Teleseismic Loss Estimates in Near-Real-Time After the M8 Wenchuan Earthquake of May 12, 2008

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WAPMERR
Geneva

What is WAPMERR?

A non-profit agency with the aim to assist developing nations with reducing earthquake risk and with recovery after earthquake disasters.

Located in Geneva, Switzerland, with employees in USA, Georgia, Russia

Collaborating with investigators in Japan, Germany, USA, Peru, Portugal, India, Iran, Turkey, Greece, Algeria, United Kingdom, Italy, Spain (CHINA?)

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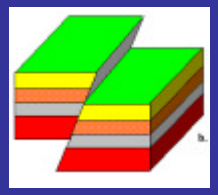
LOSSES

1) fatalities

2) injured

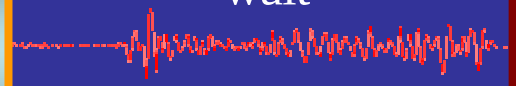
3) damage

as a function of settlement and district for large cities



Earthquake

wait



Accurate parameters: X, Y, Z, M

Earth transmission properties: ground motion

Building fragility data base

Damage to buildings

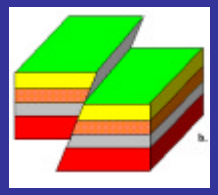
Population data base

Estimates:
- **Building conditions**
- **Number of fatalities**
- **Number of injured**

Rescue Agency:
- **mobilizing (yes/no)**
- **offer of help (yes/no)**

Disaster Manager: accept help (yes/no)

Help injured



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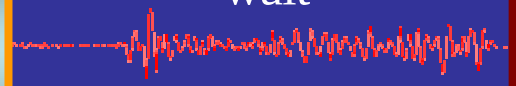

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THE JOB OF THE WAPMERR/SSS TEAM

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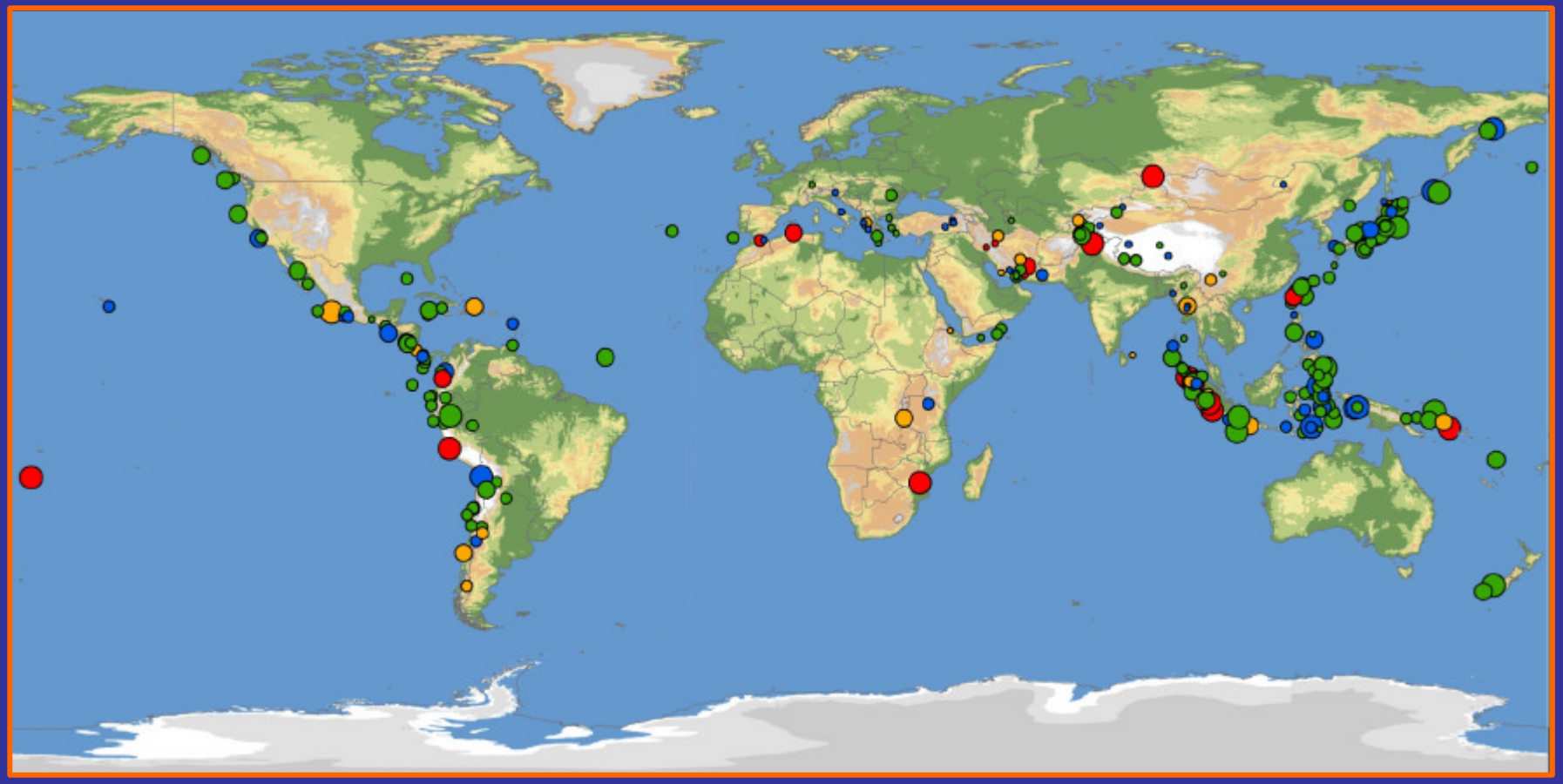
Help injured

Epicenters of earthquake for which loss reports have been issued 2004 to 2007



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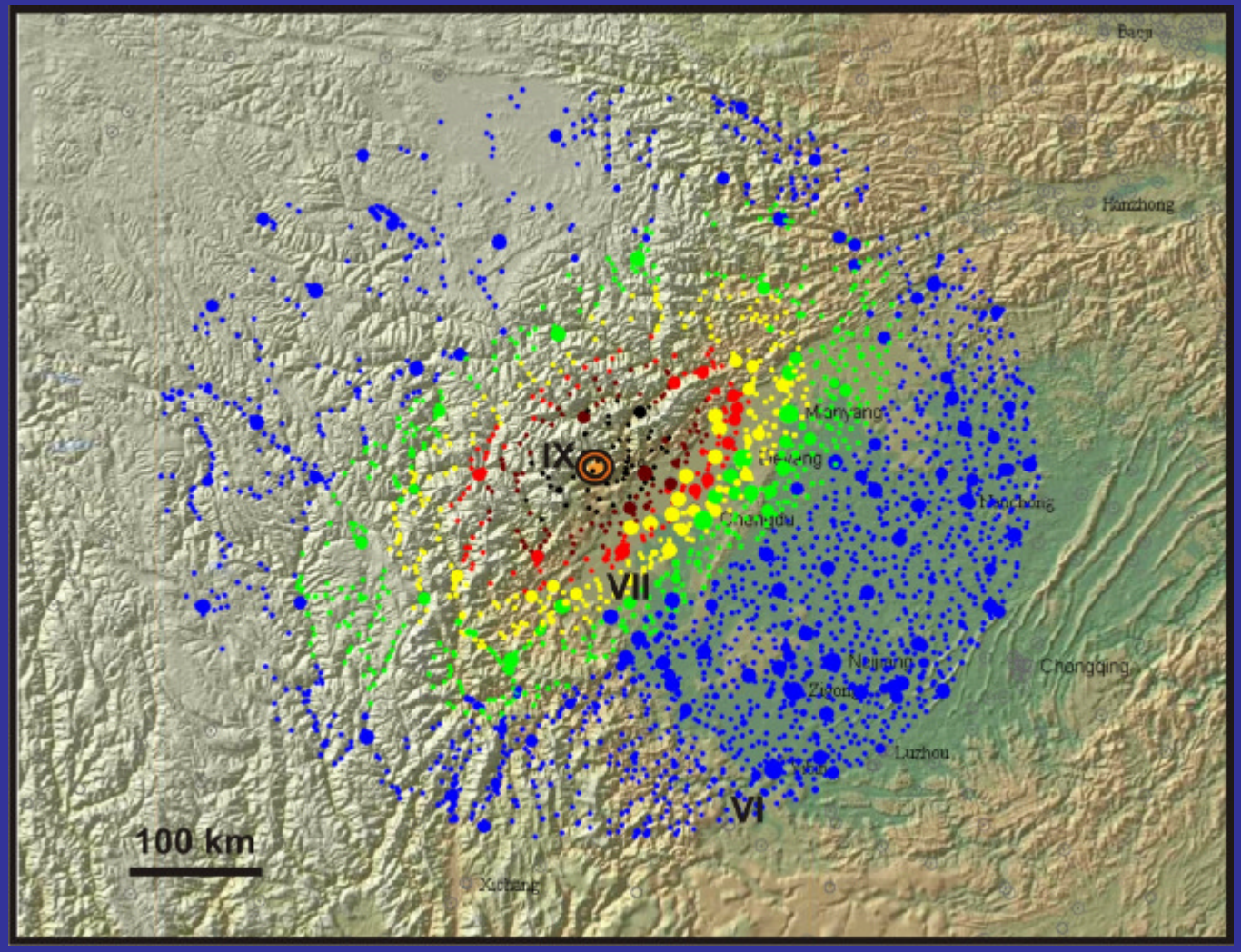
Near-real-time example: Wenchuan, M7.9, Depth 15 km, Attenuation low, 100 minutes after the event



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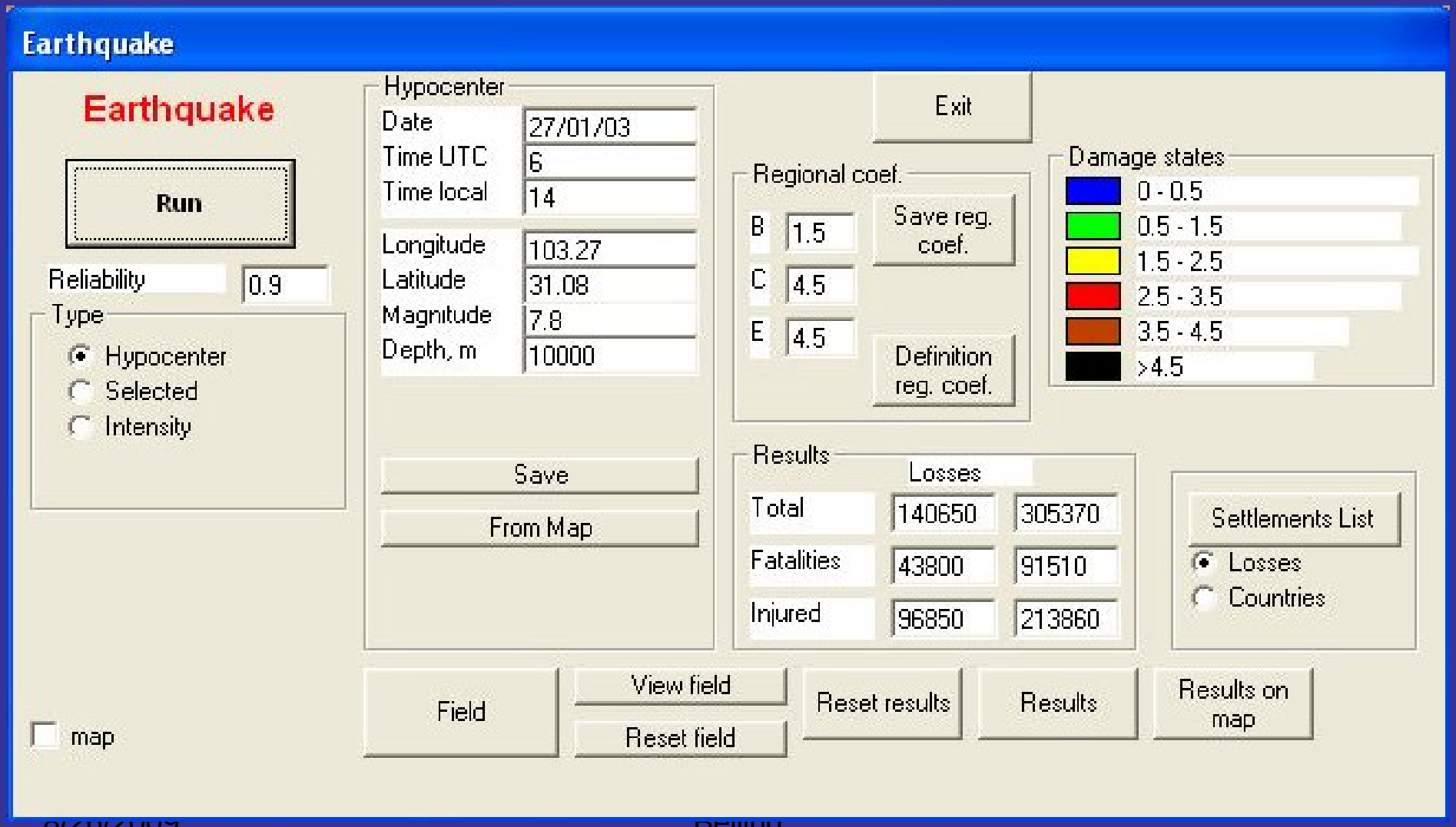
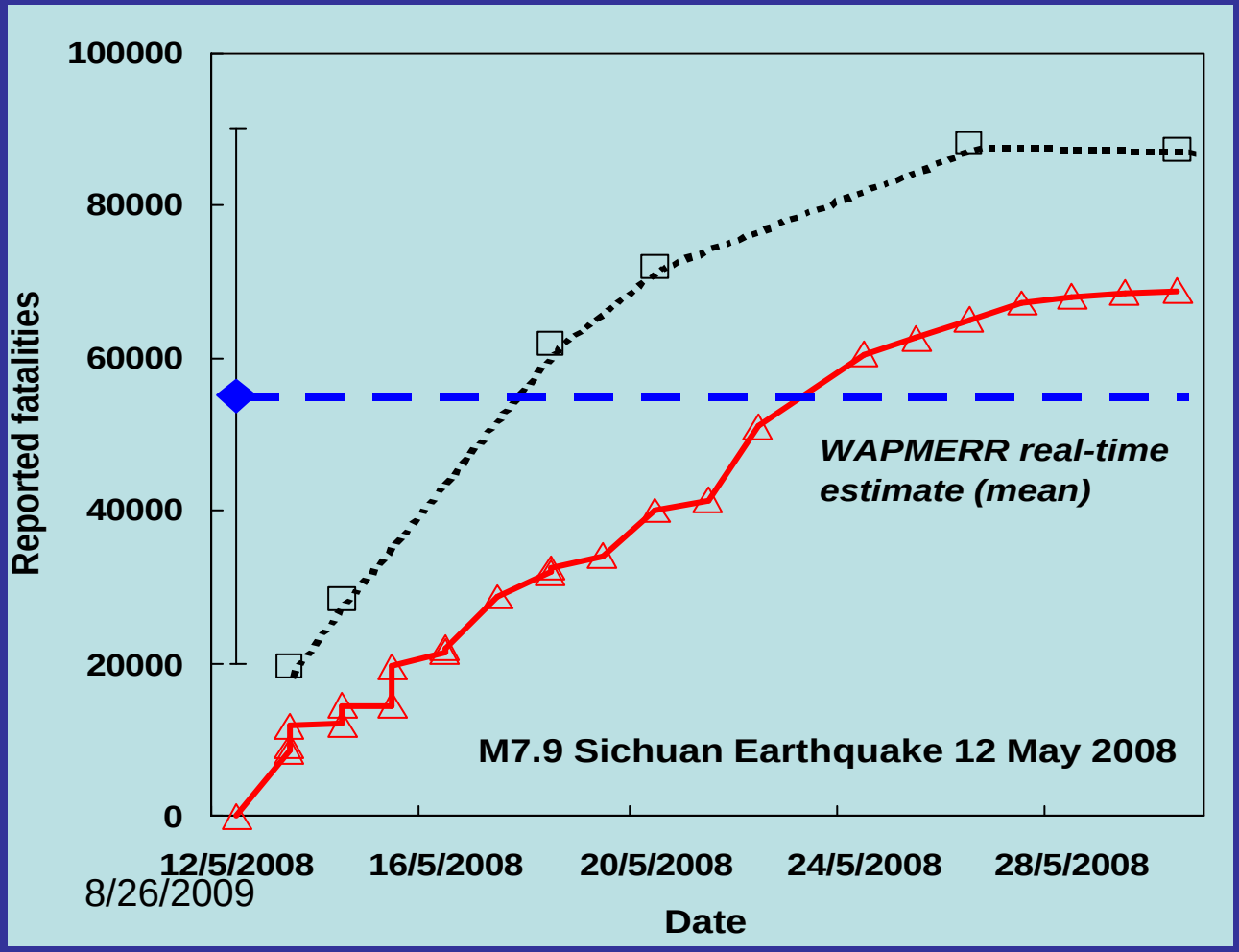
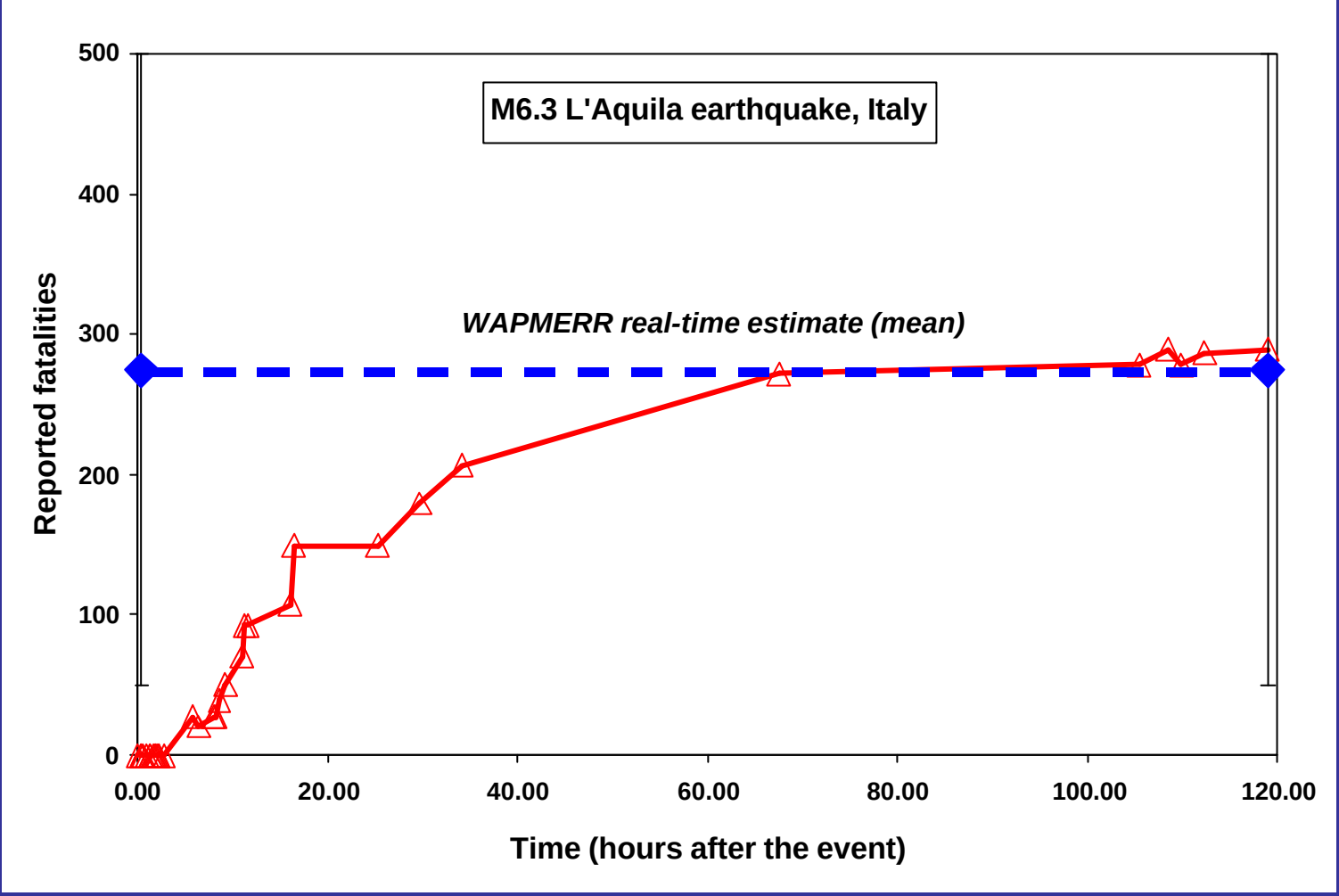
Preferred loss estimate for Wenchuan in near-real time



Wenchuan earthquake 12 May 2008: Estimates of number of fatalities in near-real time



Fatalities (red) and the sum of fatalities plus missing (squares) as a function of time, compared to WAPMERR"s estimate after 100 minutes (blue).



Reported fatalities due to the L'Aquila earthquake of 6 April 2009 (triangles) as a function of time after the earthquake, compared to the quantitative estimate by WAPMERR, based on M6.3, 22 minutes after the occurrence time (diamond with error bars).

Wenchuan earthquake: Information About Parameters With Time

Hour (GMT	Min	Agency	Lat (deg)	Lon (deg)	Dep. (km)	M	Action	Loss Estimate	Delay (min)
06	28	Origin Time							0
06	35	GFZ	31.08	103.15	43	7.7	automatic		7
06	43	JRC					automatic	red alert	15
06	49	WAPMERR					preliminary warning by phone to SDC, based on automatic solution	major disaster	21
06	55	USGS	31.08	103.27	10	7.5	reviewed parameters		27
06	57	WAPMERR	31.08	103.27	10	7.5	email, first quantitative loss estimate based on M7.5, reviewed	fatalities 1,000 to 4,000 injured 3,000 to 9,000	29
07	03	EMSC	31.12	103.25	10	7.5	reviewed parameters		35
08	07	USGS	31.08	103.27	10	7.8	revised magnitude		99
08	08	WAPMERR					revised loss estimate, based on M7.8, phone call	fatalities 20,000 to 90,000	100
08	17	GSR	31.1	103.4	10	8.0	reviewed parameters		109
08	42	EMSC	31.12	103.24	10	7.8	revised parameters		134
17	03	WAPMERR					final, revised loss estimate based on M7.9, low attenuation	fatalities 40,000 to 100,000	635

QLARM – a new tool for estimation of losses due to earthquakes worldwide

Loss Estimates by Email

If you want to be put on the alert list,

Simply let me know.

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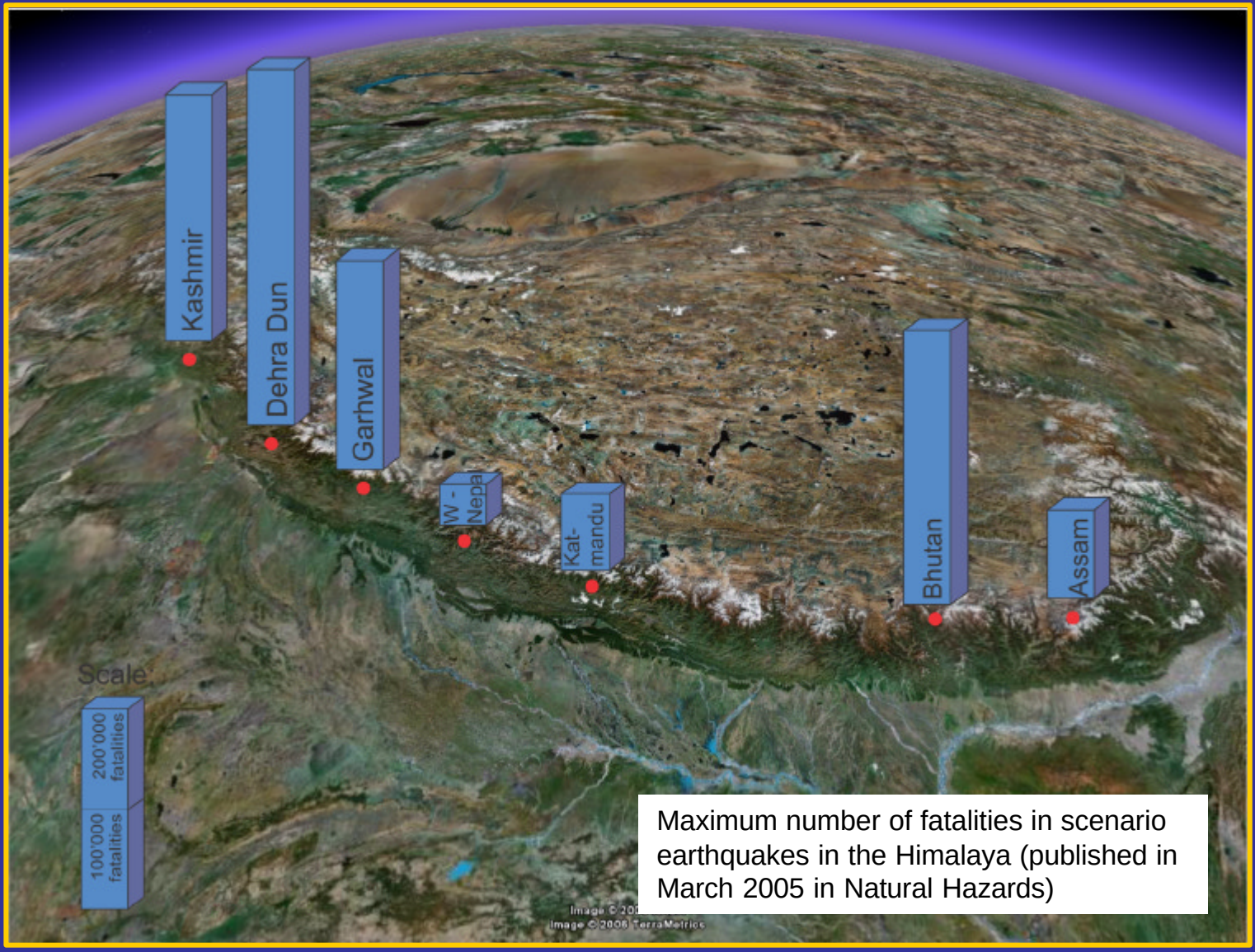
Expected Deaths due to Hypothetical Earthquakes in the Himalaya (Wyss, March, 2005)

	Location.	Lat. (deg.)	Lon. (deg.)	Depth (km)	M	Expected Deaths (thousand)	Number Injured (thousand)	No Settle I = 7	No Settle I = 5
1	Assam	27.8	92.3	25	8.1	24 - 49	52 - 99	160	1900
2	Bhutan	27.3	89.5	25	8.1	76 - 151	163 - 274	270	2500
3	Katmandu	28.1	84.2	25	8.1	21 -42	45 - 86	330	2600
4	W. Nepal	28.7	81.8	25	8.1	11 - 22	24 - 53	370	2800
5	Garhwal	29.7	79.6	25	8.1	58 - 115	125 - 230	380	3000
6	Dehra Dun	30.7	77.7	25	8.1	96 - 199	210 -433	450	3300
7	**Kashmir**	33.0	75.0	25	8.1	67 - 137	146 - 293	550	4000

Reported Death due to M7.6 Kashmir Earthquake of October 2005: 85,000



Maximum number of fatalities in scenario earthquakes in the Himalaya (published in March 2005 in Natural Hazards)

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CONCLUSIONS

- Major earthquake disasters can be discriminated from minor ones in real time (on average within 30 minutes).
- Scenario loss estimates can give order of magnitude estimates of losses in future earthquake disasters.
- Many improvements to the data sets and computer codes to estimate earthquake losses are possible and necessary.

more at www.wapmerr.org

Fields of Collaboration

- Population number by settlements
- Regional building stock
- City models
- Regional casualty matrices
- Scenario loss calculations