PHIVOLCS Current hazards Information About the BNPP Site

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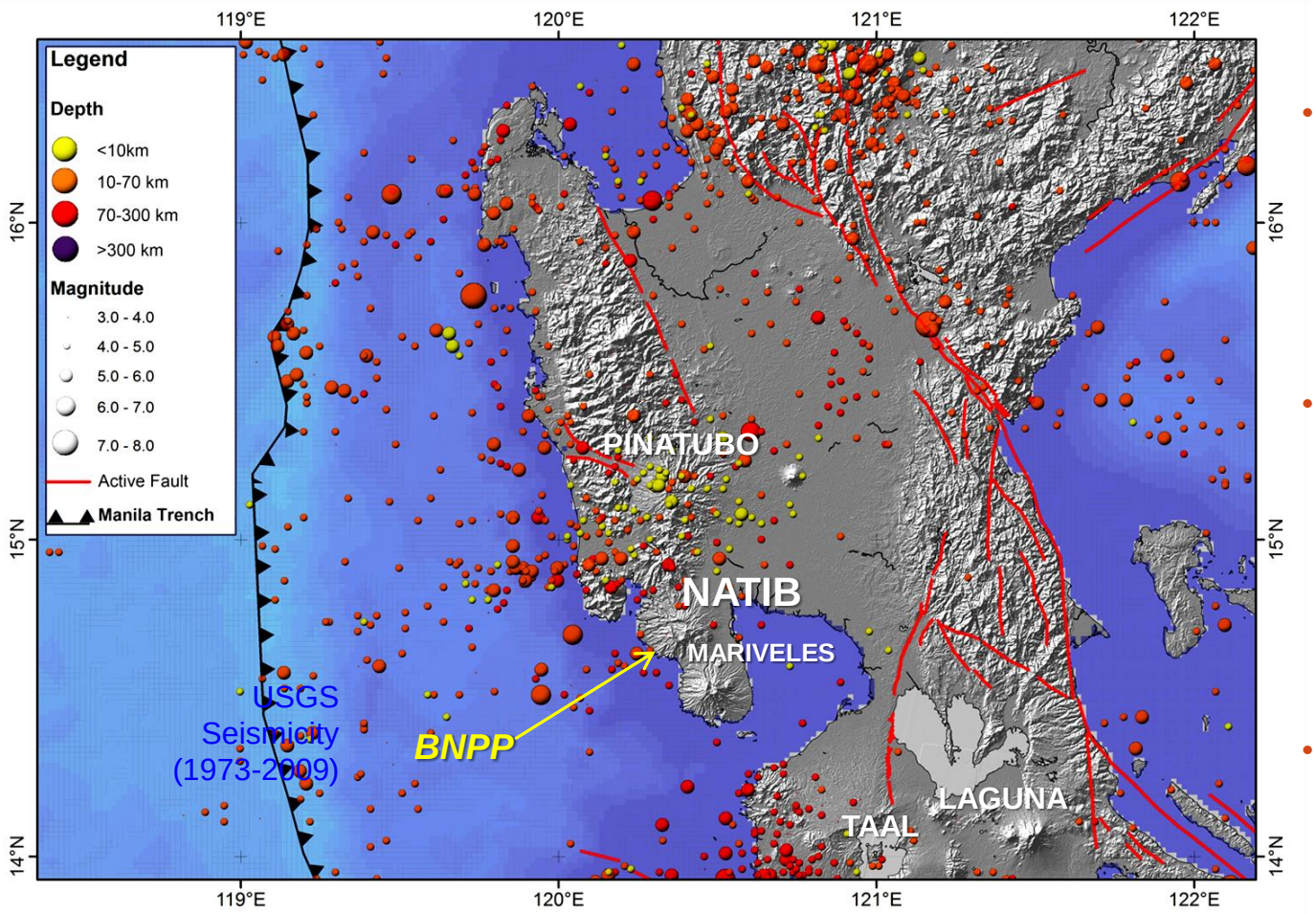
Napot Point Site Safety Issue (1): Volcanic Hazards

- On Mt. Natib, potentially active volcano in West Luzon Arc, detailed eruptive history unknown



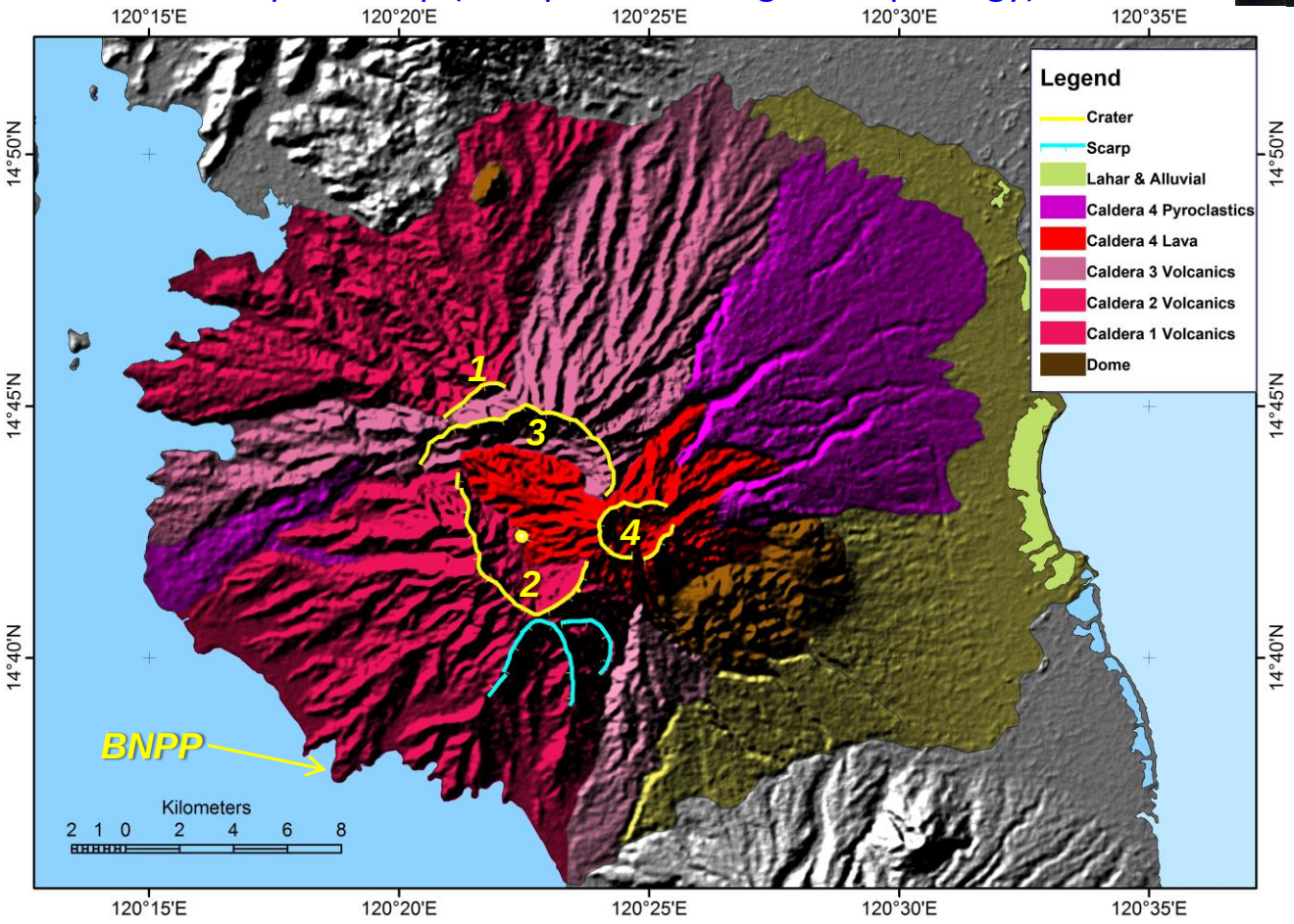
- No record of recent eruption
- Ebasco, 1977 1:30,000/year probability of eruption with VEI 6-7
- Volentik, 2012 1:5,000/year – 1, 10,000/year probability of eruption with VEI 6-7
- For reference, Pinatubo 1991 eruption is VEI 6.

From Dr, Solidum 2009 GEOCON Presentation

Issues of Volcanic Risk

- Comprehensive eruptive history? Basis of all volcanic hazards and risk analyses

Mt. Natib Deposit Map (interpreted from geomorphology)

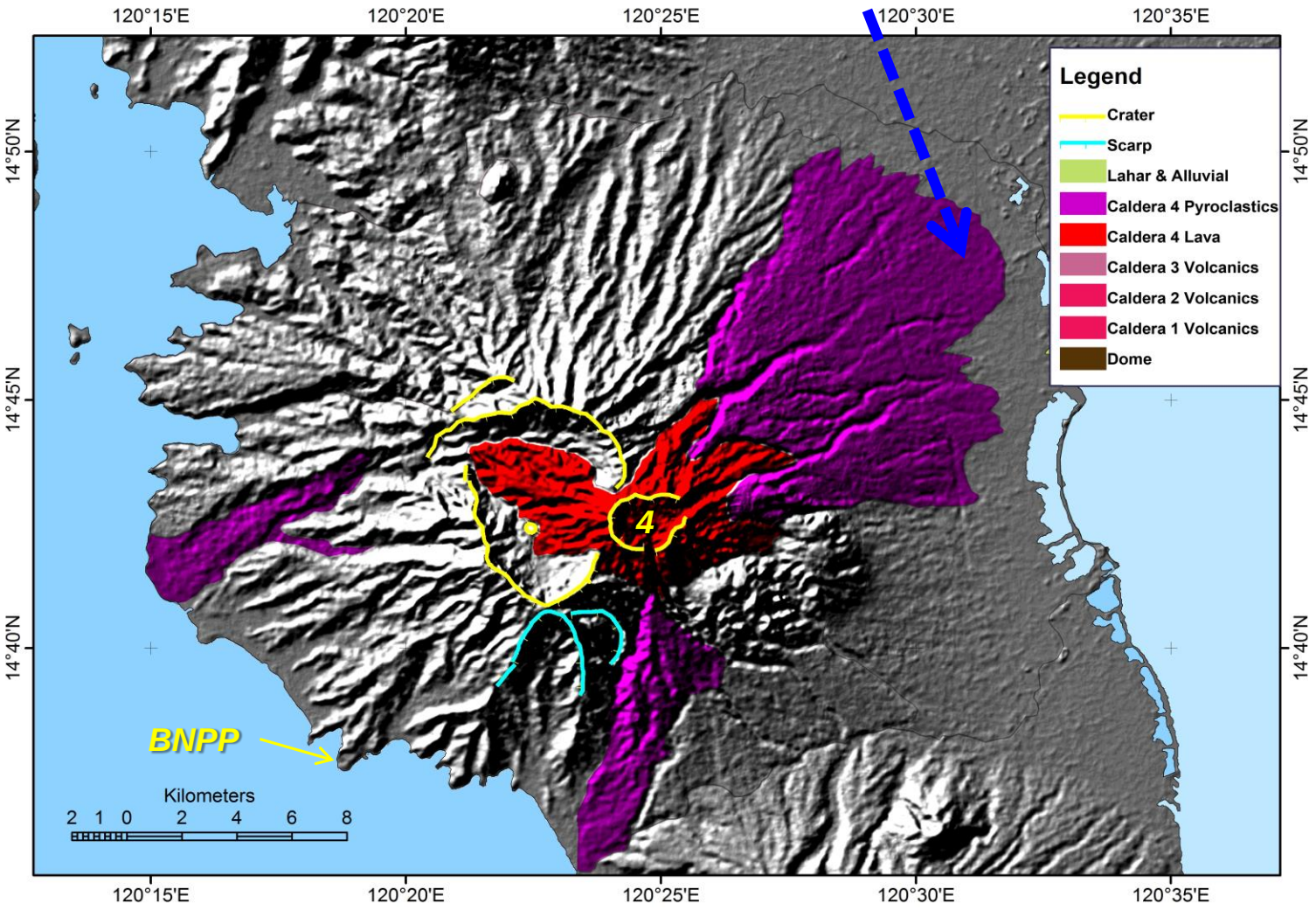


- Map is based on geomorphology. Interpreted from aerial photos, topo maps, InSar.
- No detailed fieldwork has been done to establish eruptive history of Mt. Natib.

From Dr, Solidum 2009 GEOCON Presentation

- Oldest deposits (?): 0.54-2.26 my K-Ar dating (Datuin,1982)
- Youngest deposits: Pyroclastic flows and lava from eastmost crater

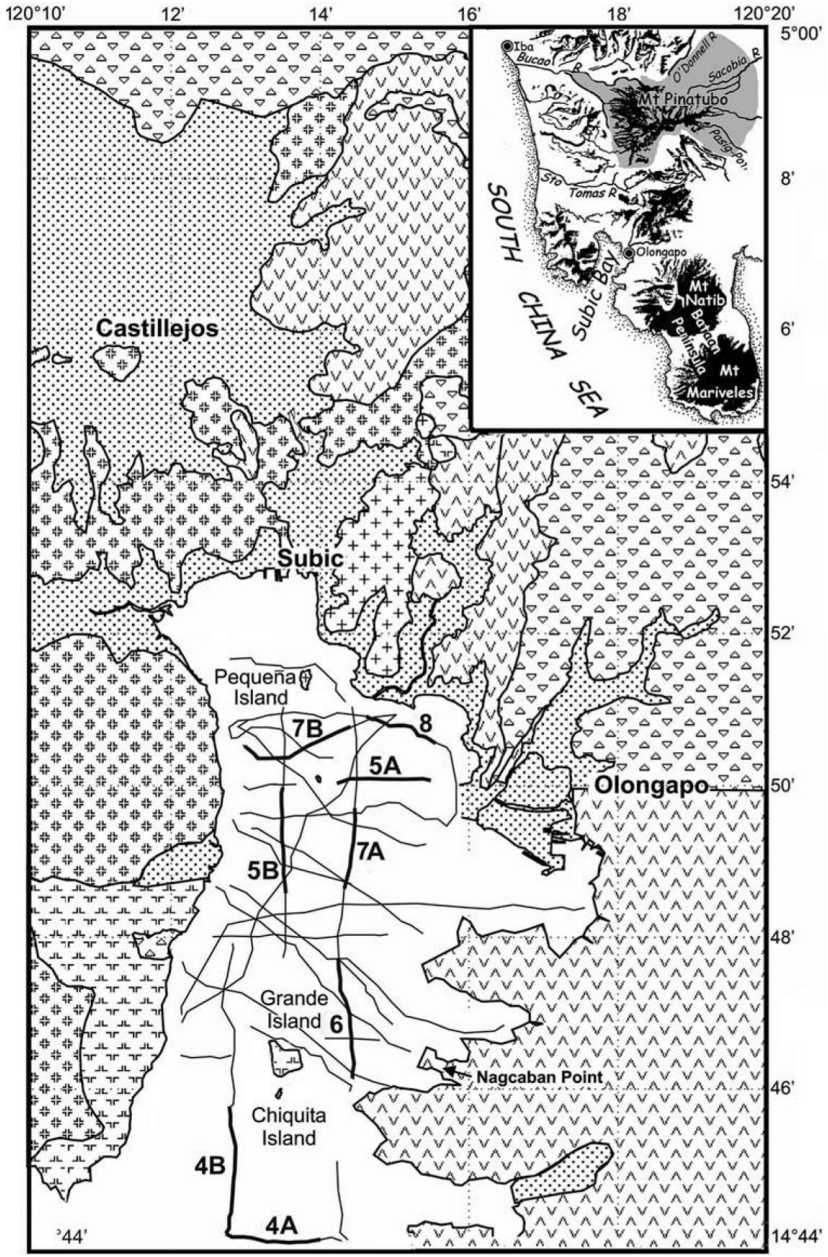
27,000 yo ^{14}C pumiceous PF (Newhall, unpub. data, 1979)

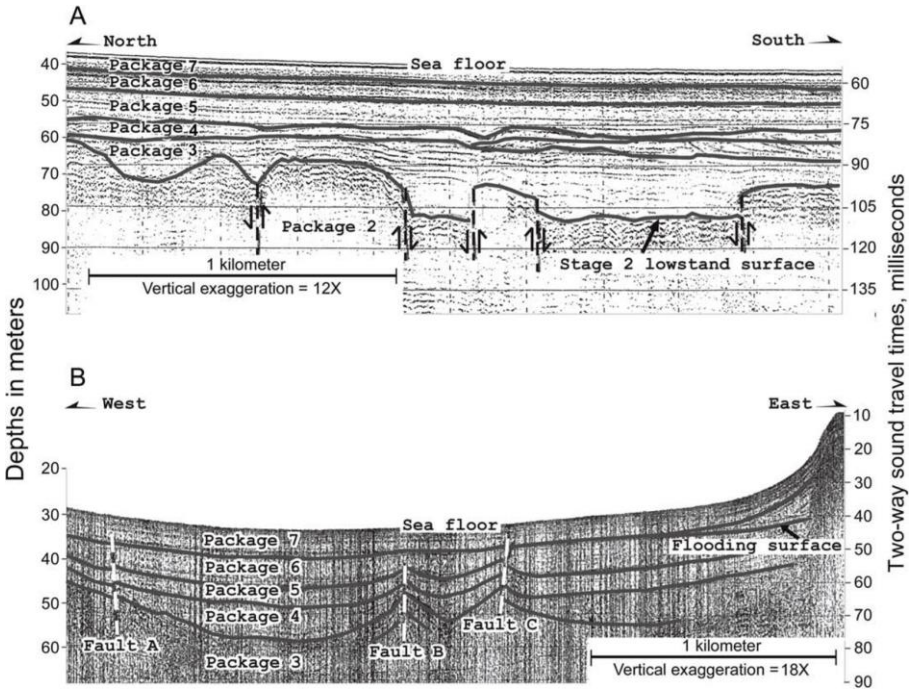


From Dr, Solidum 2009 GEOCON Presentation

CABATO ET AL, 2005, JAES

- Youngest deposits? 11-18kyo Pyroclastic flow? deposits from Natib
- No evidence yet of equivalent subaerial deposits w/ ^{14}C dating
- Inconsistent with edifice geomorphology

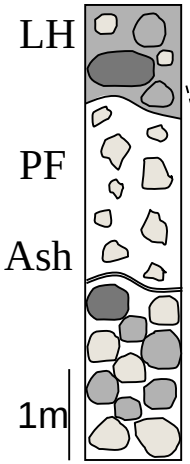




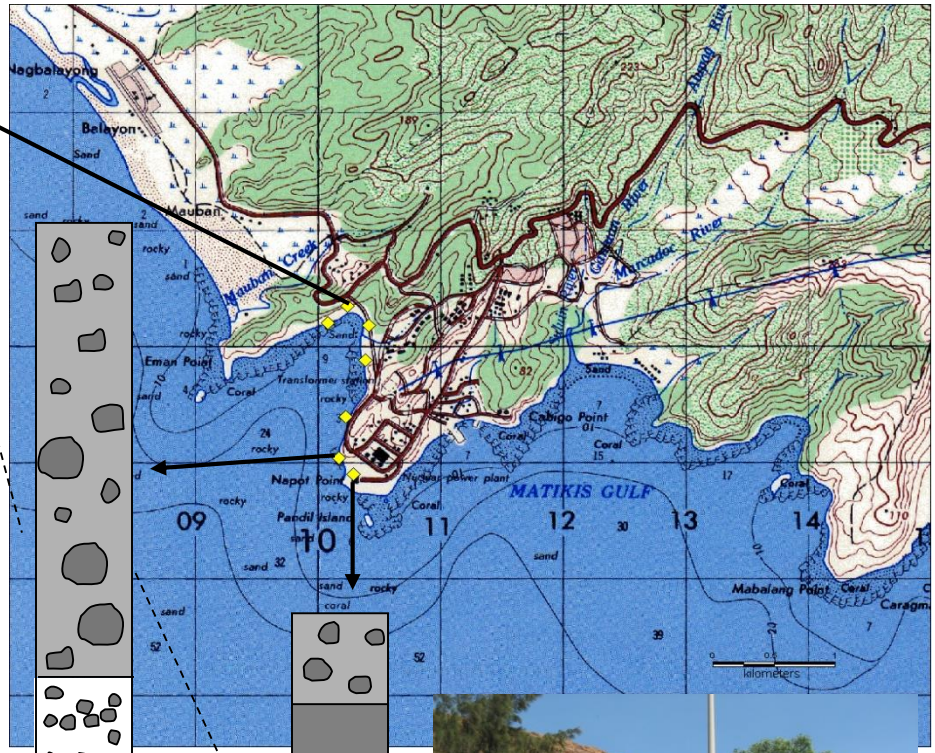
From Dr, Solidum 2009 GEOCON Presentation

Potential Volcanic Hazard

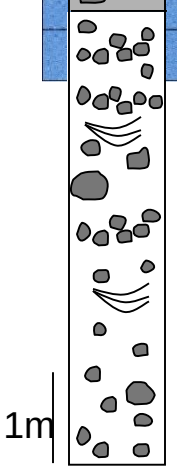
- Deposits at BNPP site and vicinity: Pyroclastic Flow, Lahars, Ashfall



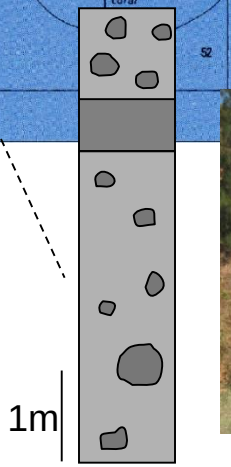
Outcrop 1



From Dr, Solidum 2009 GEOCON Presentation



Outcrop 5

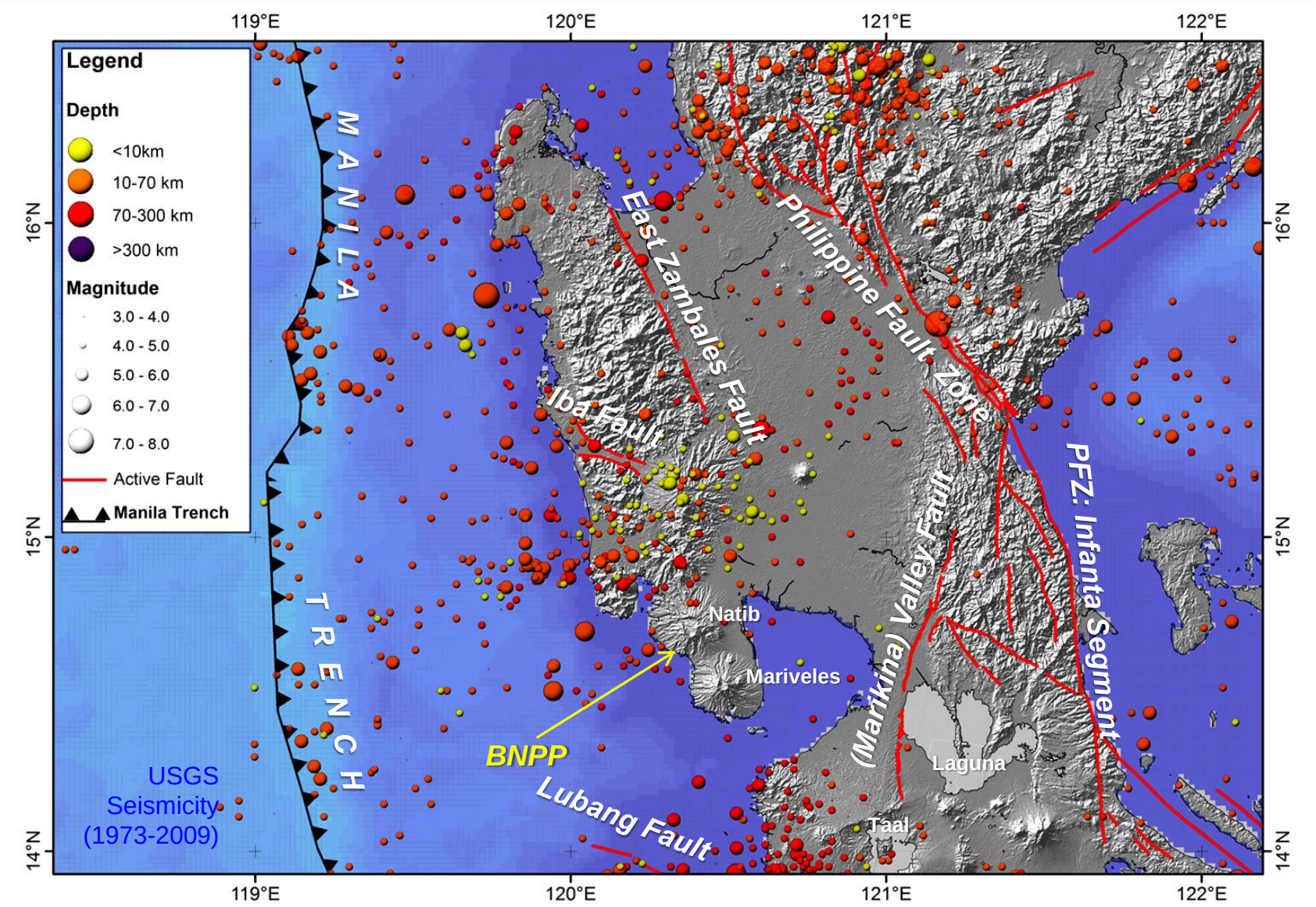


Outcrop 7

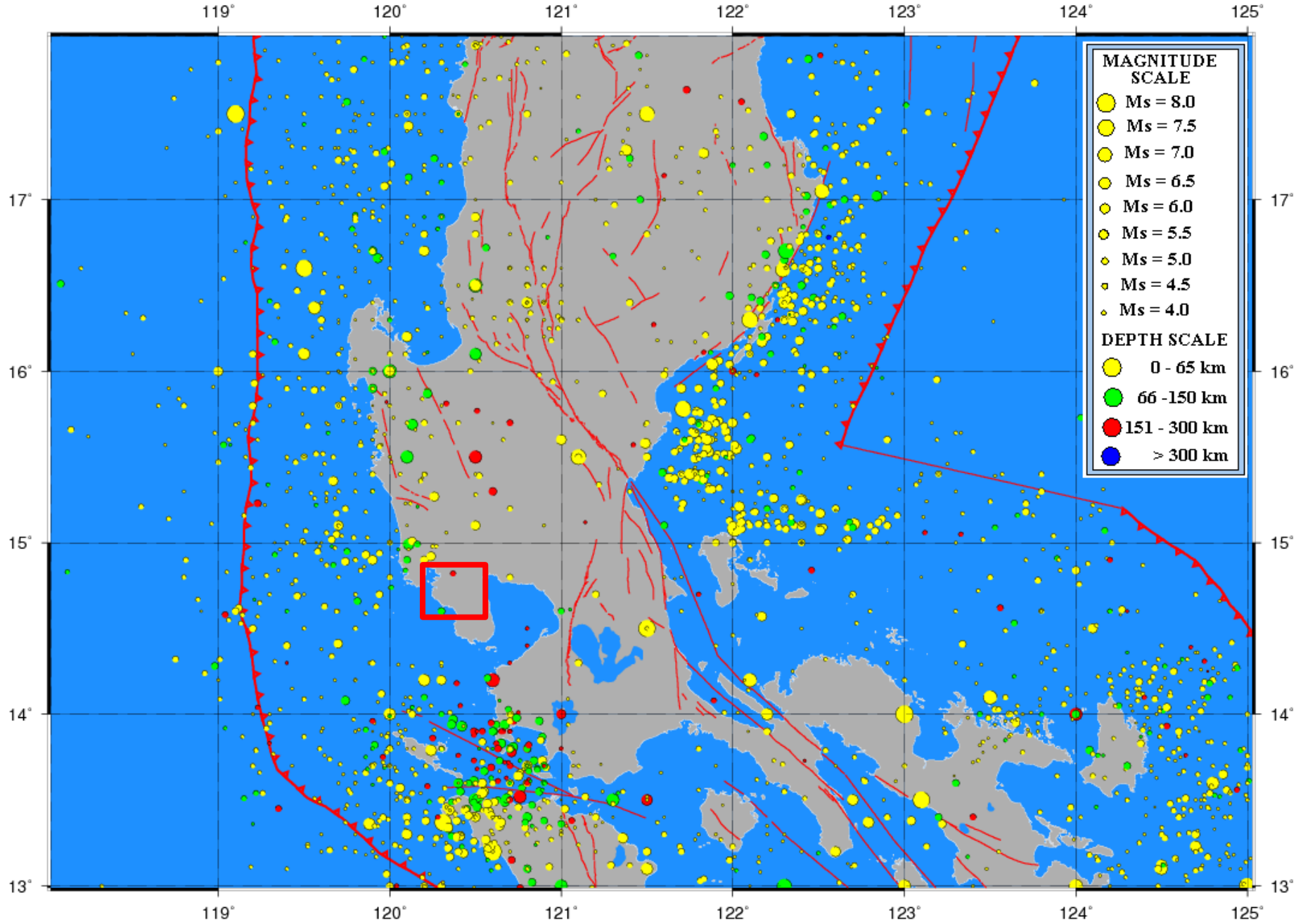
From Bacolcol and Arpa (PHIVOLCS), 2009

Napot Point Site Safety Issue (2)

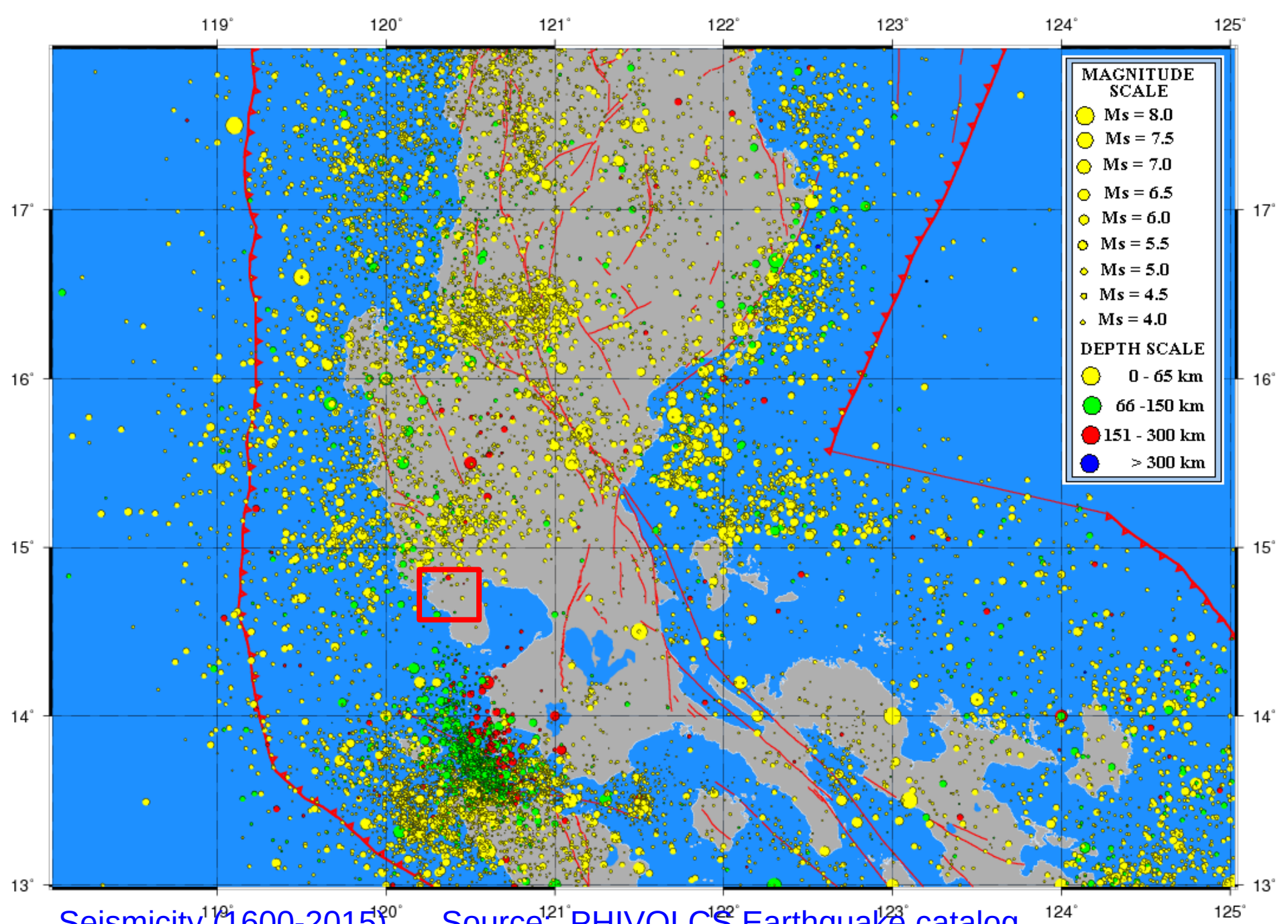
- In seismically active region; earthquake threat debated



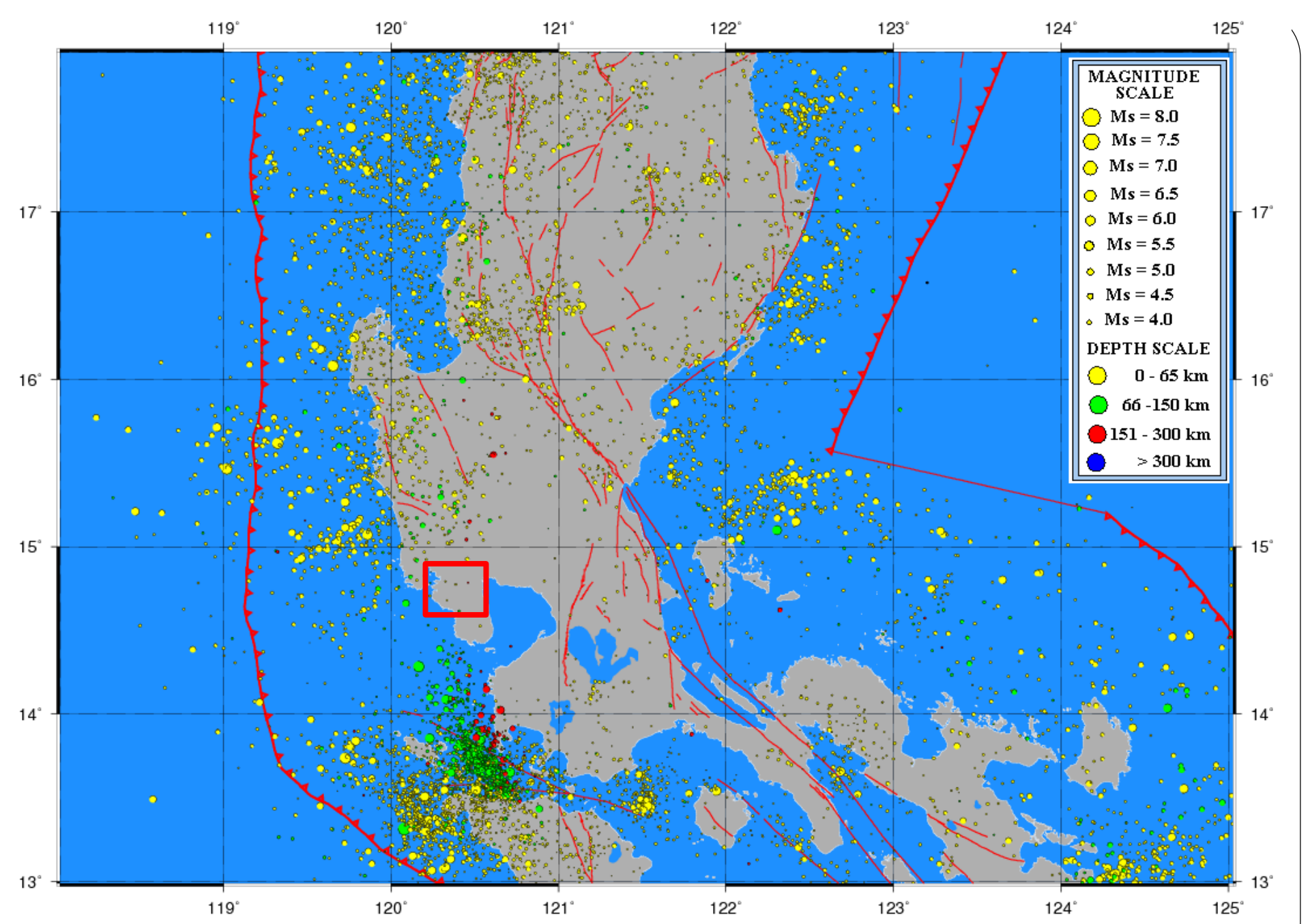
From Dr, Solidum 2009 GEOCON Presentation



Seismicity (1600-1989) Source PHIVOLCS Earthquake catalog

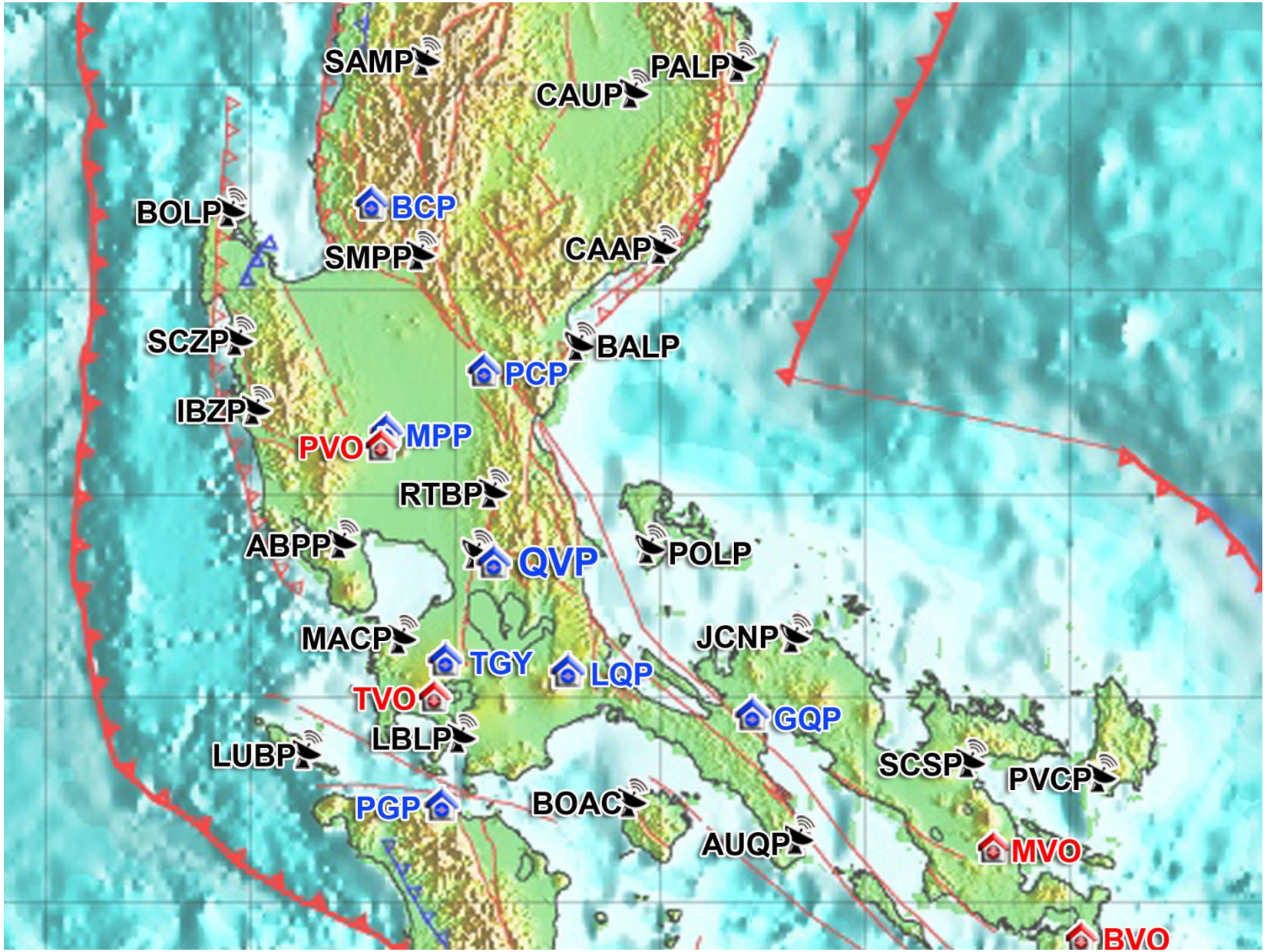


Seismicity (1600-2015) Source: PHIVOLCS Earthquake catalog



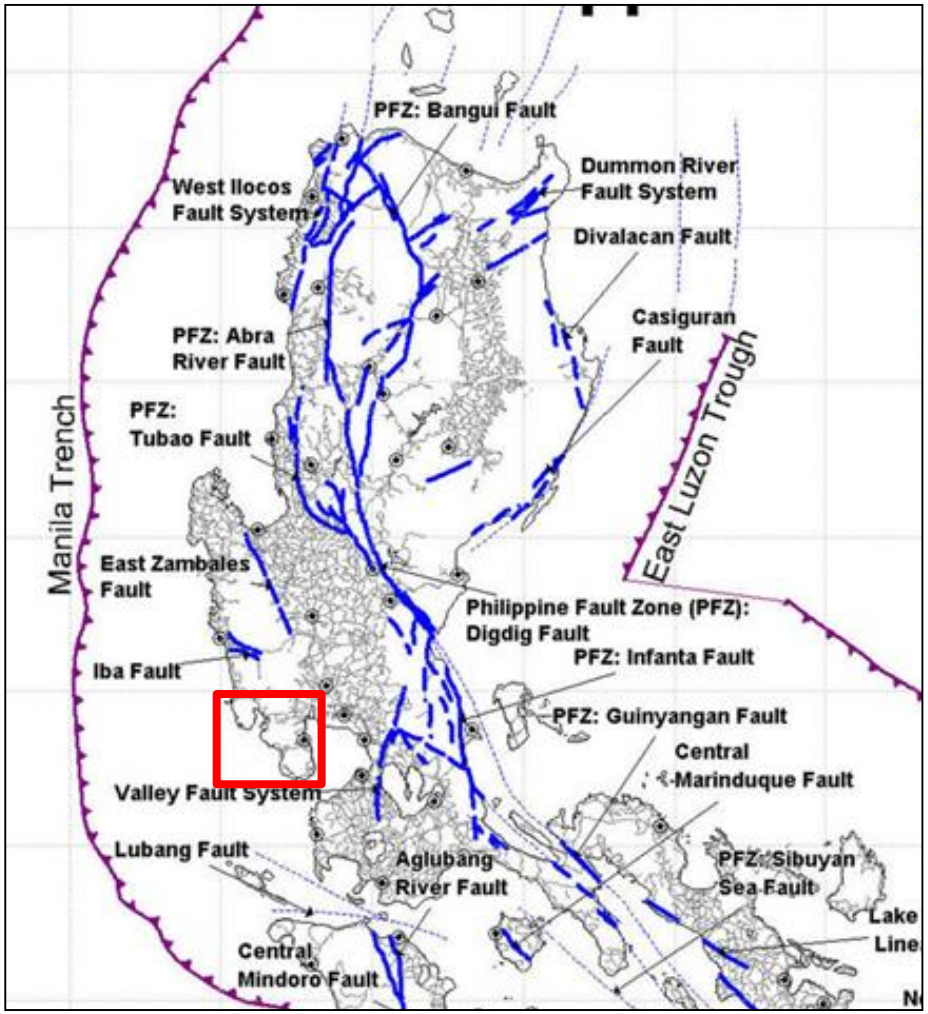
Seismicity (2000-2015) Source PHIVOLCS Earthquake catalog

PHIVOLCS Seismic Monitoring stations in the Vicinity of BNPP Site



Issues of Earthquake Risk

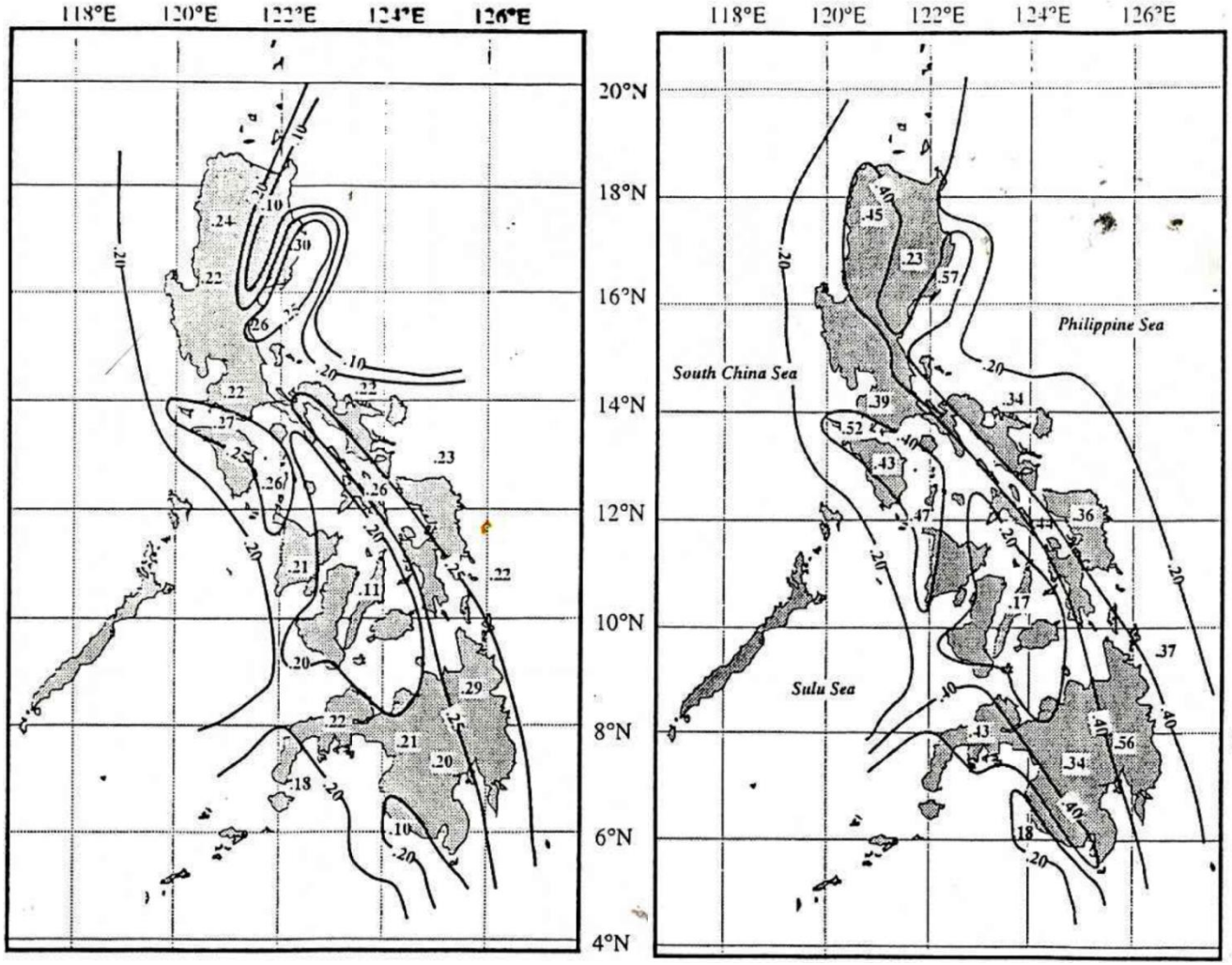
- Inference vs. paleoseismologically accepted proof of active faulting
- Distinction between ground rupture & ground shaking hazards



PHIVOLCS Active Faults Map (2000)

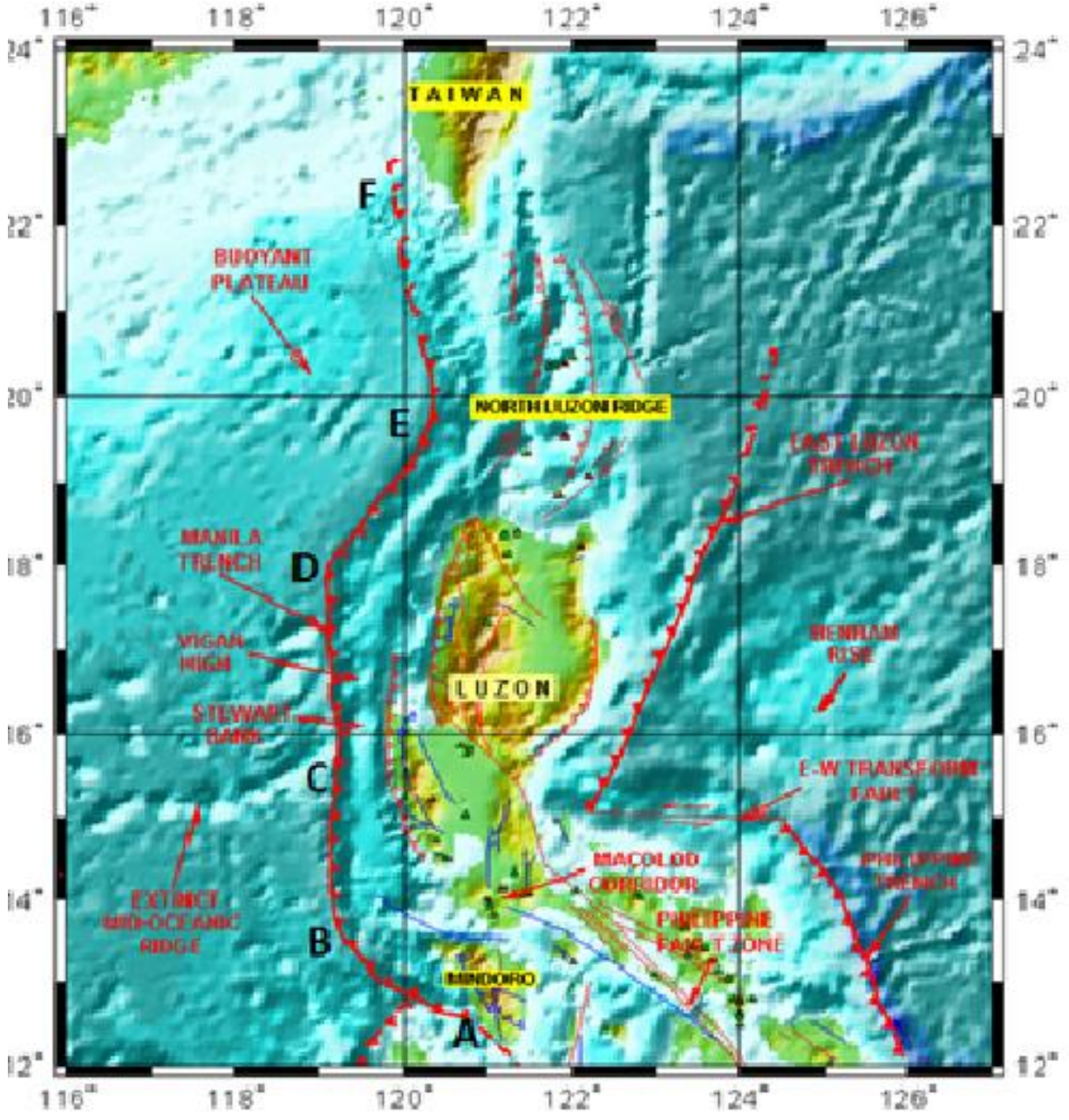
Potential Earthquake Hazard

- BNPP: built for Safe Shutdown Earthquake of 0.4g PGA
- Probabilistic ground shaking assessment



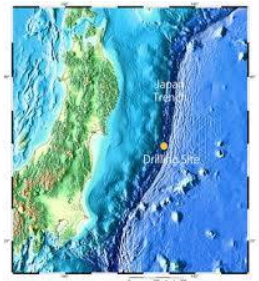
Thenhaus et al (1994): PGA in g for hard & medium soil, w/ 10% exceedence in 50 years
Napot Pt. <0.25g and <0.40g resp.

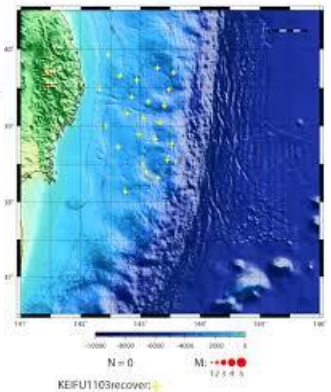
Manila Trench Segmentation



Total Length ~ 1,200 Km

Is it capable of Magnitude 9 similar to the Tohoku segment of the Japan Trench?





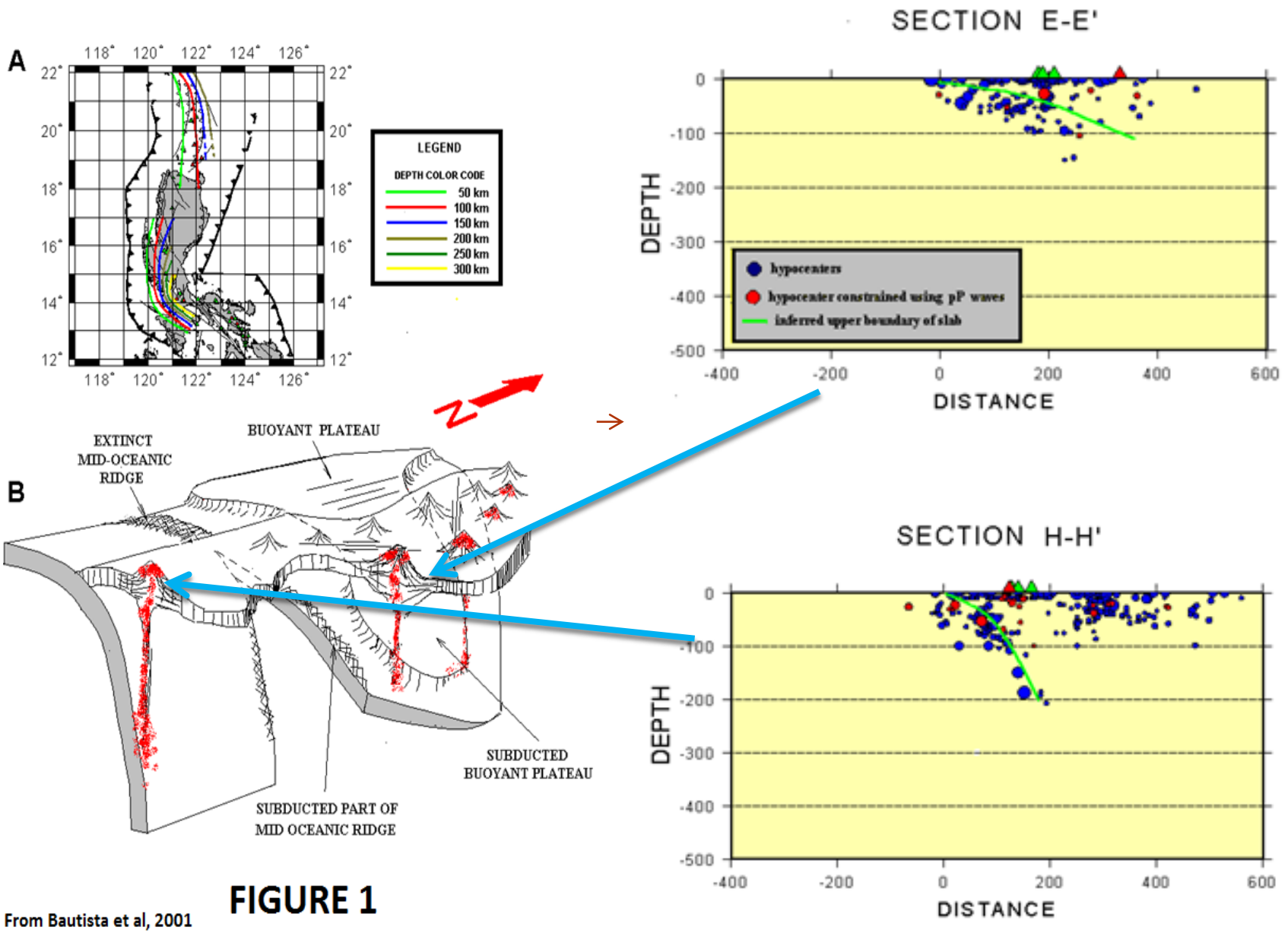
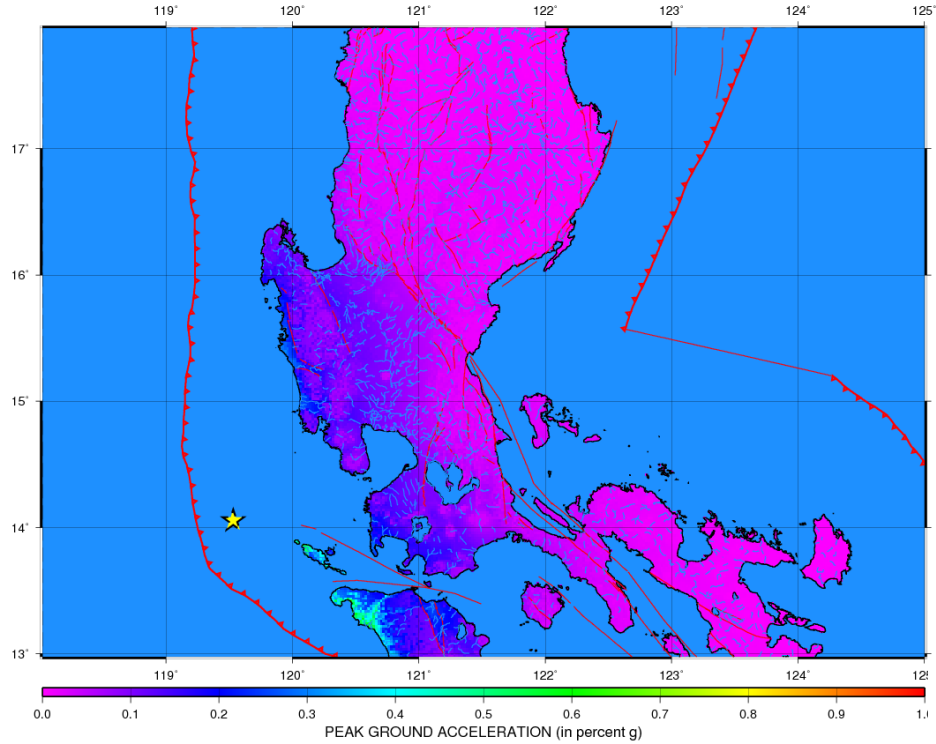


FIGURE 1

From Bautista et al, 2001



Deterministic Ground motion Estimation Using Rapid Earthquake Damage Assessment System(REDAS)

Ground Motion Prediction Model: Fukushima and Tanaka, 1990

Ground Amplification Model: USGS VS30

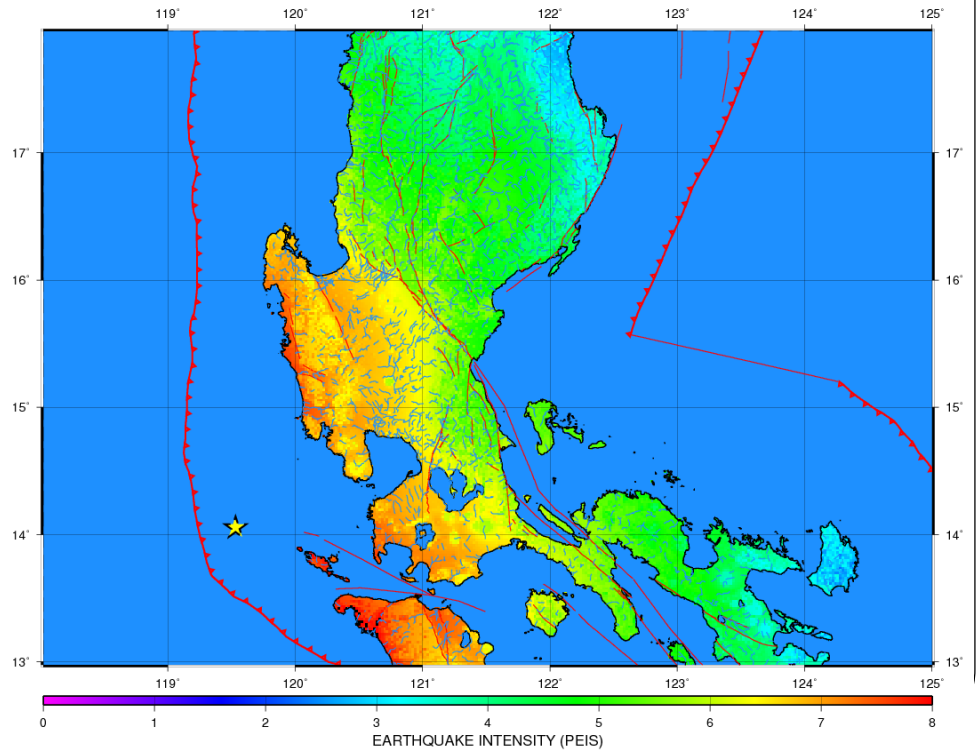
Source: Manila Trench

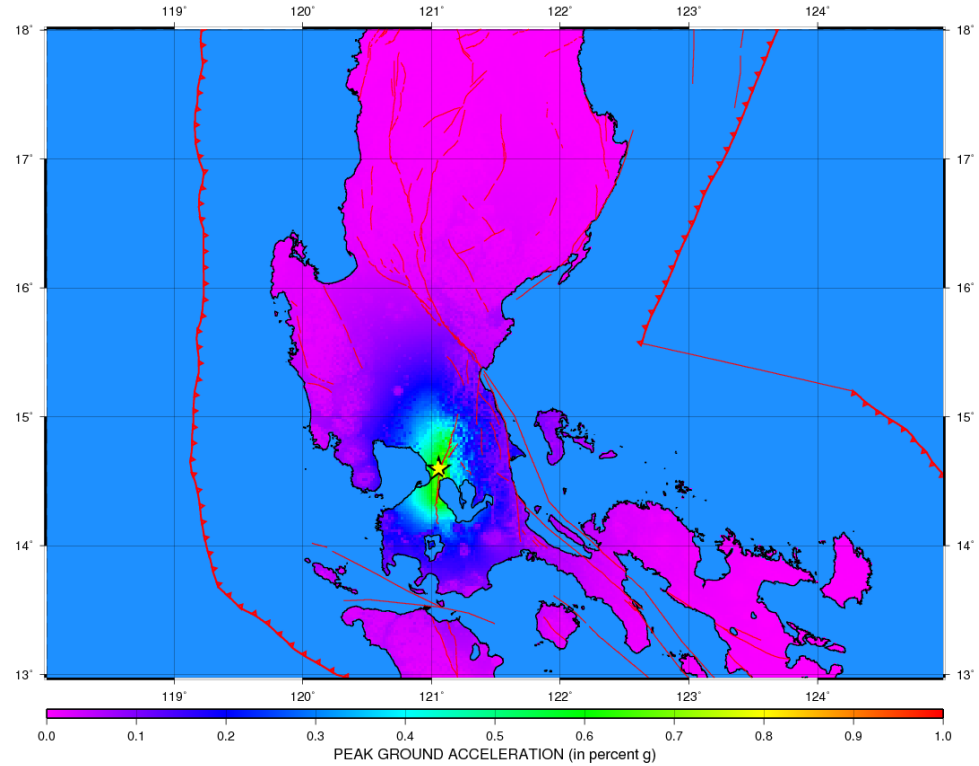
Earthquake Magnitude: 8.2

Ground Shaking Level at Napot Point

PGA: 0.2g

PEIS: VII





Deterministic Ground motion Estimation Using Rapid Earthquake Damage Assessment System(REDAS)

Ground Motion Prediction Model: Fukushima and Tanaka, 1990

Ground Amplification Model: USGS VS30

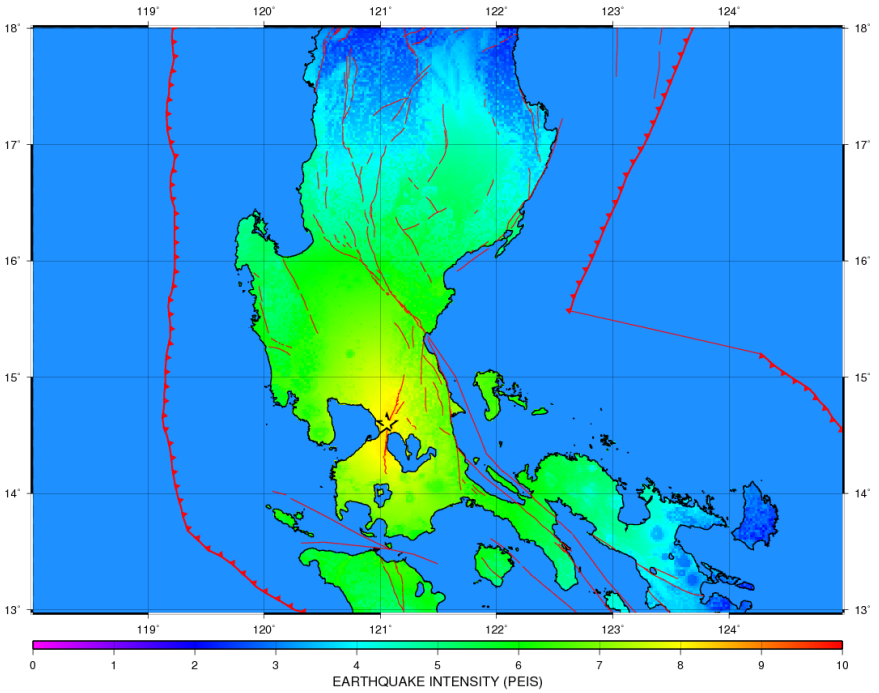
Source: West Valley Fault

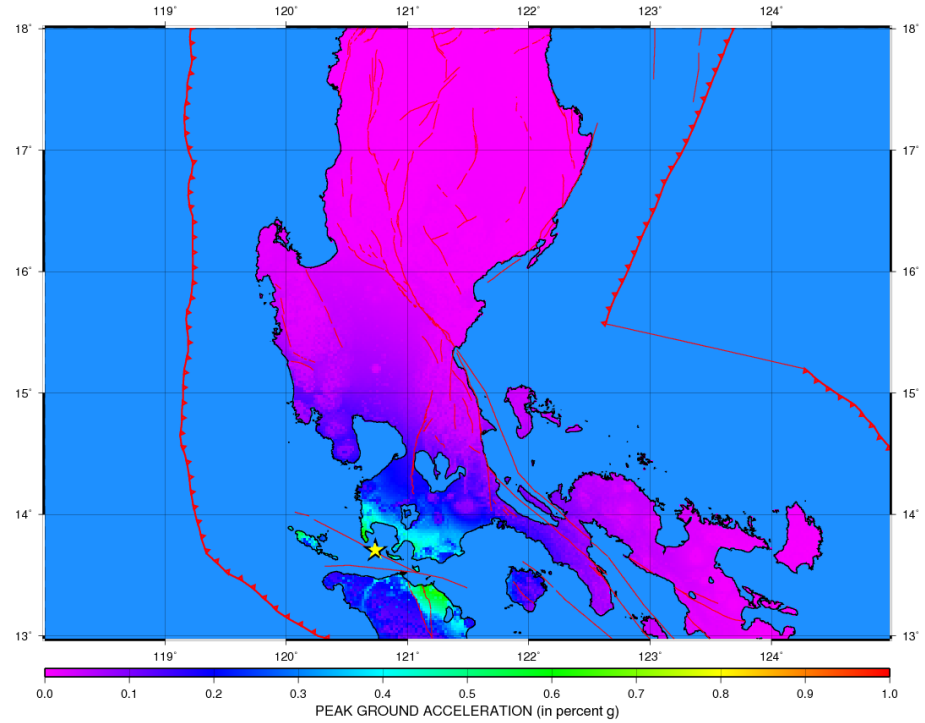
Earthquake Magnitude: 7.2

Ground Shaking Level at Napot Point

PGA: 0.1g

PEIS: VI





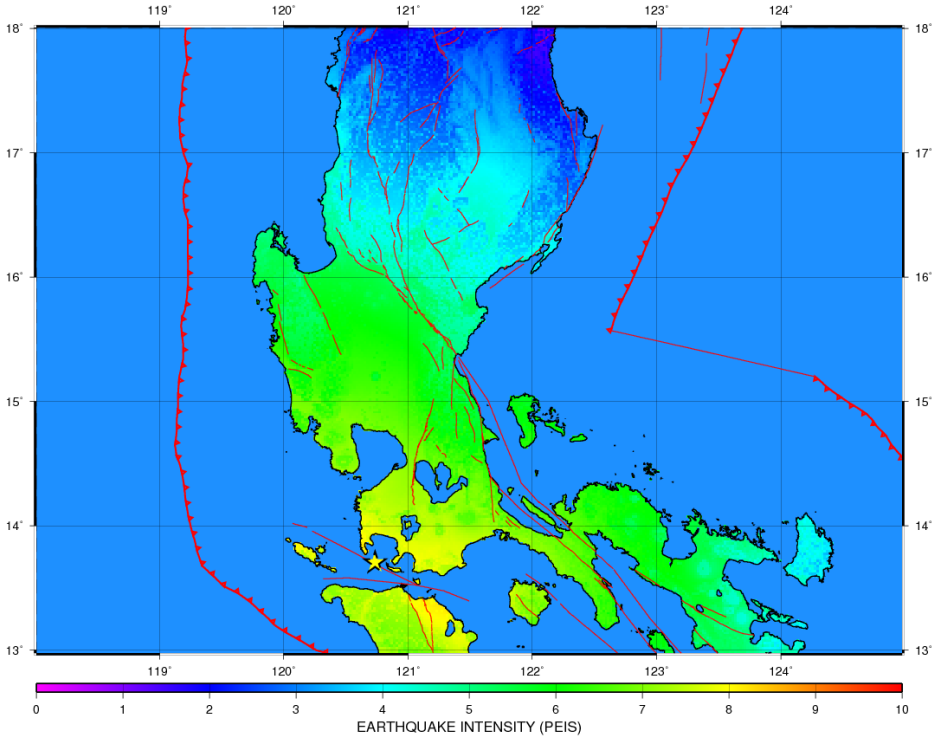
Deterministic Ground motion Estimation Using Rapid Earthquake Damage Assessment System(REDAS)

Ground Motion Prediction Model: Fukushima and Tanaka, 1990

Ground Amplification Model: USGS VS30

Source: Lubang Fault

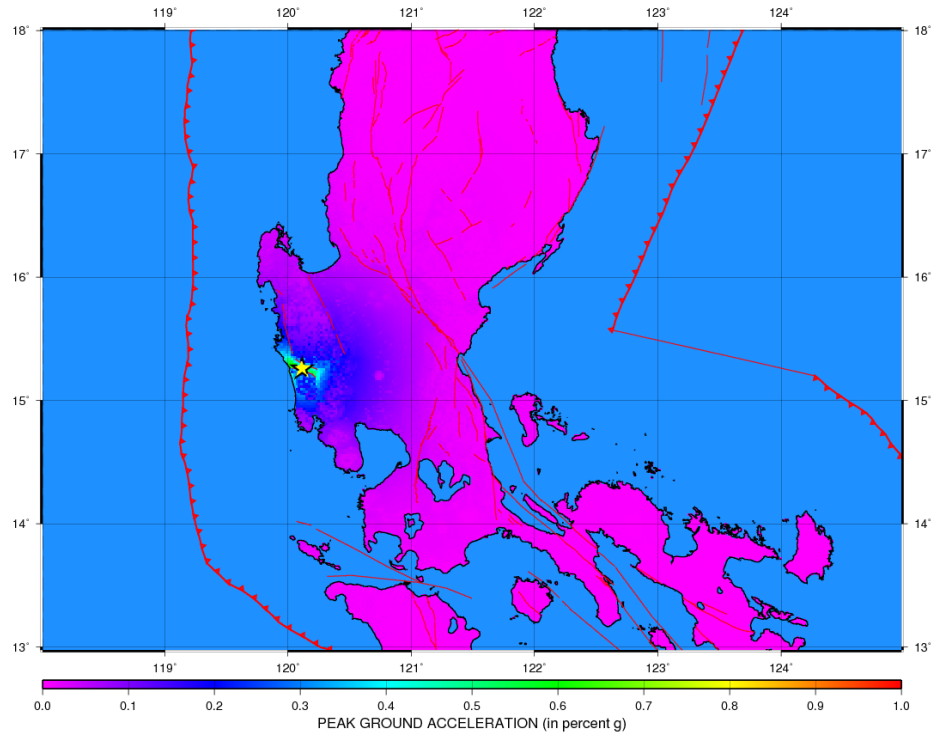
Earthquake Magnitude: 7.9



Ground Shaking Level at Napot Point

PGA: 0.15g

PEIS: VI



- Deterministic Ground motion Estimation Using Rapid Earthquake Damage Assessment System(REDAS)
- Ground Motion Prediction Model: Fukushima and Tanaka, 1990

Ground Amplification Model: USGS VS30

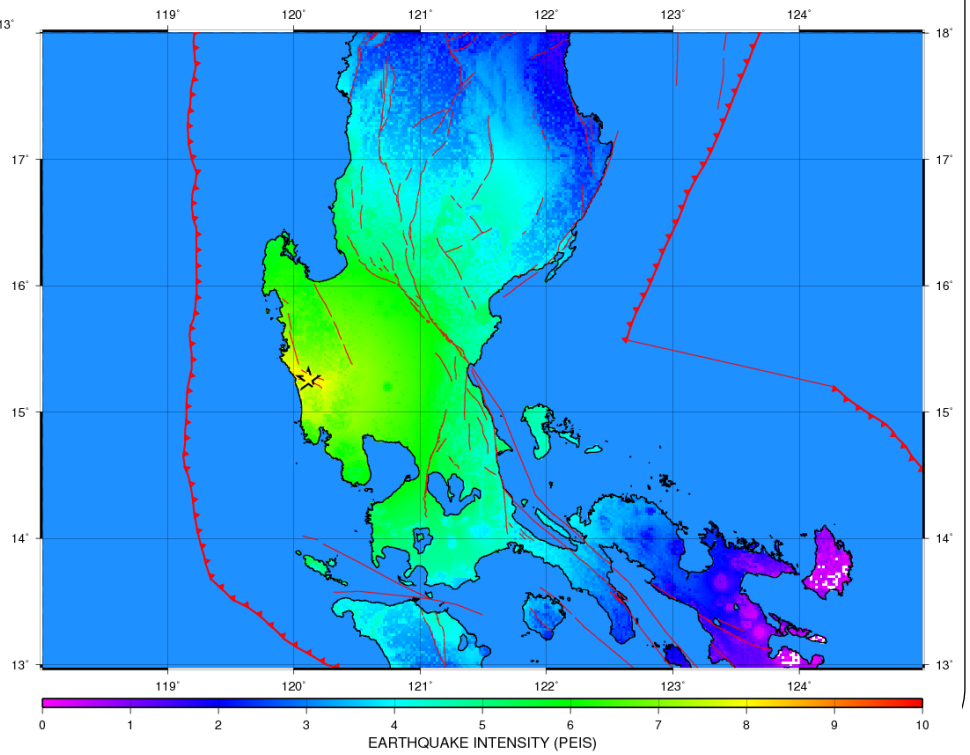
Source: Iba Fault

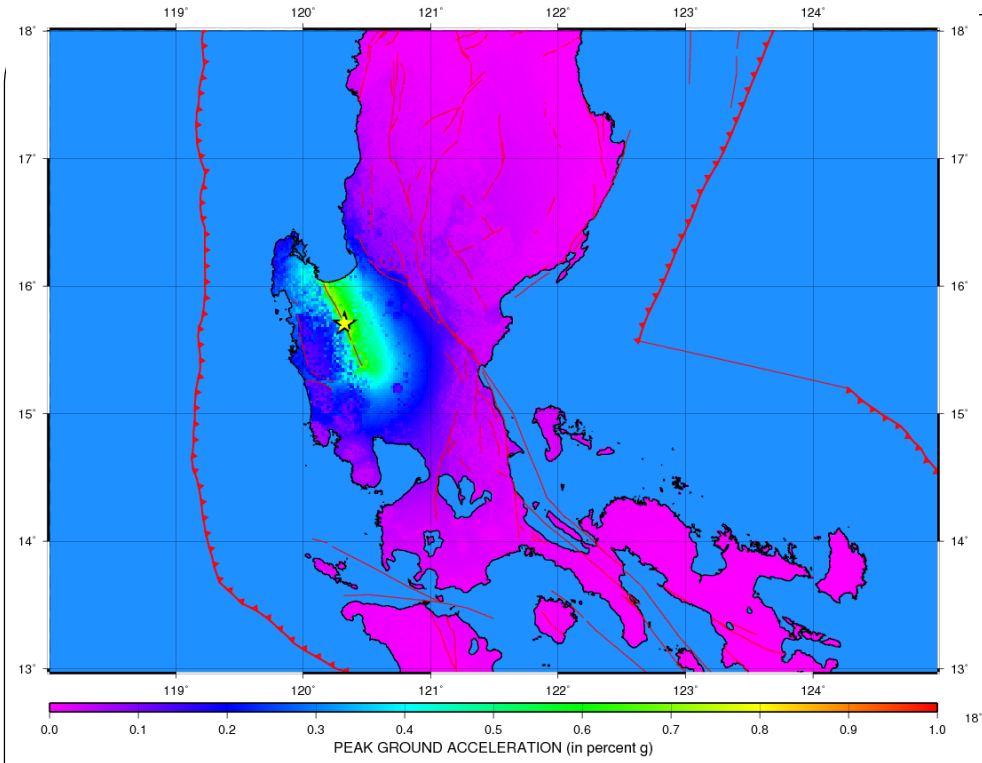
Earthquake Magnitude: 6.6

Ground Shaking Level at Napot Point

PGA: 0.1g

PEIS: VI





- Deterministic Ground motion Estimation Using Rapid Earthquake Damage Assessment System(REDAS)
- Ground Motion Prediction Model: Fukushima and Tanaka, 1990

Ground Amplification Model: USGS VS30

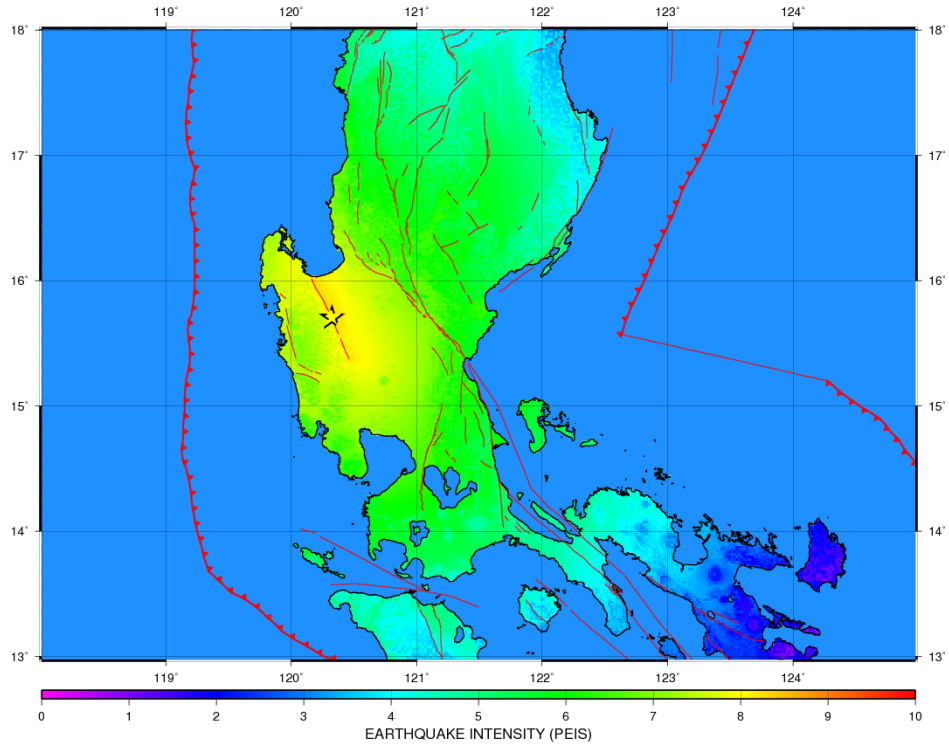
Source: East Zambales Fault

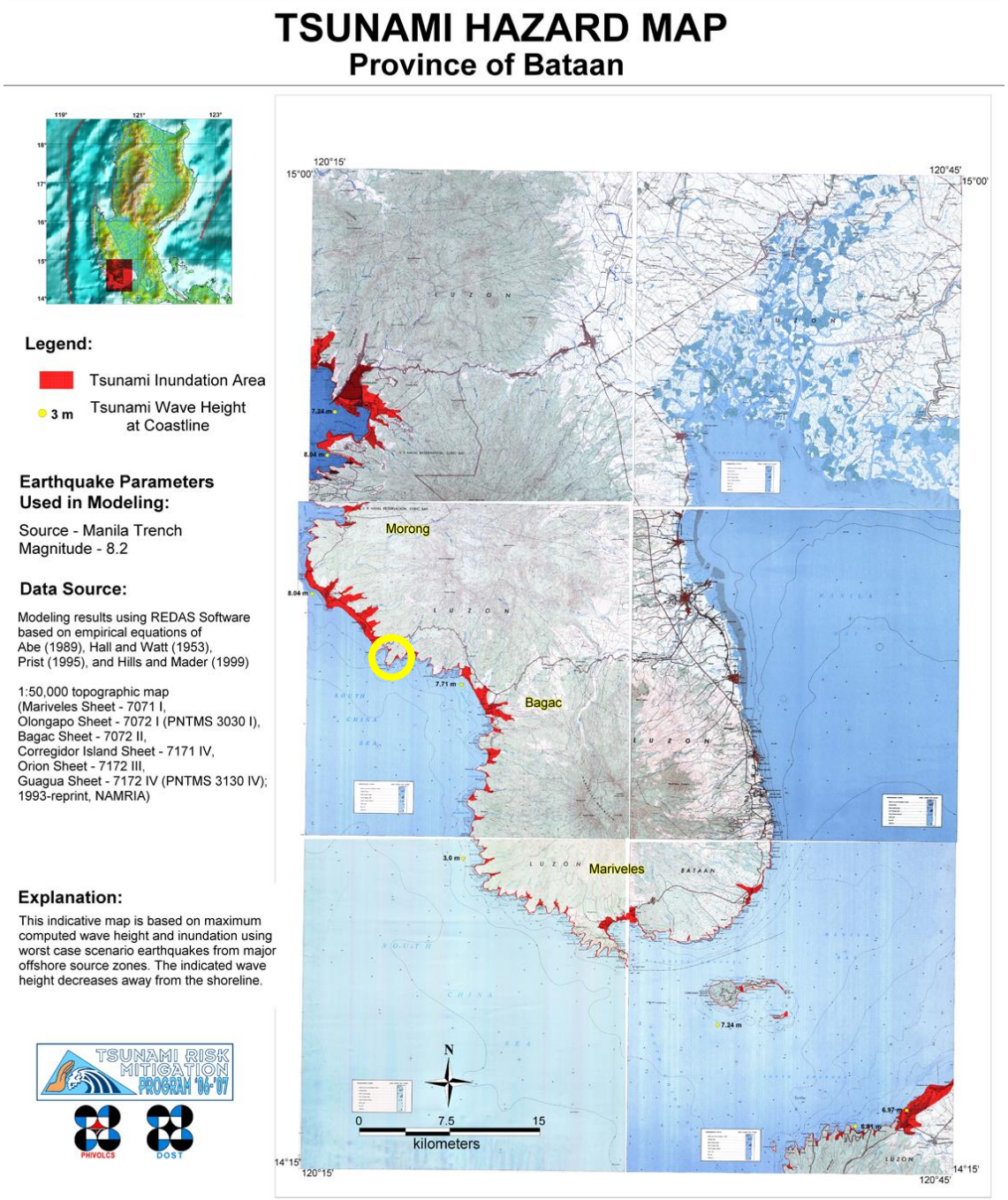
Earthquake Magnitude: 7.4

Ground Shaking Level at Napot Point

PGA: 0.1g

PEIS: VI





PHIVOLCS Initial Assessment – Tsunami Hazard

Tsunami Run-up

- M8.2 Earthquake from Manila Trench
- Napot Point: 8m
- Effect on system?

SUMMARY

- Eruption history of Mt. Natib is uncertain. A detailed magmatic/eruptive history defining eruption recurrence rates, from which probabilities for future eruptive activity can be analyzed, will be necessary for quantifying volcanic risk.

- Distinctions between active faults with potential earthquake threat vs. inference of possible faults , and ground rupture vs. ground shaking hazards, are important to public understanding.

- Earthquake risks should be reviewed based on available information versus engineering design/construction.

- A network of at least 4 seismic stations should be established around the BNPP site to detect micro seismicity from Mt. Natib and from suspected faults near the vicinity of the site.