

Annex 2

A2 Documentation of strong-motion recording stations

Table A2-1	Cariaco, Venezuela, earthquake of July 9, 1997
Table A2-2	Adana, Türkiye, earthquake of June 27, 1998
Table A2-3	İzmit, Türkiye, earthquake of August 17, 1999
Table A2-4	Düzce, Türkiye, earthquake of November 12, 1999
Table A2-5	Sultandağı, Türkiye, earthquake of February 3, 2002
Table A2-6	Bingöl, Türkiye, earthquake of May 1, 2003

Table A2-1		1997 Cariaco, Venezuela, earthquake: Strong-motion recording stations					
<i>mainshock recording (FUNVISIS, Caracas)</i>							
<i>Station</i> ¹⁾	<i>Index</i>	<i>Instrument type, S/N</i>	<i>Position [latitude, longitude]</i>	<i>Epic. distance [km]</i>	<i>Site class</i>	<i>Site conditions</i> ²⁾	<i>Place of installation</i>
Cumaná Corporiente ³⁾	COP	SMA-1	N 10.466° W 64.165°	75.5	rock	located on a steep hillside, pleistocene sediments, low consolidation, rich in clays (<i>Cerros de Caguire</i>)	multi-story RC structure
Cumaná Universidad de Oriente	UDO	SMA-1 3415	N 10.438° W 64.194°	79.0	stiff soil	top of a gentle hill, pleistocene cobble alluvial sediments (<i>Cerro del Medio</i>)	free-field
<i>aftershock recording (TaskForce)</i>							
<i>Station</i>	<i>Index</i>	<i>Instrument type, S/N</i>	<i>Position [latitude, longitude]</i>	<i>Epic. distance [km]</i>	<i>Site class</i>	<i>Site conditions</i> ²⁾	<i>Place of installation</i>
Agua Caliente	AGS	Altus K2 202	N 10.488° W 63.484°	12.5	rock	top of an ample hill, holocene alluvial plain (old salt flats), outcropping rock	next to 1-story building
Campoma (Querémene)	CAT	Altus K2 711	N 10.508° W 63.585°	14.5	soft soil	located within a lagoon (<i>Laguna de Campoma</i>), soft sediments	free-field
Cariaco	CDC	Altus K2 206	N 10.498° W 63.551°	13.0	soft soil	holocene alluvial plain	next to 1-st. building
Carupano	CGN	Altus K2 713	N 10.673° W 63.242°	28.5	stiff soil	cretaceous metamorphic rocks or alluvial plains, stiff soil to soft rock	free-field
Casanay	CAP	Altus K2 205	N 10.500° W 63.418°	13.5	soft soil	late-pleistocene alluvial plain of Casanay river, more consolidated	ground floor of 2-st. build.
Cumaná Hospital	HOS	Altus K2 711	N 10.470° W 64.161°	75.0	stiff soil	located on a shallow hillside, holocene alluvial plain (old salt flats)	free-field, close to 10-st. bld.
Cumaná Toyota	TOY	Altus K2 203	N 10.458° W 64.135°	72.0	soft soil	infills with pleistocene sediments overlain by a holocene alluvial plain	free-field
Chiguana	CHG	Altus K2 710	N 10.491° W 63.679°	24.0	soft soil	pleistocene sediments (rich in clays, low competence)	next to 1-st. building
El Cordon	COR	Altus K2 207	N 10.475° W 63.555°	15.5	rock	outcropping cretaceous rocks, partly alluvial plain of low thickness	free-field
Guarapiche	GPS	Altus K2 713	N 10.512° W 63.391°	14.5	stiff soil	located within a valley northeast of Casanay, hilly region, consolidated soils	next to 1-story building
San Antonio del Golfo	GOL	Altus K2 712	N 10.447° W 63.782°	36.0	rock	close to the seashore, coastal alluvial plain, outcropping cretaceous rocks	ground floor of 1-story build.
San José de Areocuar	SJA	Altus K2 204	N 10.598° W 63.329°	17.5	stiff soil	located in low coastland (hilly), coastal alluvial plain (consolidated)	masonry barn shed

1) locations and instruments were observed by the Engineering Group of German TaskForce for Earthquakes

2) on the basis of personal communication with Dr. M. SCHMITZ, FUNVISIS Caracas

3) records of the mainshock at station Cumaná Corporiente (COR) are not available

Table A2-2		1998 Adana, Türkiye, earthquake: Strong-motion recording stations					
<i>mainshock recording (AFET, Ankara)</i>							
<i>Station</i> ¹⁾	<i>Index</i>	<i>Instrument type, S/N</i>	<i>Position [latitude, longitude]</i>	<i>Epic. distance [km]</i>	<i>Site class</i>	<i>Site conditions</i> ²⁾	<i>Place of installation</i>
Ceyhan	CYH	Geosig SMA-2 310	N 37.024° E 35.810°		soft soil	quaternary alluvial valley covered by clay, below the clay surface, the layers consist of loose gravelly or dense hard alluvium with pockets of (clayey-)sand	basement of 2-story masonry building
<i>aftershock recording (TaskForce)</i>							
<i>Station</i>	<i>Index</i>	<i>Instrument type, S/N</i>	<i>Position [latitude, longitude]</i>	<i>Epic. distance [km]</i>	<i>Site class</i>	<i>Site conditions</i>	<i>Place of installation</i>
Abdioğlu	ABD	Altus K2 207	N 36.908° E 35.567°	9.5	soft soil	located on the southeastern margin of Adana Basin at Ceyhan River, recent holocene sediments (soft surface layers)	basement of 3-story building
Çakalkuyusu	CAK	Altus K2 712	N 37.043° E 35.226°	32.0	stiff soil	within a hilly landscape, travertine outcropping with thin layer of topsoil and transition layer	free-field
Cotlu	COT	Altus K2 203	N 36.872° E 35.475°	3.0	rock	located on a gentle hill within the sediment basin of Adana, outcropping rock	free-field
Geçitli	GEL	Altus K2 205	N 36.956° E 35.627°	17.0	stiff soil	located on a hillside of moderate slope, difficult estimation of geology (poss.: sandy gravels)	basement of 3-story building
Hakkibeyli	HAK	Altus K2 711	N 37.170° E 35.569°	36.0	soft soil	gentle hillside close to surrounding travertine formations, silty clays and gravelly sands visible	1-story building
Kizilkaş	KIZ	Altus K2 207	N 37.105° E 35.464°	28.5	stiff/rock	located on the top of a hill, claystone outcrops, surrounded by travertine formations	2-story RC structure
Sagkaya	SAG	Altus K2 710	N 37.178° E 35.689°	40.5	stiff soil	flat landscape of recent holocene alluvium, sandy gravels visible, travertine formation nearby	1-story building
Sarihuğlar	SAR	Altus K2 713	N 37.016° E 35.226°	30.0	rock	located on the northern margin of Adana Basin, travertine outcropping rock with layer of topsoil	2-story building
Yerdelen	YER	Altus K2 204	N 36.838° E 35.238°	22.5	soft soil	located within the Adana Basin, recent holocene sediments (very soft surface layers), high groundwater table	masonry barn shed

¹⁾ locations and instruments were observed by the Engineering Group of German TaskForce for Earthquakes

²⁾ after ÇELEBI (2000)

Table A2-3		1999 İzmit, Türkiye, earthquake: Strong-motion recording stations					
<i>mainshock recording (AFET, KOERI)</i>							
<i>Station</i> ¹⁾	<i>Index</i>	<i>Instrument type, S/N</i>	<i>Position [latitude, longitude]</i>	<i>Fault distance [km]</i>	<i>Site class</i>	<i>Site conditions</i> ²⁾	<i>Place of installation</i>
Adapazarı (Sakarya) ³⁾	SKR	GSR-16	N 40.737° E 30.384°	3.09 (3.3)	rock	gentle hillside with moderate slope, steeper hills to the north and west, exposed bedrock is limestone	wooden shack with concrete slab
Düzce (Meteorol. Station)	DZC	SSA 320 554	N 40.844° E 31.148°	12.66 (14.2)	soft soil	basin filled with quaternary alluvium (and basal layer of pleistocene-age lake deposits), uppermost sediments consist of holocene alluvium, sediment thickness 10 to 100m	ground floor of a 1-story RC frame structure
Gebze (Tübitak)	GBZ	SMA-1 2413	N 40.786° E 29.445°	17.0	rock (stiff soil)	local topography has rolling hills, undisturbed soil was reported to be 3-4 m thick over bedrock, rocky soil near the station, float collected from soil is reddish sandstone	ground floor of 5-story RC frame structure
İzmit	IZT	SMA-1 2755	N 40.761° E 29.910°	4.82	rock	located on a steep hillside, geological process would be erosion and soil formation of underlying bedrock (maybe sandstone/limestone mix)	ground floor of a 3-story RC frame structure (next to 10-story building)
Yarımca ⁴⁾	YPT	GSR-16	N 40.756° E 29.764°	4.4 (2.56)	soft soil	located on flat topography within a river delta dominated by sediment accumulation, fine-grained clays and silts at the surface	ground floor of a 3-story RC frame (37x12 m)

¹⁾ locations and instruments were observed by the Engineering Group of German TaskForce for Earthquakes

²⁾ after YOUNG *et al.* (eds.) (2000); AKKAR & GÜLKAN (2002); KUDO *et al.* (2002)

³⁾ only EW-component of the mainshock are available

⁴⁾ station YPT run by Kandilli Observatory and Earthquake Research Institute (KOERI) at Boğaziçi University, İstanbul

Table A2-3 (cont.)		1999 İzmit, Türkiye, earthquake: Strong-motion recording stations					
<i>aftershock recording(TaskForce)</i>							
<i>Station</i>	<i>Index</i>	<i>Instrument type, S/N</i>	<i>Position [latitude, longitude]</i>	<i>Fault distance [km]</i>	<i>Site class</i>	<i>Site conditions</i>	<i>Place of installation</i>
Adapazarı	ADA	Altus K2 203	N 40.737° E 30.380°	3.09	rock	gentle hillside, steeper hills to the north and west, exposed bedrock is limestone	wooden barn shed
Adapazarı	APA	Altus K2 203	N 40.719° E 30.389°	0.54	soft soil	plain alluvial basin, proximity to the surface rupture	free-field
Adapazarı	AZA	Altus K2 203	N 40.756° E 30.390°	5.20	stiff soil	base of a gentle hill, shallow thin soil layers, transition zone bedrock/alluvium	next to 2-st. building
Akyazi	AKY	Altus K2 711	N 40.670° E 30.623°	~ 1.0	soft soil	basin of quaternary alluvium (soft to stiff soils), proximity to river Mudurnu	free-field
Çaybaşı	CAY	Altus K2 202	N 40.690° E 30.445°	~ 1.0	soft soil	quaternary alluvium (soft soil), marshy-ground (water-saturated), proximity to river Sakarya	free-field
Düzce (Meteorol. Station)	DUZ	Altus K2 710	N 40.843° E 31.148°	12.66	soft soil	basin filled with quaternary alluvium (and basal layer of pleistocene-age lake deposits), uppermost sediments consist of holocene alluvium, sediment thickness 10 to 100 m	free-field
Gebze	GEB	Altus K2 205	N 40.782° E 29.416°	-	rock	hilly region, soft rock to rock conditions	wooden barn shed
Gölyaka	GOY	Altus K2 712	N 40.779° E 31.003°	~ 1.0	soft soil	rim area of a basin filled with quaternary alluvium (and basal layer of pleistocene-age lake deposits), uppermost sediments consist of holocene alluvium, sediment thickness up to 50 m	open arbor (wooden)
Hendek	HEN	Altus K2 204	N 40.795° E 30.735°	~ 8.5	rock	plio-pleistocene continental and marine deposits (stiff soil to soft rock)	next to 2-st. building
Karamürsel (Eregli)	KAR	Altus K2 202	N 40.701° E 29.672°	-	stiff soil	close to the southern seashore of İzmit Bay, late miocene to pliocene sedimentary rock (soft rock to rock)	basement of a mosque
Sapanca	SAP	Altus K2 206	N 40.689° E 30.257°	~ 2.0	stiff soil	proximity to lake Sapanca, plio-pleistocene sediments (partly late-holocene)	next to 2-st. building
Seymen	SEY	Altus K2 713	N 40.710° E 29.907°	~ 0.5	soft soil	gentle hillside on the southern seashore of İzmit Bay, topographic feature (soft to stiff soil)	free-field
Yalova (Çiftlikköy)	YAL	Altus K2 207	N 40.661° E 29.324°	-	soft soil	gentle hill, thick layers of gravel, sands and mud (soft soil)	next to 1-story building

Table A2-4		1999 Düzce, Türkiye, earthquake: Strong-motion recording stations					
<i>mainshock recording (AFET, Ankara)</i>							
<i>Station</i> ¹⁾	<i>Index</i>	<i>Instrument type, S/N</i>	<i>Position [latitude, longitude]</i>	<i>Fault distance [km]</i> ¹	<i>Site class</i>	<i>Site conditions</i> ²⁾	<i>Place of installation</i>
Adapazarı (Sakarya)	SKR	GSR-16	N 40.737° E 30.384°	-	rock	gentle hillside with moderate slope, steeper hills to the north and west, exposed bedrock is limestone	wooden shack with concrete slab
Bolu	BOL	SSA 320 555	N 40.746° E 31.607°	19.92	soft soil	flat agricultural land, fine-grained soil materials are expected (silty clay at the surface, flood plain deposit), no significant topography in the vicinity	founded on concrete pile within a 1-story RC frame structure
Düzce (Meteorol. Station)	DZC	SSA 320 554	N 40.844° E 31.148°	8.33	soft soil	basin filled with quaternary alluvium (and basal layer of pleistocene-age lake deposits), uppermost sediments consist of holocene alluvium, sediment thickness 10 to 100 m	ground floor of a 1-story RC frame structure
İzmit	IZT	SMA-1 2755	N 40.761° E 29.910°	-	rock	located on a steep hillside, geological process would be erosion and soil formation of underlying bedrock (maybe sandstone/limestone mix)	ground floor of a 3-story RC frame structure (next to 10-story building)
<i>aftershock recording (TaskForce)</i>							
<i>Station</i>	<i>Index</i>	<i>Instrument type, S/N</i>	<i>Position [latitude, longitude]</i>	<i>Fault distance [km]</i>	<i>Site class</i>	<i>Site conditions</i>	<i>Place of installation</i>
Düzce (Meteorol. Station)	MET	Altus K2 710	N 40.843° E 31.148°	~ 8.5	soft soil	basin filled with quaternary alluvium (and basal layer of pleistocene-age lake deposits), uppermost sediments consist of holocene alluvium, sediment thickness 10 to 100 m	free-field
Düzce (School)	SCH	Altus K2 711	N 40.841° E 31.152°				basement of a 2-st. RC frame structure
Düzce (College)	COL	Altus K2 712	N 40.835° E 31.169°				free-field

¹⁾ locations and instruments were observed by the Engineering Group of German TaskForce for Earthquakes

²⁾ after YOUNG (eds.) *et al.* (2000); AKKAR & GÜLKAN (2002); KUDO *et al.* (2002)

Table A2-5		2002 Sultandağı, Türkiye, earthquake: Strong-motion recording stations					
<i>mainshock recording (AFET, Ankara)</i>							
<i>Station</i>	<i>Index</i>	<i>Instrument type, S/N</i>	<i>Position [latitude, longitude]</i>	<i>Epic. distance [km]</i>	<i>Site class</i>	<i>Site conditions</i>	<i>Place of installation</i>
Afyon	AFY	Geosig SM-2 284	N 38.792° E 30.561°	65.0		no information available	ground level or basement
<i>aftershock recording (TaskForce)</i>							
<i>Station</i>	<i>Index</i>	<i>Instrument type, S/N</i>	<i>Position [latitude, longitude]</i>	<i>Epic. distance [km]</i>	<i>Site class</i>	<i>Site conditions</i>	<i>Place of installation</i>
Sultandağı	SUL	204	N 38.534° E 31.224°	6.0	stiff	volcanic deposits of small layer thicknesses due to the location on the foot of a hill	free-field

Table A2-6		2003 Bingöl, Türkiye, earthquake: Strong-motion recording stations					
<i>mainshock recording (AFET, Ankara)</i>							
<i>Station</i>	<i>Index</i>	<i>Instrument type, S/N</i>	<i>Position [latitude, longitude]</i>	<i>Epic. distance [km]</i>	<i>Site class</i>	<i>Site conditions</i>	<i>Place of installation</i>
Bingöl	BNG	SSA-320 2299	N 38.897° E 40.503°	~ 12.0	stiff soil	no detailed information on the local geology; soft soils of medium thickness are expected; topographical feature nearby	founded on concrete pile within a 2-story RC frame structure