

International Seismological Centre

Director's Report

2007



Thatcham, UK

STAFF LIST FOR 2007

Dr. A. Shapira (Israel) – Director (Seismologist) (left December 2007)

Mrs. M. Aspinwall (UK) – Administration Officer

Dr. P. Dawson (UK) – Data Collection Manager & Developer

Mr. O. Gaspà Rebull (Spain) – System Assistant and Developer

Mr. J. Harris (UK) – System Administrator & Developer

Mr. Przemyslaw Kowalski (Poland) – Seismologist

Mrs. Baokun Li (China) – Seismologist

Dr. D. Storchak (Russia/UK) – Chief Seismologist

Ms. B. Vera (Colombia) – Seismologist

VISITORS TO THE ISC DURING 2007

Danuta Kaczor – University of Silesia, Poland

John Woodhouse – Oxford University, UK

John Adams – Geological Survey, Canada

Gary Gibson – Seismology Research Centre, Australia

Joan L Latchman – Seismic Research Institute, Trinidad

Martin Reyners – GNS Science, New Zealand

Kevin Fenaughty – GNS Science, New Zealand

Martin Chadwick – GNS Science, New Zealand

Margaret Wiggins-Grandison – Earthquake Unit, UWI, Jamaica

Muhammad Qaisar – MSSP, Pakistan

Muhammad Daud Shah – MSSP, Pakistan

Shahzad Alta Shaheen – MSSP, Pakistan

M Tanveer – MSSP, Pakistan

Gary Gibson – SRC, Melbourne, Australia

Nada Bushraeitqhir Ahmed – Geological Research Authority, Sudan

Ray Buland – USGS, Golden, USA

Stuart Sipkin – USGS/NEIC, Golden, USA

Rémy Bossu – CSEM, Paris, France

Stéphanie Godey – CSEM, Paris, France

DIRECTOR'S REPORT 2007

Introduction

This report has been edited and compiled by Dr Avi Shapira.

During 2007 ISC published the annual Bulletin CD for 2004, the updated Catalogue CD 1904-2004 (see seismicity map in Fig. 1) and 3 printed 4-monthly bulletins of Sept.-Dec. 2004, Jan-Apr 2005 and May-Aug 2005.

The financial audited report for 2007 is attached as a complementary document.

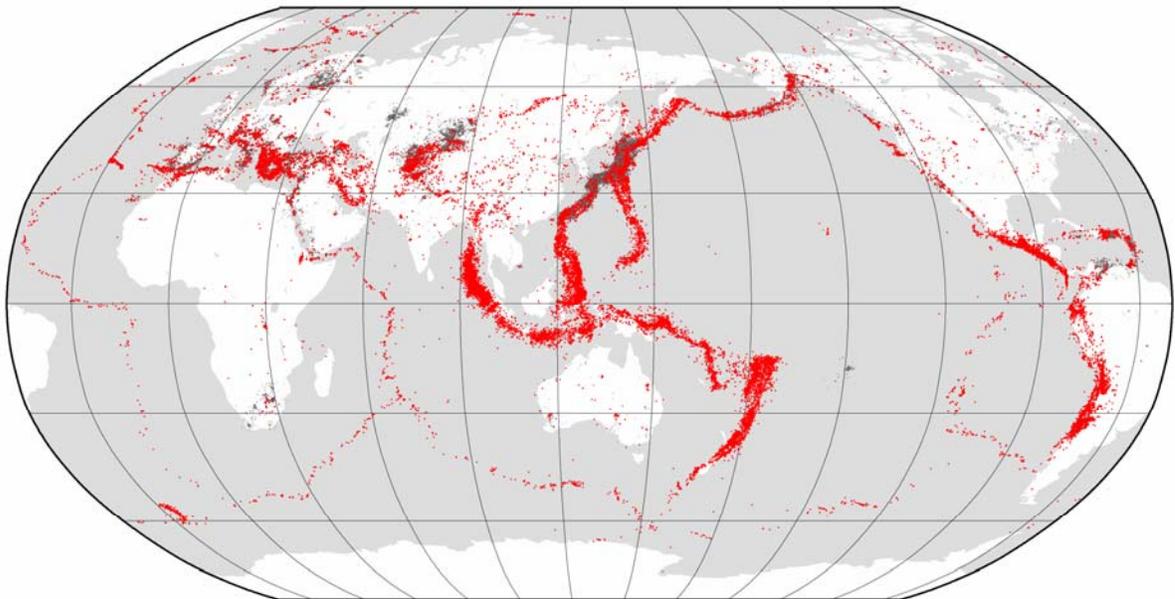


Fig. 1 : World Seismicity 1904-2005 (M>5)

Data Collection

During 2007, normal operations involved inspecting the automated e-mail data acquisition through the Internet and dealing with unknown stations, data entry mistakes, changing of e-mail formats etc. In early 2007 the main activity was to ensure that all aspects of the capture system worked OK under Linux - having moved from Unix. This operation went well and we now have a well-proven Linux-based data-capture system which interfaces with our Oracle relational database.

Data-capture involves a continuing dialogue with our contributing agencies and the development and maintenance of parsers and associated data files and software.

The capture system has been designed to be as automatic as possible - in 2007, 87.5% of all parsable files were processed automatically. In addition, ISC jointly maintains the International Registry of Seismograph Stations with NEIC - this involves considerable work and dialogue with our users. Users are increasingly using the online station-registration facility.

In 2007 the ISC received 7,742 data files from 112 agencies (see map in Fig. 2), reporting readings from 4,642 seismic stations (see map in Fig. 3) – a new record of the number of stations that report readings to ISC. About 88% of the data files were parsed automatically into ISC database the rest of the reported data files have been associated with correcting and writing parsers and with extensive correspondence with station operators and data providers. A total number of 230 changes to all capture-software-routines (including parsers and ancillary programs) and 13 new parsers were written.

350 new seismic stations contributed to the data year 2007 (an increase of about 30 stations compared with the previous year). Station information of 272 stations has been updated. 8 agencies either resumed sending their data after a long interruption or started contributing their data (directly or indirectly) to ISC. These agencies are:

- ASL
Albuquerque Seismological Laboratory Albuquerque, New Mexico. None in 2006 - but sent 2005/2006/2007 data in 2007.
- GCMT
The Global CMT Project, Lamont Doherty Earth Observatory, Columbia University, New York. Formerly Harvard - Moment Tensors.
- GFZ
GeoForschungsZentrum (GFZ) Potsdam, Germany. Sent Indonesian (GEOFON) data in 2007.
- KISR
Kuwait Institute for Scientific Research Safat, Kuwait. No data in 2006 but re-started in 2007.
- KLM
Kuala Lumpur, Seismological Division Malaysian Meteorological Service, Malaysia. No data in 2006 but re-started in 2007.
- LIC
Lamto, Station Geophysique, N'Douci, Ivory Coast. No data in 2006 but re-started in 2007.
- NIED
Nat Res Inst. for Earth Science and Disaster Prevention, Ibaraki, Japan. No data in 2006 but re-started in 2007.
- PNSN
Pacific Northwest Seismic Network, Department Earth and Space Sciences, University of Washington, Seattle, U.S.A. No data in 2006 but re-started in 2007.

Agencies which have stopped sending data or did not send any in 2007:

- HKC - Hong Kong Observatory.
- MED_RCMT - INGV, Rome, Italy MedNet Regional Centroid - Moment Tensors.
- NSSC - National Syrian Seismological Center, Damascus, Syria.
- SNSN - Saudi National Seismic Network, Riyadh, Saudi Arabia.
- TAP - CWB, Chinese Taipei

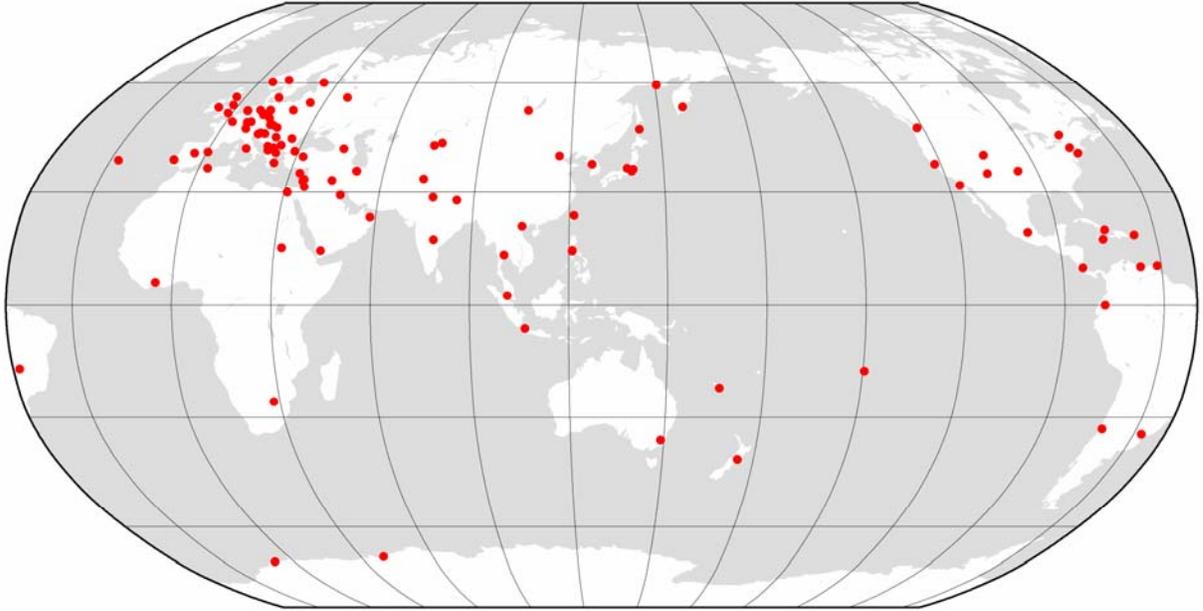


Fig.2 : Seismological Agencies contributing data to ISC (2007 update).

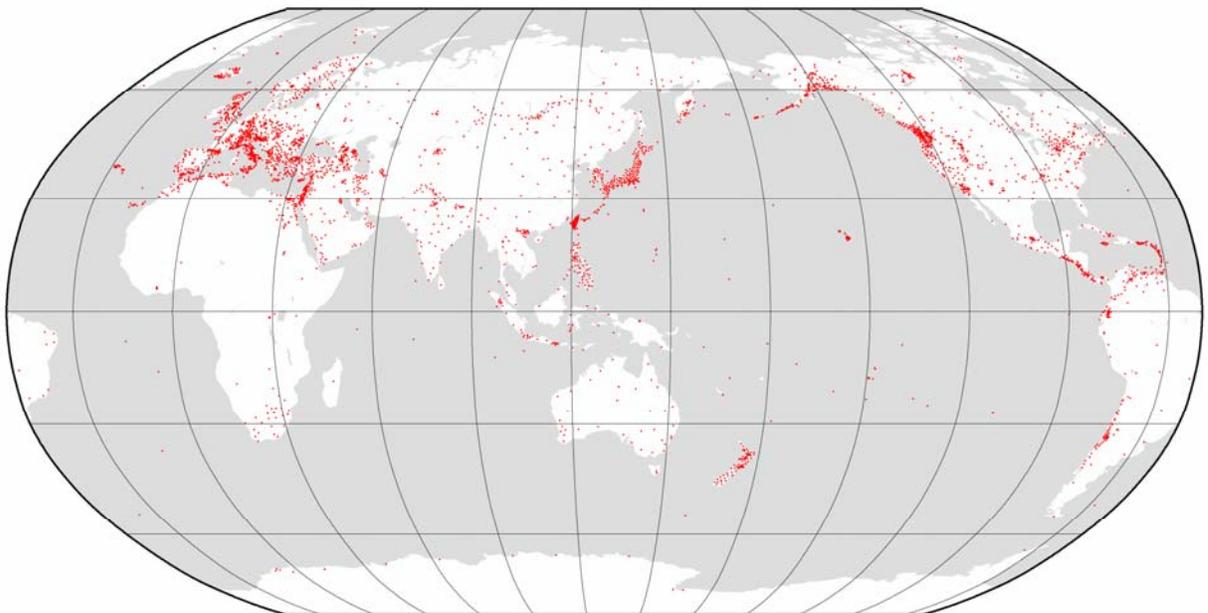


Fig 3: Distribution of stations contributing data for the 2005 ISC Bulletin.

In comparison to the year 2006, there was a growth of 4.6 Gb to the 46Gb of seismological data already in the database.

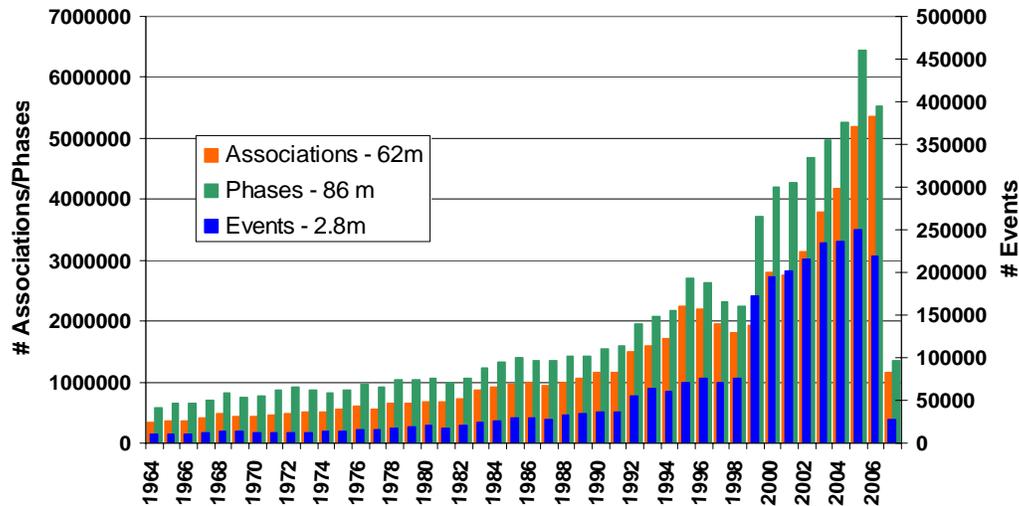


Fig. 4: The annual number of events updated April 2008

Bulletin Review

The Bulletin review during 2007 was heavily affected by the big swarm of aftershock activity in the Sumatra-Andaman region, following the Dec. 2004 Sumatra earthquake. At the beginning of 2007, ISC analysts, Beatriz Vera, Baokun Li and Przemyslaw Kowalski, headed by Dr. Dmitry Storchak completed the review of the events occurring during 2004 and part of 2005 (which was completed at the beginning of 2008). The 2004 Bulletin includes more than 230,000 events, 20% of which were reviewed and analysed by ISC seismologists. The analysis of 2005 data is almost complete, in line with our target to bring publication closer to real time.

All events with maximum reported magnitude of 3.5 and larger, along with events with multiple network reports or stations reporting at distances more than 10 degrees, were analysed and where possible relocated. By the end of 2007, 291,199 seismic events have been added to the ISC Bulletin. 48,366 of them were reviewed and edited by ISC seismologists. The ISC Bulletin for 2005 was completed in February 2008 and includes in total 247,953 events out of which 45,617 were reviewed and edited. Fig. 5 shows the seismicity of the Earth during 2005, and also indicates which of the depicted events was edited by ISC seismologists.

Starting with the analysis of January 2005 earthquakes with magnitudes lower than 2.5, will not be reviewed even when reported by several agencies. This only slightly reduces the number of events to be edited by ISC editors. Nevertheless, ISC encourages data contributors to send ALL data, irrespective of the magnitude. These data are made available to the global seismological community through the ISC Comprehensive Bulletin.

Figure 6 shows the apparent frequency-magnitude distribution of events occurring during January-November 2005. It suggests that the 2005 ISC Catalogue of earthquakes is complete for all events at about magnitude 4.0-4.5 and above. Obviously, catalogue completeness varies from region to region depending primarily on station distribution. Completeness is slightly higher in continental areas and slightly lower in the oceans. The difference is in the order of 0.5 magnitude units.

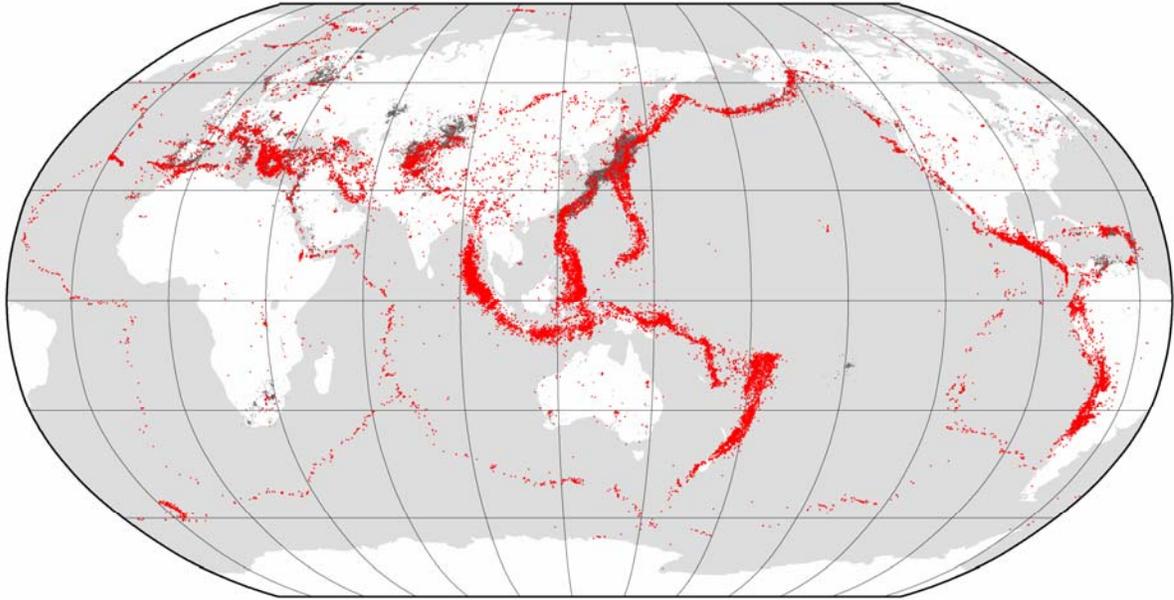


Fig. 5: Earth seismicity during 2005

Red: Epicentres of earthquakes reviewed by ISC seismologists
 Grey: Earthquake locations not reviewed by ISC seismologists

Earthquakes (2005,mb)

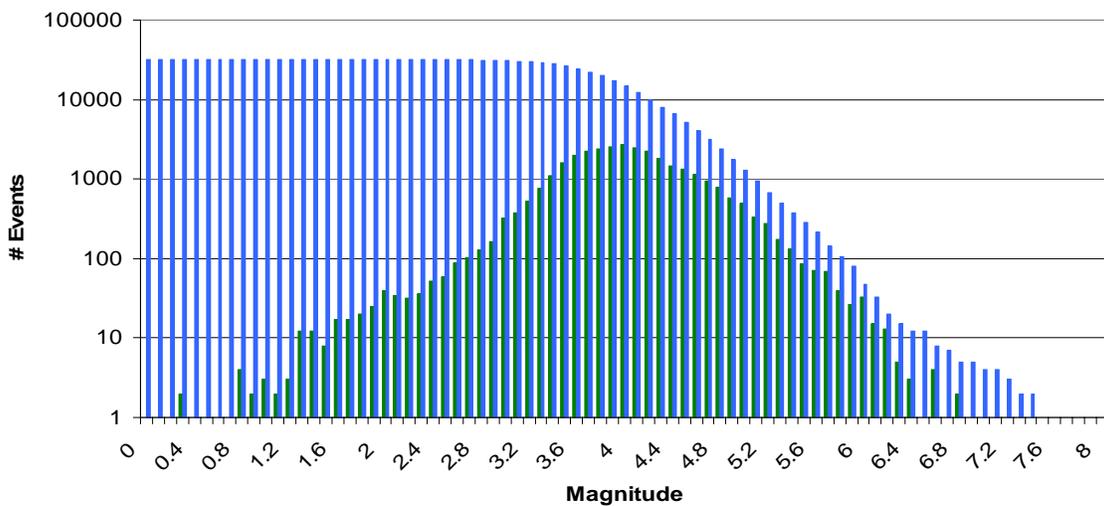


Fig.6 : Frequency-magnitude distribution of earthquakes in ISC Bulletin, Jan.-Nov., 2005

Blue = Cumulative # Events Green = Actual # Events

A more detailed analysis of the ISC Bulletin of 2005 is being prepared by ISC seismologists and will be posted on ISC web page.

ISC website and FTP service

The end of June 2007 marked a major achievement for the ISC, the launch of the new ISC website. This is the culmination of a long period of development that began in 2004 which included re-structuring the site, updating its content, re-designing the new website and adding new on-line services. Thanks are due to Maureen Aspinwall, Peter Dawson, Matthew Evans, James Harris, and Avi Shapira. Special thanks go to Oriol Gaspá Rebull for carrying out most of the programming and graphical design and to the Royal Society for providing a grant to begin the project.

In 2007, the popularity of ISC website kept increasing. There were over 1.6 million accesses to the ISC website – excluding identifiable web-crawler which is almost 18 % more than the year before. Identifiable web crawler usage is down a lot this year which means the increase of hits from users is up more significantly (14%).

There were about 140,000 accesses to the ISC website, searching for earthquake information. This is more than double the number of searches made in 2006. A breakdown of usage by country is shown in Fig. 7.

Website Usage 2007

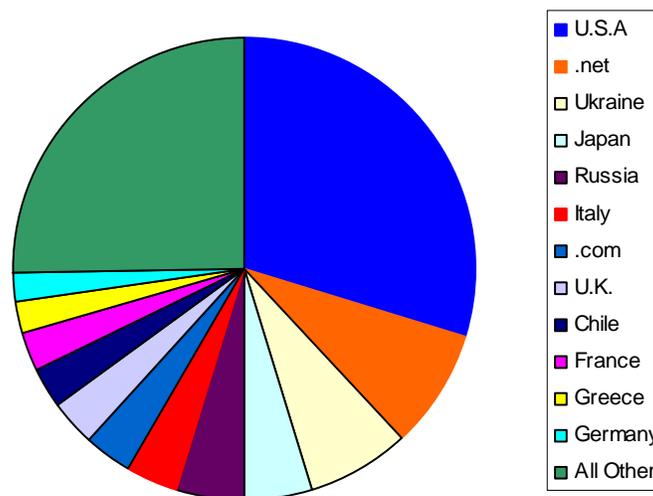


Fig. 7: Distribution of entries to the ISC website

Despite double the number of searches, we observe a 30% decrease in downloading Bulletin Data to 10 Gb downloaded. There was also a 26% decrease searches for contributed bulletins (about 1100 searches) and a 64% increase in demand for ISC Bulletin maps (~7400 people).

ISC database is accessible and data are available at the ISC website www.isc.ac.uk. We keep emphasizing the fact that data received by ISC are immediately available to the scientific community. Hypocentre grouping and phase readings association are performed continuously and become available in the comprehensive ISC Bulletin within days after the data arrive and long before it is added to the edited ISC Bulletin.

The typeset monthly Bulletins and the semi-annual Regional Catalogues are also available as PDF documents. Users who browse the listings may find these typeset documents easier to use, and they include the separate lists of explosions and major events that have long been included in the Regional Catalogue.

Additional on-line services

In addition to providing on-line earthquake information, and as a service to the seismological community, the ISC provides other on-line information. The main services are:

International Registry (IR) of Seismic Stations and station book – Continued service

The International Registry of Seismic Stations is maintained jointly by the ISC and by the World Data Center for Seismology, Denver, which is operated by US National Earthquake Information Center (NEIC). The ISC, NEIC and the European-Mediterranean Seismological Centre encourage registration of all stations, regardless of whether or not the data seems likely to be widely distributed. The Federation of Digital Seismograph Networks recognises identification of parametric data with station codes from the International Registry and network code 'IR'. The ISC website (<http://www.isc.ac.uk/IR/reg.htm>) makes it convenient for network operators to add stations to the Registry.

An on-line station book service complements the on-line station registration service. The web-based station book is in addition to the existing distribution of an ASCII text file of the station book through the FTP site and on the ISC CDs. During 2007, we had more than 10,000 entries searching for information from the station book. This is an increase of about 42% compared with the previous year.

Bibliography of Seismology – Current service and future plans

The Bibliography information provided on the ISC website still gains popularity. At present there are no references beyond 1996. It is interesting to note that about 7000 people have visited this site and retrieved information – an impressive increase of 100%.

Shear Wave Splitting of SKS Phases – Current service and future plans

Results from the automated shear wave splitting project, undertaken in collaboration with the University of Leeds and performed by Dr. Matthew Evans is available on the ISC web site (see <http://www.isc.ac.uk/SKS>).

Links to Rapid Earthquake Information – Continued service

This service (see <http://www.isc.ac.uk/realtime.html>) provides links to seismological data centres that provide rapid earthquake information, especially for destructive earthquakes. The popularity of this service is related to the occurrence of destructive earthquakes. Consequently, the number of people using the service in 2007 was 2650 - a decrease of 60%.

Contact list of Seismologists and Seismological Institutions – Continued service

ISC prepares and maintains a database that lists seismologists and seismological institutes who agree to serve as national contact points in case of emergencies associated with earthquakes (web page <http://www.isc.ac.uk/contact/index.html>). Almost 6,000 people used this service in 2007, about 10% less than in the year 2006.

Practice of Magnitude determination –

Following the recommendations made by the IASPEI Working Group on Magnitudes, ISC asked the agencies contributing data to tell about their magnitude determination practice; what is measured on the seismograms and what equations are used. Information received by ISC is made available on the webpage http://www.isc.ac.uk/magnitude/mag_info.html

Lists of agency codes –

ISC, together with NEIC and EMSC, assigns codes to the seismological agencies who contribute data. These codes are used by the data centres to properly credit the contributing agency. We have assembled the code names that are listed in the ISC database and where possible, identified the agency behind the code and other codes used by NEIC and EMSC. The list is shown at http://www.isc.ac.uk/IR/agency_mapping.html

Analysis of Contributed Data –

This service facilitates a comparison between the source parameters presented in the ISC Reviewed (Published) Bulletin and those contributed to ISC by a specific Agency.

It is in the interest of ISC that local agencies check the solutions presented in the ISC Bulletin and express their opinion. This may serve as an additional "quality control" to ISC products. Equally important, agencies can check their location and magnitude results as compared to those of the ISC Bulletin and make the ISC more useful to the local agencies. See <http://www.isc.ac.uk/search/contributed/index.html>

Engineering applications of seismicity data –

ISC has developed an on-line tool (<http://www.isc.ac.uk/mapbuilder/wfs-t/engineer/index.html>) to provide a first order approximation of seismic parameters frequently used in the process of assessing seismic hazard, primarily for engineering applications. Data

retrieved from the ISC extensive database is suitable to be submitted to several processes and filters by the user such as sub-zonation, declustering or magnitude completeness estimation, before presenting the computed seismic zone parameters.

The table below summarizes the most popular on-line services provided by ISC, the number of entries and the percentage variation when compared to the previous year.

Table 1: Most popular documents provided on-line by ISC

Documents available on-line	Downloads
IASPEI new magnitude standards [doc/analysis/2006p03/magletter.html]	1654
Reference events [reference/reference.html]	1489
[doc/products/catalogue.html]	1243
[doc/database/attributes.html]	1232
[doc/misc/news.html]	1223
Invitation letter [doc/intro/member_invite.html]	1183
On ISC data collection [doc/analysis/datacollection.html]	1111
Analysis of 2003 Bulletin [doc/analysis/2006p02/annual_2003.html]	1050
ISC newsletters [doc/newsletter/2007q2/2007q2.pdf]	1040
Documentation on the ISC Bulletin [doc/products/bulletin.html]	1011

Figure 8 shows the distribution of entries and inquiries for data from the on-line ISC Bulletin since Jan. 2000, showing also the steady increase in retrieving ISC data over the Internet.

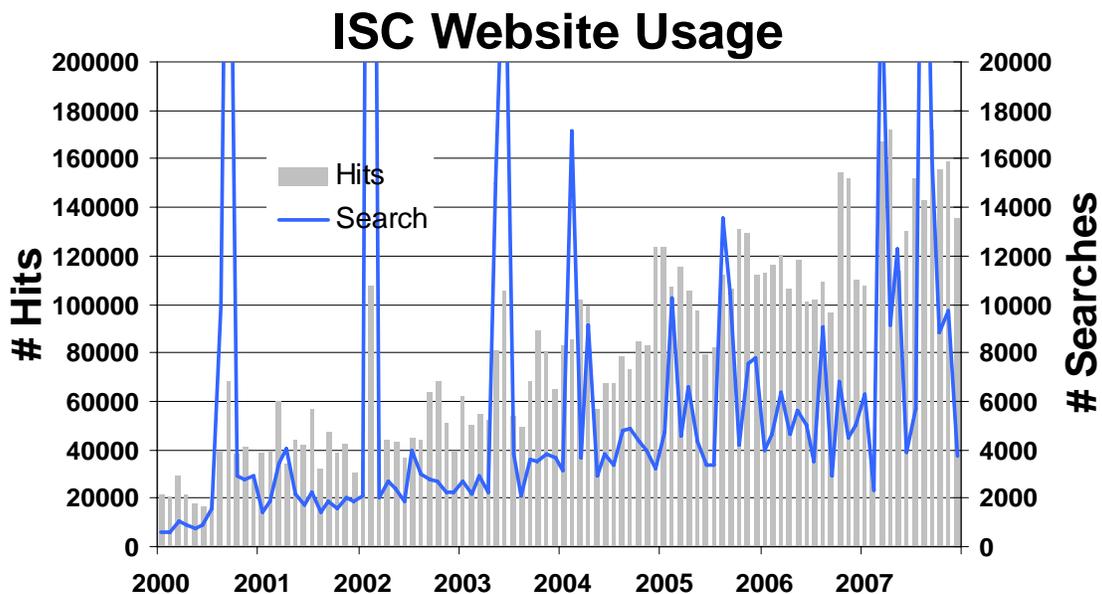


Fig. 8: Distribution of entries and inquiries for data from the on-line ISC Bulletin since 2000

FTP service

An anonymous FTP server, <ftp://ftp.isc.ac.uk>, is used to allow prompt distribution of the results of the ISC's monthly analysis. These files are available very shortly after the completion of each month's editing and allow access to the results much more rapidly than the annual CD.

In August 2007 we lost the internet service provided to ISC by GVON internet provider. Unexpectedly and abruptly, GVON stopped its operation without notice. We hired new lines and established new connections with a different provider. Sadly, the early logs have been lost when GVON ceased and our statistics are lacking information. However, it seems that most of the usage of FTP service remains about the same as last year.

Production and Distribution of printed ISC Bulletin and CD-ROMs

Each year the ISC publishes a new volume of the Bulletin of the ISC comprising 3 issues. Each Bulletin encompasses four months of data and contains printed details of the events reviewed and relocated by the ISC seismologists. An accompanying CD-ROM contains the fully comprehensive Bulletin in FFB and ISF formats with all phase data included even for the smallest un-reviewed events, as well as the full reviewed Bulletin in PDF format for each of the four months. During 2007 we distributed the annual Bulletin for 2004 (CD), the updated Catalogue 1904-2004 (CD) and 3 printed 4-monthly bulletins of Sept-Dec 2004, Jan-Apr 2005 and May-Aug 2005.

Migration to Linux

The ISC was using a system based on Oracle database and Sun Solaris for most of its key operations. ISC's IT team; James Harris, Peter Dawson and Oriol Gaspá Rebull performed tests regarding the transfer from the UNIX system to the Linux, the main benefits being cost cuts and performance improvement at the possible reduction in reliability. The performed tests have led to the selection of a PostgreSQL database to replace Oracle. By the end of 2007, most of the necessary modifications to the existing software and its compilation were completed and were tested and within the first months of 2008, ISC started using the Linux operating system and the PostgreSQL database in its routine operations. As expected, this move significantly improved and enhanced ISC performance.

Improving analysis tools

The ISC seismologists identify needs and means to further improve the tools to analyze and edit the ISC Bulletin. Additional programs were written to provide the seismologists with better visualization products for use in the analysis process. The main developments are associated with developing new interactive editing tools by converting to Perl/Tk which is fast, platform-independent and provides a full range of features - all in a Graphical User Interface environment.

Modernising the ISC Location Procedures

Based on recommendations of the first ISC/IASPEI location workshop the ISC has been preparing to adopt the AK135 Earth velocity model. Approximately 15,000 events during Jan-Oct 2004 were located by the ISC using both JB and AK135 models. These data were given to participants of the second ISC/IASPEI workshop held in Perugia, Italy in July 2007. To ensure that the introduction of new travel times into the ISC operation would not cause unwanted or unforeseen biases, the ISC encouraged seismologists from around the world to use their local knowledge of different geographic and tectonic regions to conduct critical comparisons of the ISC JB and the experimental ISC AK135 locations. The results of 19 regional studies were presented at the Perugia workshop. The outcome of the workshop and corresponding IASPEI resolution essentially led to a decision of the ISC Governing Council to adopt AK135 for ISC operations from data year 2006.

Collaboration with IASPEI's Working Groups

When applicable, ISC tries to be instrumental in supporting IASPEI activities and implement its resolutions and recommendations. During 2007, ISC continued to be active in helping the IASPEI Working Group on Magnitudes to introduce their recommendations for standard amplitude and period measurements to determine different magnitudes and standardize the magnitude formula. In support of the activities of this WG, ISC has encouraged its data contributors to provide information about their practice of magnitude determinations (see above).

ISC took part in the efforts of the IASPEI Working Group for Reference Events to Improve Location and developed an on-line service that facilitate on-line nomination of candidate events and provide information on reference events.

ISC was also involved with the activities of the working group on Seismic Stations Code that was formed on the initiative of NEIC, EMSC and ISC to better characterize the station in the context of its deployment, to accommodate the need to better credit the owners, operators and data providers and to facilitate the integration of stations of small seismic arrays, temporary deployments and strong motion stations. (See web page www.isc.ac.uk/stationcode/).

Taking part in the activities of international organizations

The ISC was invited and supported by UNESCO to take part in its initiatives known as RELEMR (Reduce Earthquake Losses in the Extended Mediterranean Region) and the Gulf Seismic Forum (Forum of the countries neighbouring the Persian Gulf Region). A. Shapira participated in the RELEMR meetings in Madrid, Spain (Dec. 2006). D. Storchak took part in the Gulf Seismic Forum meeting in Kuwait (March 2007) supported by Kuwait Institute of Scientific Research.

The ISC gratefully acknowledges with thanks the receipt of the annual CTBT/IDC reviewed bulletin. This is no doubt a very significant contribution to the completeness of the ISC Bulletin and because the ISC Bulletin is based on a far greater amount of data the collaboration helps in the evaluation of the quality of the IDC bulletin

ISC was recognised as an Observer at the GEO-IV Plenary session in Cape Town, South Africa on 28th November 2007 as part of the Global Earth Observation System of Systems (GEOSS) project.

FINANCE

The detailed financial statements of the ISC for 2007 were audited by Griffins, Chartered Accountants (Newbury, UK) and approved by Prof. John Woodhouse of ISC Executive Committee. These statements present the state of ISC's financial affairs as at 31 December 2007.

INCOME

In 2007, ISC had a total income of £ 399,297 from national contributions and sponsorship from Munich Re as well as all interest on ISC bank accounts plus the income from selling ISC publications. This amounted to over 3% more than was budgeted and approved by the ISC Governing Council during their last meeting. In comparison with 2006, this was a 1% increase in total income. The exchange rate between the UK £ and USA \$ fluctuated between £1=\$1.959 at the beginning of the year, to \$2.10 in October 2007 and finishing at the end of December at £1=\$1.99.

During 2007, two more members, each with one unit, joined the ISC Governing Council: the Sudan Seismic Network, part of the Geological Research Authority of Sudan and Uppsala Universitet's Swedish National Seismic Network, SNSN. At year-end, after 3 consecutive years the membership fees from the University of Tehran, Iran and also CRAAG, Algeria were unpaid and were written off. At the end of the year the Consiglio Nazionale delle Ricerche, Italy disclosed that they would be withdrawing their 4-unit support for the ISC.

EXPENDITURE

More than 80% of ISC expenditure in 2007 was on personnel costs. During 2007 there were no changes in personnel but at the end of the year Avi Shapira finished his term at the ISC. The salary costs include: salaries, pension contributions, recruitment of a new Director and repatriation of the serving Director. The ISC salaries follow the UK academic salaries scales. Some of the computing expenditure, for new machines, was paid for from the Computer Replacement Fund. Travel expenditure in 2007 was similar to that expended in 2006, due to the staff acquiring travel grants before attending meetings abroad.

RESERVES

The loss of income over expenditure for 2007 was £67,869. ISC total reserves, comprising the cash in the bank, building and land, the money owed to ISC (debtors) minus the money ISC owes (creditors and remaining mortgage on the building) decreased during 2007 to £374,205. The Exchange Rate Stabilization Fund (£30,000) set aside for emergency use due to exchange rate losses has been absorbed into the General Reserve following the Governing Council decision that *“The ISC should use its £30,000 Exchange Rate Stabilization Fund in 2007 to offset the reduction of the members’ contributions from the low US dollar”*. The ISC computer replacement funds have decreased during 2007 by £6,691 representing purchases made. The ISC has a general reserve of £315,833 (equivalent to just below 9 month’s operation of the ISC). This is within British guidelines for charitable organizations.

CASH FLOW

The cash flow in Fig. 9 shows receipts and outlays using dates when transactions were recorded at the bank and the bank balances with US Dollars converted to Sterling using the exchange rate as of the end of each month.

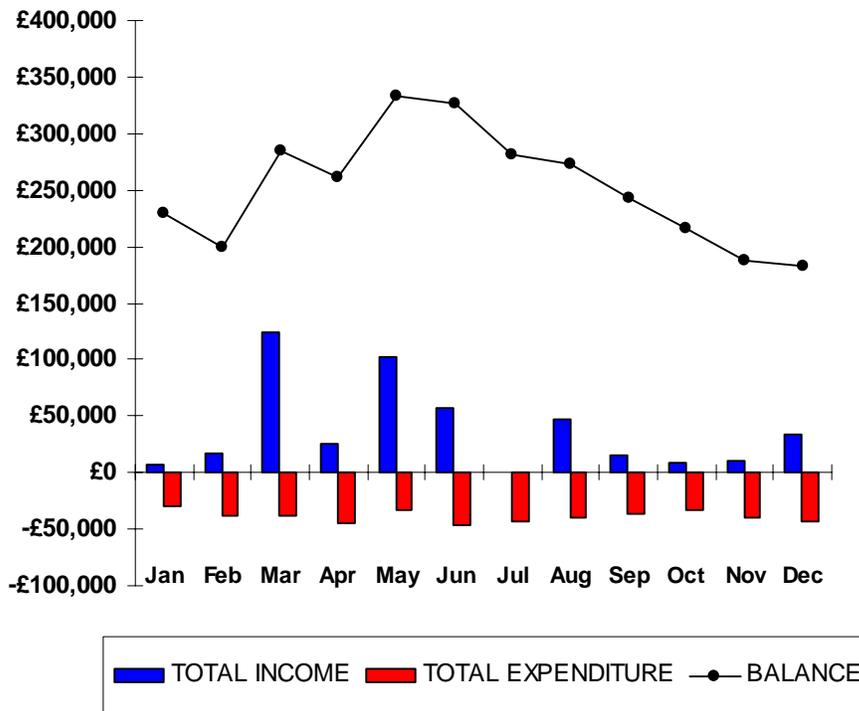


Fig. 9 Income/Expenditure cash flow and cash balance

The ISC has cancelled its £20,000 overdraft facility, as advised by the business manager at the bank in the knowledge that a new overdraft could be arranged for emergency use if contributions are delayed. If other obligations need to be met then permission from the Governing Council chairman would be requested to use the computer replacement funds that are kept in reserve.

ISC's PARTICIPATION IN MEETINGS, WORKSHOPS AND CONFERENCES

Visits by ISC personnel

March 2007 D. Storchak - the 4th Gulf Seismic Forum, supported by the Kuwait Institute of Scientific Research (KISR)

Thanks to the support of the organizing committee of the IUGG meeting and the Royal Society of London, ISC seismologists: Przemyslaw Kowalski, Baokun Li and Beatriz Vera were able to attend the meeting in addition to Avi Shapira and Dmitry Storchak and more than 10 papers were presented.

D. Storchak was invited by the Technical University of Freiberg, Germany to take part in the annual meeting of the Working Group on Seismology for the Council for Research in Physics of the Earth Interior and to partake in the celebrations for the 50th anniversary of Berggießhübel Observatory, Germany. The meeting was held in September 2007. Dmitry made presentations on the status and possible improvements of data exchange with German Seismic Networks and also the ISC development plans.

By invitation of the organizers, A. Shapira participated in meeting of the DESIRE project of GeoForschungsZentrum, in Potsdam, Germany in September 2007.

ISC was represented by A. Shapira at the international seminar in Suzdal, Russia devoted to the "50th Anniversary of the International Geophysical Year (IGY) and the Electronic Geophysical Year (eGY)". Avi presented the ISC activities with emphasis on its on-line services. The CODATA Working Group for the eGY met during the seminar and Avi discussed cooperation with the World Data Centers and the need to protect important historical documents that have been collected by ISC over the years. The visit was supported by the Geophysical Centre of the Russian Academy of Science.

During his visit to Russia, A. Shapira was invited by Prof. J. Zetzer, the director of the Institute for Geosphere Dynamics (IGD) of the Russian Academy of Science where he presented the ISC to the IGD staff.

Publications by ISC personnel

Abstracts

- D.A.Storchak, 2007. Integrating local seismic bulletins in the Gulf region. Gulf Seismic Forum, Kuwait.
- D.A.Storchak, M.K.Bolton, B.E.Vera, P.T.Kowalski, B.K.Li, 2007. Summary of the ISC Bulletin of events of 2004. IUGG General Assembly, Perugia, Italy.
- D.A.Storchak, 2007. Drafting the ISC development plan. Working Group on Seismology for the Council for Research in Physics of the Earth Interior, Berggieshubel, Germany
- D.A.Storchak, 2007. German contribution of seismic parametric data to the ISC. Working Group on Seismology for the Council for Research in Physics of the Earth Interior, Berggieshubel, Germany
- A.L.Bird, D.A.Storchak, 2007. Relocation of earthquakes off the west coast of British Columbia, Canada using processing routines at the International Seismological Centre and various travel time tables. IUGG General Assembly, Perugia, Italy
- D.A.Storchak, J.Harris, 2007. Relocating ISC Bulletin events with AK135. IUGG General Assembly, Perugia, Italy
- P. Wiejacz, P. Kowalski, 2007. Comparison of ISC seismic event locations with data of Polish mining industry. IUGG General Assembly, Perugia, Italy
- J. Benjumea, B. Vera, H. Meyer, 2007. Assessment of the ISC JB and AK135 locations in the NW of South America. IUGG General Assembly, Perugia, Italy
- B. Vera, A. Shapira, D. Storchak, J. Harris, 2007. Analysis of station travel times residuals based on the AK135 velocity model and phase weighting scheme in location procedures. IUGG General Assembly, Perugia, Italy
- V.Pinsky, A.Shapira, 2007. ISC bulletin with AK-135 velocity model for earthquakes in the Levant and East Mediterranean region with application to advanced location techniques. IUGG General Assembly, Perugia, Italy
- A. Shapira, O.Gaspà Rebull, E. R Engdahl, P G Richards, 2007. Reference events to improve earthquakes locations - a new ISC Service. IUGG General Assembly, Perugia, Italy
- B-K Li, G-L Diao, A Shapira, 2007. Stronger Aftershocks of Both the 1970 Tonghai and the 1976 Tangshan Great Earthquakes: Difference and Interpretation. IUGG General Assembly, Perugia, Italy

BUDGET FOR 2008, 2009 AND 2010

	<u>2007</u> <u>Actual</u> <u>Amounts</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>
EXPENDITURE	£	£	£	£
Publications	15,865	21,580	22,190	17,370
Personnel Costs	360,407	342,450	378,150	380,830
Buildings	24,032	23,000	23,490	24,195
Travel	16,212	19,317	15,571	15,755
Computing	15,816	13,616	11,340	11,680
Other costs	15,901	16,320	16,810	17,320
Provision for write-offs	9,213	7,500	8,400	9,350
Foreign Exchange Loss	9,720			
	£467,166	£443,780	£475,950	£476,500
INCOME		at £1650/unit	at £1,730/unit	at £1820/unit
National Contributions	366,581	407,891	424,772	437,515
Sale of Publications, CDs + Services	20,341	17,200	17,200	17,200
Extra Funding+ bank interest	12,375	9,500	7,000	7,000
	£399,297	£434,591	£448,972	£461,715
Gain or (Loss)	-£67,869	-£9,189	-£26,978	-£14,785
Net Liquid Assets	£123,951	£114,762	£87,784	£72,999
(Diff between cash and creditors)				

£1=\$1.99

This budget estimate has been compiled by D A Storchak & M A Aspinwall based on expenditure consistent with the ISC Development Plan for 2008 -2011.