

Choice of RLE400 or RLE80 equations

file: \peer_nga\teamx\choice of rle400 or rle80 equations.doc

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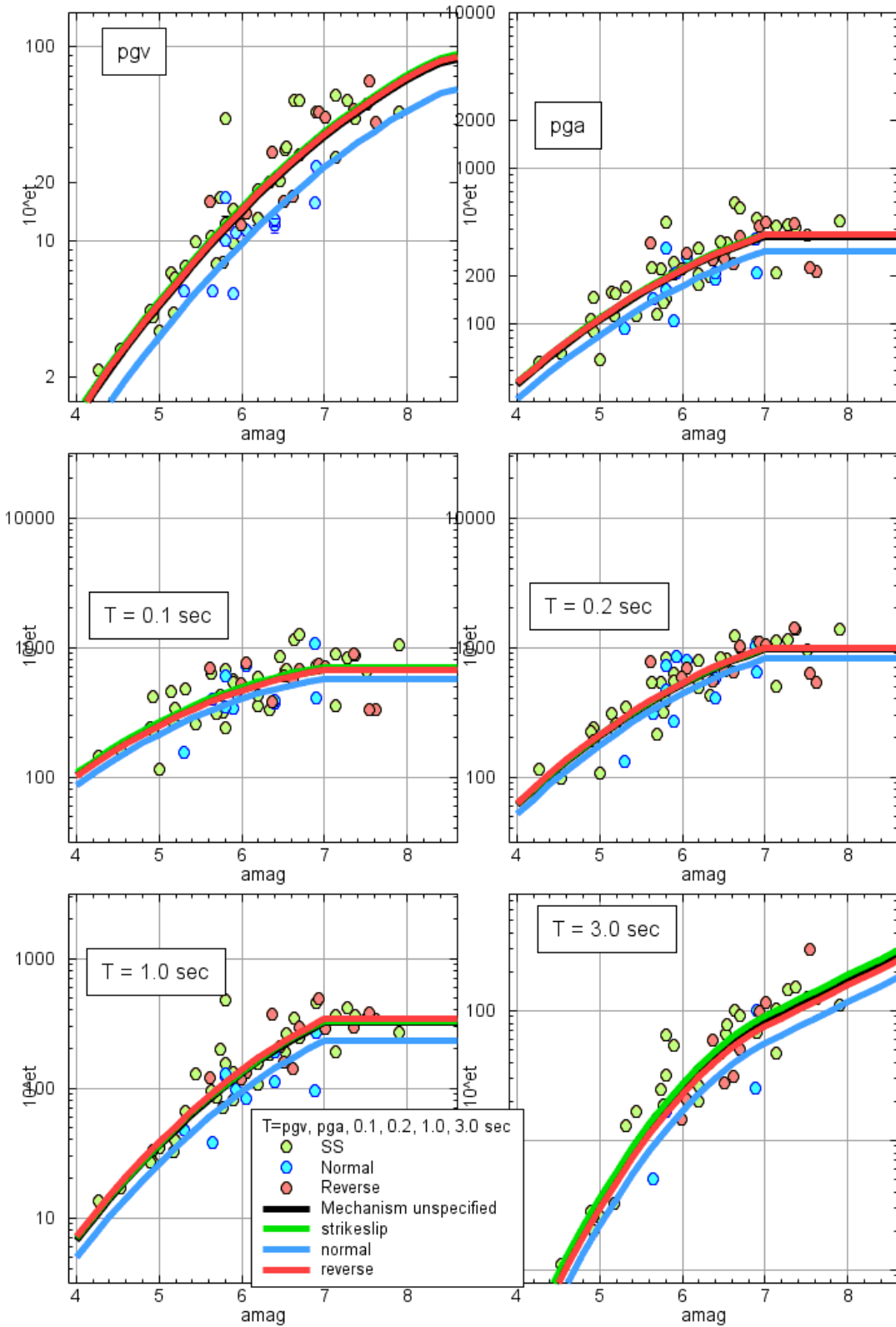
At the 07 March 2006 NGA developers meeting, Mark Petersen asked whether the new BA equations, which used data to 400 km, changed the close distance values of the motions (compared to the equations obtained using distances less than 80 km). I looked into this by redoing all equations, after updating the flatfile with the revised V30 values (indicated in file names by "feb06vels"). I did three sets of regressions: $r \leq 400$, solve for c_1 and c_2 ; $r \leq 80$, solve for c_1 and c_2 ; $r \leq 80$, solve for c_1 . In all cases, h was fixed. I made a series of plots for the event terms vs M and for ground motions vs r (for M 5.5, 6.5, and 7.5). In all but the pgv and $T=3$ s plots, I included the BJT curves. There was not a lot of difference for the $r \leq 80$ cases between solving for c_2 or fixing it at 0.0. Also, the `teamx_august05` equations gave similar answers to the fix $c_2=0$ case, as they should (only some velocities in the flatfile were changed). I include all plots below.

I noticed that the largest discrepancies at close distance are for large M and large T , with the motions for $r \leq 400$ being smaller than those for $r \leq 80$. I ran `ba_gm_tmr` to generate a table of values for the two cases, imported these into Excel, and formed ratios. I grouped them by distance. I highlighted the largest differences for $T = 0.2$ and $T = 1.0$. The table is included just below. From this, the difference at close distances is greater than 0.69. The differences at large distances are much larger (near a factor of 2). Given that the $r \leq 400$ equations do a better job of fitting the more distant data, at a relatively modest expense at close distances (30% reduction), I've decided to use the $r \leq 400$ km equations.

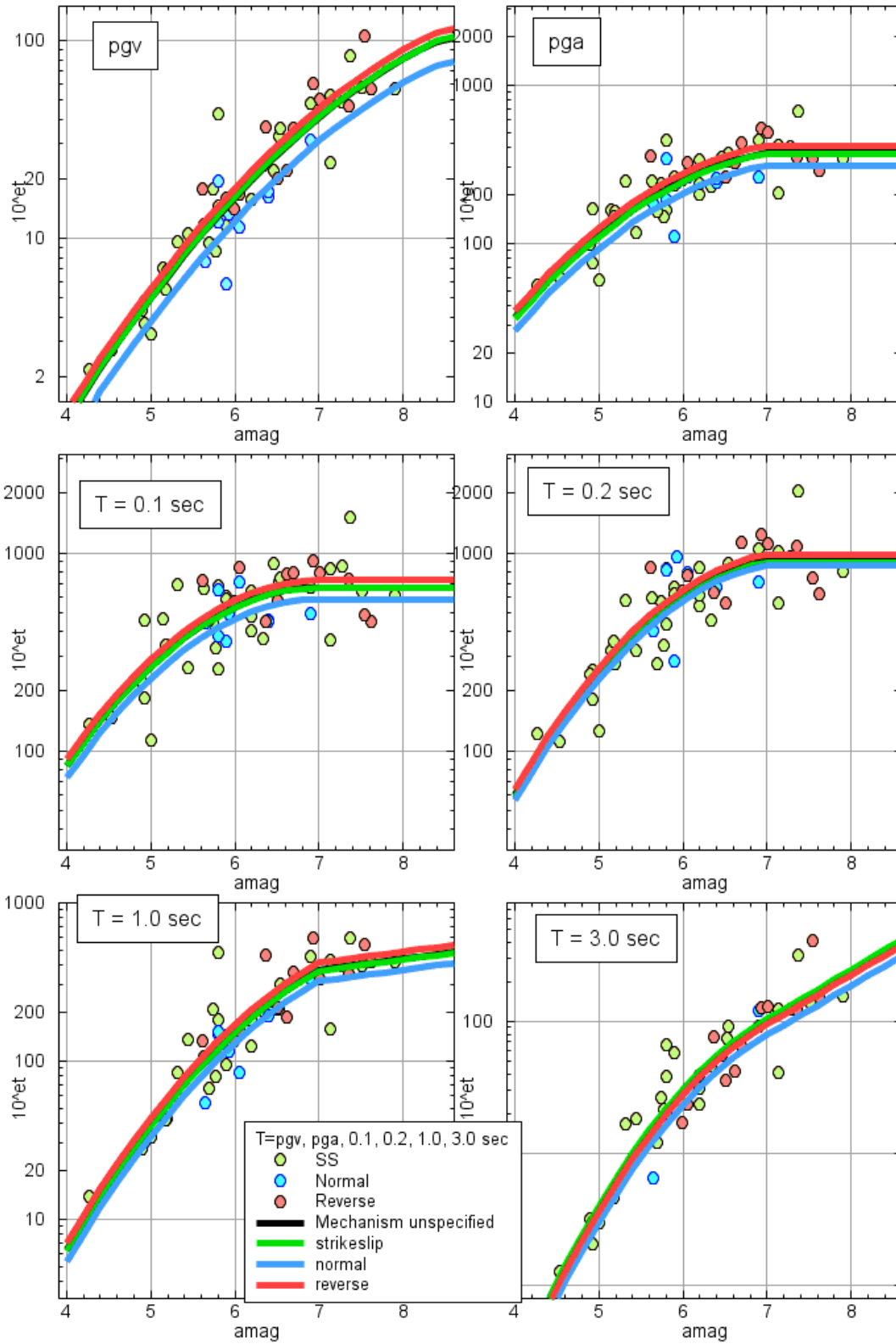
T	M	rle400_c1_c2_fix_h_feb06vels				rle80_c1_fix_h_feb06vels		
		Rjb	V30	imech	Y(cgs)	Y(cgs)	yrat_rle400/rle80	
	0	5.5	1	760	-1 2.01E+02	1.93E+02	1.04	
	0	6.5	1	760	-1 3.54E+02	4.01E+02	0.88	
	0	7.5	1	760	-1 4.22E+02	5.00E+02	0.84	
	0.1	5.5	1	760	-1 4.21E+02	4.07E+02	1.03	
	0.1	6.5	1	760	-1 6.65E+02	7.24E+02	0.92	
	0.1	7.5	1	760	-1 7.42E+02	8.15E+02	0.91	
	0.2	5.5	1	760	-1 3.84E+02	4.23E+02	0.91	
	0.2	6.5	1	760	-1 8.21E+02	8.89E+02	0.92	

0.2	7.5	1	760	-1	1.07E+03	1.07E+03	0.99
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1	6.5	1	760	-1	2.22E+02	2.59E+02	0.86
1	7.5	1	760	-1	3.31E+02	4.67E+02	0.71
2	5.5	1	760	-1	2.43E+01	2.39E+01	1.02
2	6.5	1	760	-1	9.42E+01	1.05E+02	0.90
2	7.5	1	760	-1	1.74E+02	2.53E+02	0.69
3	5.5	1	760	-1	1.03E+01	1.06E+01	0.97
3	6.5	1	760	-1	5.16E+01	5.92E+01	0.87
3	7.5	1	760	-1	1.22E+02	1.62E+02	0.75
-1	5.5	1	760	-1	8.94E+00	9.00E+00	0.99
-1	6.5	1	760	-1	2.40E+01	2.80E+01	0.86
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0.2	6.5	10	760	-1	4.54E+02	4.64E+02	0.98
0.2	7.5	10	760	-1	6.15E+02	5.60E+02	1.10
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-1	7.5	10	760	-1	3.19E+01	3.38E+01	0.95
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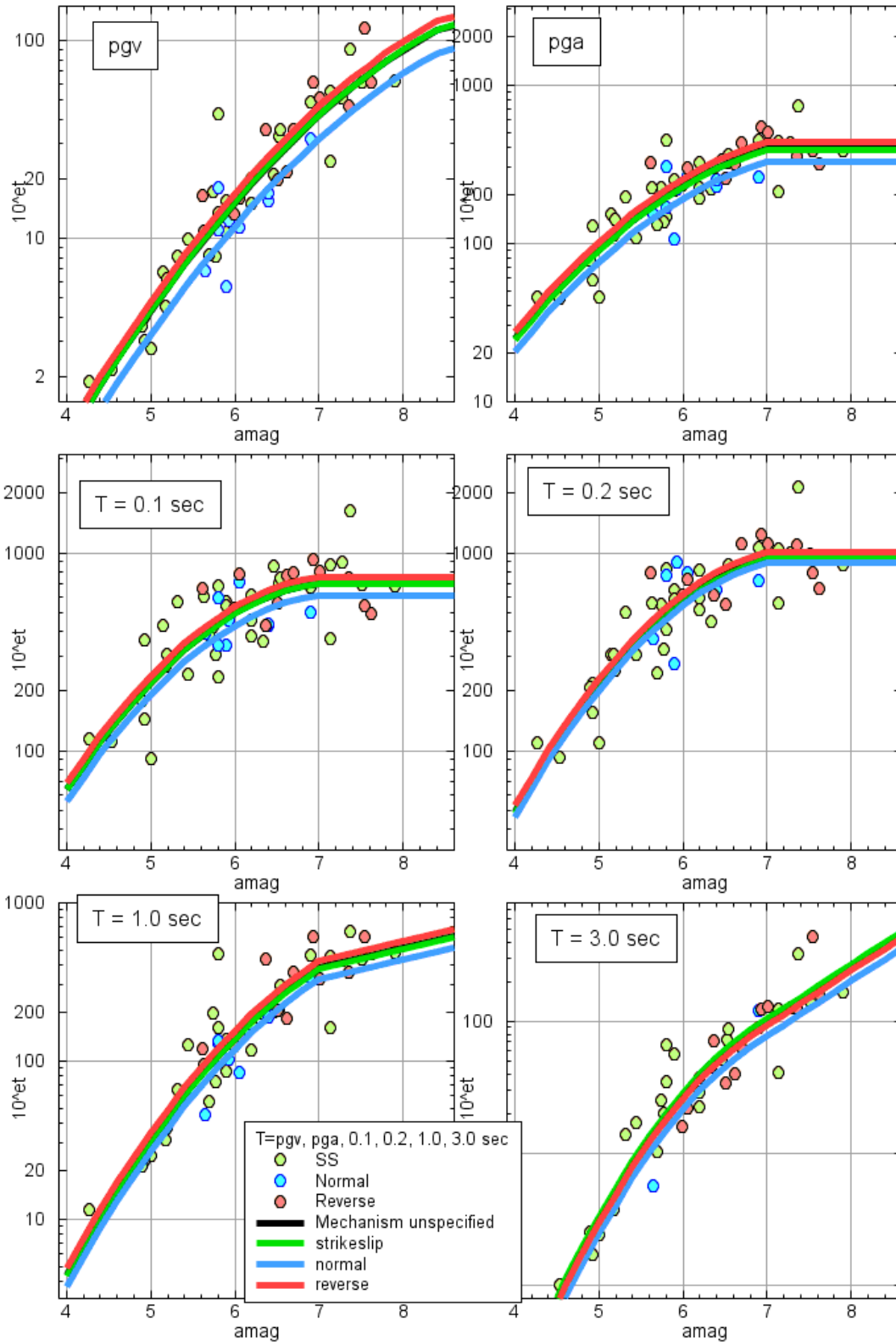
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0	7.5	100	760	-1	4.38E+01	2.43E+01	1.80
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3	7.5	200	760	-1	8.45E+00	5.95E+00	1.42
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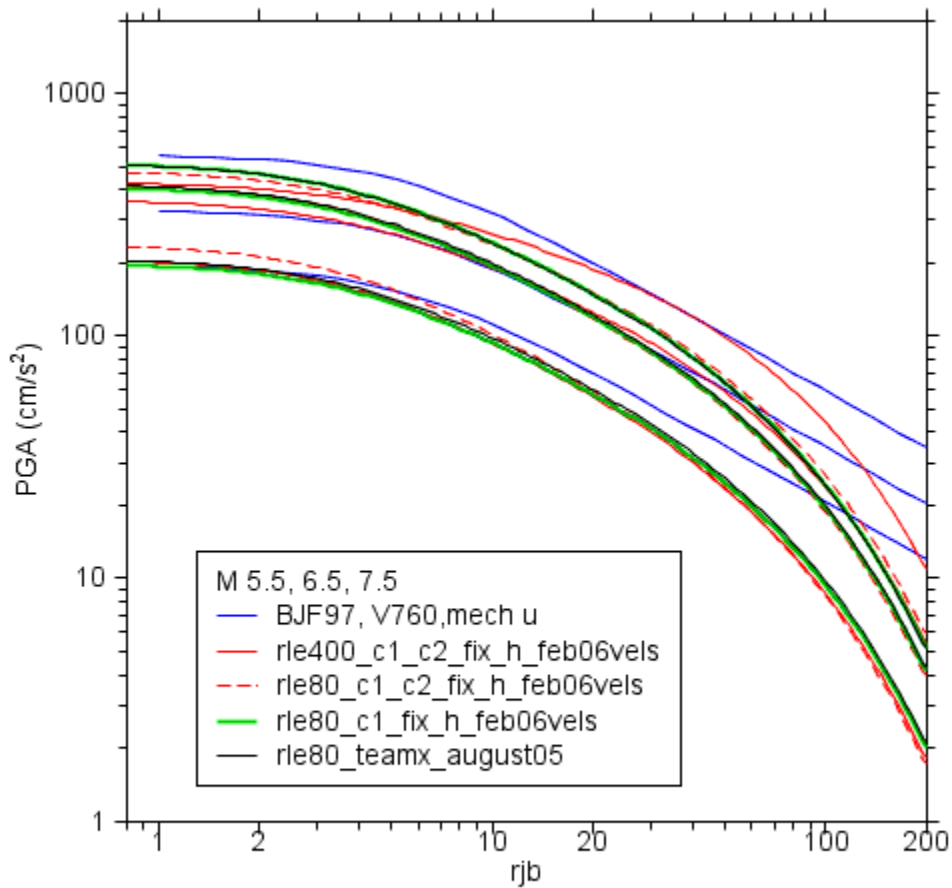
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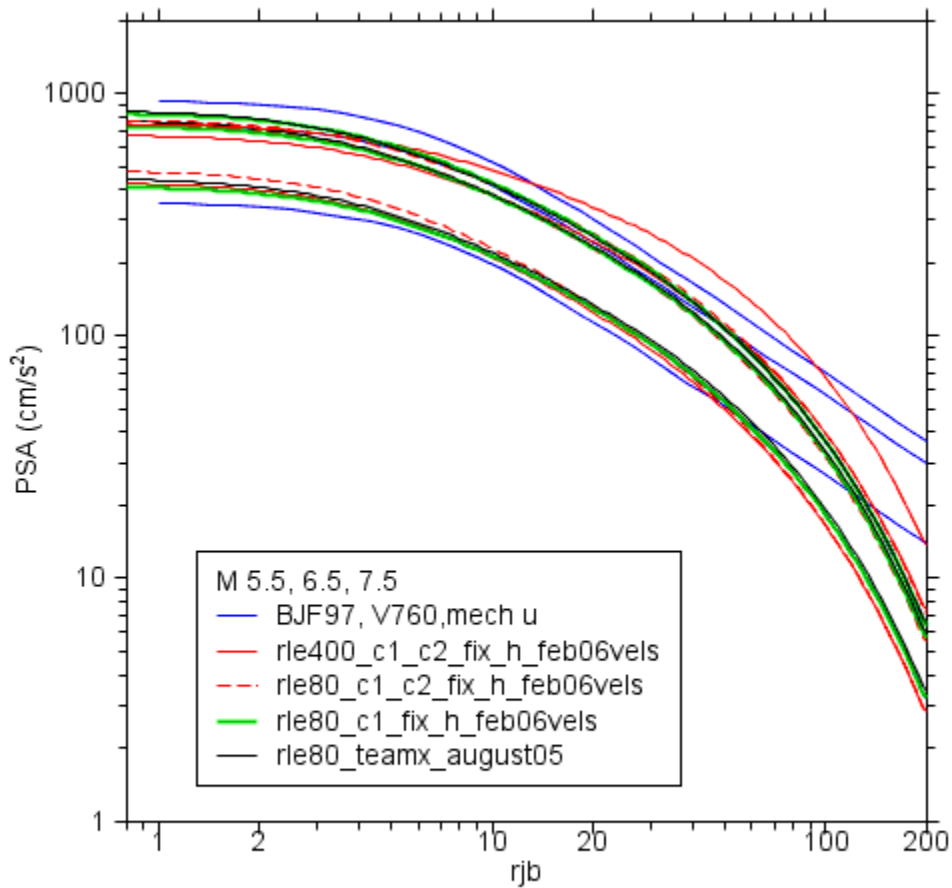
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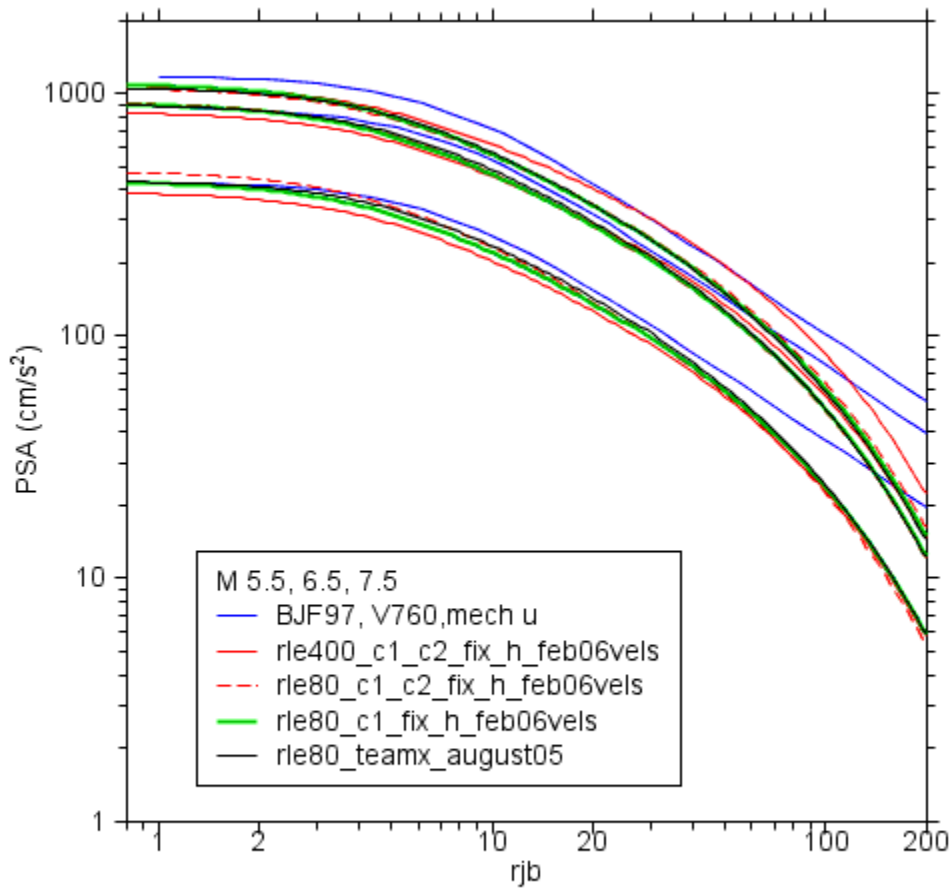
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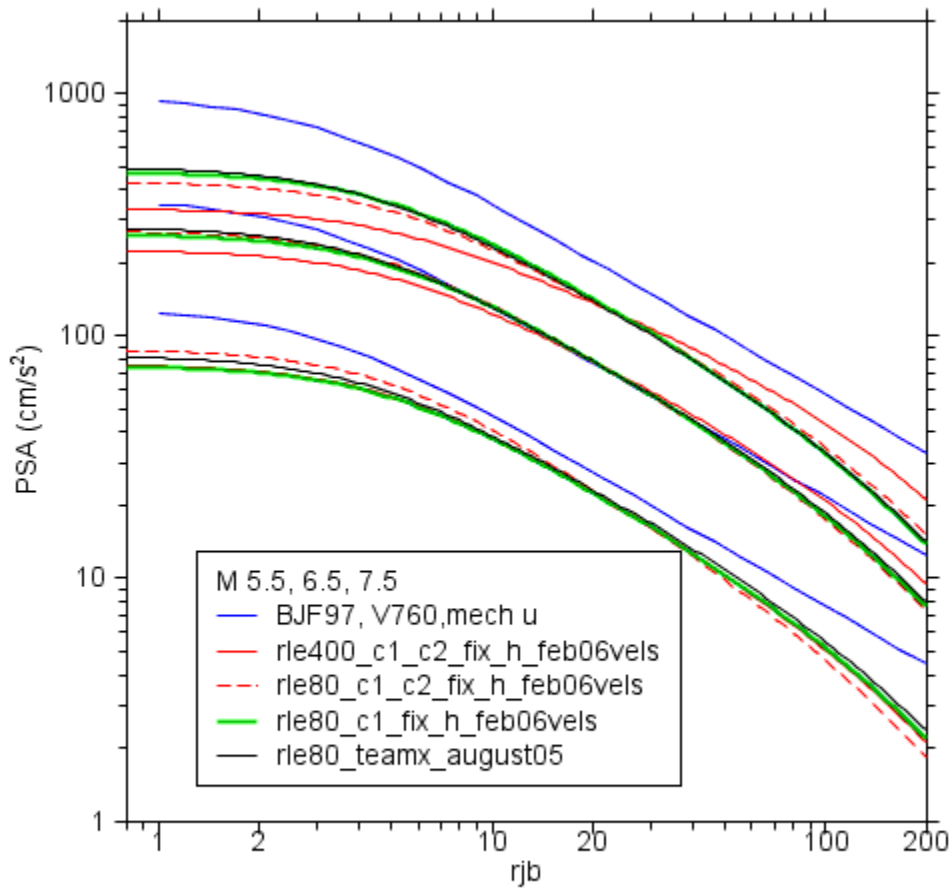
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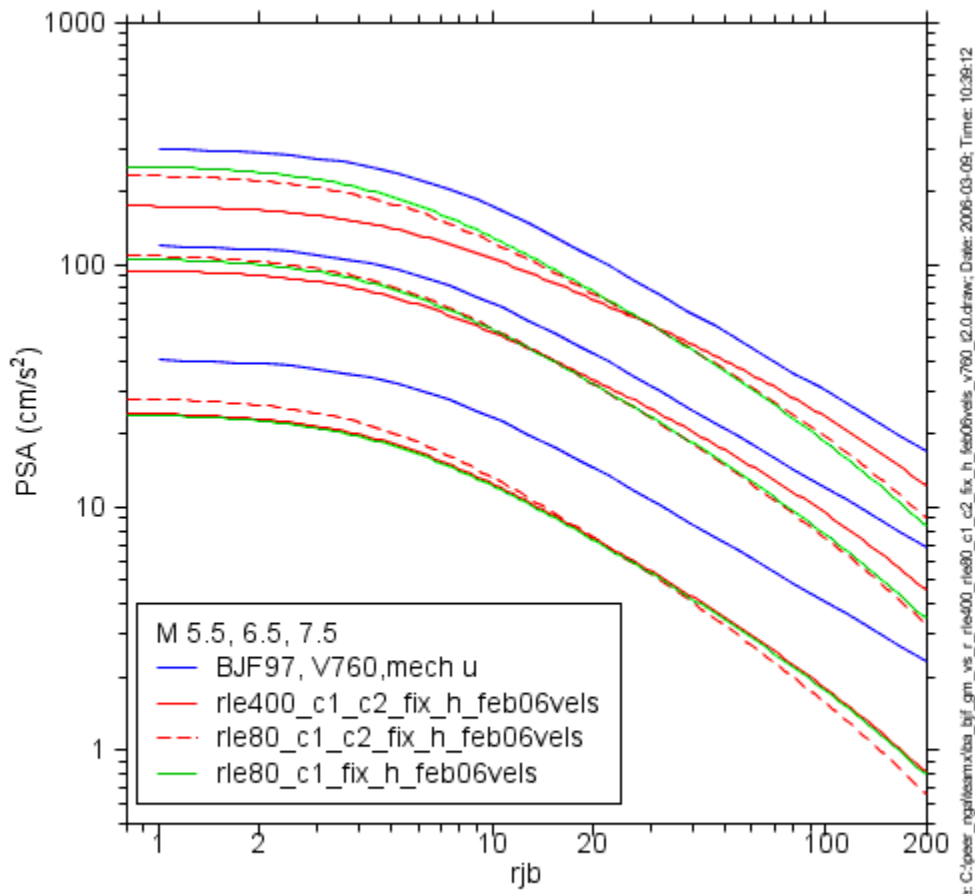
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