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On the determination of a global strain rate model

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APPENDIX

Table 1. Rotation vectors that rotate geodetic studies from their original frame into a model Eurasian reference frame, determined in the joint inversion of GPS velocity vectors and Quaternary strain rates. Table also contains rotation vectors of all rigid blocks in the model relative to Eurasia.

Source or Plate	Sites[a]	Frame[b]	Latitude	Longitude	Rate	ω_x	ω_y	ω_z	$\rho(x, y)$	$\rho(x, z)$	$\rho(y, z)$
Abdrakhmatov *et al.* (1996)	80	local	43.7°S	105.7°W	0.26	-0.051 ± 0.017	-0.182 ± 0.060	-0.180 ± 0.058	0.98	0.98	1.00
Angermann *et al.* (1999)	5	S. America	80.5°S	132.3°E	0.30	-0.033 ± 0.010	0.037 ± 0.011	-0.295 ± 0.011	−0.68	−0.25	0.35
Antonelis *et al.* (1999)	4	local	54.4°S	54.2°E	0.41	0.138 ± 0.050	0.191 ± 0.148	-0.330 ± 0.069	0.99	−0.98	−0.99
Bendick *et al.* (2000)	15	local	58.8°N	25.4°E	0.30	0.142 ± 0.006	0.068 ± 0.039	0.260 ± 0.025	0.26	0.27	0.94
Bennett *et al.* (1999)	48	N. America	70.1°S	49.8°W	0.25	0.055 ± 0.002	-0.065 ± 0.004	-0.236 ± 0.005	0.42	−0.11	−0.69
Bevis *et al.* (1995)	8	Pacific	47.8°S	48.1°E	1.10	0.492 ± 0.350	0.548 ± 0.064	-0.812 ± 0.115	0.70	0.90	0.63
Calais *et al.* (1998)	11	local	54.8°S	75.4°W	0.21	0.030 ± 0.045	-0.116 ± 0.164	-0.170 ± 0.219	−0.99	−0.99	1.00
Cocard *et al.* (1999)	36	Eurasia	39.9°N	17.6°E	0.51	0.372 ± 0.139	0.118 ± 0.044	0.327 ± 0.123	0.99	1.00	0.99
Demets *et al.* (2000)	4	ITRF96	47.1°S	91.5°E	0.35	-0.006 ± 0.038	0.240 ± 0.095	-0.258 ± 0.034	−0.92	0.81	−0.86
Dixon *et al.* (1998)	5	N. America	56.6°S	60.8°W	0.20	0.055 ± 0.242	-0.098 ± 0.709	-0.170 ± 0.286	−0.99	0.99	−0.99
Freymueller *et al.* (1993)	6	local	4.0°S	179.9°W	0.20	-0.195 ± 0.064	0.000 ± 0.950	-0.014 ± 0.103	−0.89	0.84	−0.96
Freymueller *et al.* (1999)	52	Pacific	58.3°S	90.6°E	1.12	-0.006 ± 0.084	0.587 ± 0.131	-0.949 ± 0.127	1.00	−1.00	−1.00
Freymueller *et al.* (2000)	28	local	58.8°N	25.4°E	0.30	0.142 ± 0.006	0.068 ± 0.039	0.260 ± 0.025	0.26	0.27	0.94
Heki *et al.* (1999)	10	Eurasia	52.8°S	97.7°E	0.05	-0.004 ± 0.021	0.031 ± 0.028	-0.041 ± 0.037	−0.81	−0.79	0.86
IGS[c]	127	ITRF97	59.0°S	81.0°E	0.26	0.021 ± 0.001	0.131 ± 0.001	-0.221 ± 0.002	0.42	0.94	0.46
Kato *et al.* (1998)	13	local	69.8°S	17.7°E	0.08	0.025 ± 0.019	0.008 ± 0.014	-0.072 ± 0.014	−0.82	−0.59	0.52
Kendrick *et al.* (1999)	12	local	75.0°S	137.6°E	0.29	-0.055 ± 0.012	0.050 ± 0.011	-0.276 ± 0.012	−0.78	−0.40	0.46
Khazaradze *et al.* (1999)	7	local	67.5°S	26.9°E	0.44	0.150 ± 0.067	0.076 ± 0.106	-0.404 ± 0.140	1.00	−1.00	−1.00
King *et al.* (1997)	21	local	17.4°S	75.1°W	0.43	0.106 ± 0.029	-0.397 ± 0.122	-0.129 ± 0.072	−0.95	−0.94	0.98
Larson *et al.* (1999)	8	ITRF94	58.1°S	108.5°E	0.25	-0.043 ± 0.018	0.127 ± 0.100	-0.216 ± 0.049	0.70	0.66	0.93
Ma and Ryan (1998)	75	ITRF96	55.1°S	70.3°E	0.24	0.046 ± 0.002	0.127 ± 0.001	-0.193 ± 0.002	0.15	0.71	0.06
Norabuena *et al.* (1998)	47	S. America	72.0°S	121.4°E	0.31	-0.050 ± 0.010	0.082 ± 0.017	-0.298 ± 0.009	−0.78	−0.40	0.46
Puntodewo *et al.* (1994)	6	Australia	10.7°N	23.5°E	0.61	0.550 ± 0.300	0.239 ± 0.269	0.114 ± 0.065	−0.99	0.48	−0.47
Reilinger *et al.* (1997a)	40	Eurasia	16.3°N	146.2°W	0.05	-0.036 ± 0.064	-0.024 ± 0.041	0.013 ± 0.064	0.99	0.99	0.98
Reilinger *et al.* (1997b)	4	local	42.5°S	138.5°W	0.36	-0.200 ± 0.471	-0.177 ± 0.420	-0.245 ± 0.601	1.00	1.00	1.00
Robbins *et al.* (1994)	6	local	34.5°S	153.0°W	0.79	-0.581 ± 0.190	-0.296 ± 0.098	-0.448 ± 0.159	0.97	0.99	0.96
Sauber *et al.* (1997)	9	local	12.3°S	89.4°W	0.14	0.002 ± 0.072	-0.137 ± 0.049	-0.030 ± 0.175	0.99	−0.99	−0.99
SCEC[d]	348	N. America	35.9°S	88.0°W	0.23	0.006 ± 0.012	-0.184 ± 0.023	-0.133 ± 0.018	0.98	−0.96	−0.98
SCIGN[e]	27	ITRF97	43.0°S	66.8°E	0.62	0.179 ± 0.046	0.416 ± 0.085	-0.422 ± 0.067	1.00	−0.99	−1.00
Shen *et al.* (2000)	71	local	48.9°S	75.2°E	0.26	0.043 ± 0.011	0.164 ± 0.024	-0.194 ± 0.022	−0.77	−0.75	0.89
Simons *et al.* (1999)	36	ITRF94	55.6°S	101.5°E	0.29	-0.032 ± 0.010	0.158 ± 0.015	-0.236 ± 0.008	−0.62	0.23	−0.18

Table 1. (continued).

Source or Plate	Sites[a]	Frame[b]	Latitude	Longitude	Rate	ω_x	ω_y	ω_z	$\rho(x, y)$	$\rho(x, z)$	$\rho(y, z)$
Smith *et al.* (1994)	7	local	47.9°S	76.1°E	0.28	0.044 ± 0.010	0.179 ± 0.031	-0.204 ± 0.018	0.80	−0.71	−0.90
Stevens *et al.* (1999)	6	local	61.5°S	107.2°E	0.20	-0.028 ± 0.041	0.091 ± 0.074	-0.176 ± 0.035	−0.80	0.68	−0.80
Straub *et al.* (1997)	25	local	42.5°N	32.7°E	0.14	0.086 ± 0.240	0.055 ± 0.132	0.093 ± 0.232	1.00	1.00	1.00
Taylor *et al.* (1995)	9	Australia	6.5°S	70.7°E	0.52	0.172 ± 0.222	0.490 ± 0.051	-0.059 ± 0.090	−0.96	0.97	−0.93
Tregoning *et al.* (1998a)	15	ITRF94	31.6°S	135.0°E	0.47	-0.281 ± 0.106	0.281 ± 0.060	-0.245 ± 0.021	−0.99	0.82	−0.82
Tregoning *et al.* (1998b)	3	ITRF94	5.8°N	15.3°W	1.90	1.818 ± 1.487	-0.499 ± 0.544	0.192 ± 0.305	−1.00	0.99	−0.99
Trenkamp *et al.* (1997)	31	local	30.9°S	118.2°E	0.48	-0.193 ± 0.026	0.359 ± 0.123	-0.244 ± 0.018	−0.93	0.60	−0.62
USGS[f]	319	ITRF96	55.1°S	73.0°W	0.21	0.036 ± 0.006	-0.117 ± 0.010	-0.175 ± 0.009	0.92	−0.83	−0.94
Walpersdorf *et al.* (1999)	2	local	6.3°N	41.2°E	0.98	0.733 ± 0.614	0.641 ± 0.523	0.108 ± 0.196	0.99	0.91	0.90
Yu *et al.* (1999)	36	Eurasia	25.6°N	115.7°E	0.21	-0.081 ± 0.037	0.168 ± 0.065	0.089 ± 0.030	−0.97	−0.92	0.94
Zhu *et al.* (2000)	20	ITRF96	42.1°S	86.7°E	0.25	0.011 ± 0.006	0.187 ± 0.018	-0.169 ± 0.017	−0.26	−0.23	0.78
Sunda Block	—	—	57.2°N	51.6°W	0.10	0.033 ± 0.010	-0.041 ± 0.019	0.081 ± 0.008	−0.65	−0.28	0.48
Scotia	—	—	83.3°S	156.1°E	0.26	-0.027 ± 0.012	0.012 ± 0.014	-0.257 ± 0.026	−0.92	−0.86	0.89
Carribean	—	—	66.7°S	153.3°E	0.10	-0.034 ± 0.023	0.017 ± 0.075	-0.089 ± 0.027	−0.85	0.59	−0.71
Cocos	—	—	4.8°N	93.9°W	1.44	-0.099 ± 0.023	-1.433 ± 0.158	0.120 ± 0.032	0.02	0.04	−0.76
Anatolia	—	—	30.6°N	33.3°E	1.08	0.779 ± 0.081	0.512 ± 0.053	0.550 ± 0.080	0.99	0.99	0.99
Nubia	—	—	10.1°S	29.7°W	0.02	0.021 ± 0.007	-0.012 ± 0.004	-0.004 ± 0.006	0.22	0.50	0.10
Somalia	—	—	3.2°N	5.0°E	0.05	0.047 ± 0.020	0.004 ± 0.017	0.003 ± 0.007	0.94	−0.10	−0.15
Capricorn	—	—	15.8°N	42.8°E	0.51	0.362 ± 0.007	0.335 ± 0.027	0.139 ± 0.009	0.53	−0.23	−0.66
Rivera	—	—	66.0°S	98.6°E	0.68	-0.041 ± 0.325	0.272 ± 1.014	-0.618 ± 0.407	1.00	−0.99	−1.00
Okhotsk	—	—	59.4°S	58.1°W	0.07	0.020 ± 0.052	-0.032 ± 0.037	-0.065 ± 0.084	−0.95	−0.96	0.98
Philippine Sea	—	—	49.1°S	21.8°W	1.08	0.654 ± 0.045	-0.262 ± 0.049	-0.814 ± 0.020	−0.92	−0.74	0.71
Caroline	—	—	67.3°S	70.4°E	0.85	0.110 ± 0.058	0.310 ± 0.041	-0.789 ± 0.010	−0.97	−0.50	0.49
Juan De Fuca	—	—	51.6°S	59.1°E	1.86	0.593 ± 0.117	0.991 ± 0.156	-1.456 ± 0.198	0.99	−1.00	−1.00
Nazca	—	—	0.1°N	96.8°W	0.40	-0.044 ± 0.009	-0.370 ± 0.020	0.136 ± 0.013	0.12	0.10	0.59
Arabia	—	—	23.0°N	7.9°E	0.26	0.234 ± 0.041	0.032 ± 0.053	0.101 ± 0.032	0.97	0.96	0.97
India	—	—	27.0°N	12.7°E	0.35	0.305 ± 0.006	0.069 ± 0.018	0.159 ± 0.007	0.66	0.58	0.72
Antarctica	—	—	28.8°S	131.4°E	0.07	-0.042 ± 0.003	0.047 ± 0.003	-0.035 ± 0.007	0.01	−0.06	−0.45
Pacific	—	—	63.2°S	94.5°E	0.89	-0.031 ± 0.003	0.399 ± 0.002	-0.791 ± 0.003	0.45	0.09	−0.23
Australia	—	—	8.8°N	50.6°E	0.62	0.387 ± 0.004	0.472 ± 0.004	0.095 ± 0.004	−0.72	0.82	−0.67
South America	—	—	80.4°S	141.8°E	0.27	-0.036 ± 0.006	0.028 ± 0.006	-0.268 ± 0.004	−0.86	−0.48	0.63
North America	—	—	64.9°S	52.7°W	0.23	0.059 ± 0.002	-0.078 ± 0.001	-0.208 ± 0.003	0.19	0.58	−0.24

These rotations allow the minimum least squares fit between the model strain rate field and inferred Quaternary strain rates and between the associated model velocity field and the GPS vectors within their newly determined model Eurasian frame of reference. Rotation rates are presented in deg/Myr; ω_x, ω_y, and ω_z, are the Cartesian components of the rotation vector (deg/Myr), where x is the vector direction of 0°N, 0°E, y is the vector direction of 0°N, 90°E, and z is the vector direction of the geographic north pole; $\rho(x, y)$ is the correlation coefficient between x and y directions, $\rho(x, z)$ is correlation coefficient between x and z directions, and $\rho(y, z)$ is correlation between y and z directions.

[a]Number of GPS sites used from each listed study.

[b]Original reference frame used by listed study.

[c]Determinded in this study using data from 127 IGS sites.

[d]`http://www.scecdc.scec.org/group_e/release.v2`.

[e]`http://sideshow.jpl.nasa.gov/mbh/series.html`.

[f]`http://quake.wr.usgs.gov/QUAKES/geodetic/gps/`.

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