

# PEST RUN RECORD: CASE mfit

PEST Version: 16.1

PEST run mode:-

Parameter estimation mode

Case dimensions:-

Number of parameters	:	4
Number of adjustable parameters	:	4
Number of parameter groups	:	1
Number of observations	:	500
Number of prior estimates	:	0

Model command line(s):-

MDP\_2RNE

Jacobian command line:-

MDP\_2RNE /d  
Jacobian read from file Deriv.txt  
This is an ASCII file.

Model interface files:-

Templates:  
MFIT.tpl  
for model input files:  
Input.txt  
  
(Parameter values written using single precision protocol.)  
(Decimal point always included.)  
  
Instruction files:  
MFIT.ins  
for reading model output files:  
Output.txt

PEST-to-model message file:-

na

Singular value decomposition:-

Perform SVD on $XtQX$ or $Q^{(1/2)}X$	:	$Q^{(1/2)}X$
Max. number of singular values to employ	:	4
Ratio of lowest/highest singular value	:	5.000000E-07
Record eigenvectors in SVD file	:	yes

Derivatives calculation:-

Param group	Increment type	Increment	Increment low bound	Forward or central switch	Multiplier (central)	Method (central)
pgnam	relative	1.0000E-02	none		1.500	parabolic

Parameter definitions:-

Name	Trans-formation	Change limit	Initial value	Lower bound	Upper bound
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74	h1	log	factor	33.0000	30.0000	50.0000
75	s1	log	factor	510.000	1.00000	5000.00
76	p1	log	factor	0.800000	0.100000	0.999000
77	o1	log	factor	7.500000E-04	1.000000E-10	1.000000E-02
78						
79	Name	Group	Scale	Offset	Model command number	
80	h1	pgram	1.00000	0.00000	1	
81	s1	pgram	1.00000	0.00000	0	
82	p1	pgram	1.00000	0.00000	1	
83	o1	pgram	1.00000	0.00000	0	
84						
85						
86	Prior information:-					
87						
88	No prior information supplied					
89						
90						
91	Observations:-					
92						
93	Observation name	Observation	Weight	Group		
94	o1	5.186150E-16	1.000	conc		
95	o2	6.614330E-16	1.000	conc		
96	o3	6.755630E-16	1.000	conc		
97	o4	2.107200E-14	1.000	conc		
98	o5	0.00000	1.000	conc		
99	o6	3.543900E-13	1.000	conc		
100	o7	0.00000	1.000	conc		
101	o8	4.614550E-12	1.000	conc		
102	o9	0.00000	1.000	conc		
103	o10	4.829760E-11	1.000	conc		
104	o11	0.00000	1.000	conc		
105	o12	3.682830E-10	1.000	conc		
106	o13	2.847080E-10	1.000	conc		
107	o14	1.012680E-09	1.000	conc		
108	o15	1.234790E-08	1.000	conc		
109	o16	0.00000	1.000	conc		
110	o17	2.207160E-07	1.000	conc		
111	o18	0.00000	1.000	conc		
112	o19	2.982970E-06	1.000	conc		
113	o20	0.00000	1.000	conc		
114	o21	3.844780E-05	1.000	conc		
115	o22	1.332810E-04	1.000	conc		
116	o23	4.524700E-05	1.000	conc		
117	o24	0.00000	1.000	conc		
118	o25	0.00000	1.000	conc		
119	o26	3.313920E-03	1.000	conc		
120	o27	4.709680E-03	1.000	conc		
121	o28	3.738630E-03	1.000	conc		
122	o29	0.00000	1.000	conc		
123	o30	0.795515	1.000	conc		
124	o31	0.00000	1.000	conc		
125	o32	18.0567	1.000	conc		
126	o33	0.00000	1.000	conc		
127	o34	158.617	1.000	conc		
128	o35	1021.51	1.000	conc		
129	o36	25461.2	1.000	conc		
130	o37	54889.1	1.000	conc		
131	o38	123252.	1.000	conc		
132	o39	439629.	1.000	conc		
133	o40	997271.	1.000	conc		
134	o41	1.774430E+06	1.000	conc		
135	o42	2.486710E+06	1.000	conc		
136	o43	4.526740E+06	1.000	conc		
137	o44	1.324490E+07	1.000	conc		
138	o45	1.652660E+07	1.000	conc		
139	o46	1.706350E+07	1.000	conc		
140	o47	1.896430E+07	1.000	conc		
141	o48	2.344730E+07	1.000	conc		
142	o49	1.701390E+07	1.000	conc		
143	o50	7.951230E+06	1.000	conc		
144	o51	9.231250E+06	1.000	conc		
145	o52	8.369040E+06	1.000	conc		
146	o53	7.774150E+06	1.000	conc		

147	o54	1.047680E+07	1.000	conc
148	o55	1.058310E+07	1.000	conc
149	o56	7.333510E+06	1.000	conc
150	o57	6.669610E+06	1.000	conc
151	o58	5.939640E+06	1.000	conc
152	o59	9.578960E+06	1.000	conc
153	o60	1.000890E+07	1.000	conc
154	o61	9.376560E+06	1.000	conc
155	o62	1.006980E+07	1.000	conc
156	o63	4.971070E+06	1.000	conc
157	o64	2.447770E+06	1.000	conc
158	o65	3.784400E+06	1.000	conc
159	o66	9.389320E+06	1.000	conc
160	o67	1.016350E+07	1.000	conc
161	o68	5.345640E+06	1.000	conc
162	o69	5.859810E+06	1.000	conc
163	o70	5.246670E+06	1.000	conc
164	o71	6.640150E+06	1.000	conc
165	o72	5.332380E+06	1.000	conc
166	o73	3.356340E+06	1.000	conc
167	o74	2.774270E+06	1.000	conc
168	o75	2.385890E+06	1.000	conc
169	o76	2.952400E+06	1.000	conc
170	o77	2.057460E+06	1.000	conc
171	o78	1.584830E+06	1.000	conc
172	o79	2.916260E+06	1.000	conc
173	o80	2.096230E+06	1.000	conc
174	o81	2.504470E+06	1.000	conc
175	o82	1.829420E+06	1.000	conc
176	o83	830066.	1.000	conc
177	o84	2.518770E+06	1.000	conc
178	o85	2.285180E+06	1.000	conc
179	o86	1.772680E+06	1.000	conc
180	o87	1.961070E+06	1.000	conc
181	o88	1.718450E+06	1.000	conc
182	o89	1.663840E+06	1.000	conc
183	o90	1.764140E+06	1.000	conc
184	o91	1.492310E+06	1.000	conc
185	o92	1.283080E+06	1.000	conc
186	o93	1.473610E+06	1.000	conc
187	o94	1.738380E+06	1.000	conc
188	o95	1.675570E+06	1.000	conc
189	o96	1.604000E+06	1.000	conc
190	o97	889930.	1.000	conc
191	o98	0.00000	1.000	conc
192	o99	0.00000	1.000	conc
193	o100	955486.	1.000	conc
194	o101	1.738130E+06	1.000	conc
195	o102	310564.	1.000	conc
196	o103	0.00000	1.000	conc
197	o104	202705.	1.000	conc
198	o105	166223.	1.000	conc
199	o106	110561.	1.000	conc
200	o107	86750.9	1.000	conc
201	o108	80882.2	1.000	conc
202	o109	89213.7	1.000	conc
203	o110	113375.	1.000	conc
204	o111	136223.	1.000	conc
205	o112	138918.	1.000	conc
206	o113	121682.	1.000	conc
207	o114	121917.	1.000	conc
208	o115	140363.	1.000	conc
209	o116	138477.	1.000	conc
210	o117	118625.	1.000	conc
211	o118	103562.	1.000	conc
212	o119	101237.	1.000	conc
213	o120	107748.	1.000	conc
214	o121	102626.	1.000	conc
215	o122	75468.0	1.000	conc
216	o123	61503.4	1.000	conc
217	o124	76858.3	1.000	conc
218	o125	83796.5	1.000	conc
219	o126	75864.9	1.000	conc

220	o127	78627.1	1.000	conc
221	o128	82993.1	1.000	conc
222	o129	70929.6	1.000	conc
223	o130	61300.5	1.000	conc
224	o131	66857.4	1.000	conc
225	o132	70288.6	1.000	conc
226	o133	58739.3	1.000	conc
227	o134	46363.6	1.000	conc
228	o135	48146.6	1.000	conc
229	o136	69423.2	1.000	conc
230	o137	90789.1	1.000	conc
231	o138	78851.6	1.000	conc
232	o139	55522.4	1.000	conc
233	o140	56299.4	1.000	conc
234	o141	72537.0	1.000	conc
235	o142	86973.6	1.000	conc
236	o143	84790.9	1.000	conc
237	o144	62089.3	1.000	conc
238	o145	47548.6	1.000	conc
239	o146	52955.3	1.000	conc
240	o147	55351.2	1.000	conc
241	o148	51979.7	1.000	conc
242	o149	55427.2	1.000	conc
243	o150	53199.8	1.000	conc
244	o151	33000.8	1.000	conc
245	o152	18162.2	1.000	conc
246	o153	22739.4	1.000	conc
247	o154	33621.3	1.000	conc
248	o155	39197.2	1.000	conc
249	o156	39125.2	1.000	conc
250	o157	35025.4	1.000	conc
251	o158	28518.2	1.000	conc
252	o159	21223.7	1.000	conc
253	o160	14762.2	1.000	conc
254	o161	10753.4	1.000	conc
255	o162	10066.4	1.000	conc
256	o163	11344.4	1.000	conc
257	o164	13039.5	1.000	conc
258	o165	14764.0	1.000	conc
259	o166	16068.4	1.000	conc
260	o167	15455.8	1.000	conc
261	o168	14663.3	1.000	conc
262	o169	19091.1	1.000	conc
263	o170	24352.6	1.000	conc
264	o171	21494.7	1.000	conc
265	o172	14671.8	1.000	conc
266	o173	10655.3	1.000	conc
267	o174	10844.5	1.000	conc
268	o175	14963.9	1.000	conc
269	o176	19019.4	1.000	conc
270	o177	19892.0	1.000	conc
271	o178	19083.0	1.000	conc
272	o179	18695.9	1.000	conc
273	o180	20563.9	1.000	conc
274	o181	24196.4	1.000	conc
275	o182	27794.8	1.000	conc
276	o183	30310.9	1.000	conc
277	o184	31421.3	1.000	conc
278	o185	31982.9	1.000	conc
279	o186	31860.6	1.000	conc
280	o187	25884.9	1.000	conc
281	o188	13221.5	1.000	conc
282	o189	4834.01	1.000	conc
283	o190	5004.64	1.000	conc
284	o191	9007.62	1.000	conc
285	o192	11966.3	1.000	conc
286	o193	12294.3	1.000	conc
287	o194	22618.7	1.000	conc
288	o195	46542.1	1.000	conc
289	o196	59116.4	1.000	conc
290	o197	54086.6	1.000	conc
291	o198	49842.9	1.000	conc
292	o199	49878.8	1.000	conc

293	o200	48086.8	1.000	conc
294	o201	45371.6	1.000	conc
295	o202	48500.7	1.000	conc
296	o203	52492.5	1.000	conc
297	o204	49431.0	1.000	conc
298	o205	45507.9	1.000	conc
299	o206	45413.5	1.000	conc
300	o207	43509.8	1.000	conc
301	o208	39265.3	1.000	conc
302	o209	38196.0	1.000	conc
303	o210	39207.9	1.000	conc
304	o211	37626.7	1.000	conc
305	o212	34032.5	1.000	conc
306	o213	33337.7	1.000	conc
307	o214	36078.7	1.000	conc
308	o215	39600.7	1.000	conc
309	o216	37543.5	1.000	conc
310	o217	30230.7	1.000	conc
311	o218	31305.9	1.000	conc
312	o219	39101.2	1.000	conc
313	o220	37756.0	1.000	conc
314	o221	29402.1	1.000	conc
315	o222	25088.1	1.000	conc
316	o223	26564.8	1.000	conc
317	o224	28123.6	1.000	conc
318	o225	27390.2	1.000	conc
319	o226	24404.7	1.000	conc
320	o227	22055.8	1.000	conc
321	o228	21263.4	1.000	conc
322	o229	18848.2	1.000	conc
323	o230	16756.2	1.000	conc
324	o231	20731.4	1.000	conc
325	o232	27836.6	1.000	conc
326	o233	31507.7	1.000	conc
327	o234	32254.2	1.000	conc
328	o235	34888.8	1.000	conc
329	o236	36437.5	1.000	conc
330	o237	33037.8	1.000	conc
331	o238	27844.2	1.000	conc
332	o239	23663.0	1.000	conc
333	o240	20639.0	1.000	conc
334	o241	18686.5	1.000	conc
335	o242	17719.8	1.000	conc
336	o243	17653.0	1.000	conc
337	o244	18400.6	1.000	conc
338	o245	19876.7	1.000	conc
339	o246	21947.8	1.000	conc
340	o247	22959.0	1.000	conc
341	o248	19972.5	1.000	conc
342	o249	15696.4	1.000	conc
343	o250	14824.8	1.000	conc
344	o251	14163.1	1.000	conc
345	o252	10938.9	1.000	conc
346	o253	9297.15	1.000	conc
347	o254	10474.8	1.000	conc
348	o255	10806.7	1.000	conc
349	o256	8796.51	1.000	conc
350	o257	8014.11	1.000	conc
351	o258	9493.13	1.000	conc
352	o259	11093.2	1.000	conc
353	o260	13360.3	1.000	conc
354	o261	17159.2	1.000	conc
355	o262	17469.6	1.000	conc
356	o263	12117.2	1.000	conc
357	o264	8708.14	1.000	conc
358	o265	10278.4	1.000	conc
359	o266	13136.8	1.000	conc
360	o267	14682.0	1.000	conc
361	o268	15092.5	1.000	conc
362	o269	14703.9	1.000	conc
363	o270	13870.6	1.000	conc
364	o271	14481.2	1.000	conc
365	o272	17999.1	1.000	conc

366	o273	20879.1	1.000	conc
367	o274	20813.3	1.000	conc
368	o275	20470.0	1.000	conc
369	o276	20325.7	1.000	conc
370	o277	17950.9	1.000	conc
371	o278	13279.2	1.000	conc
372	o279	10433.2	1.000	conc
373	o280	10368.9	1.000	conc
374	o281	10902.9	1.000	conc
375	o282	10993.4	1.000	conc
376	o283	10436.0	1.000	conc
377	o284	9908.35	1.000	conc
378	o285	9893.18	1.000	conc
379	o286	10141.9	1.000	conc
380	o287	10404.2	1.000	conc
381	o288	10507.0	1.000	conc
382	o289	10500.4	1.000	conc
383	o290	10687.5	1.000	conc
384	o291	11015.6	1.000	conc
385	o292	11336.7	1.000	conc
386	o293	11502.8	1.000	conc
387	o294	11425.5	1.000	conc
388	o295	11217.6	1.000	conc
389	o296	11033.7	1.000	conc
390	o297	11018.9	1.000	conc
391	o298	11137.2	1.000	conc
392	o299	11192.9	1.000	conc
393	o300	10984.6	1.000	conc
394	o301	10377.9	1.000	conc
395	o302	9476.11	1.000	conc
396	o303	8435.45	1.000	conc
397	o304	7412.14	1.000	conc
398	o305	6542.14	1.000	conc
399	o306	5899.57	1.000	conc
400	o307	5546.75	1.000	conc
401	o308	5538.49	1.000	conc
402	o309	5808.09	1.000	conc
403	o310	6190.55	1.000	conc
404	o311	6518.06	1.000	conc
405	o312	6669.54	1.000	conc
406	o313	6674.79	1.000	conc
407	o314	6594.03	1.000	conc
408	o315	6487.49	1.000	conc
409	o316	6423.96	1.000	conc
410	o317	6495.94	1.000	conc
411	o318	6800.02	1.000	conc
412	o319	7419.38	1.000	conc
413	o320	8246.96	1.000	conc
414	o321	9034.60	1.000	conc
415	o322	9530.89	1.000	conc
416	o323	9568.11	1.000	conc
417	o324	9223.84	1.000	conc
418	o325	8620.39	1.000	conc
419	o326	7880.08	1.000	conc
420	o327	7125.52	1.000	conc
421	o328	6480.04	1.000	conc
422	o329	6067.10	1.000	conc
423	o330	5990.81	1.000	conc
424	o331	6113.39	1.000	conc
425	o332	6132.63	1.000	conc
426	o333	5743.19	1.000	conc
427	o334	4692.77	1.000	conc
428	o335	3278.84	1.000	conc
429	o336	2124.16	1.000	conc
430	o337	1855.75	1.000	conc
431	o338	2987.66	1.000	conc
432	o339	5053.39	1.000	conc
433	o340	7082.62	1.000	conc
434	o341	8104.81	1.000	conc
435	o342	7667.29	1.000	conc
436	o343	6347.40	1.000	conc
437	o344	4844.30	1.000	conc
438	o345	3800.34	1.000	conc

439	o346	3332.00	1.000	conc
440	o347	3271.28	1.000	conc
441	o348	3447.37	1.000	conc
442	o349	3697.06	1.000	conc
443	o350	3916.26	1.000	conc
444	o351	4028.66	1.000	conc
445	o352	3958.99	1.000	conc
446	o353	3720.92	1.000	conc
447	o354	3489.71	1.000	conc
448	o355	3457.76	1.000	conc
449	o356	3786.29	1.000	conc
450	o357	4378.55	1.000	conc
451	o358	5010.24	1.000	conc
452	o359	5456.18	1.000	conc
453	o360	5519.01	1.000	conc
454	o361	5196.47	1.000	conc
455	o362	4569.70	1.000	conc
456	o363	3720.87	1.000	conc
457	o364	2783.53	1.000	conc
458	o365	1976.63	1.000	conc
459	o366	1527.18	1.000	conc
460	o367	1625.43	1.000	conc
461	o368	2187.95	1.000	conc
462	o369	3007.88	1.000	conc
463	o370	3877.77	1.000	conc
464	o371	4609.32	1.000	conc
465	o372	5135.25	1.000	conc
466	o373	5435.37	1.000	conc
467	o374	5489.98	1.000	conc
468	o375	5300.82	1.000	conc
469	o376	4902.23	1.000	conc
470	o377	4331.65	1.000	conc
471	o378	3660.98	1.000	conc
472	o379	3025.59	1.000	conc
473	o380	2567.69	1.000	conc
474	o381	2416.88	1.000	conc
475	o382	2596.80	1.000	conc
476	o383	3077.96	1.000	conc
477	o384	3830.52	1.000	conc
478	o385	4812.50	1.000	conc
479	o386	5895.83	1.000	conc
480	o387	6915.08	1.000	conc
481	o388	7705.17	1.000	conc
482	o389	8137.47	1.000	conc
483	o390	8144.74	1.000	conc
484	o391	7665.61	1.000	conc
485	o392	6666.14	1.000	conc
486	o393	5319.59	1.000	conc
487	o394	3893.92	1.000	conc
488	o395	2657.58	1.000	conc
489	o396	1843.08	1.000	conc
490	o397	1452.31	1.000	conc
491	o398	1396.14	1.000	conc
492	o399	1586.28	1.000	conc
493	o400	1996.92	1.000	conc
494	o401	2698.55	1.000	conc
495	o402	3769.91	1.000	conc
496	o403	5245.89	1.000	conc
497	o404	6863.28	1.000	conc
498	o405	8234.65	1.000	conc
499	o406	8972.15	1.000	conc
500	o407	8786.59	1.000	conc
501	o408	7959.86	1.000	conc
502	o409	6978.88	1.000	conc
503	o410	6322.32	1.000	conc
504	o411	6064.89	1.000	conc
505	o412	5710.94	1.000	conc
506	o413	4721.68	1.000	conc
507	o414	2762.35	1.000	conc
508	o415	750.199	1.000	conc
509	o416	77.2322	1.000	conc
510	o417	2136.35	1.000	conc
511	o418	6022.50	1.000	conc

512	o419	6694.25	1.000	conc
513	o420	5144.10	1.000	conc
514	o421	2885.38	1.000	conc
515	o422	1382.02	1.000	conc
516	o423	1080.33	1.000	conc
517	o424	1470.63	1.000	conc
518	o425	2006.22	1.000	conc
519	o426	2257.46	1.000	conc
520	o427	2243.07	1.000	conc
521	o428	2089.08	1.000	conc
522	o429	1918.42	1.000	conc
523	o430	1783.93	1.000	conc
524	o431	1669.31	1.000	conc
525	o432	1555.32	1.000	conc
526	o433	1425.76	1.000	conc
527	o434	1318.85	1.000	conc
528	o435	1319.69	1.000	conc
529	o436	1514.93	1.000	conc
530	o437	1927.13	1.000	conc
531	o438	2356.48	1.000	conc
532	o439	2554.99	1.000	conc
533	o440	2290.19	1.000	conc
534	o441	1630.71	1.000	conc
535	o442	917.822	1.000	conc
536	o443	502.633	1.000	conc
537	o444	710.489	1.000	conc
538	o445	1465.38	1.000	conc
539	o446	2374.01	1.000	conc
540	o447	3034.49	1.000	conc
541	o448	3179.19	1.000	conc
542	o449	2963.08	1.000	conc
543	o450	2624.07	1.000	conc
544	o451	2389.02	1.000	conc
545	o452	2299.28	1.000	conc
546	o453	2242.04	1.000	conc
547	o454	2099.86	1.000	conc
548	o455	1768.94	1.000	conc
549	o456	1332.86	1.000	conc
550	o457	1010.96	1.000	conc
551	o458	1025.49	1.000	conc
552	o459	1485.10	1.000	conc
553	o460	2173.72	1.000	conc
554	o461	2817.71	1.000	conc
555	o462	3158.16	1.000	conc
556	o463	3153.43	1.000	conc
557	o464	2927.44	1.000	conc
558	o465	2608.26	1.000	conc
559	o466	2318.46	1.000	conc
560	o467	2114.00	1.000	conc
561	o468	2006.63	1.000	conc
562	o469	2007.23	1.000	conc
563	o470	2111.33	1.000	conc
564	o471	2274.46	1.000	conc
565	o472	2445.72	1.000	conc
566	o473	2576.12	1.000	conc
567	o474	2641.08	1.000	conc
568	o475	2633.07	1.000	conc
569	o476	2544.91	1.000	conc
570	o477	2374.42	1.000	conc
571	o478	2172.82	1.000	conc
572	o479	2023.83	1.000	conc
573	o480	2011.43	1.000	conc
574	o481	2162.14	1.000	conc
575	o482	2366.61	1.000	conc
576	o483	2495.85	1.000	conc
577	o484	2434.78	1.000	conc
578	o485	2228.21	1.000	conc
579	o486	2023.19	1.000	conc
580	o487	1968.43	1.000	conc
581	o488	2188.95	1.000	conc
582	o489	2582.80	1.000	conc
583	o490	2921.79	1.000	conc
584	o491	2977.08	1.000	conc



585	o492	2650.13	1.000	conc
586	o493	2123.20	1.000	conc
587	o494	1615.08	1.000	conc
588	o495	1326.27	1.000	conc
589	o496	1270.57	1.000	conc
590	o497	1352.40	1.000	conc
591	o498	1474.85	1.000	conc
592	o499	1549.54	1.000	conc
593	o500	1561.66	1.000	conc

594  
595

596 Control settings:-

597

598	Initial lambda	:	10.000
599	Lambda adjustment factor	:	2.0000
600	Sufficient new/old phi ratio per optimisation iteration	:	0.30000
601	Limiting relative phi reduction between lambdas	:	1.00000E-02
602	Maximum trial lambdas per iteration	:	8
603	Forgive model run failure during lamda testing	:	yes
604	Forgive model run failure during Jacobian runs	:	yes
605			
606	Perform Broyden's update of Jacobian matrix	:	no
607	Undertake observation re-referencing	:	no
608			
609	Maximum factor parameter change (factor-limited changes)	:	10.000
610	Maximum relative parameter change (relative-limited changes)	:	na
611	Fraction of initial parameter values used in computing		
612	change limit for near-zero parameters	:	1.00000E-03
613	Allow bending of parameter upgrade vector	:	no
614	Allow parameters to stick to their bounds	:	no
615			
616	Relative phi reduction below which to begin use of		
617	central derivatives	:	0.10000
618	Iteration at which to first consider derivatives switch	:	1
619			
620	Relative phi reduction indicating convergence	:	0.50000E-02
621	Number of phi values required within this range	:	4
622	Maximum number of consecutive failures to lower phi	:	4
623	Minimal relative parameter change indicating convergence	:	0.50000E-02
624	Number of consecutive iterations with minimal param change	:	4
625	Maximum number of optimisation iterations	:	200
626			
627	Attempt automatic user intervention	:	no
628			
629	Attempt reuse of parameter sensitivities	:	no
630			
631	Scale parameters by their bounds	:	yes

632  
633

634 File saving options: -

635

636	Save best JCO file	:	yes
637	Save multiple JCO files	:	no
638	Save multiple REI files	:	no
639	Save multiple PAR files	:	yes

640  
641

# OPTIMISATION RECORD

642  
643

644 INITIAL CONDITIONS:

645 Sum of squared weighted residuals (ie phi) = 4.78192E+14

646  
647

648	Current parameter values	
649	h1	33.0000
650	s1	510.000
651	p1	0.800000
652	o1	7.500000E-04

653  
654

655	OPTIMISATION ITERATION NO.	:	1
656	Model calls so far	:	1
657	Derivative model calls so far	:	0

```

658 Starting phi for this iteration: 4.78192E+14
659
660 Lambda = 10.000 ----->
661 Phi = 3.79929E+14 ( 0.795 of starting phi)
662
663 Lambda = 5.0000 ----->
664 Phi = 3.79929E+14 ( 0.795 of starting phi)
665
666 No more lambdas: relative phi reduction between lambdas less than 0.0100
667 Lowest phi this iteration: 3.79929E+14
668
669 Current parameter values Previous parameter values
670 h1 34.4779 h1 33.0000
671 s1 1532.35 s1 510.000
672 p1 0.810216 p1 0.800000
673 o1 4.496110E-04 o1 7.500000E-04
674 Maximum factor change: 3.005 ["s1"]
675 Maximum relative change: 2.005 ["s1"]
676
677
678 OPTIMISATION ITERATION NO. : 2
679 Model calls so far : 5
680 Derivative model calls so far : 1
681 Starting phi for this iteration: 3.79929E+14
682
683 Lambda = 5.0000 ----->
684 Phi = 2.22370E+14 ( 0.585 of starting phi)
685
686 Lambda = 2.5000 ----->
687 Phi = 2.22370E+14 ( 0.585 of starting phi)
688
689 No more lambdas: relative phi reduction between lambdas less than 0.0100
690 Lowest phi this iteration: 2.22370E+14
691
692 Current parameter values Previous parameter values
693 h1 33.7862 h1 34.4779
694 s1 1396.30 s1 1532.35
695 p1 0.800007 p1 0.810216
696 o1 5.708461E-04 o1 4.496110E-04
697 Maximum factor change: 1.270 ["o1"]
698 Maximum relative change: 0.2696 ["o1"]
699
700
701 OPTIMISATION ITERATION NO. : 3
702 Model calls so far : 9
703 Derivative model calls so far : 2
704 Starting phi for this iteration: 2.22370E+14
705
706 Lambda = 2.5000 ----->
707 Phi = 2.08110E+14 ( 0.936 of starting phi)
708
709 Lambda = 1.2500 ----->
710 Phi = 2.08110E+14 ( 0.936 of starting phi)
711
712 No more lambdas: relative phi reduction between lambdas less than 0.0100
713 Lowest phi this iteration: 2.08110E+14
714 Relative phi reduction between optimisation iterations less than 0.1000
715 Switch to higher order derivatives calculation
716
717 Current parameter values Previous parameter values
718 h1 33.6670 h1 33.7862
719 s1 1782.84 s1 1396.30
720 p1 0.795725 p1 0.800007
721 o1 5.561629E-04 o1 5.708461E-04
722 Maximum factor change: 1.277 ["s1"]
723 Maximum relative change: 0.2768 ["s1"]
724
725
726 OPTIMISATION ITERATION NO. : 4
727 Model calls so far : 13
728 Derivative model calls so far : 3
729 Starting phi for this iteration: 2.08110E+14
730

```

```

731      Lambda = 1.2500      ----->
732      Phi = 2.05750E+14 ( 0.989 of starting phi)
733
734      Lambda = 0.62500      ----->
735      Phi = 2.05750E+14 ( 0.989 of starting phi)
736
737      No more lambdas: relative phi reduction between lambdas less than 0.0100
738      Lowest phi this iteration: 2.05750E+14
739
740      Current parameter values      Previous parameter values
741      h1      33.7425      h1      33.6670
742      s1      1609.73      s1      1782.84
743      p1      0.796664      p1      0.795725
744      o1      5.389217E-04      o1      5.561629E-04
745      Maximum factor change: 1.108      ["s1"]
746      Maximum relative change: 9.7098E-02      ["s1"]
747
748
749      OPTIMISATION ITERATION NO.      : 5
750      Model calls so far      : 19
751      Derivative model calls so far : 4
752      Starting phi for this iteration: 2.05750E+14
753
754      Lambda = 0.62500      ----->
755      Phi = 2.05663E+14 ( 1.000 of starting phi)
756
757      Lambda = 0.31250      ----->
758      Phi = 2.05663E+14 ( 1.000 of starting phi)
759
760      No more lambdas: relative phi reduction between lambdas less than 0.0100
761      Lowest phi this iteration: 2.05663E+14
762
763      Current parameter values      Previous parameter values
764      h1      33.7443      h1      33.7425
765      s1      1641.24      s1      1609.73
766      p1      0.796750      p1      0.796664
767      o1      5.391827E-04      o1      5.389217E-04
768      Maximum factor change: 1.020      ["s1"]
769      Maximum relative change: 1.9577E-02      ["s1"]
770
771
772      OPTIMISATION ITERATION NO.      : 6
773      Model calls so far      : 25
774      Derivative model calls so far : 5
775      Starting phi for this iteration: 2.05663E+14
776
777      Lambda = 0.31250      ----->
778      Phi = 2.05637E+14 ( 1.000 of starting phi)
779
780      Lambda = 0.15625      ----->
781      Phi = 2.05637E+14 ( 1.000 of starting phi)
782
783      No more lambdas: relative phi reduction between lambdas less than 0.0100
784      Lowest phi this iteration: 2.05637E+14
785
786      Current parameter values      Previous parameter values
787      h1      33.7492      h1      33.7443
788      s1      1635.36      s1      1641.24
789      p1      0.796770      p1      0.796750
790      o1      5.381239E-04      o1      5.391827E-04
791      Maximum factor change: 1.004      ["s1"]
792      Maximum relative change: 3.5811E-03      ["s1"]
793
794
795      OPTIMISATION ITERATION NO.      : 7
796      Model calls so far      : 31
797      Derivative model calls so far : 6
798      Starting phi for this iteration: 2.05637E+14
799
800      Lambda = 0.15625      ----->
801      Phi = 2.05640E+14 ( 1.000 times starting phi)
802
803      Lambda = 7.81250E-02 ----->

```

```

804         Phi = 2.05640E+14 ( 1.000 times starting phi)
805
806     No more lambdas: relative phi reduction between lambdas less than 0.0100
807     Lowest phi this iteration: 2.05640E+14
808
809         Current parameter values                Previous parameter values
810         h1                33.7485                h1                33.7492
811         s1                1638.13                s1                1635.36
812         p1                0.796763                p1                0.796770
813         o1                5.383118E-04                o1                5.381239E-04
814     Maximum factor change: 1.002 ["s1"]
815     Maximum relative change: 1.6892E-03 ["s1"]
816
817     Optimisation complete: the 4 lowest phi's are within a relative distance
818                           of eachother of 5.000E-03
819     Total model calls:      37
820
821     The model has been run one final time using best parameters.
822     Thus all model input files contain best parameter values, and model
823     output files contain model results based on these parameters.
824

```

# 825 826 OPTIMISATION RESULTS

```

827
828     Covariance matrix and parameter confidence intervals cannot be determined:-
829     Memory conservation is operative so that covariance matrix is not calculated.
830

```

```

831
832     Parameters ----->
833

```

Parameter	Estimated value
h1	33.7492
s1	1635.36
p1	0.796770
o1	5.381239E-04

```

839
840     See file mfit.sen for parameter sensitivities.
841

```

```

842
843     Observations ----->
844

```

Observation	Measured value	Calculated value	Residual	Weight	Group
o1	5.186150E-16	0.00000	5.186150E-16	1.000	
conc					
o2	6.614330E-16	3.911353-315	6.614330E-16	1.000	
conc					
o3	6.755630E-16	5.911513-284	6.755630E-16	1.000	
conc					
o4	2.107200E-14	2.340870-256	2.107200E-14	1.000	
conc					
o5	0.00000	9.636611-232	-9.636611-232	1.000	
conc					
o6	3.543900E-13	1.078024-209	3.543900E-13	1.000	
conc					
o7	0.00000	7.218103-190	-7.218103-190	1.000	
conc					
o8	4.614550E-12	5.568550-172	4.614550E-12	1.000	
conc					
o9	0.00000	8.560173-156	-8.560173-156	1.000	
conc					
o10	4.829760E-11	4.160521-141	4.829760E-11	1.000	
conc					
o11	0.00000	9.460560-128	-9.460560-128	1.000	
conc					
o12	3.682830E-10	1.406593-115	3.682830E-10	1.000	
conc					
o13	2.847080E-10	1.823221-104	2.847080E-10	1.000	
conc					
o14	1.012680E-09	2.641774E-94	1.012680E-09	1.000	
conc					
o15	1.234790E-08	5.310304E-85	1.234790E-08	1.000	
conc					

862	o16	0.00000	1.787984E-76	-1.787984E-76	1.000
	conc				
863	o17	2.207160E-07	1.189573E-68	2.207160E-07	1.000
	conc				
864	o18	0.00000	1.808766E-61	-1.808766E-61	1.000
	conc				
865	o19	2.982970E-06	7.147952E-55	2.982970E-06	1.000
	conc				
866	o20	0.00000	8.228708E-49	-8.228708E-49	1.000
	conc				
867	o21	3.844780E-05	3.054487E-43	3.844780E-05	1.000
	conc				
868	o22	1.332810E-04	4.003104E-38	1.332810E-04	1.000
	conc				
869	o23	4.524700E-05	2.009114E-33	4.524700E-05	1.000
	conc				
870	o24	0.00000	4.154133E-29	-4.154133E-29	1.000
	conc				
871	o25	0.00000	3.779267E-25	-3.779267E-25	1.000
	conc				
872	o26	3.313920E-03	1.605508E-21	3.313920E-03	1.000
	conc				
873	o27	4.709680E-03	3.361158E-18	4.709680E-03	1.000
	conc				
874	o28	3.738630E-03	3.641499E-15	3.738630E-03	1.000
	conc				
875	o29	0.00000	2.134619E-12	-2.134619E-12	1.000
	conc				
876	o30	0.795515	7.050911E-10	0.795515	1.000
	conc				
877	o31	0.00000	1.362001E-07	-1.362001E-07	1.000
	conc				
878	o32	18.0567	1.591792E-05	18.0567	1.000
	conc				
879	o33	0.00000	1.161262E-03	-1.161262E-03	1.000
	conc				
880	o34	158.617	5.442290E-02	158.563	1.000
	conc				
881	o35	1021.51	1.68244	1019.83	1.000
	conc				
882	o36	25461.2	35.1586	25426.0	1.000
	conc				
883	o37	54889.1	508.042	54381.1	1.000
	conc				
884	o38	123252.	5184.37	118068.	1.000
	conc				
885	o39	439629.	38103.2	401526.	1.000
	conc				
886	o40	997271.	205454.	791817.	1.000
	conc				
887	o41	1.774430E+06	827102.	947328.	1.000
	conc				
888	o42	2.486710E+06	2.528157E+06	-41447.1	1.000
	conc				
889	o43	4.526740E+06	5.965732E+06	-1.438992E+06	1.000
	conc				
890	o44	1.324490E+07	1.105499E+07	2.189910E+06	1.000
	conc				
891	o45	1.652660E+07	1.639246E+07	134145.	1.000
	conc				
892	o46	1.706350E+07	1.989503E+07	-2.831527E+06	1.000
	conc				
893	o47	1.896430E+07	2.036653E+07	-1.402232E+06	1.000
	conc				
894	o48	2.344730E+07	1.834823E+07	5.099067E+06	1.000
	conc				
895	o49	1.701390E+07	1.541077E+07	1.603128E+06	1.000
	conc				
896	o50	7.951230E+06	1.286894E+07	-4.917707E+06	1.000
	conc				
897	o51	9.231250E+06	1.118894E+07	-1.957689E+06	1.000
	conc				
898	o52	8.369040E+06	1.022259E+07	-1.853554E+06	1.000

899	conc o53	7.774150E+06	9.658084E+06	-1.883934E+06	1.000
900	conc o54	1.047680E+07	9.266509E+06	1.210291E+06	1.000
901	conc o55	1.058310E+07	8.935110E+06	1.647990E+06	1.000
902	conc o56	7.333510E+06	8.621998E+06	-1.288488E+06	1.000
903	conc o57	6.669610E+06	8.315177E+06	-1.645567E+06	1.000
904	conc o58	5.939640E+06	8.012312E+06	-2.072672E+06	1.000
905	conc o59	9.578960E+06	7.713532E+06	1.865428E+06	1.000
906	conc o60	1.000890E+07	7.419419E+06	2.589481E+06	1.000
907	conc o61	9.376560E+06	7.130564E+06	2.245996E+06	1.000
908	conc o62	1.006980E+07	6.847483E+06	3.222317E+06	1.000
909	conc o63	4.971070E+06	6.570614E+06	-1.599544E+06	1.000
910	conc o64	2.447770E+06	6.300320E+06	-3.852550E+06	1.000
911	conc o65	3.784400E+06	6.036897E+06	-2.252497E+06	1.000
912	conc o66	9.389320E+06	5.780581E+06	3.608739E+06	1.000
913	conc o67	1.016350E+07	5.531553E+06	4.631947E+06	1.000
914	conc o68	5.345640E+06	5.289944E+06	55695.9	1.000
915	conc o69	5.859810E+06	5.055841E+06	803969.	1.000
916	conc o70	5.246670E+06	4.829291E+06	417379.	1.000
917	conc o71	6.640150E+06	4.610306E+06	2.029844E+06	1.000
918	conc o72	5.332380E+06	4.398868E+06	933512.	1.000
919	conc o73	3.356340E+06	4.194930E+06	-838590.	1.000
920	conc o74	2.774270E+06	3.998421E+06	-1.224151E+06	1.000
921	conc o75	2.385890E+06	3.809249E+06	-1.423359E+06	1.000
922	conc o76	2.952400E+06	3.627303E+06	-674903.	1.000
923	conc o77	2.057460E+06	3.452457E+06	-1.394997E+06	1.000
924	conc o78	1.584830E+06	3.284572E+06	-1.699742E+06	1.000
925	conc o79	2.916260E+06	3.123496E+06	-207236.	1.000
926	conc o80	2.096230E+06	2.969069E+06	-872839.	1.000
927	conc o81	2.504470E+06	2.821122E+06	-316652.	1.000
928	conc o82	1.829420E+06	2.679481E+06	-850061.	1.000
929	conc o83	830066.	2.543967E+06	-1.713901E+06	1.000
930	conc o84	2.518770E+06	2.414397E+06	104373.	1.000
931	conc o85	2.285180E+06	2.290586E+06	-5405.54	1.000
932	conc o86	1.772680E+06	2.172347E+06	-399667.	1.000
933	conc o87	1.961070E+06	2.059495E+06	-98424.8	1.000
934	conc o88	1.718450E+06	1.951842E+06	-233392.	1.000

935	o89 conc	1.663840E+06	1.849204E+06	-185364.	1.000
936	o90 conc	1.764140E+06	1.751397E+06	12742.9	1.000
937	o91 conc	1.492310E+06	1.658240E+06	-165930.	1.000
938	o92 conc	1.283080E+06	1.569554E+06	-286474.	1.000
939	o93 conc	1.473610E+06	1.485164E+06	-11553.6	1.000
940	o94 conc	1.738380E+06	1.404897E+06	333483.	1.000
941	o95 conc	1.675570E+06	1.328586E+06	346984.	1.000
942	o96 conc	1.604000E+06	1.256067E+06	347933.	1.000
943	o97 conc	889930.	1.187179E+06	-297249.	1.000
944	o98 conc	0.00000	1.121767E+06	-1.121767E+06	1.000
945	o99 conc	0.00000	1.059679E+06	-1.059679E+06	1.000
946	o100 conc	955486.	1.000770E+06	-45283.6	1.000
947	o101 conc	1.738130E+06	944895.	793235.	1.000
948	o102 conc	310564.	891920.	-581356.	1.000
949	o103 conc	0.00000	841709.	-841709.	1.000
950	o104 conc	202705.	794136.	-591431.	1.000
951	o105 conc	166223.	749077.	-582854.	1.000
952	o106 conc	110561.	706412.	-595851.	1.000
953	o107 conc	86750.9	666027.	-579276.	1.000
954	o108 conc	80882.2	627813.	-546931.	1.000
955	o109 conc	89213.7	591663.	-502449.	1.000
956	o110 conc	113375.	557475.	-444100.	1.000
957	o111 conc	136223.	525154.	-388931.	1.000
958	o112 conc	138918.	494605.	-355687.	1.000
959	o113 conc	121682.	465738.	-344056.	1.000
960	o114 conc	121917.	438470.	-316553.	1.000
961	o115 conc	140363.	412718.	-272355.	1.000
962	o116 conc	138477.	388404.	-249927.	1.000
963	o117 conc	118625.	365453.	-246828.	1.000
964	o118 conc	103562.	343795.	-240233.	1.000
965	o119 conc	101237.	323361.	-222124.	1.000
966	o120 conc	107748.	304087.	-196339.	1.000
967	o121 conc	102626.	285912.	-183286.	1.000
968	o122 conc	75468.0	268776.	-193308.	1.000
969	o123 conc	61503.4	252624.	-191121.	1.000
970	o124 conc	76858.3	237403.	-160545.	1.000
971	o125	83796.5	223062.	-139265.	1.000

972	conc o126	75864.9	209553.	-133688.	1.000
973	conc o127	78627.1	196830.	-118203.	1.000
974	conc o128	82993.1	184851.	-101858.	1.000
975	conc o129	70929.6	173573.	-102644.	1.000
976	conc o130	61300.5	162959.	-101658.	1.000
977	conc o131	66857.4	152970.	-86112.6	1.000
978	conc o132	70288.6	143572.	-73283.6	1.000
979	conc o133	58739.3	134732.	-75992.5	1.000
980	conc o134	46363.6	126417.	-80053.8	1.000
981	conc o135	48146.6	118599.	-70452.4	1.000
982	conc o136	69423.2	111248.	-41825.2	1.000
983	conc o137	90789.1	104339.	-13549.8	1.000
984	conc o138	78851.6	97845.0	-18993.4	1.000
985	conc o139	55522.4	91742.9	-36220.5	1.000
986	conc o140	56299.4	86009.7	-29710.3	1.000
987	conc o141	72537.0	80624.2	-8087.19	1.000
988	conc o142	86973.6	75566.0	11407.6	1.000
989	conc o143	84790.9	70816.0	13974.9	1.000
990	conc o144	62089.3	66356.2	-4266.87	1.000
991	conc o145	47548.6	62169.4	-14620.8	1.000
992	conc o146	52955.3	58239.5	-5284.22	1.000
993	conc o147	55351.2	54551.4	799.816	1.000
994	conc o148	51979.7	51090.6	889.077	1.000
995	conc o149	55427.2	47843.7	7583.51	1.000
996	conc o150	53199.8	44797.8	8401.99	1.000
997	conc o151	33000.8	41940.9	-8940.14	1.000
998	conc o152	18162.2	39261.7	-21099.5	1.000
999	conc o153	22739.4	36749.5	-14010.1	1.000
1000	conc o154	33621.3	34394.1	-772.809	1.000
1001	conc o155	39197.2	32186.1	7011.09	1.000
1002	conc o156	39125.2	30116.5	9008.66	1.000
1003	conc o157	35025.4	28177.0	6848.42	1.000
1004	conc o158	28518.2	26359.5	2158.71	1.000
1005	conc o159	21223.7	24656.6	-3432.90	1.000
1006	conc o160	14762.2	23061.3	-8299.10	1.000
1007	conc o161	10753.4	21567.0	-10813.6	1.000



1008	o162 conc	10066.4	20167.4	-10101.0	1.000
1009	o163 conc	11344.4	18856.7	-7512.33	1.000
1010	o164 conc	13039.5	17629.5	-4589.96	1.000
1011	o165 conc	14764.0	16480.4	-1716.43	1.000
1012	o166 conc	16068.4	15404.8	663.635	1.000
1013	o167 conc	15455.8	14397.9	1057.90	1.000
1014	o168 conc	14663.3	13455.6	1207.75	1.000
1015	o169 conc	19091.1	12573.7	6517.42	1.000
1016	o170 conc	24352.6	11748.5	12604.1	1.000
1017	o171 conc	21494.7	10976.4	10518.3	1.000
1018	o172 conc	14671.8	10254.2	4417.64	1.000
1019	o173 conc	10655.3	9578.53	1076.77	1.000
1020	o174 conc	10844.5	8946.61	1897.89	1.000
1021	o175 conc	14963.9	8355.63	6608.27	1.000
1022	o176 conc	19019.4	7802.99	11216.4	1.000
1023	o177 conc	19892.0	7286.26	12605.7	1.000
1024	o178 conc	19083.0	6803.15	12279.8	1.000
1025	o179 conc	18695.9	6351.53	12344.4	1.000
1026	o180 conc	20563.9	5929.38	14634.5	1.000
1027	o181 conc	24196.4	5534.82	18661.6	1.000
1028	o182 conc	27794.8	5166.09	22628.7	1.000
1029	o183 conc	30310.9	4821.51	25489.4	1.000
1030	o184 conc	31421.3	4499.55	26921.7	1.000
1031	o185 conc	31982.9	4198.75	27784.2	1.000
1032	o186 conc	31860.6	3917.73	27942.9	1.000
1033	o187 conc	25884.9	3655.24	22229.7	1.000
1034	o188 conc	13221.5	3410.06	9811.44	1.000
1035	o189 conc	4834.01	3181.07	1652.94	1.000
1036	o190 conc	5004.64	2967.23	2037.41	1.000
1037	o191 conc	9007.62	2767.55	6240.07	1.000
1038	o192 conc	11966.3	2581.11	9385.19	1.000
1039	o193 conc	12294.3	2407.05	9887.25	1.000
1040	o194 conc	22618.7	2244.56	20374.1	1.000
1041	o195 conc	46542.1	2092.88	44449.2	1.000
1042	o196 conc	59116.4	1951.30	57165.1	1.000
1043	o197 conc	54086.6	1819.17	52267.4	1.000
1044	o198	49842.9	1695.87	48147.0	1.000

1045	conc o199	49878.8	1580.81	48298.0	1.000
1046	conc o200	48086.8	1473.45	46613.4	1.000
1047	conc o201	45371.6	1373.28	43998.3	1.000
1048	conc o202	48500.7	1279.83	47220.9	1.000
1049	conc o203	52492.5	1192.66	51299.8	1.000
1050	conc o204	49431.0	1111.35	48319.7	1.000
1051	conc o205	45507.9	1035.51	44472.4	1.000
1052	conc o206	45413.5	964.783	44448.7	1.000
1053	conc o207	43509.8	898.825	42611.0	1.000
1054	conc o208	39265.3	837.320	38428.0	1.000
1055	conc o209	38196.0	779.972	37416.0	1.000
1056	conc o210	39207.9	726.504	38481.4	1.000
1057	conc o211	37626.7	676.658	36950.0	1.000
1058	conc o212	34032.5	630.190	33402.3	1.000
1059	conc o213	33337.7	586.876	32750.8	1.000
1060	conc o214	36078.7	546.504	35532.2	1.000
1061	conc o215	39600.7	508.877	39091.8	1.000
1062	conc o216	37543.5	473.811	37069.7	1.000
1063	conc o217	30230.7	441.134	29789.6	1.000
1064	conc o218	31305.9	410.686	30895.2	1.000
1065	conc o219	39101.2	382.315	38718.9	1.000
1066	conc o220	37756.0	355.883	37400.1	1.000
1067	conc o221	29402.1	331.258	29070.8	1.000
1068	conc o222	25088.1	308.319	24779.8	1.000
1069	conc o223	26564.8	286.951	26277.8	1.000
1070	conc o224	28123.6	267.048	27856.6	1.000
1071	conc o225	27390.2	248.511	27141.7	1.000
1072	conc o226	24404.7	231.247	24173.5	1.000
1073	conc o227	22055.8	215.171	21840.6	1.000
1074	conc o228	21263.4	200.200	21063.2	1.000
1075	conc o229	18848.2	186.260	18661.9	1.000
1076	conc o230	16756.2	173.282	16582.9	1.000
1077	conc o231	20731.4	161.198	20570.2	1.000
1078	conc o232	27836.6	149.949	27686.7	1.000
1079	conc o233	31507.7	139.477	31368.2	1.000
1080	conc o234	32254.2	129.730	32124.5	1.000
	conc				

1081	o235 conc	34888.8	120.657	34768.1	1.000
1082	o236 conc	36437.5	112.212	36325.3	1.000
1083	o237 conc	33037.8	104.353	32933.4	1.000
1084	o238 conc	27844.2	97.0390	27747.2	1.000
1085	o239 conc	23663.0	90.2330	23572.8	1.000
1086	o240 conc	20639.0	83.8999	20555.1	1.000
1087	o241 conc	18686.5	78.0072	18608.5	1.000
1088	o242 conc	17719.8	72.5247	17647.3	1.000
1089	o243 conc	17653.0	67.4239	17585.6	1.000
1090	o244 conc	18400.6	62.6788	18337.9	1.000
1091	o245 conc	19876.7	58.2646	19818.4	1.000
1092	o246 conc	21947.8	54.1585	21893.6	1.000
1093	o247 conc	22959.0	50.3393	22908.7	1.000
1094	o248 conc	19972.5	46.7871	19925.7	1.000
1095	o249 conc	15696.4	43.4834	15652.9	1.000
1096	o250 conc	14824.8	40.4109	14784.4	1.000
1097	o251 conc	14163.1	37.5538	14125.5	1.000
1098	o252 conc	10938.9	34.8969	10904.0	1.000
1099	o253 conc	9297.15	32.4265	9264.72	1.000
1100	o254 conc	10474.8	30.1295	10444.7	1.000
1101	o255 conc	10806.7	27.9938	10778.7	1.000
1102	o256 conc	8796.51	26.0084	8770.50	1.000
1103	o257 conc	8014.11	24.1626	7989.95	1.000
1104	o258 conc	9493.13	22.4467	9470.68	1.000
1105	o259 conc	11093.2	20.8517	11072.3	1.000
1106	o260 conc	13360.3	19.3692	13340.9	1.000
1107	o261 conc	17159.2	17.9913	17141.2	1.000
1108	o262 conc	17469.6	16.7106	17452.9	1.000
1109	o263 conc	12117.2	15.5204	12101.7	1.000
1110	o264 conc	8708.14	14.4143	8693.73	1.000
1111	o265 conc	10278.4	13.3864	10265.0	1.000
1112	o266 conc	13136.8	12.4313	13124.4	1.000
1113	o267 conc	14682.0	11.5438	14670.5	1.000
1114	o268 conc	15092.5	10.7192	15081.8	1.000
1115	o269 conc	14703.9	9.95306	14693.9	1.000
1116	o270 conc	13870.6	9.24129	13861.4	1.000
1117	o271	14481.2	8.58004	14472.6	1.000

1118	conc o272	17999.1	7.96577	17991.1	1.000
1119	conc o273	20879.1	7.39517	20871.7	1.000
1120	conc o274	20813.3	6.86514	20806.4	1.000
1121	conc o275	20470.0	6.37284	20463.6	1.000
1122	conc o276	20325.7	5.91559	20319.8	1.000
1123	conc o277	17950.9	5.49092	17945.4	1.000
1124	conc o278	13279.2	5.09652	13274.1	1.000
1125	conc o279	10433.2	4.73026	10428.5	1.000
1126	conc o280	10368.9	4.39014	10364.5	1.000
1127	conc o281	10902.9	4.07431	10898.8	1.000
1128	conc o282	10993.4	3.78105	10989.6	1.000
1129	conc o283	10436.0	3.50875	10432.5	1.000
1130	conc o284	9908.35	3.25594	9905.09	1.000
1131	conc o285	9893.18	3.02122	9890.16	1.000
1132	conc o286	10141.9	2.80331	10139.1	1.000
1133	conc o287	10404.2	2.60102	10401.6	1.000
1134	conc o288	10507.0	2.41322	10504.6	1.000
1135	conc o289	10500.4	2.23891	10498.2	1.000
1136	conc o290	10687.5	2.07710	10685.4	1.000
1137	conc o291	11015.6	1.92691	11013.7	1.000
1138	conc o292	11336.7	1.78751	11334.9	1.000
1139	conc o293	11502.8	1.65814	11501.1	1.000
1140	conc o294	11425.5	1.53807	11424.0	1.000
1141	conc o295	11217.6	1.42664	11216.2	1.000
1142	conc o296	11033.7	1.32323	11032.4	1.000
1143	conc o297	11018.9	1.22728	11017.7	1.000
1144	conc o298	11137.2	1.13824	11136.1	1.000
1145	conc o299	11192.9	1.05562	11191.8	1.000
1146	conc o300	10984.6	0.978960	10983.6	1.000
1147	conc o301	10377.9	0.907836	10377.0	1.000
1148	conc o302	9476.11	0.841849	9475.27	1.000
1149	conc o303	8435.45	0.780630	8434.67	1.000
1150	conc o304	7412.14	0.723837	7411.42	1.000
1151	conc o305	6542.14	0.671152	6541.47	1.000
1152	conc o306	5899.57	0.622279	5898.95	1.000
1153	conc o307	5546.75	0.576945	5546.17	1.000
	conc				

1154	o308	5538.49	0.534895	5537.96	1.000
1155	conc o309	5808.09	0.495892	5807.59	1.000
1156	conc o310	6190.55	0.459718	6190.09	1.000
1157	conc o311	6518.06	0.426167	6517.63	1.000
1158	conc o312	6669.54	0.395052	6669.14	1.000
1159	conc o313	6674.79	0.366195	6674.42	1.000
1160	conc o314	6594.03	0.339435	6593.69	1.000
1161	conc o315	6487.49	0.314620	6487.18	1.000
1162	conc o316	6423.96	0.291609	6423.67	1.000
1163	conc o317	6495.94	0.270272	6495.67	1.000
1164	conc o318	6800.02	0.250488	6799.77	1.000
1165	conc o319	7419.38	0.232145	7419.15	1.000
1166	conc o320	8246.96	0.215138	8246.74	1.000
1167	conc o321	9034.60	0.199370	9034.40	1.000
1168	conc o322	9530.89	0.184751	9530.71	1.000
1169	conc o323	9568.11	0.171199	9567.94	1.000
1170	conc o324	9223.84	0.158636	9223.68	1.000
1171	conc o325	8620.39	0.146990	8620.24	1.000
1172	conc o326	7880.08	0.136195	7879.94	1.000
1173	conc o327	7125.52	0.126189	7125.39	1.000
1174	conc o328	6480.04	0.116914	6479.92	1.000
1175	conc o329	6067.10	0.108317	6066.99	1.000
1176	conc o330	5990.81	0.100349	5990.71	1.000
1177	conc o331	6113.39	9.296461E-02	6113.30	1.000
1178	conc o332	6132.63	8.612080E-02	6132.54	1.000
1179	conc o333	5743.19	7.977834E-02	5743.11	1.000
1180	conc o334	4692.77	7.390070E-02	4692.70	1.000
1181	conc o335	3278.84	6.845399E-02	3278.77	1.000
1182	conc o336	2124.16	6.340678E-02	2124.10	1.000
1183	conc o337	1855.75	5.872992E-02	1855.69	1.000
1184	conc o338	2987.66	5.439638E-02	2987.61	1.000
1185	conc o339	5053.39	5.038109E-02	5053.34	1.000
1186	conc o340	7082.62	4.666078E-02	7082.57	1.000
1187	conc o341	8104.81	4.321391E-02	8104.77	1.000
1188	conc o342	7667.29	4.002047E-02	7667.25	1.000
1189	conc o343	6347.40	3.706192E-02	6347.36	1.000
1190	conc o344	4844.30	3.432108E-02	4844.27	1.000

1191	conc o345	3800.34	3.178200E-02	3800.31	1.000
1192	conc o346	3332.00	2.942990E-02	3331.97	1.000
1193	conc o347	3271.28	2.725109E-02	3271.25	1.000
1194	conc o348	3447.37	2.523285E-02	3447.34	1.000
1195	conc o349	3697.06	2.336341E-02	3697.04	1.000
1196	conc o350	3916.26	2.163185E-02	3916.24	1.000
1197	conc o351	4028.66	2.002806E-02	4028.64	1.000
1198	conc o352	3958.99	1.854264E-02	3958.97	1.000
1199	conc o353	3720.92	1.716691E-02	3720.90	1.000
1200	conc o354	3489.71	1.589280E-02	3489.69	1.000
1201	conc o355	3457.76	1.471285E-02	3457.75	1.000
1202	conc o356	3786.29	1.362011E-02	3786.28	1.000
1203	conc o357	4378.55	1.260819E-02	4378.54	1.000
1204	conc o358	5010.24	1.167112E-02	5010.23	1.000
1205	conc o359	5456.18	1.080341E-02	5456.17	1.000
1206	conc o360	5519.01	9.999928E-03	5519.00	1.000
1207	conc o361	5196.47	9.255954E-03	5196.46	1.000
1208	conc o362	4569.70	8.567097E-03	4569.69	1.000
1209	conc o363	3720.87	7.929293E-03	3720.86	1.000
1210	conc o364	2783.53	7.338774E-03	2783.52	1.000
1211	conc o365	1976.63	6.792051E-03	1976.62	1.000
1212	conc o366	1527.18	6.285890E-03	1527.17	1.000
1213	conc o367	1625.43	5.817295E-03	1625.42	1.000
1214	conc o368	2187.95	5.383490E-03	2187.94	1.000
1215	conc o369	3007.88	4.981903E-03	3007.88	1.000
1216	conc o370	3877.77	4.610151E-03	3877.77	1.000
1217	conc o371	4609.32	4.266029E-03	4609.32	1.000
1218	conc o372	5135.25	3.947491E-03	5135.25	1.000
1219	conc o373	5435.37	3.652643E-03	5435.37	1.000
1220	conc o374	5489.98	3.379730E-03	5489.98	1.000
1221	conc o375	5300.82	3.127129E-03	5300.82	1.000
1222	conc o376	4902.23	2.893333E-03	4902.23	1.000
1223	conc o377	4331.65	2.676948E-03	4331.65	1.000
1224	conc o378	3660.98	2.476683E-03	3660.98	1.000
1225	conc o379	3025.59	2.291342E-03	3025.59	1.000
1226	conc o380	2567.69	2.119818E-03	2567.69	1.000

1227	o381 conc	2416.88	1.961085E-03	2416.88	1.000
1228	o382 conc	2596.80	1.814192E-03	2596.80	1.000
1229	o383 conc	3077.96	1.678260E-03	3077.96	1.000
1230	o384 conc	3830.52	1.552475E-03	3830.52	1.000
1231	o385 conc	4812.50	1.436082E-03	4812.50	1.000
1232	o386 conc	5895.83	1.328383E-03	5895.83	1.000
1233	o387 conc	6915.08	1.228731E-03	6915.08	1.000
1234	o388 conc	7705.17	1.136526E-03	7705.17	1.000
1235	o389 conc	8137.47	1.051215E-03	8137.47	1.000
1236	o390 conc	8144.74	9.722848E-04	8144.74	1.000
1237	o391 conc	7665.61	8.992590E-04	7665.61	1.000
1238	o392 conc	6666.14	8.316981E-04	6666.14	1.000
1239	o393 conc	5319.59	7.691947E-04	5319.59	1.000
1240	o394 conc	3893.92	7.113716E-04	3893.92	1.000
1241	o395 conc	2657.58	6.578796E-04	2657.58	1.000
1242	o396 conc	1843.08	6.083957E-04	1843.08	1.000
1243	o397 conc	1452.31	5.626206E-04	1452.31	1.000
1244	o398 conc	1396.14	5.202774E-04	1396.14	1.000
1245	o399 conc	1586.28	4.811098E-04	1586.28	1.000
1246	o400 conc	1996.92	4.448804E-04	1996.92	1.000
1247	o401 conc	2698.55	4.113698E-04	2698.55	1.000
1248	o402 conc	3769.91	3.803745E-04	3769.91	1.000
1249	o403 conc	5245.89	3.517066E-04	5245.89	1.000
1250	o404 conc	6863.28	3.251919E-04	6863.28	1.000
1251	o405 conc	8234.65	3.006692E-04	8234.65	1.000
1252	o406 conc	8972.15	2.779895E-04	8972.15	1.000
1253	o407 conc	8786.59	2.570148E-04	8786.59	1.000
1254	o408 conc	7959.86	2.376172E-04	7959.86	1.000
1255	o409 conc	6978.88	2.196787E-04	6978.88	1.000
1256	o410 conc	6322.32	2.030900E-04	6322.32	1.000
1257	o411 conc	6064.89	1.877497E-04	6064.89	1.000
1258	o412 conc	5710.94	1.735643E-04	5710.94	1.000
1259	o413 conc	4721.68	1.604471E-04	4721.68	1.000
1260	o414 conc	2762.35	1.483180E-04	2762.35	1.000
1261	o415 conc	750.199	1.371028E-04	750.199	1.000
1262	o416 conc	77.2322	1.267328E-04	77.2321	1.000
1263	o417	2136.35	1.171447E-04	2136.35	1.000

1264	conc o418	6022.50	1.082796E-04	6022.50	1.000
1265	conc o419	6694.25	1.000833E-04	6694.25	1.000
1266	conc o420	5144.10	9.250536E-05	5144.10	1.000
1267	conc o421	2885.38	8.549938E-05	2885.38	1.000
1268	conc o422	1382.02	7.902231E-05	1382.02	1.000
1269	conc o423	1080.33	7.303437E-05	1080.33	1.000
1270	conc o424	1470.63	6.749873E-05	1470.63	1.000
1271	conc o425	2006.22	6.238135E-05	2006.22	1.000
1272	conc o426	2257.46	5.765073E-05	2257.46	1.000
1273	conc o427	2243.07	5.327773E-05	2243.07	1.000
1274	conc o428	2089.08	4.923541E-05	2089.08	1.000
1275	conc o429	1918.42	4.549885E-05	1918.42	1.000
1276	conc o430	1783.93	4.204498E-05	1783.93	1.000
1277	conc o431	1669.31	3.885250E-05	1669.31	1.000
1278	conc o432	1555.32	3.590169E-05	1555.32	1.000
1279	conc o433	1425.76	3.317431E-05	1425.76	1.000
1280	conc o434	1318.85	3.065349E-05	1318.85	1.000
1281	conc o435	1319.69	2.832365E-05	1319.69	1.000
1282	conc o436	1514.93	2.617035E-05	1514.93	1.000
1283	conc o437	1927.13	2.418028E-05	1927.13	1.000
1284	conc o438	2356.48	2.234108E-05	2356.48	1.000
1285	conc o439	2554.99	2.064136E-05	2554.99	1.000
1286	conc o440	2290.19	1.907057E-05	2290.19	1.000
1287	conc o441	1630.71	1.761897E-05	1630.71	1.000
1288	conc o442	917.822	1.627754E-05	917.822	1.000
1289	conc o443	502.633	1.503794E-05	502.633	1.000
1290	conc o444	710.489	1.389247E-05	710.489	1.000
1291	conc o445	1465.38	1.283399E-05	1465.38	1.000
1292	conc o446	2374.01	1.185593E-05	2374.01	1.000
1293	conc o447	3034.49	1.095220E-05	3034.49	1.000
1294	conc o448	3179.19	1.011715E-05	3179.19	1.000
1295	conc o449	2963.08	9.345592E-06	2963.08	1.000
1296	conc o450	2624.07	8.632708E-06	2624.07	1.000
1297	conc o451	2389.02	7.974048E-06	2389.02	1.000
1298	conc o452	2299.28	7.365502E-06	2299.28	1.000
1299	conc o453	2242.04	6.803268E-06	2242.04	1.000
	conc				



1300	o454 conc	2099.86	6.283831E-06	2099.86	1.000
1301	o455 conc	1768.94	5.803943E-06	1768.94	1.000
1302	o456 conc	1332.86	5.360602E-06	1332.86	1.000
1303	o457 conc	1010.96	4.951033E-06	1010.96	1.000
1304	o458 conc	1025.49	4.572670E-06	1025.49	1.000
1305	o459 conc	1485.10	4.223143E-06	1485.10	1.000
1306	o460 conc	2173.72	3.900261E-06	2173.72	1.000
1307	o461 conc	2817.71	3.601997E-06	2817.71	1.000
1308	o462 conc	3158.16	3.326481E-06	3158.16	1.000
1309	o463 conc	3153.43	3.071982E-06	3153.43	1.000
1310	o464 conc	2927.44	2.836902E-06	2927.44	1.000
1311	o465 conc	2608.26	2.619763E-06	2608.26	1.000
1312	o466 conc	2318.46	2.419200E-06	2318.46	1.000
1313	o467 conc	2114.00	2.233950E-06	2114.00	1.000
1314	o468 conc	2006.63	2.062849E-06	2006.63	1.000
1315	o469 conc	2007.23	1.904817E-06	2007.23	1.000
1316	o470 conc	2111.33	1.758861E-06	2111.33	1.000
1317	o471 conc	2274.46	1.624059E-06	2274.46	1.000
1318	o472 conc	2445.72	1.499562E-06	2445.72	1.000
1319	o473 conc	2576.12	1.384584E-06	2576.12	1.000
1320	o474 conc	2641.08	1.278398E-06	2641.08	1.000
1321	o475 conc	2633.07	1.180336E-06	2633.07	1.000
1322	o476 conc	2544.91	1.089776E-06	2544.91	1.000
1323	o477 conc	2374.42	1.006146E-06	2374.42	1.000
1324	o478 conc	2172.82	9.289179E-07	2172.82	1.000
1325	o479 conc	2023.83	8.576025E-07	2023.83	1.000
1326	o480 conc	2011.43	7.917482E-07	2011.43	1.000
1327	o481 conc	2162.14	7.309381E-07	2162.14	1.000
1328	o482 conc	2366.61	6.747868E-07	2366.61	1.000
1329	o483 conc	2495.85	6.229382E-07	2495.85	1.000
1330	o484 conc	2434.78	5.750637E-07	2434.78	1.000
1331	o485 conc	2228.21	5.308592E-07	2228.21	1.000
1332	o486 conc	2023.19	4.900443E-07	2023.19	1.000
1333	o487 conc	1968.43	4.523598E-07	1968.43	1.000
1334	o488 conc	2188.95	4.175660E-07	2188.95	1.000
1335	o489 conc	2582.80	3.854419E-07	2582.80	1.000
1336	o490	2921.79	3.557831E-07	2921.79	1.000

1337	conc o491	2977.08	3.284010E-07	2977.08	1.000
1338	conc o492	2650.13	3.031211E-07	2650.13	1.000
1339	conc o493	2123.20	2.797826E-07	2123.20	1.000
1340	conc o494	1615.08	2.582367E-07	1615.08	1.000
1341	conc o495	1326.27	2.383460E-07	1326.27	1.000
1342	conc o496	1270.57	2.199838E-07	1270.57	1.000
1343	conc o497	1352.40	2.030328E-07	1352.40	1.000
1344	conc o498	1474.85	1.873849E-07	1474.85	1.000
1345	conc o499	1549.54	1.729402E-07	1549.54	1.000
1346	conc o500	1561.66	1.596063E-07	1561.66	1.000

1347  
1348 See file mfit.res for more details of residuals in graph-ready format.

1349  
1350 See file mfit.seo for composite observation sensitivities.

1351  
1352  
1353 Objective function ----->

1354  
1355 Sum of squared weighted residuals (ie phi) = 2.0564E+14

1356  
1357  
1358 Correlation Coefficient ----->

1359  
1360 Correlation coefficient = 0.96796

1361  
1362  
1363 Analysis of residuals ----->

1364  
1365 All residuals:-

1366	Number of residuals with non-zero weight	= 500
1367	Mean value of non-zero weighted residuals	= -2.4301E+04
1368	Maximum weighted residual [observation "o48"]	= 5.0991E+06
1369	Minimum weighted residual [observation "o50"]	= -4.9177E+06
1370	Standard variance of weighted residuals	= 4.1459E+11
1371	Standard error of weighted residuals	= 6.4389E+05

1372  
1373 Note: the above variance was obtained by dividing the objective  
1374 function by the number of system degrees of freedom (ie. number of  
1375 observations with non-zero weight plus number of prior information  
1376 articles with non-zero weight minus the number of adjustable parameters.)  
1377 If the degrees of freedom is negative the divisor becomes  
1378 the number of observations with non-zero weight plus the number of  
1379 prior information items with non-zero weight.

1380  
1381  
1382 Covariance and other statistical matrices cannot be determined:-  
1383 Memory conservation is operative so that covariance matrix is not calculated.

1384  
1385