

Table 1. Land use classification results.

METHOD	SVM		KNN		ML	
	Pre	Post	Pre	Post	Pre	Post
% Accuracy	90,33	91,00	81,33	85,67	83,00	81,67
Kappa	0,90	0,91	0,81	0,86	0,83	0,82

Table 2 Processing steps of the PS and SBAS methods.

SBAS	PS
Data Acquisition	
Data Pre-processing	
Interferogram Generation	
-	Stability Analysis
-	Pair Selection
-	Gaussian Filtering
Phase Unwrapping	
Atmospheric Correction	
Time Series Analysis	
Inversion (Deformation Estimation)	
Result Visualization	
Validation and Quality Control	
Displacement Map	

Table 3. Comparison of classification results and field studies in Elazığ city center.

BUFFER 5 meters			
Damage Class	Satellite Image	Fieldwork	Accuracy (%)
Grade 4	554	616	89.9
Grade 5	248	267	92.9
BUFFER 10 meters			
Damage Class	Satellite Image	Fieldwork	Accuracy (%)
Grade 4	518	616	84.1
Grade 5	240	267	89.9
BUFFER 15 meters			
Damage Class	Satellite Image	Fieldwork	Accuracy (%)
Grade 4	472	616	76.6
Grade 5	225	267	84.3

Table 4 DInSAR results.

Ground Displacement Values (DInSAR)		
Satellite	Maximum Values (mm)	
	Subsidence	Uplift
S1A Ascending	173	254
S1A Descending	248	202
S1B Ascending	222	255
S1B Descending	293	211

Table 5 PS and SBAS average velocity results.

	Orbit	Ascending		Descending		Average (mm/yr)
	Method	PS	SBAS	PS	SBAS	
(EMS98)	Grade 1	2.6	2.9	2.2	2.1	2.5
	Grade 2	2.6	1.0	2.4	1.1	1.8
	Grade 3	3.4	1.4	3.1	1.2	2.3
	Grade 4	3.9	2.2	3.5	2.4	3.0
	Grade 5	4.5	3.5	4.6	3.0	3.9

Table 6. Geological Substrate of the Buildings.

Formation (%)	Damage Level	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
	Alluvium	35	38	34	56	55
	Conglomerate, Sandstone, Mudstone	26	26	24	18	17
	Ophiolite	5	5	4	2	4
	Claystone	4	3	7	1	5
	Limestone	12	10	14	11	4
	Magmatic Rocks	18	18	17	12	15

Table 7. Variation of damage parameters with epicentral distance

Epicentral Distance (Km)	Average Values			Displacements (DlnSAR, mm)		Surface Velocity (mm/yr)	Building Type		Damage Class (Grade) %					Vs30 (m/s)	Formation	%	Number of Stories	%	Number of Stories	%
	Fault Distance (Km)	PGA	Coulomb	Horizontal	Vertical		Masonry	RC	1	2	3	4	5							
0 - 5	3	0.47	-0.1	20.4	10.8	6.8	61.8	38.2	47.1	8.8	38.2	0	5.9	684.4	Alluvium	50.0	1	64	2	36
5 - 10	6	0.45	0.1	23.3	8.7	1.5	68.9	31.1	23.3	21.3	43.3	7.1	5.0	325.7	Gnays-Micaschist	30.4	2	49	1	40
10 - 15	10	0.33	0.1	16.3	5.1	2.2	80.5	19.5	19.2	22.0	55.2	1.8	1.9	331.0	Alluvium	20.5	1	48	2	46
15 - 20	11	0.26	0.1	13.3	10.1	5.5	83.1	16.9	23.8	29.0	41.5	3.6	2.2	376.6	Metagabbro-Amphibolite	19.1	2	49	1	43
20 -25	12	0.17	0.1	29.6	20.8	5.1	76.1	23.9	26.7	34.1	35.9	1.9	1.4	403.5	Alluvium	30.9	2	45	1	39
25 - 30	23	0.12	0.1	94.6	51.2	3.9	51.3	48.7	41.2	34.9	22.0	0.7	1.2	389.5	Alluvium	51.6	1	33	2	22
30 - 35	23	0.10	-0.1	45.4	20.7	3.5	50.6	49.4	44.8	39.1	14.1	1.2	0.8	445.7	Alluvium	34.2	1	29	2	21
35 - 40	20	0.11	-0.1	33.9	45.1	4.9	76.5	23.5	42.4	33.1	23.2	0.4	0.9	405.7	Alluvium	23.2	1	50	2	35
40- 45	18	0.10	0.1	46.4	28.6	4.2	69.5	30.5	42.5	35.2	21.7	0.3	0.3	389.7	Alluvium	17.5	1	46	2	43
45 - 50	14	0.10	-0.1	19.6	15.9	4.1	75.1	24.9	39.7	37.9	21.7	0.4	0.3	325.9	Alluvium	30.1	1	43	2	46
50 - 55	9	0.10	0.1	21.1	6.6		77.4	22.6	29.7	44.0	25.1	0.6	0.6	392.3	Volcanite	29.7	2	46	1	44
55 - 60	11	0.10	0.1	11.3	5.4		76.2	23.8	43.2	40.0	15.7	0.9	0.2	211.8	Ophiolitic Rocks	38.7	2	51	1	36
60 - 65	11	0.10	0.1	13.4	9.7		73.8	26.2	34.4	37.5	26.0	1.3	0.8	341.1	Split	33.3	2	49	1	42
65 - 70	10	0.10	-0.1	8.0	10.8		57.6	42.4	39.5	33.5	25.0	0.9	1.0	468.3	Sandstone-mudstone-limestone	43.3	2	49	1	39
70 - 75	6	0.10	0.1	11.0	13.5		59.1	40.9	36.9	35.1	26.5	0.5	1.0	452.6	Sandstone-mudstone-limestone	72.2	2	51	1	43
75 - 80	6	0.10	0.1	12.6	10.3		74.9	25.1	36.1	35.6	28.0	0.1	0.2	490.8	Ophiolite	32.4	2	51	1	38
80 - 85	6	0.10	0.1	6.6	5.9		50.8	49.2	68.6	19.9	10.5	0.1	0.9	536.1	Ophiolite	48.2	2	40	1	21
85 - 90	6	0.10	0.1	6.6	4.1		56.0	44.0	54.1	26.9	18.5	0.4	0.1	483.0	Claystone - Conglomerate	63.6	1	36	2	30

Table A1. Sentinel-1 SAR images used in this study

Sentinel-1A Descending Bursts	S1B Ascending Bursts
S1_262893_IW2_20200116T032558_VV_99B7	S1_247237_IW3_20200115T152616_VV_0BAA
S1_262893_IW2_20200104T032559_VV_B001	S1_247237_IW3_20200103T152616_VV_F9A0
S1_262893_IW2_20191223T032559_VV_3842	S1_247237_IW3_20191222T152617_VV_6F4D
S1_262893_IW2_20191211T032600_VV_1EEB	S1_247237_IW3_20191128T152618_VV_90D1
S1_262893_IW2_20191117T032601_VV_73B9	S1_247237_IW3_20191116T152618_VV_6DF4
S1_262893_IW2_20191105T032601_VV_8F12	S1_247237_IW3_20191104T152618_VV_647F
S1_262893_IW2_20191012T032601_VV_0918	S1_247237_IW3_20191023T152618_VV_BEA0
S1_262893_IW2_20190906T032600_VV_3E90	S1_247237_IW3_20191011T152618_VV_A306
S1_262893_IW2_20190825T032559_VV_F2A4	S1_247237_IW3_20190929T152618_VV_58D3
S1_262893_IW2_20190813T032559_VV_08EC	S1_247237_IW3_20190917T152618_VV_1474
S1_262893_IW2_20190801T032558_VV_C0D5	S1_247237_IW3_20190731T152615_VV_8989
S1_262893_IW2_20190720T032557_VV_E4D8	S1_247237_IW3_20190719T152615_VV_86E7
S1_262893_IW2_20190602T032554_VV_BDE2	S1_247237_IW3_20190707T152614_VV_0B7D
S1_262893_IW2_20190521T032554_VV_D2D6	S1_247237_IW3_20190625T152613_VV_4E76
S1_262893_IW2_20190427T032553_VV_22FB	S1_247237_IW3_20190613T152612_VV_E180
S1_262893_IW2_20190415T032552_VV_3D37	S1_247237_IW3_20190601T152612_VV_582F
S1_262893_IW2_20190226T032551_VV_0BC6	S1_247237_IW3_20190520T152611_VV_BC96
S1_262893_IW2_20190214T032551_VV_85C7	S1_247237_IW3_20190414T152609_VV_951D
S1_262893_IW2_20181216T032553_VV_023F	S1_247237_IW3_20190402T152609_VV_3078
S1_262893_IW2_20181204T032554_VV_2C68	S1_247237_IW3_20190321T152609_VV_B7C4
S1_262893_IW2_20181122T032554_VV_A410	S1_247237_IW3_20190309T152609_VV_CF52
S1_262893_IW2_20181029T032555_VV_744A	S1_247237_IW3_20190225T152609_VV_3B04
S1_262893_IW2_20181017T032555_VV_8DDB	S1_247237_IW3_20190213T152609_VV_98E6
S1_262893_IW2_20181005T032554_VV_62D3	S1_247237_IW3_20190201T152609_VV_6DDD
S1_262893_IW2_20180923T032554_VV_C71D	S1_247237_IW3_20190120T152610_VV_F0C4
S1_262893_IW2_20180911T032554_VV_E922	S1_247237_IW3_20190108T152610_VV_79DE
S1_262893_IW2_20180830T032553_VV_243F	S1_247237_IW3_20181227T152610_VV_FB3B
S1_262893_IW2_20180818T032553_VV_9AF4	S1_247237_IW3_20181215T152611_VV_472D
S1_262893_IW2_20180806T032552_VV_4D4E	S1_247237_IW3_20181203T152611_VV_3033
S1_262893_IW2_20180725T032551_VV_7447	S1_247237_IW3_20181028T152612_VV_ACF7
S1_262893_IW2_20180713T032551_VV_D2E5	S1_247237_IW3_20181004T152612_VV_1465
S1_262893_IW2_20180701T032550_VV_5E72	S1_247237_IW3_20180922T152612_VV_F74E
S1_262893_IW2_20180607T032548_VV_EB96	S1_247237_IW3_20180910T152611_VV_B1F4
S1_262893_IW2_20180526T032548_VV_BA65	S1_247237_IW3_20180829T152611_VV_9337
S1_262893_IW2_20180514T032547_VV_6090	S1_247237_IW3_20180817T152610_VV_1DF1
S1_262893_IW2_20180502T032546_VV_5426	S1_247237_IW3_20180805T152610_VV_2C69
S1_262893_IW2_20180327T032545_VV_E31D	S1_247237_IW3_20180724T152609_VV_064C
S1_262893_IW2_20180315T032545_VV_2150	S1_247237_IW3_20180712T152608_VV_89D7
S1_262893_IW2_20180303T032545_VV_A302	S1_247237_IW3_20180630T152607_VV_909C

S1_262893_IW2_20180219T032545_VV_8B63	S1_247237_IW3_20180618T152607_VV_3BE8
S1_262893_IW2_20180207T032545_VV_2599	S1_247237_IW3_20180606T152606_VV_1421
S1_262893_IW2_20180126T032545_VV_E26B	S1_247237_IW3_20180513T152605_VV_C42A
S1_262893_IW2_20180114T032546_VV_3FFA	S1_247237_IW3_20180501T152604_VV_4B57
S1_262893_IW2_20180102T032546_VV_3252	S1_247237_IW3_20180419T152603_VV_AFB9
S1_262893_IW2_20171221T032546_VV_4D1D	S1_247237_IW3_20180407T152603_VV_4EC4
S1_262893_IW2_20171127T032547_VV_2F0E	S1_247237_IW3_20180326T152603_VV_F3E8
S1_262893_IW2_20171115T032548_VV_1D8F	S1_247237_IW3_20180314T152602_VV_1760
S1_262893_IW2_20171103T032548_VV_86F3	S1_247237_IW3_20180302T152602_VV_BF53
S1_262893_IW2_20171022T032548_VV_28F9	S1_247237_IW3_20180218T152602_VV_50D2
S1_262893_IW2_20171010T032548_VV_4D04	S1_247237_IW3_20180125T152603_VV_2E74
S1_262893_IW2_20170928T032548_VV_6543	S1_247237_IW3_20180113T152603_VV_86CF
S1_262893_IW2_20170916T032547_VV_5274	S1_247237_IW3_20171208T152604_VV_5C7A
S1_262893_IW2_20170904T032547_VV_8C8B	S1_247237_IW3_20171126T152605_VV_6FE6
S1_262893_IW2_20170823T032546_VV_3B3B	S1_247237_IW3_20171114T152605_VV_3E50
S1_262893_IW2_20170811T032546_VV_ADA0	S1_247237_IW3_20171102T152606_VV_CB8D
S1_262893_IW2_20170730T032545_VV_E154	S1_247237_IW3_20171021T152606_VV_412D
S1_262893_IW2_20170624T032543_VV_E10E	S1_247237_IW3_20171009T152605_VV_E2F5
S1_262893_IW2_20170612T032542_VV_B776	S1_247237_IW3_20170927T152605_VV_55CC
S1_262893_IW2_20170531T032542_VV_1311	S1_247237_IW3_20170915T152605_VV_7503
S1_262893_IW2_20170519T032541_VV_2358	S1_247237_IW3_20170903T152604_VV_1E73
S1_262893_IW2_20170507T032541_VV_6870	S1_247237_IW3_20170822T152604_VV_EACE
S1_262893_IW2_20170425T032540_VV_38B2	S1_247237_IW3_20170810T152603_VV_C10A
S1_262893_IW2_20170413T032539_VV_0215	S1_247237_IW3_20170729T152603_VV_EA88
S1_262893_IW2_20170224T032538_VV_0745	S1_247237_IW3_20170717T152602_VV_BB41
S1_262893_IW2_20170131T032538_VV_DA2D	S1_247237_IW3_20170705T152601_VV_5B55
S1_262893_IW2_20161226T032541_VV_25DA	S1_247237_IW3_20170623T152601_VV_D483
S1_262893_IW2_20161120T032542_VV_A182	S1_247237_IW3_20170611T152600_VV_8853
S1_262893_IW2_20161108T032542_VV_81DA	S1_247237_IW3_20170530T152559_VV_DC02
S1_262893_IW2_20161027T032542_VV_9042	S1_247237_IW3_20170518T152559_VV_1599
S1_262893_IW2_20161015T032542_VV_9CA3	S1_247237_IW3_20170424T152557_VV_6ED4
S1_262893_IW2_20160921T032542_VV_FE35	S1_247237_IW3_20170412T152557_VV_B299
S1_262893_IW2_20160816T032540_VV_27FB	S1_247237_IW3_20170331T152556_VV_E20B
S1_262893_IW2_20160723T032539_VV_ED0C	S1_247237_IW3_20170319T152556_VV_251C
S1_262893_IW2_20160629T032538_VV_0DB1	S1_247237_IW3_20170307T152556_VV_CFC0
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S1_262893_IW2_20160524T032536_VV_1455	S1_247237_IW3_20170211T152556_VV_B9D5
S1_262893_IW2_20160418T032534_VV_5C1C	S1_247237_IW3_20170118T152556_VV_0AE6
S1_262893_IW2_20160325T032533_VV_CDF8	S1_247237_IW3_20170106T152557_VV_AEE3
S1_262893_IW2_20160301T032533_VV_E362	S1_247237_IW3_20161225T152558_VV_56EC
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S1_262893_IW2_20151208T032535_VV_B0FD	S1_247237_IW3_20161014T152600_VV_7EB3
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S1_262893_IW2_20151114T032535_VV_6A30	S1_247237_IW3_20160920T152559_VV_FFCC
S1_262893_IW2_20151102T032535_VV_FBAC	S1_247237_IW3_20160908T152559_VV_E1F8
S1_262893_IW2_20151009T032535_VV_15BE	S1_247237_IW3_20160827T152559_VV_F5C0
S1_262893_IW2_20150822T032534_VV_0307	S1_247237_IW3_20160815T152558_VV_786B
S1_262893_IW2_20150729T032533_VV_C997	S1_247237_IW3_20160803T152558_VV_0156
S1_262893_IW2_20150717T032532_VV_2981	S1_247237_IW3_20160722T152557_VV_E3A8
S1_262893_IW2_20150705T032531_VV_D966	S1_247237_IW3_20160628T152555_VV_F7C7
S1_262893_IW2_20150623T032532_VV_2ADD	S1_247237_IW3_20160616T152555_VV_367F
S1_262893_IW2_20150611T032531_VV_7AAD	S1_247237_IW3_20160604T152554_VV_CA96
S1_262893_IW2_20150518T032530_VV_EA73	S1_247237_IW3_20160523T152553_VV_C859
S1_262893_IW2_20150506T032529_VV_7837	S1_247237_IW3_20160511T152553_VV_2AEA
S1_262893_IW2_20150331T032527_VV_88A5	S1_247237_IW3_20160429T152552_VV_E1B0
S1_262893_IW2_20150319T032526_VV_FC42	S1_247237_IW3_20160417T152552_VV_AFFB
S1_262893_IW2_20150307T032527_VV_320D	S1_247237_IW3_20160405T152551_VV_DEBE
S1_262893_IW2_20150223T032526_VV_3845	S1_247237_IW3_20160324T152551_VV_4C52
S1_262893_IW2_20150130T032527_VV_4451	S1_247237_IW3_20160312T152550_VV_7378
S1_262893_IW2_20150118T032527_VV_9887	S1_247237_IW3_20160229T152550_VV_9735
S1_262893_IW2_20141225T032528_VV_0047	S1_247237_IW3_20160217T152550_VV_589F
S1_262893_IW2_20141213T032528_VV_7B05	S1_247237_IW3_20160205T152550_VV_B459
S1_262893_IW2_20141201T032529_VV_3603	S1_247237_IW3_20160112T152551_VV_0045
S1_262893_IW2_20141107T032529_VV_6DDF	S1_247237_IW3_20151219T152552_VV_B870
	S1_247237_IW3_20151207T152552_VV_680E
	S1_247237_IW3_20151113T152553_VV_24A1
	S1_247237_IW3_20151101T152553_VV_A332
	S1_247237_IW3_20151020T152553_VV_19A9
	S1_247237_IW3_20151008T152553_VV_D069
	S1_247237_IW3_20150926T152553_VV_03D3
	S1_247237_IW3_20150914T152553_VV_F310
	S1_247237_IW3_20150902T152552_VV_4E56
	S1_247237_IW3_20150821T152552_VV_D3BF
	S1_247237_IW3_20150809T152551_VV_175F
	S1_247237_IW3_20150728T152550_VV_E85B
	S1_247237_IW3_20150716T152550_VV_0BDF
	S1_247237_IW3_20150704T152549_VV_AC99
	S1_247237_IW3_20150622T152549_VV_54D7

	S1_247237_IW3_20150610T152548_VV_1985
	S1_247237_IW3_20150529T152548_VV_EAD6
	S1_247237_IW3_20150517T152547_VV_8707
	S1_247237_IW3_20150505T152546_VV_CEF4
	S1_247237_IW3_20150423T152545_VV_4591
	S1_247237_IW3_20150411T152545_VV_F146
	S1_247237_IW3_20150330T152545_VV_A790
	S1_247237_IW3_20150318T152544_VV_5873
	S1_247237_IW3_20150306T152544_VV_A5D1
	S1_247237_IW3_20150222T152544_VV_C916
	S1_247237_IW3_20150210T152544_VV_C81A
	S1_247237_IW3_20150129T152544_VV_97E9
	S1_247237_IW3_20150117T152545_VV_7F88
	S1_247237_IW3_20150105T152545_VV_880C
	S1_247237_IW3_20141212T152546_VV_1265

Table A2. Sentinel-2 optical images used in this study

Satellite	Product Level	Granule ID	Date of Acquisition
Sentinel-2B	MSIL2A	T080609_N0500_R078_T37SEC_20230630T105037	20.09.2019
Sentinel-2A	MSIL2A	T080651_N0500_R078_T37SEC_20230702T114845	25.09.2019
Sentinel-2A	MSIL2A	T080801_N0500_R078_T37SEC_20230719T055533	05.10.2019
Sentinel-2A	MSIL2A	T080911_N0500_R078_T37SEC_20230623T021826	15.10.2019
Sentinel-2A	MSIL2A	T081231_N0500_R078_T37SEC_20230420T064821	18.11.2020
Sentinel-2B	MSIL2A	T080859_N0500_R078_T37SEC_20230613T070350	27.02.2020
Sentinel-2B	MSIL2A	T080749_N0500_R078_T37SEC_20231104T204700	08.03.2020
Sentinel-2B	MSIL2A	T080609_N0500_R078_T37SEC_20230616T105316	06.06.2020
Sentinel-2B	MSIL2A	T080649_N0500_R078_T37SEC_20230504T135159	24.09.2020
Sentinel-2B	MSIL2A	T080719_N0500_R078_T37SEC_20230517T164835	13.03.2021
Sentinel-2B	MSIL2A	T080609_N0300_R078_T37SEC_20210512T114134	12.05.2021
Sentinel-2A	MSIL2A	T080611_N0301_R078_T37SEC_20210904T111331	04.09.2021