Earthquakes

"The Great Assam Earthquake"
1950 Indo-China

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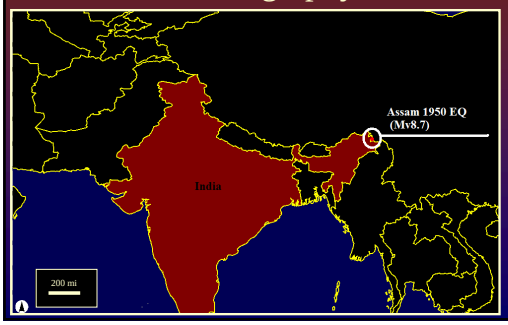
Outline

- Geography Lesson
- Geologic History
- Human History
- Precursors of Disaster
- Pre-event Awareness and Preparation
- Scale of Event(!) and Disaster
- Post Disaster Cause and Effect
- Main Cause of Loss of Life and Property
- Actions That Could Have Reduced Losses
- Evaluation of Mitigation Process (ongoing)

Quick Geography Lesson!



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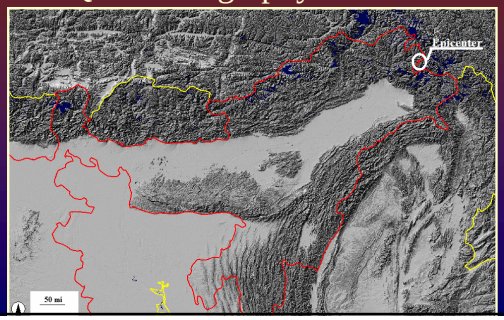

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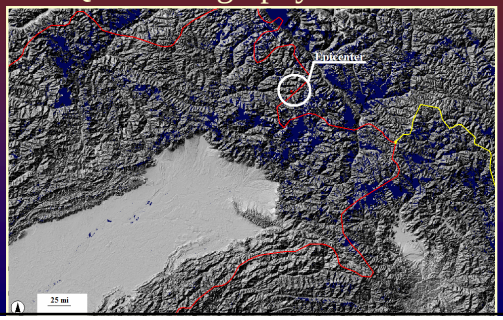
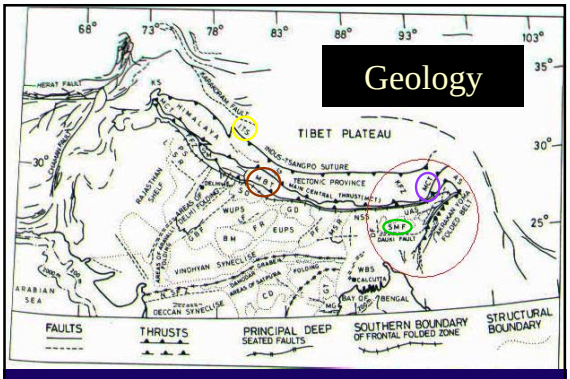
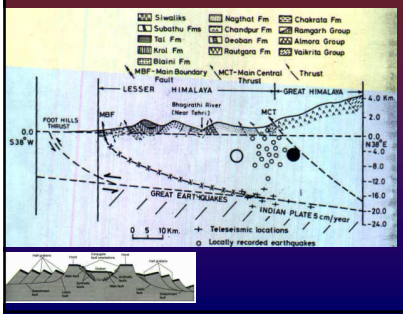


Geology



SMF = Shillong Massif, ITS = Indus Suture Thrust (dips south), MCT = Main Central Thrust (dips north), MBT = Main Boundary Thrust (dips north)

Geology Con't



- Assam plateau is a horst structure with a slight NE dip.

Geology Con't

- Southern flank of plateau has steep faults dipping south.
- Thrusts in Upper Assam has covered gently dipping Tertiary rocks.
- In the plateau there are numerous N-S strike-slip faults
  - Associated with 1897 EQ (Oldham)

Human History

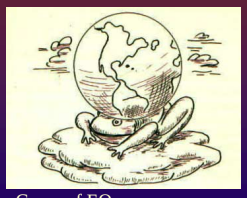
- 1950 human events
  - India gains Independence from Britain
  - Gandhi -> Caste system upheavals
  - China and Tibet border dispute
  - Cold War
- 1950 human scientific events
  - Tectonics not yet understood/discovered (1964, Alaska)
  - Seismic network finally installed (prior to Assam EQ)

Precursors of Disaster

- Numerous EQs along Himalayas recorded throughout human history.
- Oldham noted in 1897-1906 that...
  - "Assams susceptibility to EQs is due largely to multiple faulting."
  - Oldham discovered the Earths Core in 1906 with data from 1897 Assam EQ (Mv8.7).
  - Uplift of 20m (growth of Assam hills south of Himalayas).
- No small EQs prior to 1950 in Assam area.

Pre-event Awareness and Preparation

- Local tribes men knew of EQs in region but thought is was evil spirits.
- No preparation took place.



Cause of EQs

Scale of Event(!) and Disaster

- 7:39pm 15 August 1950 Assam EQ
- One of the sixth largest EQ in the 20th century
- Scale Mv8.7
- Shock lasted 8 minutes.
- 1,526 deaths
- 2,000 homes, temples, and mosques destroyed in Brahmaputra River Basin

Observations

- Ground rolling observed.
- Pilots noted huge landslides in Assam Hills.
  - 2 billion tons of material.
- Indian border guards noted huge chasms opening up.
  - One person lost is life by falling in a 10m chasm.
- Lakes in Norway and England oscillated (Seismic Seiche).

Observations

- Energy matched that of 100,000 atomic bombs.
- 10,000 sq.mi. of earth were churned up.
- Railroad and roads rendered useless.
- $25 million in damage (1950 U.S.$)

Post Disaster Cause and Effect

Landslides (LS)

- Cause = Monsoon Rains & EQ liquefying soils.
- Effect = Dammed tributaries feeding Brahmaputra River creating temporary lakes. 70 villages consumed and 156 casualties.

Rockslides (RS)

- Cause = Immidiate response from EQ and from previous EQs (unstability from unloading)
- Effect = Same as LS.

Post Disaster Cause and Effect and Main cause of Loss of Life and Property

- 8 days later TIDAL WAVE Flooding (amplitude 7m)
  - Cause = Natural dams from LS and RS breached and temporary lakes drained.
  - Effect = Several villages submerged killing 532* people. Also, Tea industry wiped out for a decade.

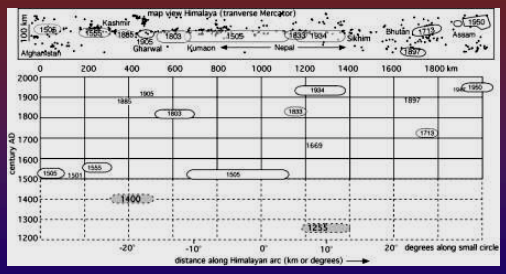
Actions That Could Have Reduced Losses

- Better understanding from indigenous people.
- Flood warning system.
- Construction of rock dams along Brahmaputra River. Provides electricity and flood control.
  - Head side must have a low angle (disperse later force of river to shear).
  - Down side is if dam breaches in EQ.
- Shift from traditional construction materials to buildings with a low center of gravity and rigid structure.

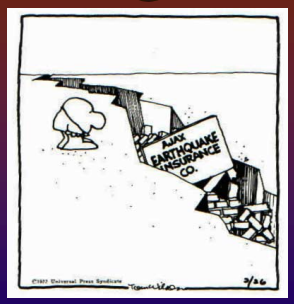
Evaluation of Mitigation Process (ongoing)

- Preparedness & understanding
  - Controversy of Dam construction
  - Shift in building materials.
    - Controversial
      - People not required.
      - Govt. and Industries are.
  - Construction of EQ hazard map.
  - Seismic gaps?

Seismic Gaps



- Maximum probability that an EQ will occur where there has not been one.



Questions?

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