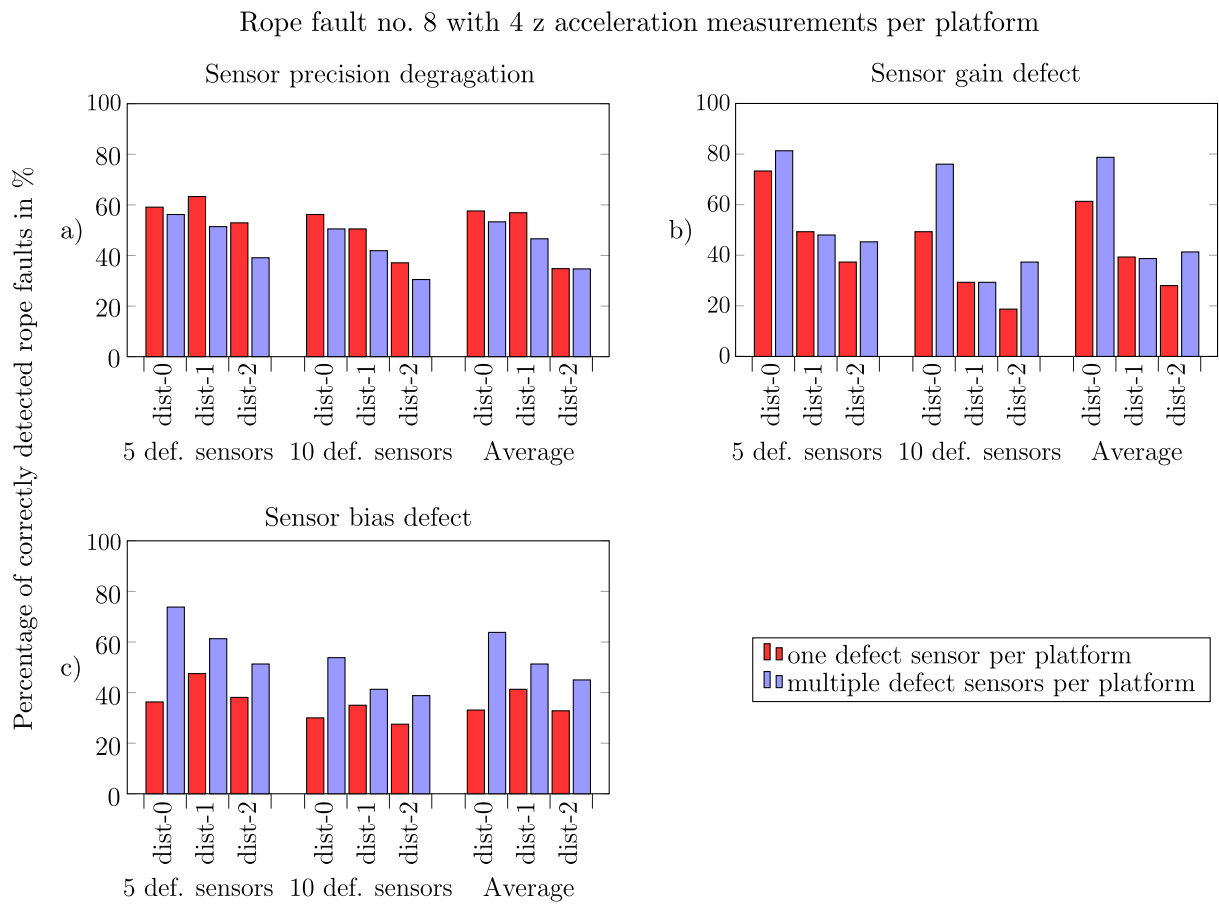
**Figure S2.** Impact of sensor gain defects on the percentage of correct detected rope faults by the EKF rope fault estimation for a rope fault in rope number 8. **(a)** 3 z acceleration sensors and **(b)** 4 z acceleration sensors per platform are used. **(c)** Improvement of fault detection using 4 z acceleration sensors.



**Figure S3.** Impact of sensor bias defects on the percentage of correct detected rope faults by the EKF rope fault estimation for a rope fault in rope number 8. **(a)** 3 z acceleration sensors and **(b)** 4 z acceleration sensors per platform are used. **(c)** Improvement of fault detection using 4 z acceleration sensors.



**Figure S4.** Comparison of single and multiple sensor defects per platform on the reliability of rope fault detection for a rope fault in rope number 8 with 3 z acceleration sensors per platform. Results for three different distances between defect sensors and the rope fault are shown: **(a)** For sensor precision degradation, **(b)** for sensor gain defects and **(c)** for sensor bias defects.



**Figure S5.** Comparison of single and multiple sensor defects per platform on the reliability of rope fault detection for a rope fault in rope number 8 with 3 z acceleration sensors per platform. Results for three different distances between defect sensors and the rope fault are shown: **(a)** For sensor precision degradation, **(b)** for sensor gain defects and **(c)** for sensor bias defects.