

## MONTHLY TELESEISMIC BULLETIN of SZGRF-ERLANGEN - December 1998

H. Aichele, K. Klinge, R. Hohl

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date          distance backazimut
station time   phase   comp per[s] ampl[nm] magn
. . . . .
SZGRF or NEIC-QED LOCATION
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1998-12-01      D 76.9  AZ 36
  GRA1 01:07:53.8 e P      d Z          mb5.0
  ALIGN 01:07:53.8          T0.9   A12
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1998-12-01      D 89.5  AZ 61
  GRA1 05:31:31.4 i P      d Z          mb5.0
  BEAM 05:31:31.4          T1.0   A11
  GRA1 06:12:32.1 e L      Z T20.8 A124  MS4.3
NEIC: OT 05:18:25.4 13.6N 120.3E dep 33km mb4.9
  MINDORO, PHILIPPINE ISLANDS
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1998-12-01      D 62.5  AZ 81
  GRA1 05:45:40.0 e P      Z          mb5.0
  BEAM 05:45:40.0          T1.3   A12
NEIC: OT 05:35:18.6 27.7N 89.7E dep 33km mb4.9
  BHUTAN
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1998-12-01      D 78.7  AZ358
  GRA1 10:50:40.0 i P      c Z          mb5.8
  BEAM 10:50:40.0          T1.2   A135
  GRA1 10:50:56.7 e (pP)   Z
  GRA1 11:29:27.2 e L      Z T20.8 A355  MS4.7
SZGRF: OT 10:38:46.1 51.9N 165.2W dep 60km
  ALEUTIAN ISLANDS REGION
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1998-12-01      D 97.0  AZ252
  GRA1 16:11:53.4 i P      d Z          mb5.5
  BEAM 16:11:53.4          T1.3   A16
  GRA1 16:12:31.0 e (pP)   Z
NEIC: OT 15:58:36.8 17.7S 69.3W dep161km mb4.9
  PERU-BOLIVIA BORDER REGION
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1998-12-01      D 86.8  AZ289
  GRA1 18:59:05.5 i P      d Z          mb4.9

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BEAM 18:59:05.5 T1.5 A14  
 GRA1 18:59:25.1 e pP Z  
 NEIC: OT 18:46:00.1 15.2N 91.7W dep238km mb4.3  
 MEXICO-GUATEMALA BORDER REGION

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1998-12-01

GRA1 19:35:18.0 e PKPab Z  
 GRA1 20:23:29.1 e L Z T20.7 A93

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1998-12-01 D 56.8 AZ214

GRA1 20:16:43.4 e P Z mb4.6  
 BEAM 20:16:43.4 T1.5 A10

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1998-12-02 D 69.6 AZ 76

GRA1 01:15:12.1 e P Z mb4.6  
 BEAM 01:15:12.1 T1.1 A6

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1998-12-02 D133.1

GRA1 07:30:22.5 e PKPdf Z  
 GRA1 08:25:50.5 e L Z T20.7 A496 MS5.2  
 NEIC: OT 07:11:03.7 33.5S 109.3W dep 10km mb5.4  
 SOUTHERN EAST PACIFIC RISE

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1998-12-02 D 69.9 AZ 73

GRA1 10:21:56.8 e P Z mb4.9  
 BEAM 10:21:56.8 T1.3 A13  
 SZGRF: OT 10:10:49.5  
 YUNNAN PROVINCE, CHINA

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1998-12-02 D 68.6 AZ 77

GRA1 13:35:47.6 i P c Z mb5.3  
 ALIGN 13:35:47.6 T0.9 A16  
 NEIC: OT 13:25:05.4 26.6N 93.4E dep 33km mb4.9  
 NORTHEASTERN INDIA

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1998-12-02

GRA1 16:40:58.9 e PKPab Z

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1998-12-02

GRA1 16:51:56.0 e PKPdf Z

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1998-12-02

GRA1 21:01:49.3 e PKPdf Z

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1998-12-02      D 75.3  AZ124
  GRA1 23:53:07.6 e P      Z      mb5.0
  BEAM 23:53:07.6          T1.3  A21
  GRA1 23:53:19.7 e        Z
  GRA1 23:53:44.1 e        Z
  GRA1 00:26:03.2 e L      Z T18.0 A332 MS4.7
NEIC:  OT 23:41:17.8  9.0S  67.5E dep 10km mb5.1
  MID-INDIAN RIDGE
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1998-12-03      D  5.4
  GRA1 02:24:25.8 e Pn     Z
  GRA1 02:25:26.7 e Sn     N
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1998-12-03      D 13.8  AZ192
  GRA1 16:39:06.2 e P      Z
  GRA1 16:41:41.5 e Sn     Z
  GRA1 16:44:15.1 e L      Z T18.9 A928 MS3.9
NEIC:  OT 16:35:45.7 36.1N  8.8E dep 10km
  TUNISIA
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1998-12-03      D 80.8  AZ 28
  GRA1 20:02:37.7 e P      Z      mb4.6
  BEAM 20:02:37.7          T0.9  A6
NEIC:  OT 19:50:37.7 44.9N 147.5E dep 33km mb5.0
  KURIL ISLANDS
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1998-12-03      D 27.4  AZ274
  GRA1 20:38:26.3 e P      Z      mb4.9
  ALIGN 20:38:26.3          T1.2  A31
  GRA1 20:43:04.8 e S      Z
  GRA1 20:48:07.4 e L      Z T18.4 A336 MS3.9
NEIC:  OT 20:33:00.8 45.4N 25.4W dep 10km mb4.6
  NORTHERN MID-ATLANTIC RIDGE
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1998-12-03
  GRA1 20:54:58.9 e PKPab  Z
NEIC:  OT 20:34:24.5 30.4S 178.1W dep 33km mb5.1
  KERMADEC ISLANDS, NEW ZEALAND
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1998-12-04      D 81.1
  GRA1 03:51:53.8 e P      Z
  GRA1 03:52:33.7 e (pP)  Z
NEIC:  OT 03:39:55.0  6.8N  73.1W dep168km mb4.7
  NORTHERN COLOMBIA
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1998-12-04      D  3.7  409km
  GRA1 04:07:00.2 e Pn     Z      M14.4
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GRA1 04:07:59.2 e Sg E  
 SZGRF: OT 04:06:01.7 51.5N 16.2E dep 1km  
 POLAND

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 1998-12-04

GRA1 05:04:21.2 e (P) Z

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 1998-12-04

GRA1 10:44:31.1 e PKPab Z

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 1998-12-04 D 87.0 AZ 64

GRA1 11:13:04.2 i P c Z mb5.8  
 ALIGN 11:13:04.2 T2.2 A166  
 GRA1 11:13:12.2 e pP Z  
 GRA1 11:13:16.2 e sP Z  
 GRA1 11:16:35.6 e PP Z  
 GRA1 11:54:37.6 e L Z T21.8 A1167 MS5.2  
 NEIC: OT 11:00:17.6 20.0N 120.9E dep 10km mb5.4  
 PHILIPPINE ISLANDS REGION

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 1998-12-04 D 18.6 AZ128

GRA1 16:51:30.6 i P d Z mb4.2  
 ALIGN 16:51:30.6 T0.7 A12  
 GRA1 16:55:01.9 e S Z  
 GRA1 16:59:10.9 e L Z T19.5 A165

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 1998-12-04 D 27.9 AZ275

GRA1 18:55:59.2 i P d Z mb4.9  
 ALIGN 18:55:59.2 T1.2 A22  
 GRA1 19:05:09.4 e L Z T21.9 A343 MS3.9  
 NEIC: OT 18:50:07.8 43.6N 28.8W dep 10km mb4.7  
 NORTHERN MID-ATLANTIC RIDGE

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 1998-12-04 D 78.9 AZ358

GRA1 22:01:24.9 i P d Z mb5.4  
 BEAM 22:01:24.9 T1.4 A56  
 GRA1 22:01:35.2 e pP Z  
 GRA1 22:41:49.9 e L Z T21.0 A174 MS4.4  
 NEIC: OT 21:49:23.3 52.0N 169.5W dep 28km mb5.0  
 FOX ISLANDS, ALEUTIAN ISLANDS

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 1998-12-05 D 79.1 AZ 2

GRA1 01:24:47.1 e P c Z mb5.6  
 BEAM 01:24:47.1 T1.2 A68  
 GRA1 01:25:01.5 e pP Z  
 GRA1 02:05:03.2 e L Z T19.4 A1653 MS5.4

SZGRF: OT 01:12:50.0 51.5N 171.9W dep 50km  
 FOX ISLANDS, ALEUTIAN ISLANDS

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 1998-12-05 D 78.6 AZ167  
 GRA1 05:04:41.1 i P d Z mb4.8  
 ALIGN 05:04:41.1 T1.0 A11

SZGRF: OT 04:52:40.5 28.1S 25.8E dep 33km  
 REPUBLIC OF SOUTH AFRICA

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 1998-12-05 D 22.8 AZ333  
 GRA1 05:22:02.9 e P c Z mb4.6  
 ALIGN 05:22:02.9 T1.8 A36  
 GRA1 05:22:11.1 e (pP) Z  
 GRA1 05:30:13.0 e L Z T19.6 A281 MS3.7  
 SZGRF: OT 05:17:04.2 67.7N 16.6W dep 35km  
 ICELAND REGION

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 1998-12-05  
 GRA1 06:12:05.3 e PKPab Z

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 1998-12-05 D 80.3 AZ 5  
 GRA1 11:05:38.3 e P Z mb4.5  
 BEAM 11:05:38.3 T1.0 A6  
 GRA1 11:05:52.1 e pP Z

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 1998-12-05 D 23.8 AZ334  
 GRA1 14:13:57.9 e P Z mb4.2  
 BEAM 14:13:57.9 T1.7 A15  
 GRA1 14:14:04.4 e pP Z  
 GRA1 14:22:58.2 e L Z T18.5 A55 MS3.1  
 SZGRF: OT 14:08:48.0  
 ICELAND REGION

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 1998-12-05  
 GRA1 19:05:46.7 e PKPab Z

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 1998-12-05 D 59.3 AZ 71  
 GRA1 22:07:34.9 i P c Z mb5.0  
 BEAM 22:07:34.9 T1.2 A19  
 GRA1 22:07:38.9 e pP Z  
 SZGRF: OT 21:57:35.0 34.7N 92.6E dep 14km  
 TSINGHAI PROVINCE, CHINA

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 1998-12-06 D105.0  
 GRA1 01:01:19.7 e Pdiff c Z  
 GRA1 01:04:35.8 e Z

GRA1 01:05:30.2 e PP Z  
GRA1 01:17:09.2 e PKKPbc Z  
GRA1 01:17:26.7 e PKKPdf Z  
GRA1 01:45:01.1 e Z  
GRA1 01:51:04.8 e L Z T21.6 A18062 MS6.6  
NEIC: OT 00:47:13.5 1.3N 126.3E dep 33km mb6.3  
NORTHERN MOLUCCA SEA

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1998-12-06 D 59.3 AZ 70  
GRA1 12:05:58.3 e P c Z mb4.4  
BEAM 12:05:58.3 T0.7 A3  
GRA1 12:06:02.5 e pP Z  
SZGRF: OT 11:55:58.5  
TSINGHAI PROVINCE, CHINA

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1998-12-06 AZ142  
GRA1 16:11:42.9 e (P) Z

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1998-12-06 D152.6  
GRA1 23:49:39.6 e PKPdf Z  
GRA1 23:49:46.1 i PKPbc d Z  
GRA1 23:49:55.4 e PKPab Z  
GRA1 23:52:11.9 e pPKPbc Z  
NEIC: OT 23:30:12.7 20.6S 179.1W dep107km mb5.1  
FIJI ISLANDS REGION

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1998-12-07  
GRA1 01:28:40.9 e PKPdf Z

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1998-12-07  
GRA1 04:58:42.8 e PKPdf Z

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1998-12-07 D 84.8  
GRA1 09:13:49.1 e P c Z mb5.4  
BEAM 09:13:49.1 T1.4 A35  
GRA1 09:55:01.8 e L Z T20.4 A925 MS5.2

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1998-12-07  
GRA1 09:34:59.8 e PKPdf Z

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1998-12-07  
GRA1 10:14:03.2 e PKPdf Z

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1998-12-07 D 4.4 485km  
 GRA1 13:48:43.0 e Sg E M13.7  
 SZGRF: OT 13:46:25.0 46.2N 7.3E dep 10km  
 SWITZERLAND

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 1998-12-07 D 94.9  
 GRA1 16:06:49.1 i P c Z mb5.1  
 BEAM 16:06:49.1 T0.9 A8  
 GRA1 16:07:03.3 e pP Z  
 GRA1 16:10:51.2 e (PP) Z  
 GRA1 16:57:53.0 e L Z T21.7 A112 MS4.3  
 NEIC: OT 15:53:30.2 5.1S 103.1E dep 56km mb5.2  
 SOUTHERN SUMATERA, INDONESIA

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 1998-12-07  
 GRA1 20:23:52.5 e PKPdf Z

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 1998-12-07 D109.5  
 GRA1 23:56:19.5 e PP Z  
 GRA1 00:44:13.2 e L Z T21.9 A883 MS5.3  
 NEIC: OT 23:37:06.4 8.3S 121.5E dep 33km mb5.5  
 FLORES REGION, INDONESIA

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 1998-12-08 D 66.5 AZ271  
 GRA1 02:43:46.3 i P d Z T1.3 A66 mb5.7  
 GRA1 02:43:51.6 e pP Z  
 GRA1 02:43:54.4 e sP Z  
 GRA1 03:13:51.7 e L Z T18.8 A325 MS4.6  
 SZGRF: OT 02:32:58.1 18.4N 63.7W dep 20km  
 LEEWARD ISLANDS

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 1998-12-08  
 GRA1 15:10:28.7 e PKPdf Z

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 1998-12-09 D 27.4 AZ106  
 GRA1 09:31:48.0 i P c Z mb4.6  
 BEAM 09:31:48.0 T1.4 A15  
 GRA1 09:31:51.9 e (pP) Z  
 SZGRF: OT 09:26:03.3 36.4N 44.4E dep 15km  
 IRAN-IRAQ BORDER REGION

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 1998-12-09 D 79.3 AZ 36  
 GRA1 16:08:35.0 i P c Z mb5.1  
 ALIGN 16:08:35.0 T1.0 A23  
 GRA1 16:08:39.7 e (pP) Z  
 GRA1 16:45:19.9 e L Z T20.7 A145 MS4.3

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 1998-12-09 D 4.3 478km  
 GRA1 22:09:20.1 e Pn Z M13.8  
 GRA1 22:10:30.9 e Sg N  
 SZGRF: OT 22:08:14.9 46.2N 7.4E dep 10km  
 SWITZERLAND

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 1998-12-09 D 3.6 401km  
 GRA1 23:21:45.0 i Pn c Z  
 GRA1 23:22:43.5 e Sg E  
 SZGRF: OT 23:20:48.7 51.5N 16.1E dep 10km  
 POLAND

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 1998-12-10 D 90.7 AZ258  
 GRA1 08:33:14.0 i P d Z mb5.6  
 ALIGN 08:33:14.0 T1.4 A43  
 GRA1 08:35:32.2 e pP Z  
 GRA1 08:37:01.7 e PP Z  
 SZGRF: OT 08:21:18.2 8.0S 70.4W dep648km  
 WESTERN BRAZIL

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 1998-12-10 D 3.8 427km  
 GRA1 09:59:24.2 e Pg Z  
 GRA1 10:00:04.2 e Sg Z

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 1998-12-10 D 3.7 411km  
 GRA1 12:43:01.5 e Pn Z M14.0  
 GRA1 12:44:01.3 e Sg E  
 SZGRF: OT 12:42:03.2 51.5N 16.3E dep 1km  
 POLAND

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 1998-12-10 D 39.2 AZ106  
 GRA1 14:29:15.6 e P c Z mb4.4  
 BEAM 14:29:15.6 T0.9 A8  
 SZGRF: OT 14:21:51.1 28.4N 54.7E dep 33km  
 SOUTHERN IRAN

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 1998-12-10 D 15.0 AZ210  
 GRA1 17:05:04.2 e P Z  
 BEAM 17:05:04.2 T1.3 A21

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 1998-12-10 D 81.1 AZ 21  
 GRA1 23:00:19.8 e P Z  
 SZGRF: OT 22:48:09.2  
 KURIL ISLANDS REGION

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 1998-12-11 D 40.0 AZ105



GRA1 07:05:48.4 i P c Z mb4.6  
 ALIGN 07:05:48.4 T0.7 A12  
 GRA1 07:05:59.9 e pP Z  
 NEIC: OT 06:58:15.7 28.3N 55.6E dep 33km mb4.9  
 SOUTHERN IRAN

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 1998-12-11 D106.9  
 GRA1 08:56:21.4 e PP Z  
 GRA1 08:56:50.5 e pPP Z  
 NEIC: OT 08:37:51.1 31.1S 68.8W dep118km mb5.5  
 SAN JUAN PROVINCE, ARGENTINA

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 1998-12-11 D152.6  
 GRA1 09:07:17.1 e PKPdf Z  
 GRA1 09:07:21.1 i PKPbc c Z  
 GRA1 09:07:35.4 e PKPab Z

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 1998-12-11 D 12.2  
 GRA1 15:12:16.4 e Pn Z  
 GRA1 15:14:57.9 e (Sn) Z  
 GRA1 15:15:43.1 e Lg Z  
 GRA1 15:17:41.7 e L Z T13.1 A1805 MS4.2  
 NEIC: OT 15:09:20.1 42.3N 25.3E dep 10km mb5.0  
 BULGARIA

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 1998-12-11 D 42.9 AZ 85  
 GRA1 20:24:15.9 i P c Z mb5.2  
 ALIGN 20:24:15.9 T1.3 A59  
 GRA1 20:25:03.2 e pP Z  
 GRA1 20:26:41.8 e PP Z  
 GRA1 20:29:22.5 e ScP Z  
 GRA1 20:46:06.1 e L Z T18.8 A638 MS4.5  
 SZGRF: OT 20:16:40.2 36.8N 68.9E dep222km  
 HINDU KUSH REGION

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 1998-12-11 D146.8  
 GRA1 22:02:27.1 e PKPdf Z  
 GRA1 22:02:42.7 e (pPKPdf) Z

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 1998-12-12 D 78.2 AZ 24  
 GRA1 06:59:58.9 i P c Z mb5.4  
 ALIGN 06:59:58.9 T1.2 A35  
 GRA1 07:00:13.0 e pP Z  
 GRA1 07:40:06.5 e L Z T18.5 A197 MS4.5  
 SZGRF: OT 06:48:06.8 47.5N 154.5E dep 49km  
 KURIL ISLANDS

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1998-12-12      D 94.5
  GRA1 21:52:44.4 i Pdiff c Z
  BEAM 21:52:44.4          T0.9  A8
NEIC: OT 21:39:26.3 4.5S 103.0E dep 43km mb5.3
  SOUTHERN SUMATERA, INDONESIA
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1998-12-13      D 76.7  AZ 23
  GRA1 13:29:50.2 i P      c Z          mb5.9
  ALIGN 13:29:50.2          T1.1  A124
  GRA1 13:29:57.6 e pP      Z
  GRA1 13:30:03.2 e sP      Z
  GRA1 14:07:36.6 e L      Z  T20.6  A465  MS4.8
SZGRF: OT 13:18:03.4 49.3N 155.3E dep 29km
  KURIL ISLANDS
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1998-12-13      D 60.4  AZ254
  GRA1 17:41:54.7 i P      d Z          mb5.4
  ALIGN 17:41:54.7          T1.5  A61
  GRA1 17:42:02.1 e (pP)    Z
  GRA1 18:01:54.0 e L      Z  T20.2  A774  MS4.8
SZGRF: OT 17:31:47.3 13.0N 48.1W dep 27km
  NORTH ATLANTIC OCEAN
-----
1998-12-13      D 58.2  AZ252
  GRA1 20:17:49.0 e P      Z          mb4.8
  BEAM 20:17:49.0          T1.4  A13
  GRA1 20:17:57.2 e pP      Z
  GRA1 20:18:03.5 e sP      Z
  GRA1 20:37:46.8 e L      Z  T21.2  A289  MS4.4
NEIC: OT 20:07:52.0 13.4N 44.9W dep 10km mb4.9
  NORTHERN MID-ATLANTIC RIDGE
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1998-12-13      D 15.0  AZ170
  GRA1 23:00:29.7 e P      Z
  ALIGN 23:00:29.7          T1.0  A77
NEIC: OT 22:58:08.9 39.7N 13.4E dep474km mb4.4
  TYRRHENIAN SEA
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1998-12-14      D 15.0  AZ202
  GRA1 00:42:48.2 e P      Z
  BEAM 00:42:48.2          T1.3  A17
  GRA1 00:48:39.9 e L      Z  T18.1  A189
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1998-12-14      D 84.6  AZ 44
  GRA1 04:42:52.2 i P      d Z          mb4.9
  BEAM 04:42:52.2          T1.2  A10
  GRA1 04:44:36.7 e pP      Z
SZGRF: OT 04:31:10.7 32.6N 136.0E dep468km

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## SOUTHEAST OF SHIKOKU, JAPAN

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1998-12-14 D 15.0 AZ103  
GRA1 12:49:10.8 e P Z  
BEAM 12:49:10.8 T2.0 A30

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1998-12-14 D 20.5  
GRA1 13:10:50.4 e P Z mb4.5  
BEAM 13:10:50.4 T2.0 A50  
GRA1 13:22:12.4 e L Z T21.7 A312 MS3.6

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1998-12-14  
GRA1 16:43:47.8 e PKPdf Z  
GRA1 16:43:58.5 e pPKPdf Z  
GRA1 16:44:41.0 e PP Z

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1998-12-14 D 86.4 AZ 53  
GRA1 16:54:38.8 e P Z mb5.1  
ALIGN 16:54:38.8 T1.3 A19  
SZGRF: OT 16:42:00.7 26.3N 129.1E dep 33km  
RYUKYU ISLANDS

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1998-12-14 D140.4  
GRA1 19:54:34.9 e PKPdf Z  
GRA1 19:54:42.1 e Z  
GRA1 19:55:30.5 e (pPKPdf) Z  
GRA1 19:57:39.7 e PP Z  
NEIC: OT 19:35:26.4 15.1S 167.3E dep140km mb5.4  
VANUATU ISLANDS

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1998-12-14 D 39.6 AZ 6  
GRA1 20:25:12.7 i P d Z mb5.2  
ALIGN 20:25:12.7 T2.2 A133  
GRA1 20:25:20.2 e pP Z  
GRA1 20:39:48.3 e L Z T21.8 A568 MS4.4

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1998-12-15  
GRA1 04:26:45.2 e (PKPab) Z  
GRA1 04:27:05.2 e pPKPab Z

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1998-12-15  
GRA1 10:10:40.8 e PKPdf Z

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1998-12-15 D 48.5 AZ263  
 GRA1 14:39:53.6 e P Z mb4.8  
 BEAM 14:39:53.6 T1.3 A10  
 GRA1 14:55:52.1 e L Z T18.4 A399 MS4.4  
 NEIC: OT 14:31:09.2 26.5N 44.6W dep 10km mb4.6  
 NORTHERN MID-ATLANTIC RIDGE

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1998-12-15 D 15.0 AZ104  
 GRA1 20:19:47.5 e P Z  
 BEAM 20:19:47.5 T1.7 A16

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1998-12-16 D 83.4 AZ 46  
 GRA1 00:31:09.5 i P c Z mb6.2  
 ALIGN 00:31:09.5 T2.5 A375  
 GRA1 00:31:22.5 e (pP) Z  
 GRA1 00:41:37.3 e S Z  
 GRA1 01:12:39.6 e L Z T18.2 A23496 MS6.6

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1998-12-16 D 71.9 AZ338  
 GRA1 06:05:25.6 e P Z mb4.7  
 BEAM 06:05:25.6 T1.3 A8

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1998-12-16 D 24.4 AZ338  
 GRA1 09:33:53.2 e P c Z mb4.9  
 BEAM 09:33:53.2 T1.4 A54  
 GRA1 09:42:43.6 e L Z T21.5 A702 MS4.1

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1998-12-16 D 84.8 AZ 39  
 GRA1 10:47:49.8 e P Z mb4.9  
 BEAM 10:47:49.8 T1.3 A12

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1998-12-16 D 77.4 AZ 22  
 GRA1 13:53:39.7 i P c Z mb5.5  
 ALIGN 13:53:39.7 T1.1 A50  
 GRA1 13:53:59.2 e pP Z  
 GRA1 14:29:02.3 e L Z T21.9 A191 MS4.4  
 SZGRF: OT 13:41:54.5 49.1N 157.6E dep 73km  
 KURIL ISLANDS REGION

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1998-12-16 D 49.3  
 GRA1 17:59:11.9 e Pdiff Z  
 GRA1 17:59:19.9 e pPdiff Z  
 GRA1 18:03:39.4 e PP Z  
 GRA1 18:48:56.0 e L Z T21.8 A3871 MS5.4

NEIC: OT 17:45:05.4 1.2N 126.2E dep 33km mb6.1  
NORTHERN MOLUCCA SEA

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1998-12-17 D 4.7 520km  
GRA1 01:31:17.9 e Pn Z M13.9  
GRA1 01:32:36.4 e Sg N  
SZGRF: OT 01:30:08.4 49.9N 18.4E dep 1km  
CZECHOSLOVAKIA

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1998-12-17  
GRA1 03:12:25.4 e PKPdf d Z  
NEIC: OT 02:53:44.8 18.4S 178.1W dep600km mb4.3  
FIJI ISLANDS REGION

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1998-12-17 D 81.7 AZ285  
GRA1 07:32:28.9 e P Z mb5.0  
ALIGN 07:32:28.9 T1.2 A15  
GRA1 07:32:41.4 e pP Z  
GRA1 07:32:48.1 e sP Z  
GRA1 08:14:29.2 e L Z T18.4 A750 MS5.1

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1998-12-17 D 3.6 403km  
GRA1 12:20:49.3 e Pn Z M13.9  
GRA1 12:21:47.0 e Sg E  
SZGRF: OT 12:19:51.8 51.5N 16.2E dep 1km  
POLAND

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1998-12-17 D 83.8  
GRA1 13:02:06.6 i P c Z mb5.3  
ALIGN 13:02:06.6 T1.3 A28  
GRA1 13:02:16.7 e pP Z  
GRA1 13:02:20.7 e (sP) Z  
GRA1 13:43:10.1 e L Z T19.4 A472 MS4.9  
NEIC: OT 12:49:39.2 36.3N 141.2E dep 38km mb5.0  
NEAR EAST COAST OF HONSHU, JAPAN

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1998-12-17 AZ206  
GRA1 13:08:25.1 e P Z  
GRA1 13:09:02.2 e Z

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1998-12-17 D 3.1 349km  
GRA1 19:37:23.1 e Pg Z M13.4  
GRA1 19:37:55.7 e Sn N  
GRA1 19:38:01.5 e Sg N  
SZGRF: OT 19:36:23.5 47.6N 7.7E dep 10km  
Loerrach/Upper Rhine Graben, N of Basel/CH

1998-12-18 D 21.5 AZ326  
GRA1 03:53:58.1 e P d Z mb4.3  
ALIGN 03:53:58.1 T1.5 A26  
SZGRF: OT 03:49:12.6 64.9N 17.5W dep 33km  
ICELAND

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1998-12-18 D 3.6 404km  
GRA1 14:30:47.9 e Pn Z M14.1  
GRA1 14:31:46.5 e Sg N  
SZGRF: OT 14:29:50.6 51.5N 16.1E dep 1km  
POLAND

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1998-12-18 D 32.2 AZ276  
GRA1 14:34:20.9 e P d Z mb5.0  
ALIGN 14:34:20.9 T1.4 A29  
GRA1 14:34:26.4 e (pP) Z  
GRA1 14:43:13.5 e L Z T21.3 A1406 MS4.6  
SZGRF: OT 14:27:55.3 43.2N 35.1W dep 21km  
NORTH ATLANTIC OCEAN

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1998-12-18 D 61.1 AZ245  
GRA1 16:11:03.6 e P Z mb4.6  
BEAM 16:11:03.6 T1.4 A14  
GRA1 16:11:08.8 e pP Z  
SZGRF: OT 16:00:50.2  
NORTH ATLANTIC OCEAN

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1998-12-18  
GRA1 18:32:29.4 e PKPab Z

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1998-12-19 D 87.1 AZ 65  
GRA1 00:34:10.6 e P Z mb4.7  
BEAM 00:34:10.6 T1.5 A9

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1998-12-19 D 56.5 AZ208  
GRA1 01:24:52.2 e P Z mb4.6  
BEAM 01:24:52.2 T1.3 A8  
GRA1 01:25:03.8 e (pP) Z  
GRA1 01:25:12.5 e (sP) Z  
GRA1 01:47:49.1 e L Z T21.6 A385 MS4.5  
SZGRF: OT 01:15:13.2  
NORTH OF ASCENSION ISLAND

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1998-12-19  
GRA1 04:59:30.8 e PKPdf Z

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1998-12-19 D126.6  
GRA1 08:51:08.6 e PKPdf Z  
GRA1 09:47:27.0 e L Z T20.1 A110 MS4.5  
NEIC: OT 08:32:08.1 6.5S 152.8E dep 33km mb4.9  
NEW BRITAIN REGION, P.N.G.

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1998-12-19 D 79.2 AZ 19  
GRA1 09:42:30.1 e P Z mb4.8  
ALIGN 09:42:30.1 T0.8 A9  
GRA1 09:42:34.8 e (pP) Z  
NEIC: OT 09:30:31.9 47.4N 154.5E dep 33km mb4.4  
KURIL ISLANDS

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1998-12-19 D 84.8 AZ 50  
GRA1 14:36:44.5 i P c Z mb5.6  
ALIGN 14:36:44.5 T1.0 A44  
SZGRF: OT 14:24:14.1 28.9N 130.1E dep 33km  
RYUKYU ISLANDS

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1998-12-19 D 23.9  
GRA1 16:20:28.6 e P Z mb5.1  
ALIGN 16:20:28.6 T1.5 A91  
GRA1 16:24:33.1 e (S) Z  
GRA1 16:32:20.5 e L Z T21.3 A298 MS3.7

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1998-12-20 D 23.6 AZ107  
GRA1 03:26:24.2 e P Z mb4.7  
BEAM 03:26:24.2 T1.4 A19  
GRA1 03:30:36.8 e (S) Z  
NEIC: OT 03:21:13.9 38.5N 40.0E dep 10km mb4.6  
TURKEY

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1998-12-20 D 51.4 AZ 81  
GRA1 06:37:03.6 i P d Z mb5.1  
ALIGN 06:37:03.6 T1.1 A25  
NEIC: OT 06:28:52.7 37.5N 71.9E dep 33km mb4.8  
AFGHANISTAN-TAJIKISTAN BORD REG.

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1998-12-20 D 94.1  
GRA1 10:15:21.8 e Pdiff Z  
GRA1 11:00:47.3 e L Z T21.0 A316 MS4.8

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1998-12-20 D 44.4 AZ 76  
GRA1 00:40:49.5 e P Z

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1998-12-20

GRA1 21:05:11.7 e PKPab Z

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1998-12-22

GRA1 02:01:33.4 e (PKPdf) Z

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1998-12-22 D 44.4 AZ 83

GRA1 02:32:49.4 i P d Z mb4.6

ALIGN 02:32:49.4 T1.2 A14

GRA1 02:33:14.8 e pP Z

GRA1 02:33:25.6 e sP Z

GRA1 02:33:53.5 e Z

NEIC: OT 02:24:47.1 36.1N 70.2E dep100km mb4.9

HINDU KUSH REGION, AFGHANISTAN

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1998-12-22 D 21.4

GRA1 04:56:03.6 e P Z mb3.4

BEAM 04:56:03.6 T0.9 A2

NEIC: OT 04:51:11.6 35.9N 33.9E dep 10km mb4.4

CYPRUS REGION

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1998-12-22 D 15.0 AZ213

GRA1 06:03:39.0 e P Z

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1998-12-22

GRA1 09:32:28.4 e PKPdf Z

GRA1 09:32:40.3 e (pPKPdf) Z

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1998-12-22 D 76.2 AZ346

GRA1 12:40:01.7 i P c Z mb4.9

ALIGN 12:40:01.7 T0.9 A9

GRA1 12:40:08.0 e pP Z

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1998-12-22 D 43.5 AZ348

GRA1 17:12:41.3 i P d Z T0.9 A25 mb5.0

GRA1 17:12:50.4 e (pP) Z

NEIC: OT 17:04:35.3 80.0N 90.5W dep 10km mb4.4

QUEEN ELIZABETH ISLANDS, CANADA

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1998-12-22 D 89.0 AZ 91

GRA1 17:33:04.8 i P c Z mb5.1

ALIGN 17:33:04.8 T1.0 A12

GRA1 17:33:20.5 e (pP) Z

NEIC: OT 17:20:12.0 .1S 99.2E dep 33km mb5.1

SOUTHERN SUMATERA, INDONESIA



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1998-12-22

GRA1 20:20:53.0 e PKPdf Z

GRA1 20:21:03.6 e (pPKPdf)Z

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1998-12-22 D153.8

GRA1 22:26:46.8 e (PKPdf) Z

GRA1 22:27:10.7 e PKPab Z

GRA1 22:28:58.8 e pPKPab Z

GRA1 22:29:08.6 e sPKPab Z

NEIC: OT 22:07:54.6 25.0S 179.6E dep522km mb5.1

SOUTH OF FIJI ISLANDS

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1998-12-23 D 18.8 AZ145

GRA1 04:55:20.7 e P Z

BEAM 04:55:20.7 T1.3 A4 mb3.5

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1998-12-23

GRA1 12:30:05.9 e PKPdf Z

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1998-12-23 D 63.6 AZ 36

GRA1 14:45:04.9 e P Z mb4.7

BEAM 14:45:04.9 T1.0 A5

SZGRF: OT 14:34:39.1

EASTERN USSR

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1998-12-23 D 24.0 AZ103

GRA1 16:26:13.0 e P Z mb4.7

BEAM 16:26:13.0 T1.3 A33

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1998-12-23

GRA1 16:41:40.5 e PKPdf Z

GRA1 16:42:07.9 e pPKPdf Z

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1998-12-23 D 46.4 AZ 74

GRA1 19:32:03.3 i P c Z mb5.0

ALIGN 19:32:03.3 T1.1 A18

GRA1 19:32:14.0 e (pP) Z

GRA1 19:32:17.2 e (sP) Z

GRA1 19:33:36.0 e Z

NEIC: OT 19:23:37.9 39.8N 76.9E dep 33km mb4.9

SOUTHERN XINJIANG, CHINA

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1998-12-23 D 3.7 409km

GRA1 20:01:41.6 e Pn Z M13.5  
GRA1 20:02:40.4 e Sg E  
SZGRF: OT 20:00:43.7 51.6N 16.1E dep 1km  
POLAND

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1998-12-23 D144.5  
GRA1 20:20:58.4 i PKPdf c Z

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1998-12-24  
GRA1 06:52:48.0 e PKPdf Z

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1998-12-24 D111.8  
GRA1 11:34:18.7 i PKPdf d Z

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1998-12-24 D 3.5 392km  
GRC1 16:42:53.5 e Pn Z M13.9  
GRA1 16:43:08.1 e Pn Z M14.2  
GRA1 16:44:15.6 e Sg N  
SZGRF: OT 16:41:59.7 45.5N 10.7E dep 10km  
NORTHERN ITALY

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1998-12-25 D151.1  
GRA1 00:15:34.2 e PKPdf Z  
GRA1 00:15:40.3 i PKPbc c Z  
GRA1 00:15:46.0 e PKPab Z  
GRA1 00:15:55.2 e pPKPbc Z  
GRA1 00:16:00.0 e pPKPab Z

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1998-12-25  
GRA1 01:21:14.7 e PKPdf Z  
GRA1 01:21:25.8 e (pPKPdf) Z

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1998-12-25  
GRA1 01:52:57.4 e PKPdf Z

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1998-12-25  
GRA1 05:18:03.8 e PKPdf Z

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1998-12-25 D162.2  
GRA1 18:05:26.7 e PKPdf Z  
GRA1 18:06:02.6 e Z  
GRA1 18:06:12.0 e PKPab Z

GRA1 18:06:44.2 e pX Z  
GRA1 18:06:55.3 e pPKPab Z  
NEIC: OT 17:45:34.6 33.0S 179.5W dep 78km mb5.1  
SOUTH OF KERMADEC ISLANDS

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1998-12-25 D152.0  
GRA1 19:19:58.9 e (PKPdf) Z  
GRA1 19:20:05.6 e PKPbc Z  
GRA1 19:20:10.5 e pPKPbc Z  
GRA1 19:20:13.2 e PKPab Z

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1998-12-26 D 97.3  
GRA1 01:01:07.8 e Pdiff Z  
NEIC: OT 00:47:45.2 16.1S 71.5W dep115km mb4.5  
SOUTHERN PERU

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1998-12-26 D 84.3 AZ 40  
GRA1 03:59:00.6 e P Z mb4.7  
BEAM 03:59:00.6 T1.3 A7  
SZGRF: OT 03:46:32.9 35.1N 140.4E dep 33km  
NEAR EAST COAST OF HONSHU, JAPAN

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1998-12-26 D 72.4 AZ266  
GRA1 11:40:32.4 e P Z mb4.7  
BEAM 11:40:32.4 T1.1 A7  
GRA1 11:40:35.0 e pP Z  
GRA1 11:40:37.7 e sP Z

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1998-12-26 D105.2  
GRA1 15:53:19.3 e Pdiff Z  
NEIC: OT 15:39:07.3 1.3S 123.7E dep 33km mb5.4  
SULAWESI, INDONESIA

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1998-12-26 D 3.1 347km  
GRC1 19:31:47.4 e Pn Z M13.9  
GRA1 19:31:56.5 e Pn Z M14.1  
GRA1 19:32:12.4 e Pg Z  
GRA1 19:33:02.9 e Sg E  
SZGRF: OT 19:31:02.4 45.9N 11.4E dep 10km  
NORTHERN ITALY

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1998-12-26  
GRA1 19:47:18.9 e Pg Z  
GRA1 19:48:08.9 e Sg Z

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1998-12-27 D150.5

GRA1 00:57:58.6 i PKPdf d Z  
GRA1 00:58:05.3 i PKPbc d Z  
GRA1 00:58:14.2 e PKPab Z  
GRA1 00:58:46.9 e pPKPbc Z  
GRA1 01:01:37.2 e PP Z

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1998-12-27 D 35.9 AZ107  
GRA1 04:18:05.5 i P c Z mb4.7  
ALIGN 04:18:05.5 T1.2 A15  
SZGRF: OT 04:11:09.0 30.7N 51.9E dep 33km  
IRAN

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1998-12-27  
GRA1 14:16:39.5 e PKPdf Z  
GRA1 14:16:51.5 e (pPKPdf) Z

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1998-12-27  
GRA1 18:12:21.0 e (PKPdf) Z

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1998-12-28 D 85.2 AZ 51  
GRA1 05:40:46.4 i P d Z mb6.0  
ALIGN 05:40:46.4 T1.1 A116

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1998-12-28 D 71.9 AZ280  
GRA1 07:34:57.0 e P d Z mb5.3  
ALIGN 07:34:57.0 T1.1 A24  
GRA1 07:35:00.2 e pP Z  
GRA1 07:35:03.0 e (sP) Z  
GRA1 08:04:07.4 e L Z T19.4 A1565 MS5.3  
SZGRF: OT 07:23:34.5 20.4N 74.3W dep 13km  
CUBA REGION

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1998-12-28  
GRA1 17:33:07.6 e (P) Z

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1998-12-28  
GRA1 18:27:40.5 e PKPab Z

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1998-12-28 D 48.8 AZ 98  
GRA1 23:12:01.4 i P c Z mb4.6  
BEAM 23:12:01.4 T0.9 A6  
SZGRF: OT 23:03:19.5 26.0N 67.2E dep 33km  
PAKISTAN

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1998-12-29

GRA1 10:17:52.4 e (PKPab) Z

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1998-12-29

GRA1 11:23:56.7 e PKPdf Z

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1998-12-29 D 54.1 AZ300

GRA1 12:43:27.8 e P Z mb4.2

BEAM 12:43:27.8 T0.9 A2

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1998-12-29

GRA1 15:00:56.6 e PKPdf Z

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1998-12-29 D148.8

GRA1 15:05:47.7 e (PKPdf) Z

GRA1 15:05:49.2 e PKPbc Z

GRA1 15:05:54.8 e PKPab Z

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1998-12-29 D 18.8 AZ 93

GRA1 17:45:15.3 e P Z mb3.8

BEAM 17:45:15.3 T1.2 A8

GRA1 17:45:18.1 e pP Z

NEIC: OT 17:40:24.1 43.2N 41.6E dep 33km mb4.1

NORTHWESTERN CAUCASUS

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1998-12-29 D 88.0 AZ285

GRA1 17:47:32.5 e P Z mb4.9

BEAM 17:47:32.5 T1.2 A8

SZGRF: OT 17:34:46.0 11.1N 88.7W dep 33km

OFF COAST OF CENTRAL AMERICA

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1998-12-29 D 34.5 AZ296

GRA1 20:08:17.3 e P Z mb5.0

BEAM 20:08:17.3 T2.0 A36

NEIC: OT 20:02:18.5 54.1N 35.2W dep 10km mb4.7

NORTH ATLANTIC OCEAN

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1998-12-30 D 95.3 AZ122

GRA1 02:30:08.7 e P Z T1.4 A18 mb5.3

GRA1 02:30:16.0 e pP Z

SZGRF: OT 02:16:46.9

SOUTH INDIAN OCEAN

1998-12-30 D 90.6 AZ270  
GRA1 03:45:22.4 i P c Z mb5.5  
ALIGN 03:45:22.4 T1.4 A34  
NEIC: OT 03:32:37.1 1.7S 77.9W dep170km mb4.9  
ECUADOR

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1998-12-30  
GRA1 07:41:26.2 e PKPdf Z

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1998-12-30  
GRA1 07:44:57.8 e PKPdf Z

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1998-12-30  
GRA1 10:52:21.6 e PKPdf Z

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1998-12-30 D 87.8 AZ291  
GRA1 15:45:00.8 i P c Z mb5.3  
ALIGN 15:45:00.8 T1.1 A18  
GRA1 15:45:05.0 e (pP) Z

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1998-12-31 D 4.9 549km  
GRC1 00:14:36.6 e Pn Z  
GRA1 00:14:44.4 e Pn Z  
NEIC: OT 00:12:44.7 44.3N 20.1E dep 10km mb3.9  
NORTHWESTERN BALKAN REGION

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1998-12-31 D 74.5 AZ 17  
GRA1 19:03:42.9 e P Z mb4.9  
BEAM 19:03:42.9 T1.6 A20  
GRA1 19:03:54.3 e pP Z

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1998-12-31 D 3.7 408km  
GRA1 11:23:27.4 e Sg E M13.6  
SZGRF: OT 11:21:30.7 51.6N 16.1E dep 1km  
POLAND

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