Assessing ISC locations using the data of Iranian National Broadband Seismic Network (INSN)

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INTRODUCTION

Iranian plateau has been registered as one of the most active areas of the world and it frequently suffers destructive and catastrophic earthquakes that cause lose of human life and economical damages. This country is under stress from point of two tectonic plates (Arabian and Eurasian plates). For this reason many earthquakes occurre in Iran every year. So study of Iran seismicity is an important subject, because this subject cause knows the high-risk zones and regional that has potential for great events. During one decade ago scientific centers in Iran specially INSN (Iranian National Broadband Seismic Network) has investigated Iran seismicity and crust of Iran and find velocity models for it. INSN has been established in 1995 by IIEES (International Institute of Earthquake Engineering and Seismology) to study the seismotectonic of Iran, earthquake location, and rapid announcement to rescue teams, mitigation of seismic hazards and deriving crust and structure upper mantle beneath Iranian plateau. Our purpose in this paper is assessing of earthquake location during past two years from 2004/07/01 to 2006/12/31 by INSN and compares obtained results by other seismological centers.

INSN

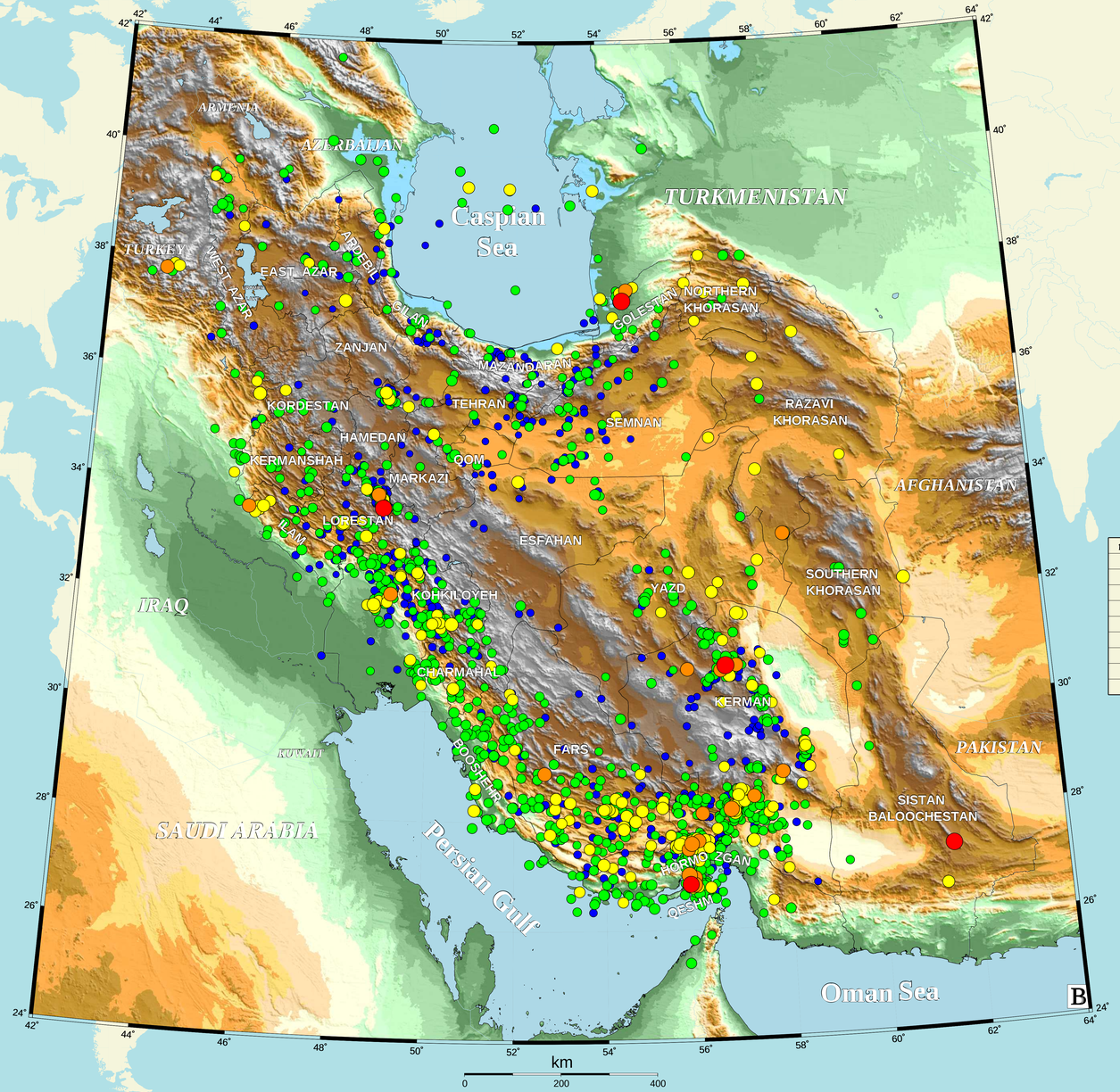
INSN is a Guralp system consists of 15 remote stations that have been installed by IIEES since 2003 (Fig. A). Each station is consist of a broadband, three components seismometer. That is equipped by 24-bit digitizer, GPS antenna and an acquisition computer. Data digitally stores the event records on acquisition computer with using two modes. A continuous mode with sampling frequency 50 Hz and a triggering mode with sampling frequency 100 Hz. In continuous mode system allows a common clock that is synchronized with a GPS receiver and reduces time uncertainties. The Data that are sorted in stations send via satellite to center of processing in INSN and store on another acquisition computer to GCF format (Guralp Compressed Format). In INSN data convert from GCF format to Seisan format by Seislog software and ready for processing. INSN uses Seisan software for processing.

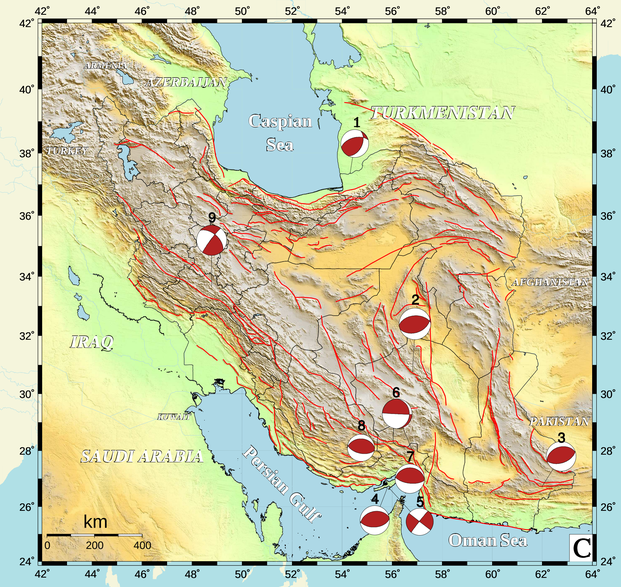
DATA PROCESSING

During this period INSN recorded and processed more than 3200 events that had recorded by minimum 2 stations which had magnitude range between $2 \le M < 6.5$. The uncertainties in this collection were more than standard. So we relocated these events and chose more than 2500 events that their earthquake characteristics were computed accurately and had magnitude range between $2.5 \le M < 6.5$ which recorded by minimum 3 stations and close to the world standards (Fig. B). After that we compared our results with other centers and in more than 90% we had good results in computing of earthquake characteristics. But sometimes less than 10% for lack of stations in some parts of Iran we had poor results. We put these results on IIEES website and also prepared seismological Bulletins (in PDF format), earthquakes catalogues, and seismicity maps and published our results.

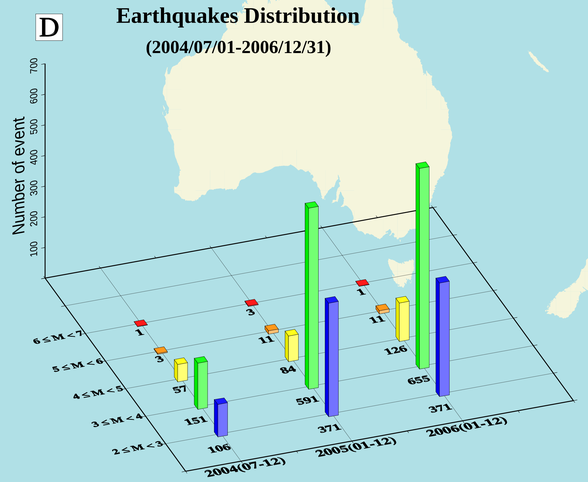
CASE STUDY

As mentioned more than 90% of events are reliable and accurate in location in comparision to other centers. There are some important events that are occurred in Iran at this period and their earthquake characteristics computed accurately and listed in below: (Zarand, Qeshm, Faryab, Doroud, Saravan EQ. that their focal mechanisms are computed by CMT. Fig. C). These events have errors in latitude and longitude in order of 2-3 km and error depth in order of 1-2 km. But there were some events that we couldn't locate them accurately for lack of seismic stations and poor velocity model for that area .These events had azimutal gaps more than 270 degree and uncertainties in longitude and latitude about 50-70 km and error depth about 5-10 km .(Fig. C, e.g. event # 3 Saravan EQ)





No	Date	Time	Lat	Long	Depth	Strike1	Dip1	Slip1	Mag	Region
1	2004/10/07	21:46:24.8	37.37	54.32	32	27	46	53	5.6	North-East of Aq Qaleh
2	2005/02/22	2:25:30.0	30.76	56.81	12	71	44	79	6.4	East of Zarand
3	2005/03/13	3:31:26.3	26.73	62.00	58	253	37	-89	6.0	West of Saravan
4	2005/11/27	10:22:22.7	26.66	55.80	12	257	39	83	5.9	South-West of Qeshm
5	2005/11/27	16:30:40.2	26.65	55.89	12	218	87	-2	5.5	West of Qeshm
6	2006/02/28	7:31:07.1	27.86	56.87	25.5	302	19	118	6.0	North-West of Bandar-e abbas
7	2006/03/25	7:29:02.1	27.43	55.62	12	268	26	81	5.9	North-West of Bandar-e abbas
8	2006/03/25	9:55:17.5	27.47	55.70	12	270	34	80	5.5	North-West of Bandar-e abbas
9	2006/03/31	1:17:10.8	33.69	48.78	12	311	54	-172	6.1	North-West of Dorud



2542 events during 2004/07/02 12:56:40 to 2006/12/31 23:26:51				
● $2 \le M < 3$	● $3 \le M < 4$	● $4 \le M < 5$	● $5 \le M < 6$	● $6 \le M < 7$
N = 848	N = 1397	N = 267	N = 25	N = 5

DISCUSSION AND RESULTS

Focal depth in most part of Zagros and Alborz is about 18-20 km, and in central of Iran about 12-16km, but there is exception that depth is about 48-54 km.

Dominant magnitude range were recorded at INSN is between $3 \le M < 4$. (Fig. D)

Regions of Alborz and Zagros show dense seismicity because these regions are under stresses from Arabian and Eurasian plates.

Our experiences show, events that recorded by more than 6 stations and also occurred inside network reduce uncertainties in location and have azimuthal gap less than 180 degree.

Velocity model is compatible in most part of Iran but we are obtaining and computing a better model for Iran.

CONCLUSION

As mentioned before INSN has been installed 15 broadband stations in Iran, but unfortunately some parts of Iran have not a good coverage of stations (e.g. South east and North east of Iran). One of goals of INSN is develop and promotion of stations and reach them to 50 stations that cover all of Iran. Also study of crust and deriving crust and structure upper mantle beneath Iranian plateau, to obtain a good models for earthquake location.

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