

FUKUSHIMA – EARTHQUAKE, TSUNAMI AND AFFECTED NUCLEAR POWER PLANTS

Mentor: prof. Iztok Tiselj

Author: Miha Povšič

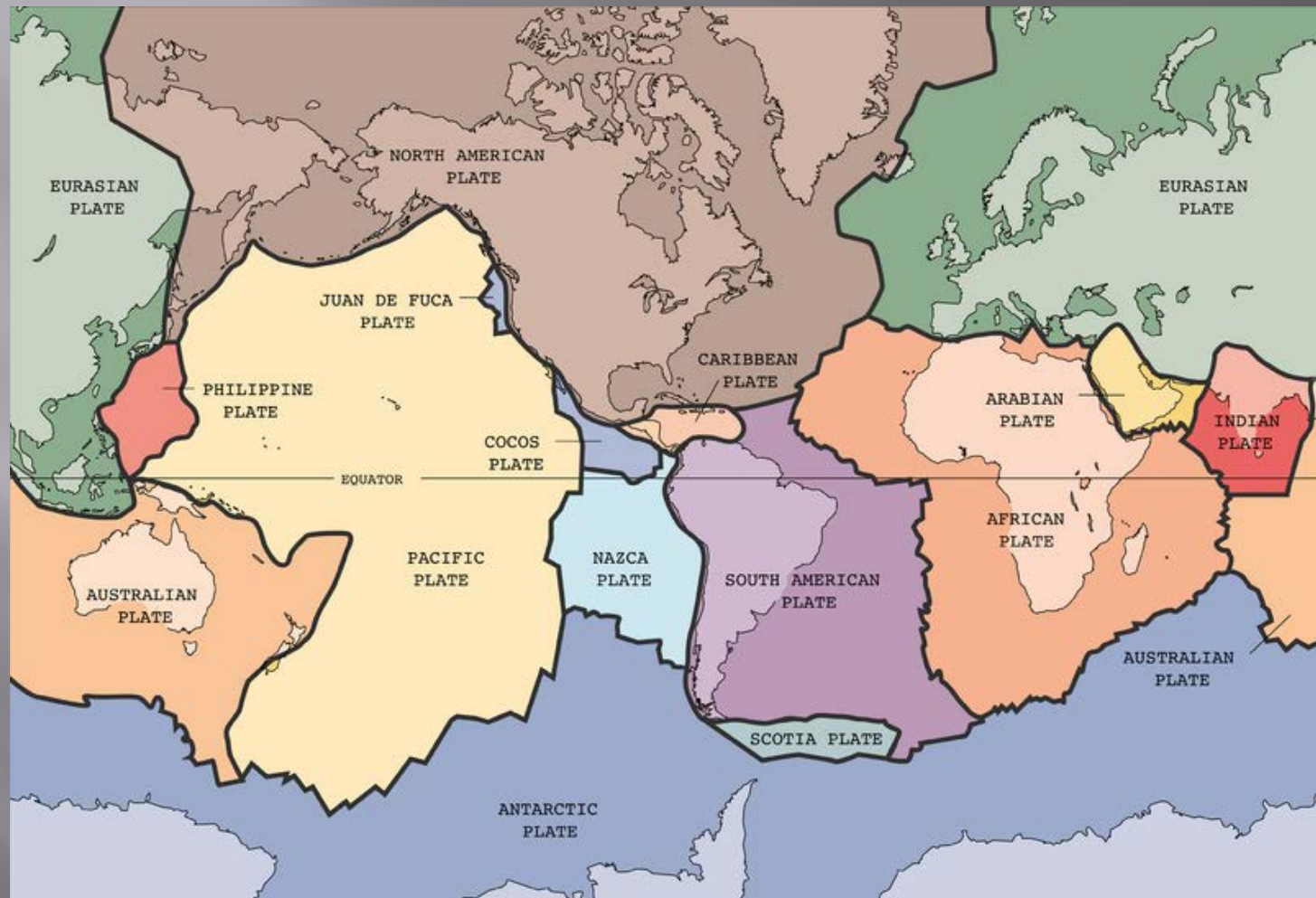
Japan

- Population : 128mio
- 54 nuclear power plants
- Biggest nuclear power plant Kashiwazaki-Kariwa with capacity of 8GW
- Fukushima I and Fukushima II were fourth and fifth biggest with capacity around 4,5GW
- Japanese NPP: power of 48GW(electricity)
- NPP produce around 25% of electricity

Earthquakes in Japan

- Japan lies on the edges of four tectonics plates: Eurasian plate, Pacific plate, North American plate and Philippine plate
- three major earthquakes in last 100 years
- 1923, death toll of 140 000
- 1995, death toll of 6500
- 2011, death toll of 16000

Tectonic plates



Tsunami

- Japanese word, means harbour wave
- a series of water waves caused by the displacement of a large volume of a body of water
- caused by Earthquakes, volcanic eruptions , landslides, glacier calvings, meteorite impacts
- highest death toll in december 2004, killed 230 000 people

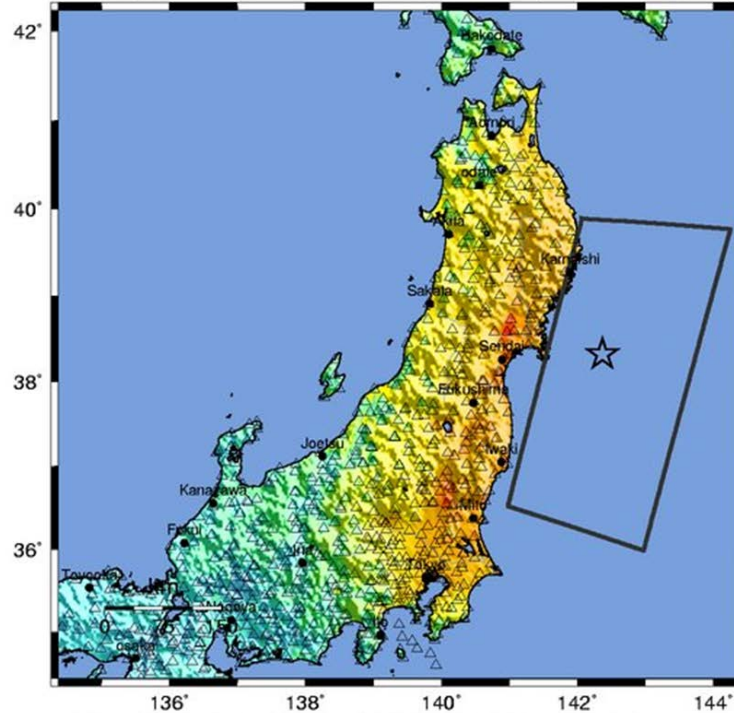
11.03.2011

- 2011 Tohoku earthquake or the Great East Japan Earthquake
- 5:46 AM
- magnitude of 9,0
- epicentre 70 km east of the Oshika Peninsula of Tōhoku
- hypocenter at an underwater depth of 32 km
- the most powerful known earthquake ever to have hit Japan and one of the five most powerful earthquakes in the world

Power of earthquake

USGS ShakeMap : NEAR THE EAST COAST OF HONSHU, JAPAN

Fri Mar 11, 2011 05:46:23 GMT M 9.0 N38.32 E142.37 Depth: 32.0km ID:c0001xgp



Map Version 11 Processed Sat Mar 26, 2011 07:04:10 AM MDT – NOT REVIEWED BY HUMAN

PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC. (%g)	<.17	.17-1.4	1.4-3.9	3.9-9.2	9.2-18	18-34	34-65	65-124	>124
PEAK VEL. (cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	16-31	31-60	60-116	>116
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

- after an hour tsunami reached Japanese coast
- height up to 40m
- travelled up to 10km inland



Affected nuclear power plants

- four NPP on affected area
- three were safely stopped
- Fukushima Daichi(or Fukushima I) was hit by tsunami and electrical generators turned off
- in the accident, there were damage on reactors fuel in four reactors

Fukušima Daiči

Blok 1	460 MW
Blok 2	784 MW
Blok 3	784 MW
Blok 4	784 MW
Blok 5	784 MW
Blok 6	1100 MW

Fukušima Daini

Blok 1	1100 MW
Blok 2	1100 MW
Blok 3	1100 MW
Blok 4	1100 MW

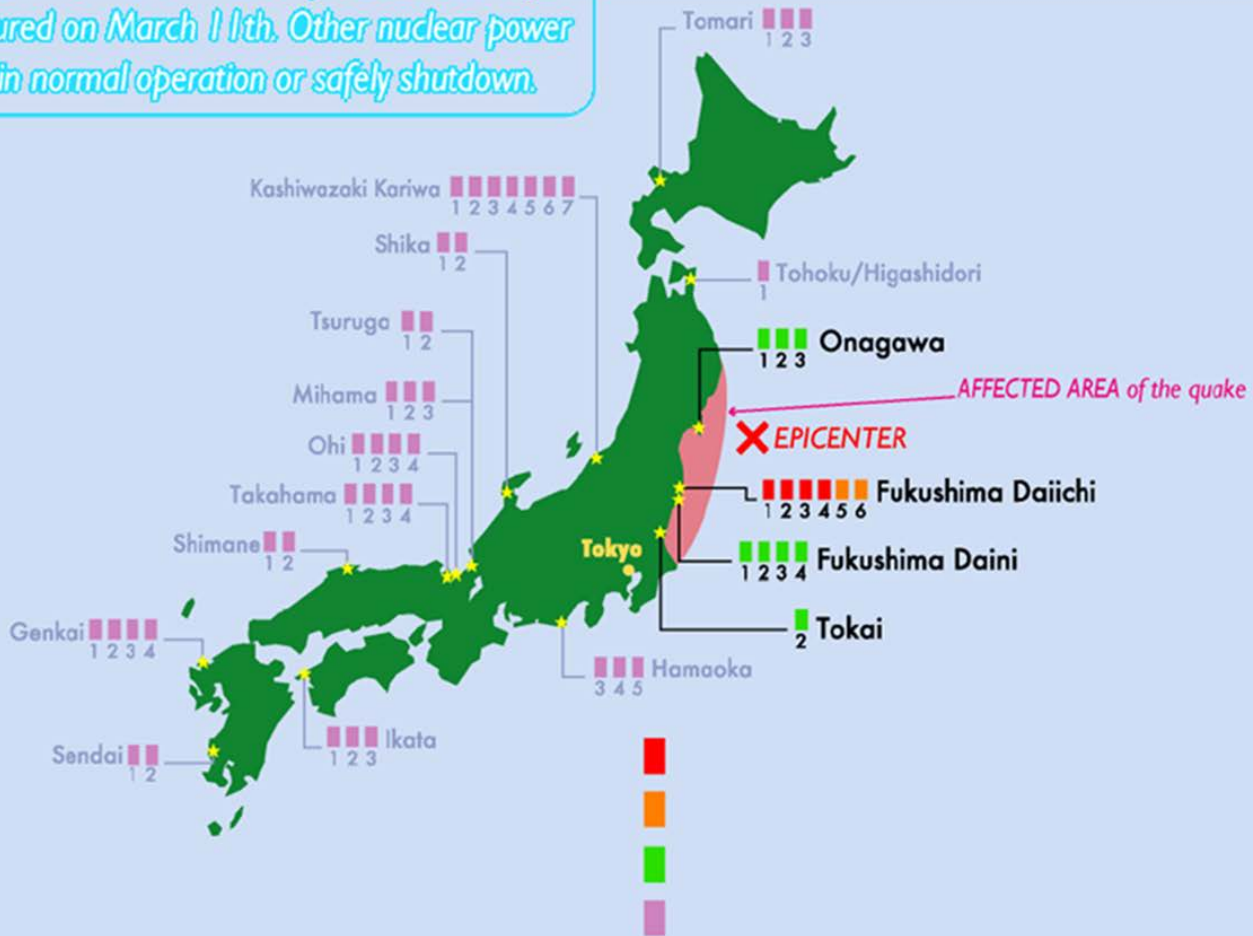
Tokai

Blok 1	zaprt
Blok 2	1100 MW

Onagawa

Blok 1	524 MW
Blok 2	825 MW
Blok 3	825 MW

...ured on March 11th. Other nuclear power
... in normal operation or safely shutdown.

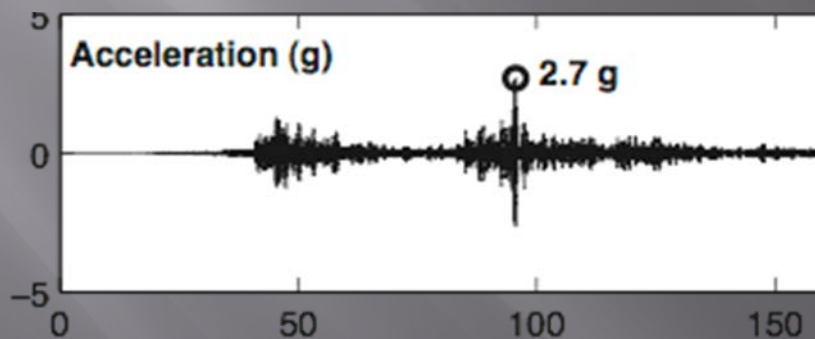


Design of Fukushima I

- it was designed to withstand force up to 0.45g
- reactor would stop working at 0.135g
- diesel generators in case of shut down
- 5.7m high seawall against tsunami

Consequences of an earthquake in Fukushima I

- forces in units 2, 3, 5 were higher than 0.45g
- shut down of the power plant
- 15m high tsunami hit the power plant
- beginning of the worst nuclear accident after Chernobil



pospešek (g)	izmerjen (klet)	projektiran
S-J	0.35	0.45
V-Z	0.56	0.45
Gor-Dol	0.31	0.43

Sources

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