



Suitability assessment of X band satellite SAR data for geotechnical monitoring of site scale slow moving landslides

Guadalupe Bru ¹, Joaquín Escayo ¹, José Fernández ^{1,*}, Jordi J. Mallorquí ³, Rubén Iglesias, Eugenio Sansosti ⁴, Tamara Abajo ¹ and Antonio Morales ⁵

1. Error matrices

Table S1. List of error matrices that show correspondence between the predicted class (classification results) and the actual class (ground truth) for each land cover classification obtained from multiband S2 images.

	Predicted class			
Class	High coherence	Low coherence	Very low coherence	Σ
Actual class				
High coherence	1423	499	306	2228
Low coherence	153	2464	16	2633
Very low coherence	253	287	7480	8020
Σ	1829	3250	7802	12881

Kappa coefficient = 0.785

S2-20170422 (bands 2348, 10m)

	Predicted class			
Class	High coherence	Low coherence	Very low coherence	Σ
Actual class				
High coherence	1414	571	243	2228
Low coherence	188	2203	242	2633
Very low coherence	192	785	7043	8020
Σ	1794	3559	7528	12881

Kappa coefficient = 0.690

S2-20170422 (bands 342, 10m)

	Predicted class			
Class	High coherence	Low coherence	Very low coherence	Σ
Actual class				
High coherence	1310	662	256	2228
Low coherence	63	2568	2	2633
Very low coherence	85	283	7652	8020
Σ	1458	3513	7910	12881

Kappa coefficient = 0.807

S2-20170820 (bands 342, 10m)

	Predicted class			
Class	High coherence	Low coherence	Very low coherence	Σ
Actual class				
High coherence	1261	699	268	2228
Low coherence	55	2571	7	2633
Very low coherence	43	227	7750	8020
Σ	1359	3497	8025	12881
Kappa coefficient = 0.813		S2-20170820 (bands 2348, 10m)		

	Predicted class			
Class	High coherence	Low coherence	Very low coherence	Σ
Actual class				
High coherence	561	357	181	1099
Low coherence	38	532	44	614
Very low coherence	38	178	1772	1988
Σ	637	1067	1997	3701
Kappa coefficient = 0.630		S2-20170422 (bands 342, 20m)		

	Predicted class			
Class	High coherence	Low coherence	Very low coherence	Σ
Actual class				
High coherence	613	267	219	1099
Low coherence	46	557	11	614
Very low coherence	73	63	1852	1988
Σ	732	887	2082	3701
Kappa coefficient = 0.694		S2-20170422 (bands 2,3,4,8A, 20m)		

	Predicted class			
Class	High coherence	Low coherence	Very low coherence	Σ
Actual class				
High coherence	605	308	186	1099
Low coherence	27	545	42	614
Very low coherence	40	183	1765	1988
Σ	672	1036	1993	3701
Kappa coefficient = 0.652		S2-20170422 (bands 5,4,2, 20m)		

	Predicted class			
Class	High coherence	Low coherence	Very low coherence	Σ
Actual class				
High coherence	560	282	257	1099
Low coherence	46	555	13	614
Very low coherence	69	73	1846	1988
Σ	675	910	2116	3701
Kappa coefficient = 0.666		S2-20170422 (bands 7,4,2, 20m)		

	Predicted class			
Class	High coherence	Low coherence	Very low coherence	Σ
Actual class				
High coherence	704	213	182	1099
Low coherence	13	592	9	614
Very low coherence	72	67	1849	1988
Σ	789	872	2040	3701
Kappa coefficient = 0.750		S2-20170422 (bands 2,3,4,5,6,7,8A,11,12, 20m)		

	Predicted class			
Class	High coherence	Low coherence	Very low coherence	Σ
Actual class				
High coherence	538	368	193	1099
Low coherence	18	596	0	614
Very low coherence	26	74	1888	1988
Σ	582	1038	2081	3701
Kappa coefficient = 0.697		S2-20170820 (bands 3,4,2, 20m)		

	Predicted class			
Class	High coherence	Low coherence	Very low coherence	Σ
Actual class				
High coherence	516	387	196	1099
Low coherence	17	597	0	614
Very low coherence	17	81	1890	1988
Σ	550	1065	2086	3701
Kappa coefficient = 0.688		S2-20170820 (bands 2,3,4,8A, 20m)		

	Predicted class			
Class	High coherence	Low coherence	Very low coherence	Σ
Actual class				
High coherence	550	359	190	1099
Low coherence	8	603	3	614
Very low coherence	22	79	1887	1988
Σ	580	1041	2080	3701
Kappa coefficient = 0.705		S2-20170820 (bands 5,4,2, 20m)		

	Predicted class			
Class	High coherence	Low coherence	Very low coherence	Σ
Actual class				
High coherence	501	403	195	1099
Low coherence	17	592	5	614
Very low coherence	16	78	1894	1988
Σ	534	1073	2094	3701
Kappa coefficient = 0.681		S2-20170820 (bands 7,4,2, 20m)		

	Predicted class			
Class	High coherence	Low coherence	Very low coherence	Σ
Actual class				
High coherence	661	208	230	1099
Low coherence	13	598	3	614
Very low coherence	34	53	1901	1988
Σ	708	859	2134	3701
Kappa coefficient = 0.754		S2-20170820 (bands 2,3,4,5,6,7,8A,11,12, 20m)		

2. A-DInSAR monitoring analysis and urban damages

Figure S1. Connection diagrams of the interferograms of the (a) CSK and (b) TSX acquisitions.

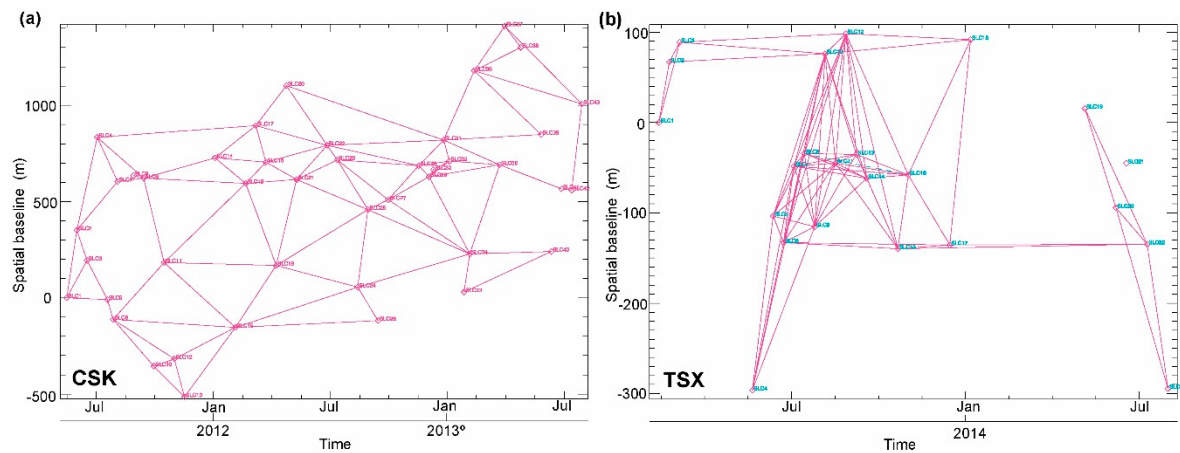


Figure S2. Standard deviation maps of the studied area for the (a) CSK dataset and (b) the TSX dataset. Note that the threshold values of 10mm/y for CSK and 12 mm/y for TSX, have been assessed taking into account all the studied scene.

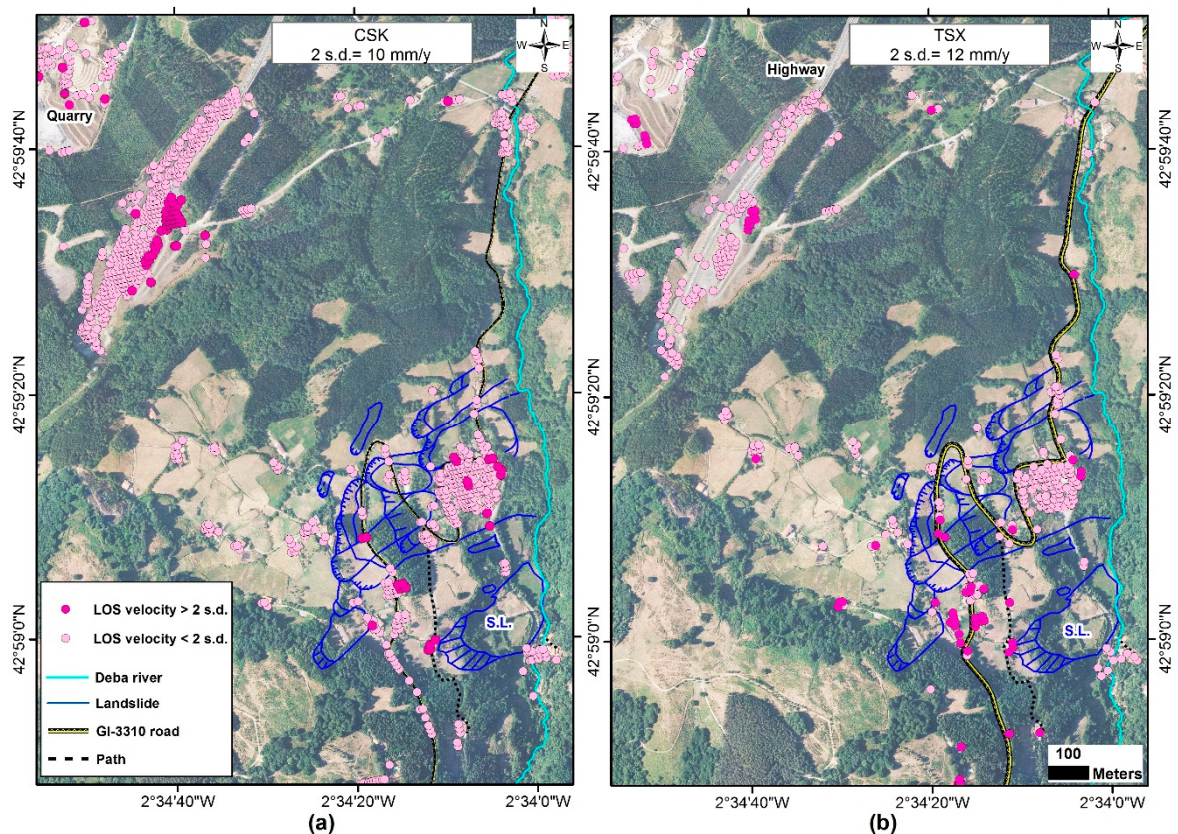


Figure S3. Urban damages. (a) Damages in roads caused by the secondary landslide. (b) Building damages in the center of the village. (c) Damages in the fronton court. (d) Flanks of the head of the landslide and transverse crack at the crown affecting a road. (e) Cracks at the head of the secondary landslide affecting a house.

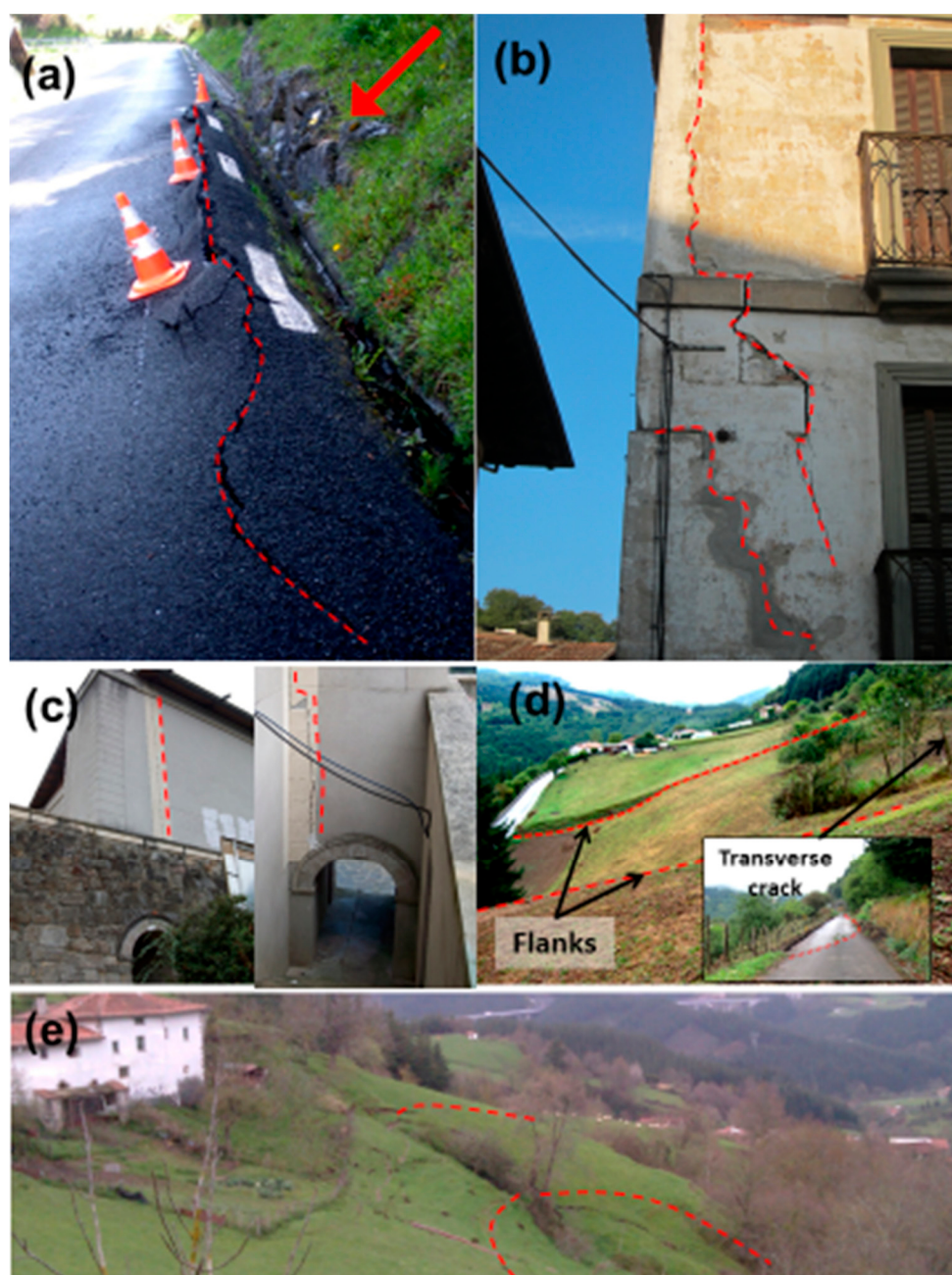


Figure S4. Location of the pictures shown in Figure S1 over the SLOPE velocity map of the CSK SAR dataset.

