NGA-I Database

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Outline

- Data sources
  - Strong motion database
  - Source and site databanks
- Recommendations

Data Sources

- Problems encountered:
  - Low quality accelerogram processing
  - Limited site characterization
  - Inconsistent source descriptions
- Objectives:
  - Processing of accelerograms to NGA standards
  - V_{s30} for all recording sites with data
  - Consistent source descriptions

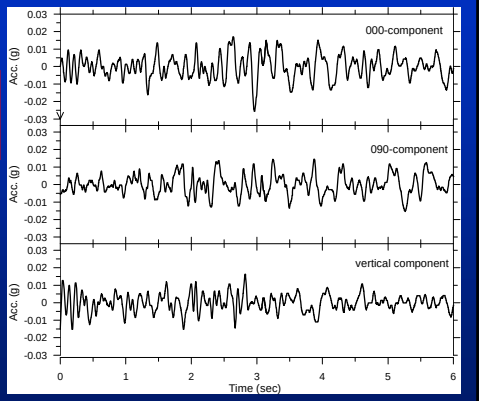
Accelerogram Database

- Data downloaded 3/2005 (ESD website)
- Supplemented with DPC (2004) recordings of Molise earthquake
- 509 3-component records with M > 3.7
  - ESD: 1972-1998
  - DPC: 2004-2005

Accelerogram Database

- S-triggers

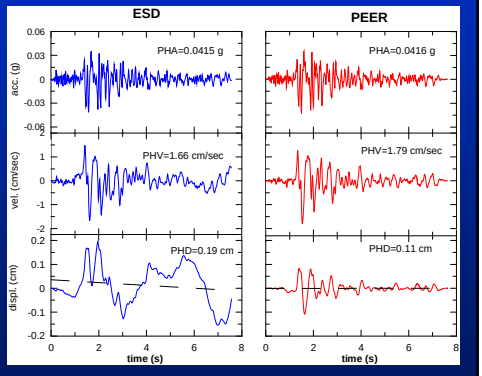
Biases S_a (Douglas, 2003)
∴ Data discarded



Accelerogram Database

- S-triggers
- Baseline correction errors

Biases S_a at long period and PHV/PHD



Accelerogram Database

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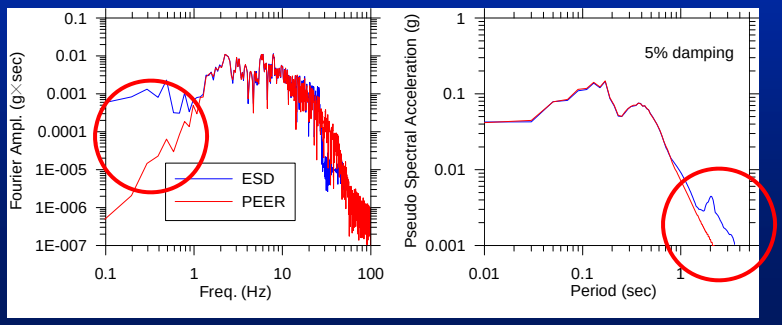
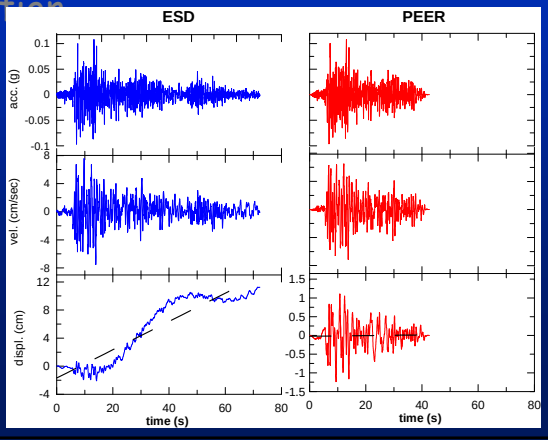


Accelerogram Database

- S-triggers
- Baseline correction errors
- Multiple events



Accelerogram Database

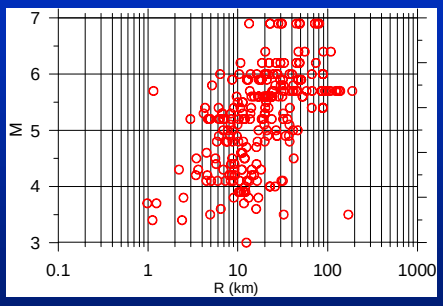
- S-triggers
- Baseline correction errors
- Multiple events
- Uniform record processing to PEER/NGA stnds.

-Vol. 1 data
-Record-specific f_c
-Instrument correction
-Integration to v(t) & d(t)
-Details in Darragh et al. (2004)

Accelerogram Database

Resulting database:

- 247 recordings
- 89 earthquakes
- 101 recording stations



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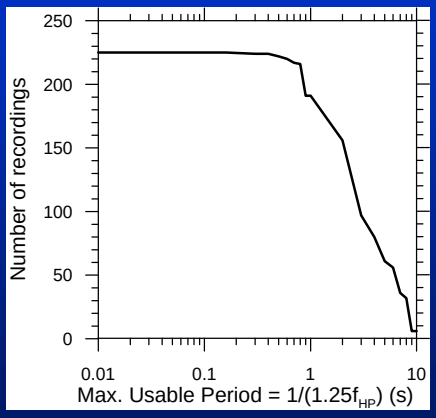

Accelerogram Database

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Site Characterization

Approach taken:

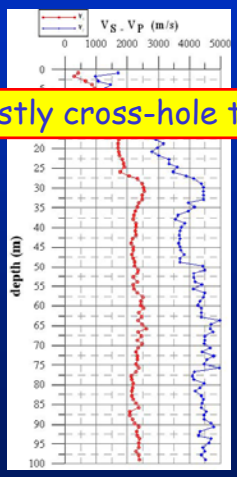
- Compile data from literature
- Surface geology (all stations)
- V_s measurements
- V_{s30} from meas. when available
- V_{s30} correlations otherwise

Final product:
-Surface geology at all stations with recordings
-V_{s30} at all stations with recordings

Site Characterization: Literature

- 1976 Friuli eqk. stations (Fontanive et al., 1985)
- 1980 Irpinia eqk. Stations (Palazzo, 1991a,b; Faccioli, 1992)
- Microzonation
- Other indiv. sites

Mostly cross-hole testing

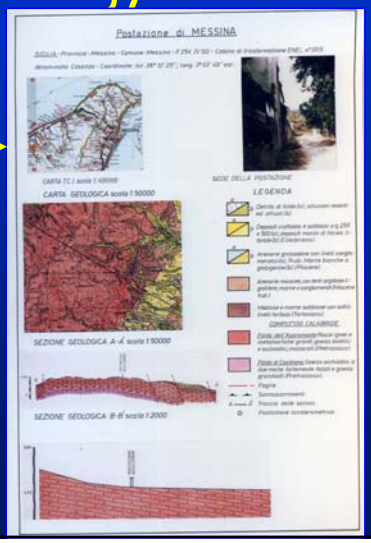


Bagnoli

Site Characterization: Surface Geology

In order of preference:

- Local mapping (1:2000) with site visit (ENEL)
- Local microzonation or site studies
- Large-scale maps (1:100,000) by Servizio Geologico d'Italia



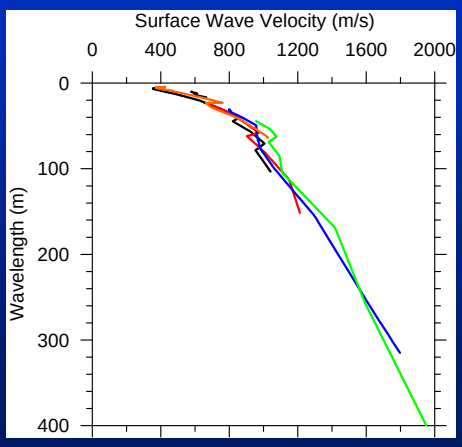
Site Characterization: V_s Measurements

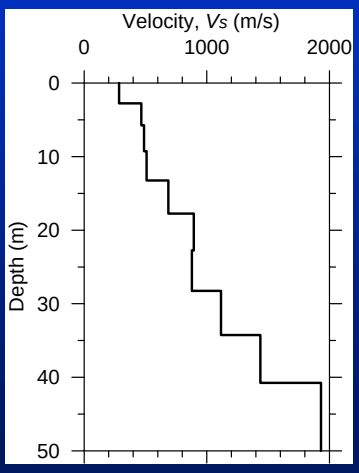
- SASW by Kayen et al. (2008)
- Two source
- Multi-receiver

Site Characterization: V_s Measurements

- SASW by Kayen et al. (2008)
- Two source
- Multi-receiver
- 17 sites

Site Characterization: V_s Measurements





Site Characterization: V_{s30}-Geology Correlations

Approach:

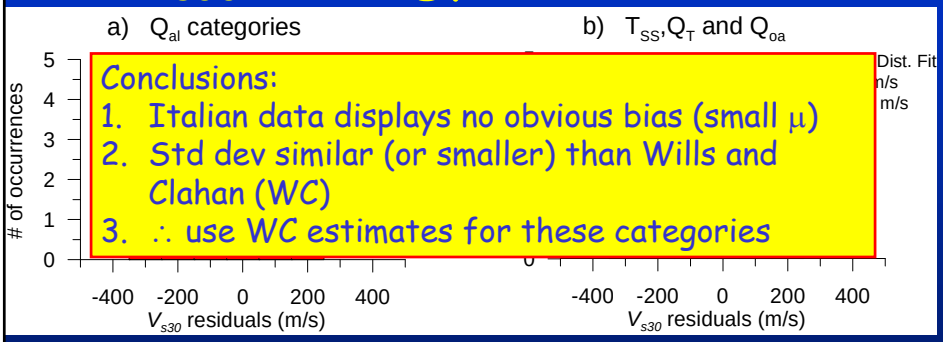
- Use California models where applicable (Wills and Clahan, 2006)
- Develop preliminary correlations for conditions dis-similar to California

Site Characterization: V_{s30}-Geology Correlations

Categories considered descriptive of Italian sites:

- Quaternary alluvium ($Q_{al,deep}$; $Q_{al,thin}$; $Q_{al,coarse}$)
- Older Quaternary alluvium (Q_{oa})
- Quaternary to Tertiary alluvial deposits (Q_T)
- Tertiary sandstone formations (T_{SS})

Site Characterization: V_{s30}-Geology Correlations



Conclusions:

1. Italian data displays no obvious bias (small μ)
2. Std dev similar (or smaller) than Wills and Clahan (WC)
3. ∴ use WC estimates for these categories

$$R_i = (V_{s30})_{m,i} - (V_{s30})_{WC}$$

From profile

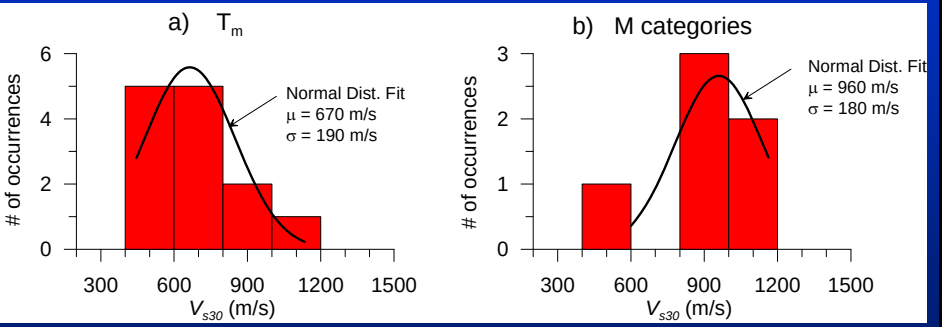
Wills and Clahan: μ

Site Characterization: V_{s30}-Geology Correlations

Categories dissimilar to California:

- Tm: Tertiary Marl and overconsolidated clays (13 profiles)
- Pc: Pleistocene to Pliocene cemented conglomerate (2 profiles)
- M: Mesozoic limestone (Ml), volcanics (Mv), and gneiss (Mg) (6 profiles)

Site Characterization: V_{s30}-Geology Correlations



Approach:
1. Tm and M taken from present correlations
2. Pc taken as 1000 m/s

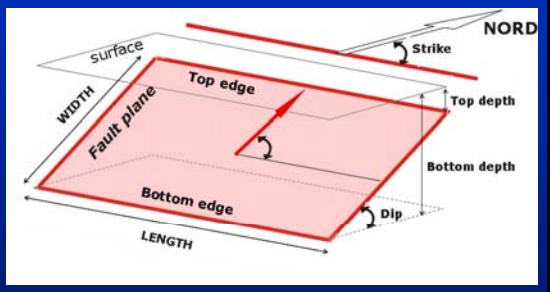
Source Descriptions

Source Descriptions

- Desired attributes:
  - Magnitude (M_w preferred)
  - Location and dimensions of fault plane
  - Focal mechanism
- Point source data:
  - INGV (2007); Pondrelli et al. (2006)
  - Moment tensor solutions (Harvard and European-Mediterranean Regional CMT)

Source Descriptions

- Finite fault data:
  - Important for distance calculations
  - Database of Individual Seismogenic Sources (DISS)
  - INGV (2007b); Basili et al. (2007)



Data Summary

- Described in Scasserra et al. (2008): in review at *J. Earthquake Engineering*
- Strong motion data and site profiles http://sisma.dsg.uniroma1.it
- SASW data in USGS Open File Report

Recommendations

Strong motion:

- Adopt NGA data processing standard for new data.
- As becomes available, add new data in consistent format
- Archive data from high-sensitivity instruments (similar to Tri-Net)

Recommendations

Site Data:

- Compile full inventory of instrument sites beyond those with currently useful recordings
- Additional V_s profiling (verification subset)
- Basin depth evaluation (deep boreholes; geophysics)
- Adopt consistent format for data archival

Recommendations

Site Data (con't):

- Assemble V_s profiles for non-instrument sites
- Improve prediction models for V_{s30}
- Develop V_{s30}-depth correlations

Recommendations

Source:

- Work closely with INGV to complete source inventory for all strong motion recordings
- Encourage INGV to check their finite-fault models against NGA and resolve differences