SAND2020-4330PE

# Structural Dynamics Short Course
# Practical Examples

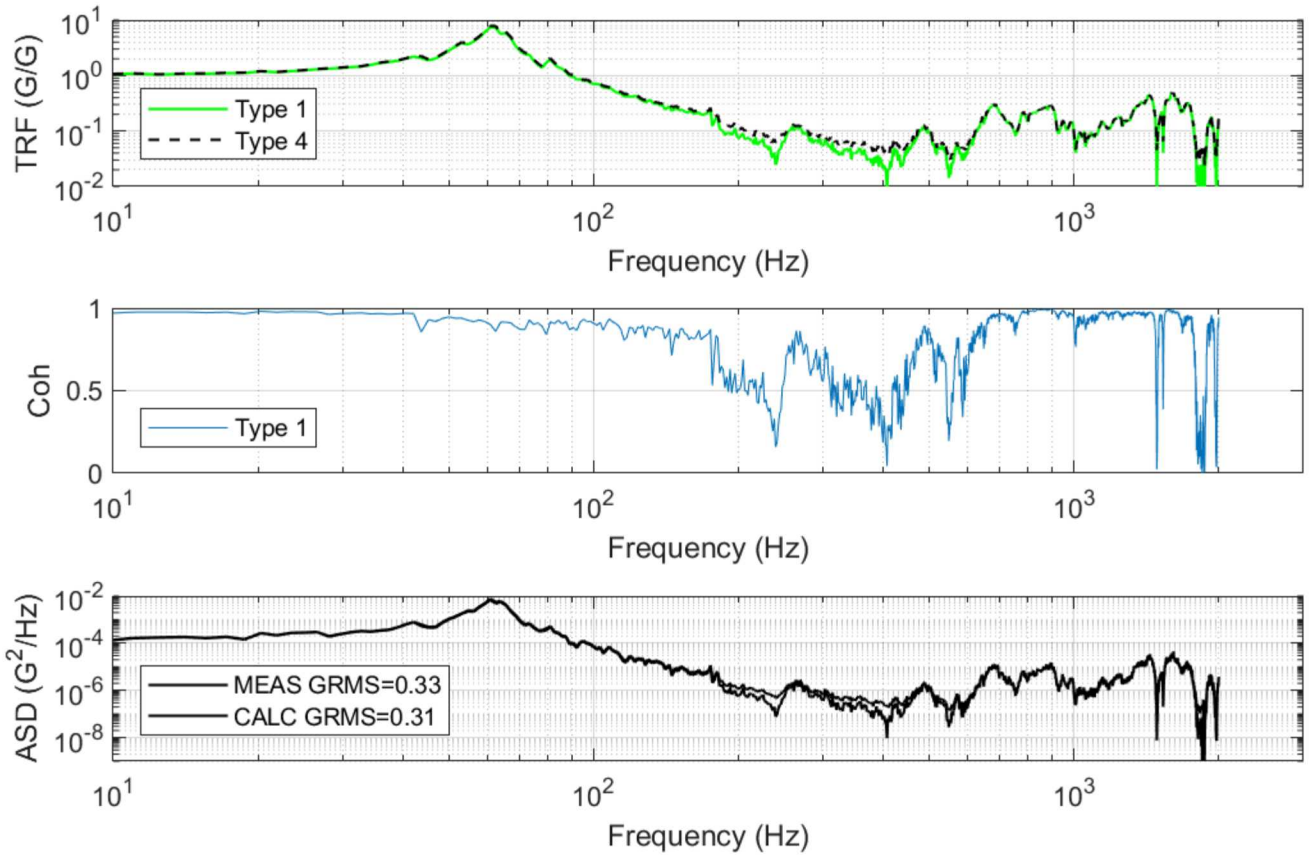
Jerome S. Cap

# Outline

- Transmissibility Response Function (TRF) Types
- Good vs Bad TRFs
- Smoothing
- Linearity
- Temperature Effects
- Spatial Effects
- Drift
- Extrapolation
- Coordinate Transformation
- Pseudo 3-D Responses

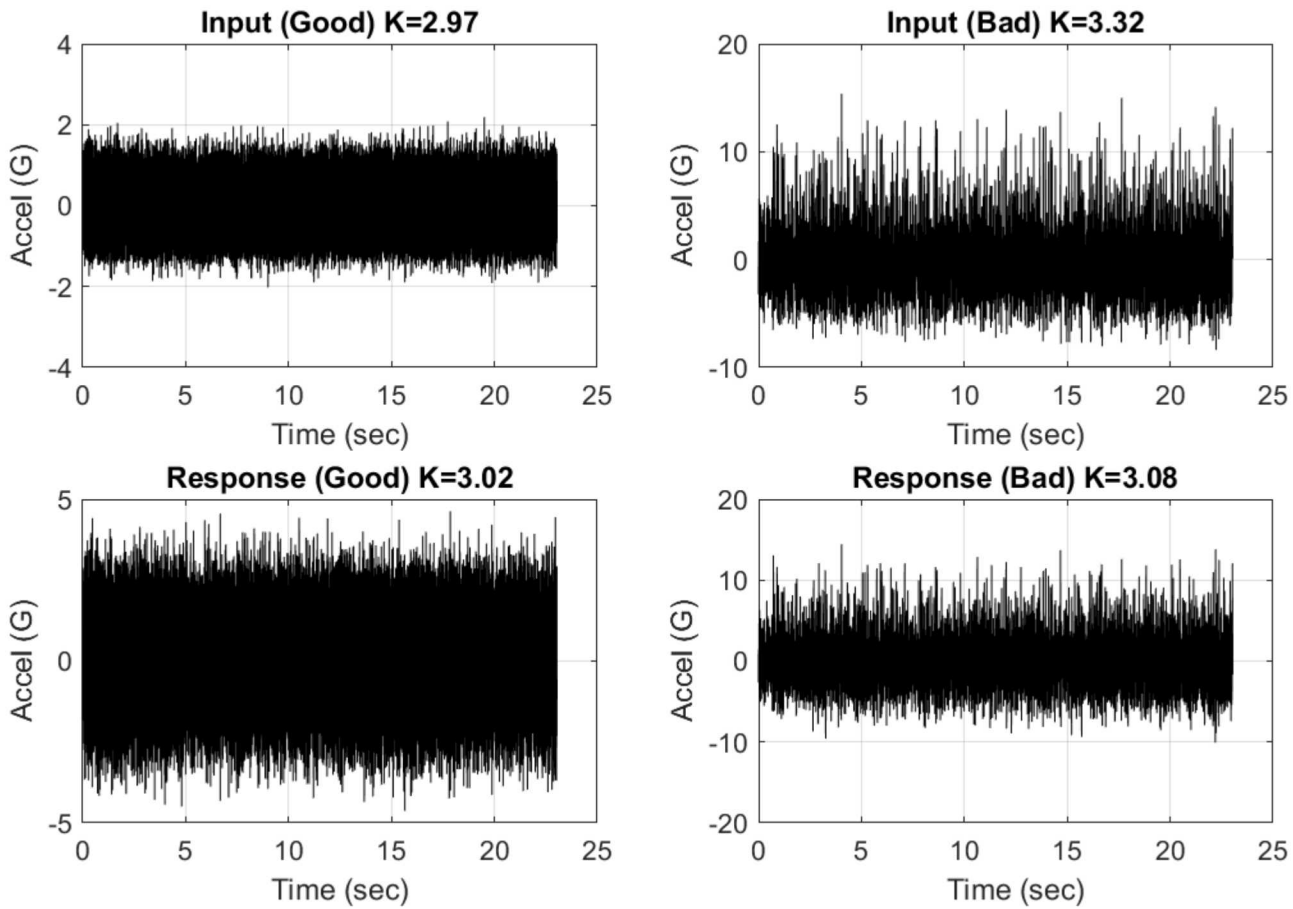
# TRF Types

- Type 1 versus Type 4
- Calculated response ASD was generated using the type 1 TRF and the input ASD



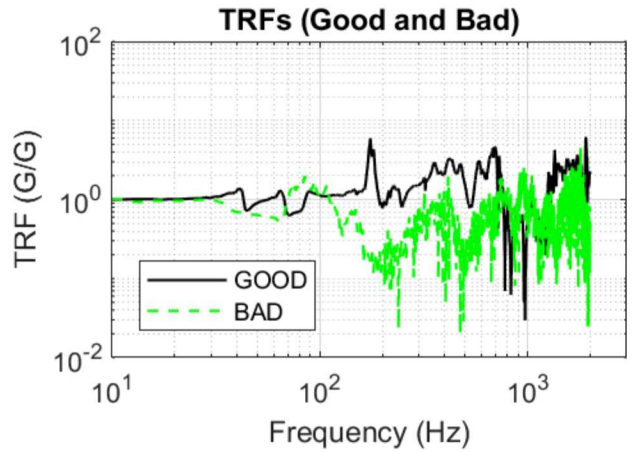
# Good vs Bad TRFs

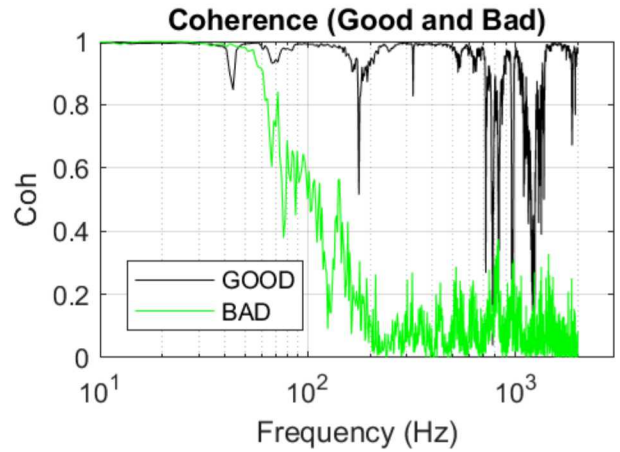
- Acceleration histories for good and bad tests
- Bad test contains banging (one-sided response)
- Kurtosis for bad test is not that far from Gaussian (K=3)

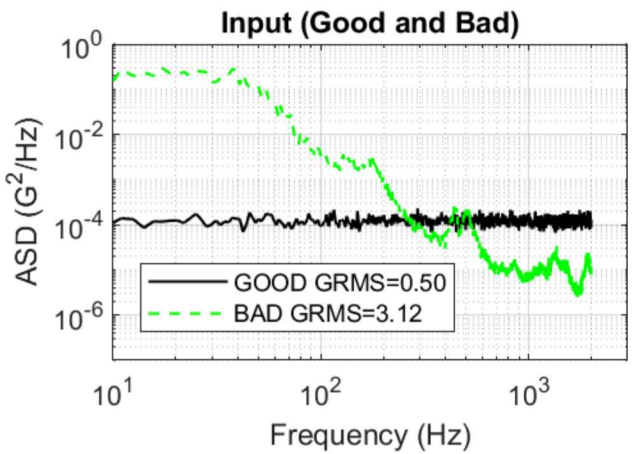


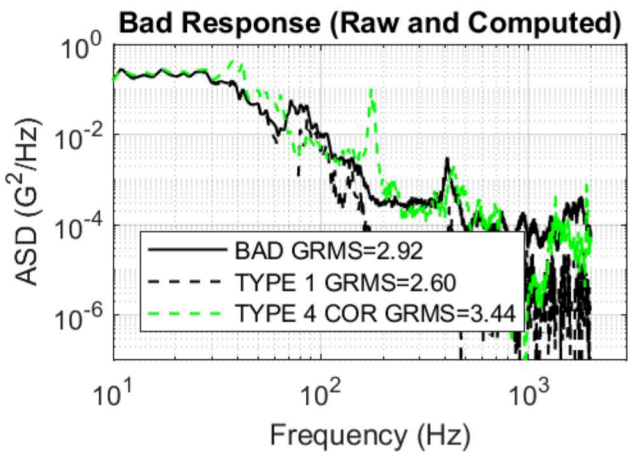
# Good vs Bad TRFs

- Bad TRF is due to rattling near response
  - Low coherence is best indicator
- Corrected ASD is computed using “bad” input and “good” TRF
  - Type 4 TRF still computes measured response



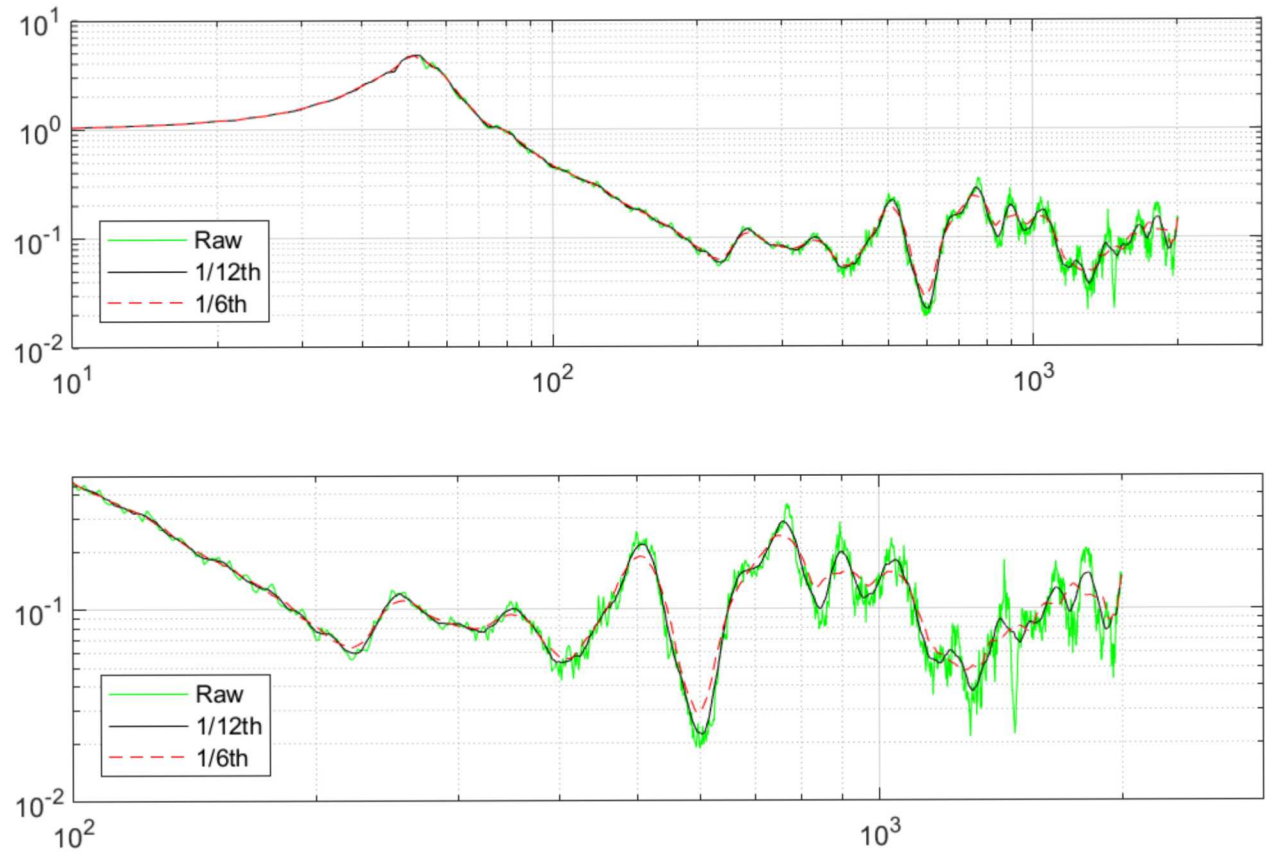



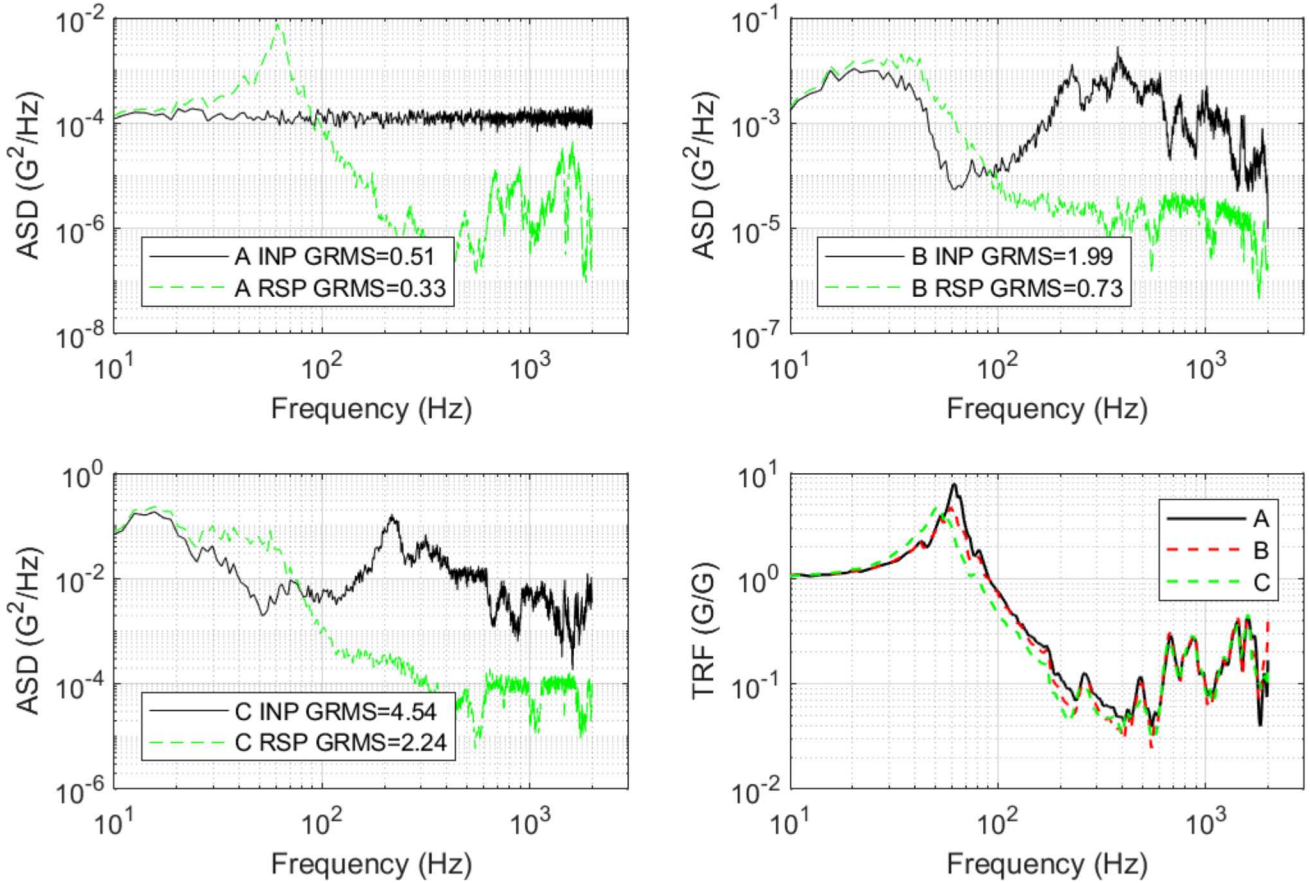
# Smoothing

- Linear average smoothing of magnitud based on 1/Nth octal bandwidths



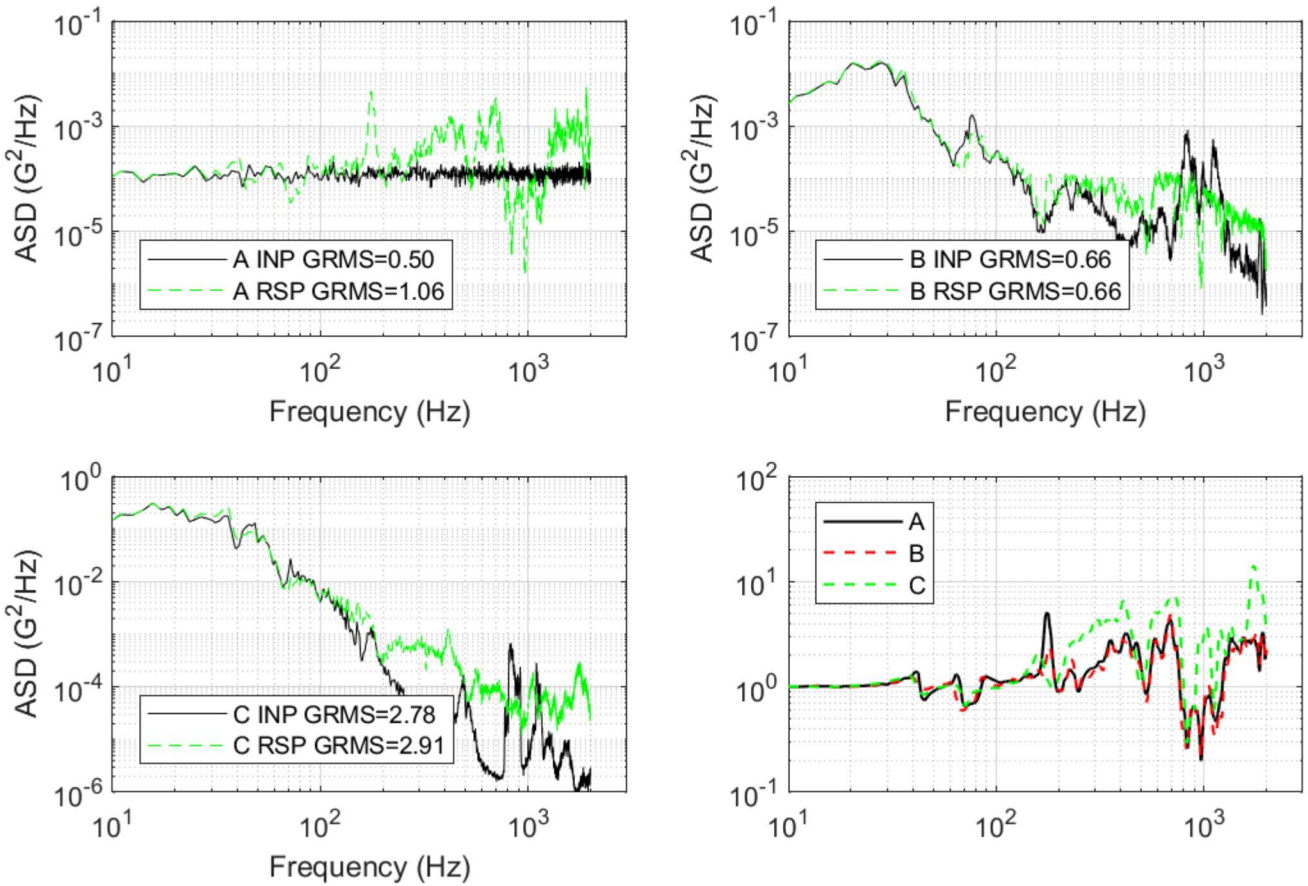
# Linearity

- Comparison of TRFs for three different X axis inputs



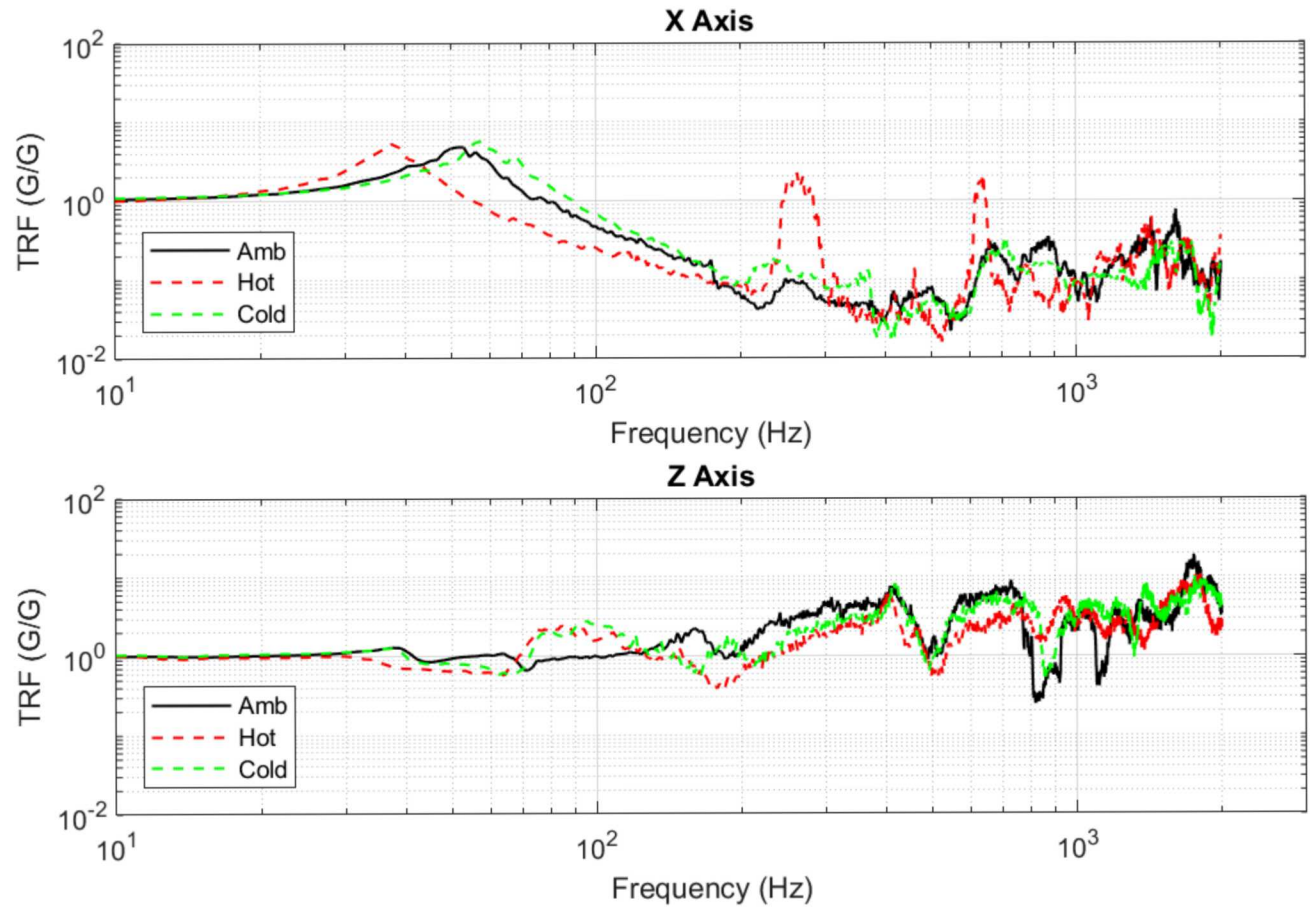
# Linearity

- Comparison of TRFs for three different Z axis inputs



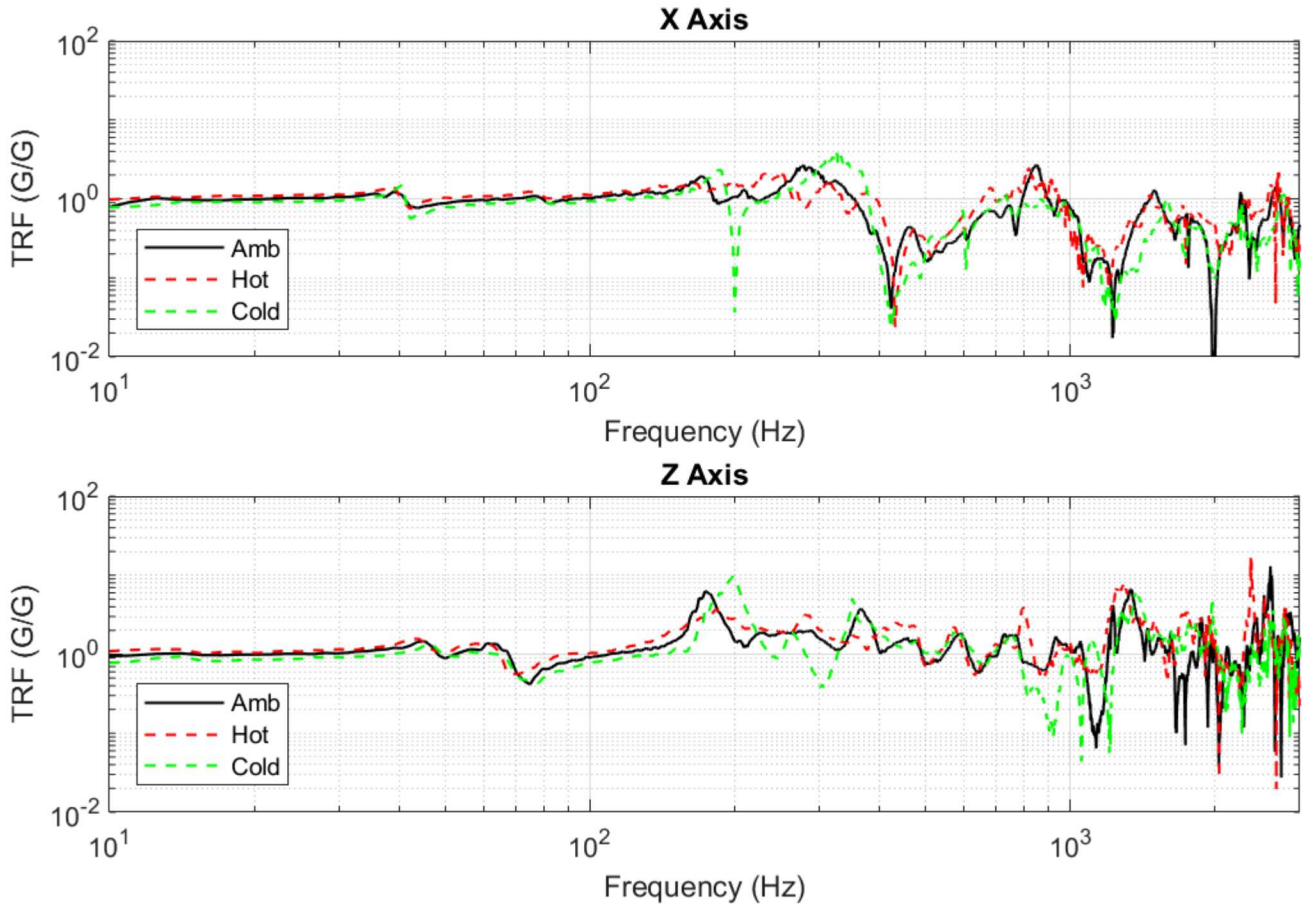
# Temperature effects

- TRFs for three different temperatures
- Soft mounted system



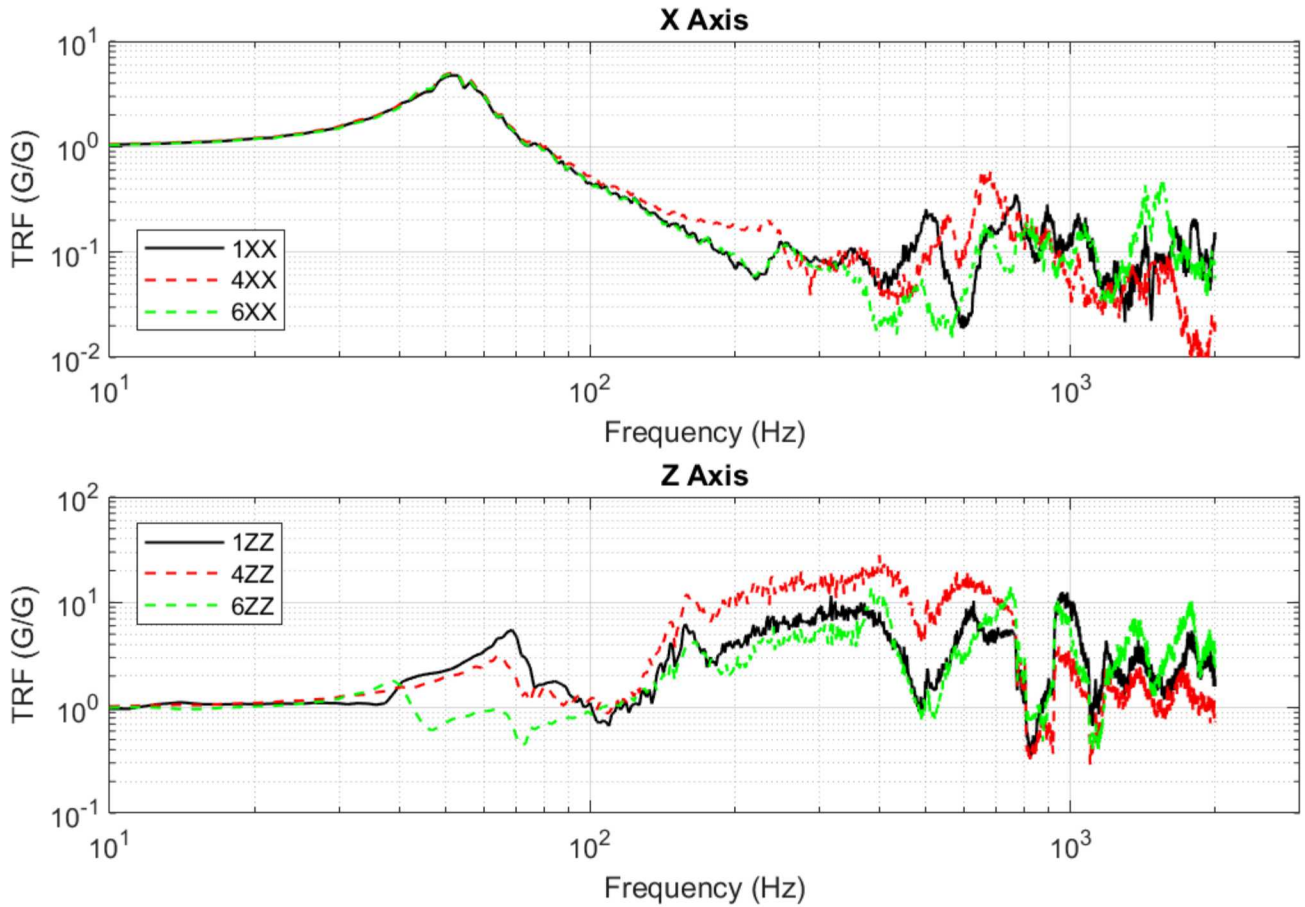
# Temperature effects

- TRFs for three different temperatures
- Hard mounted system



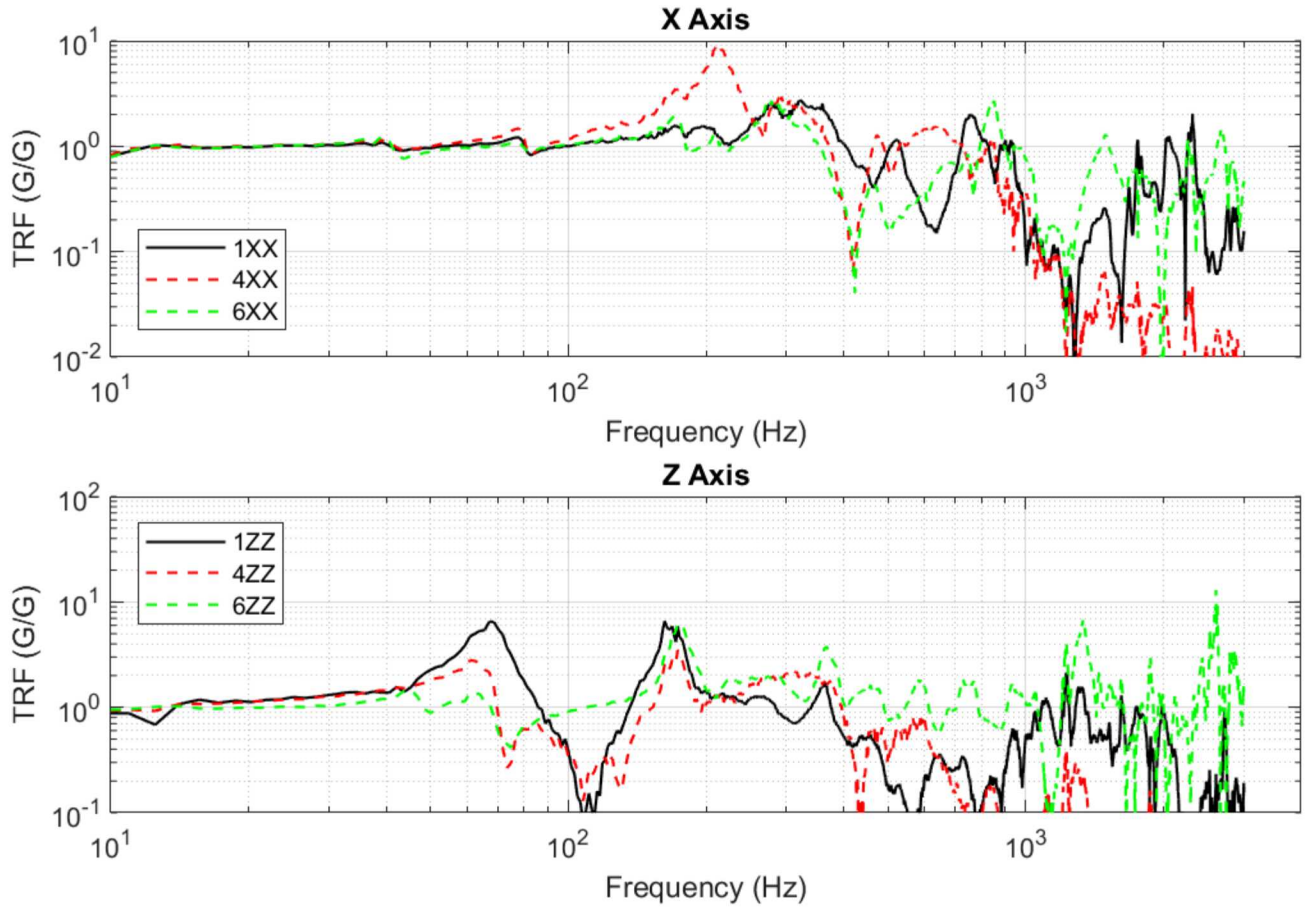
# Spatial effects

- TRFs for three different locations
  - Channel 1: Jointed
  - Channel 2: Hard case mounted
  - Channel 3: Soft mounted
- Soft mounted system



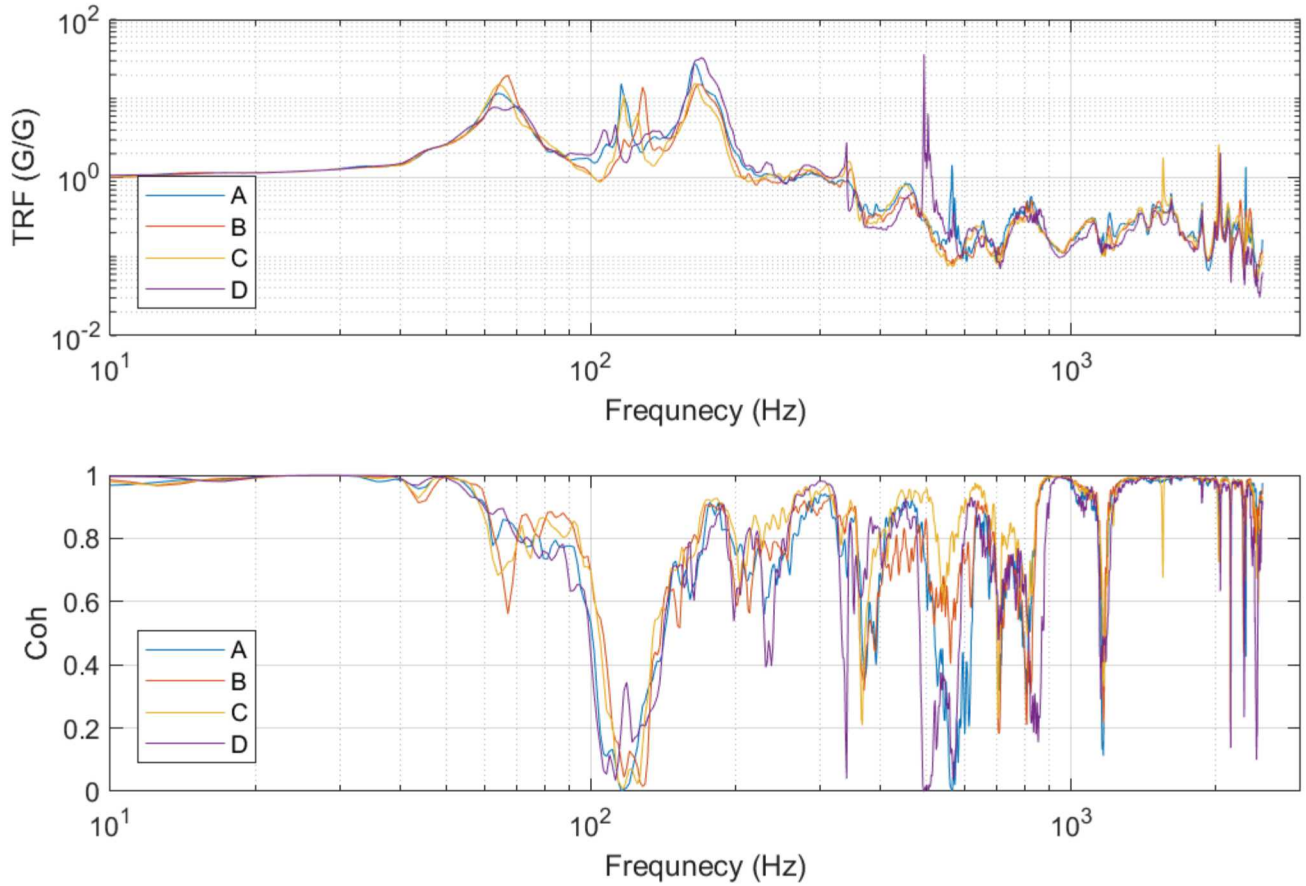
# Spatial effects

- TRFs for three different locations
  - Channel 1: Jointed
  - Channel 2: Hard case mounted
  - Channel 3: Soft mounted
- Hard mounted system



# Drift

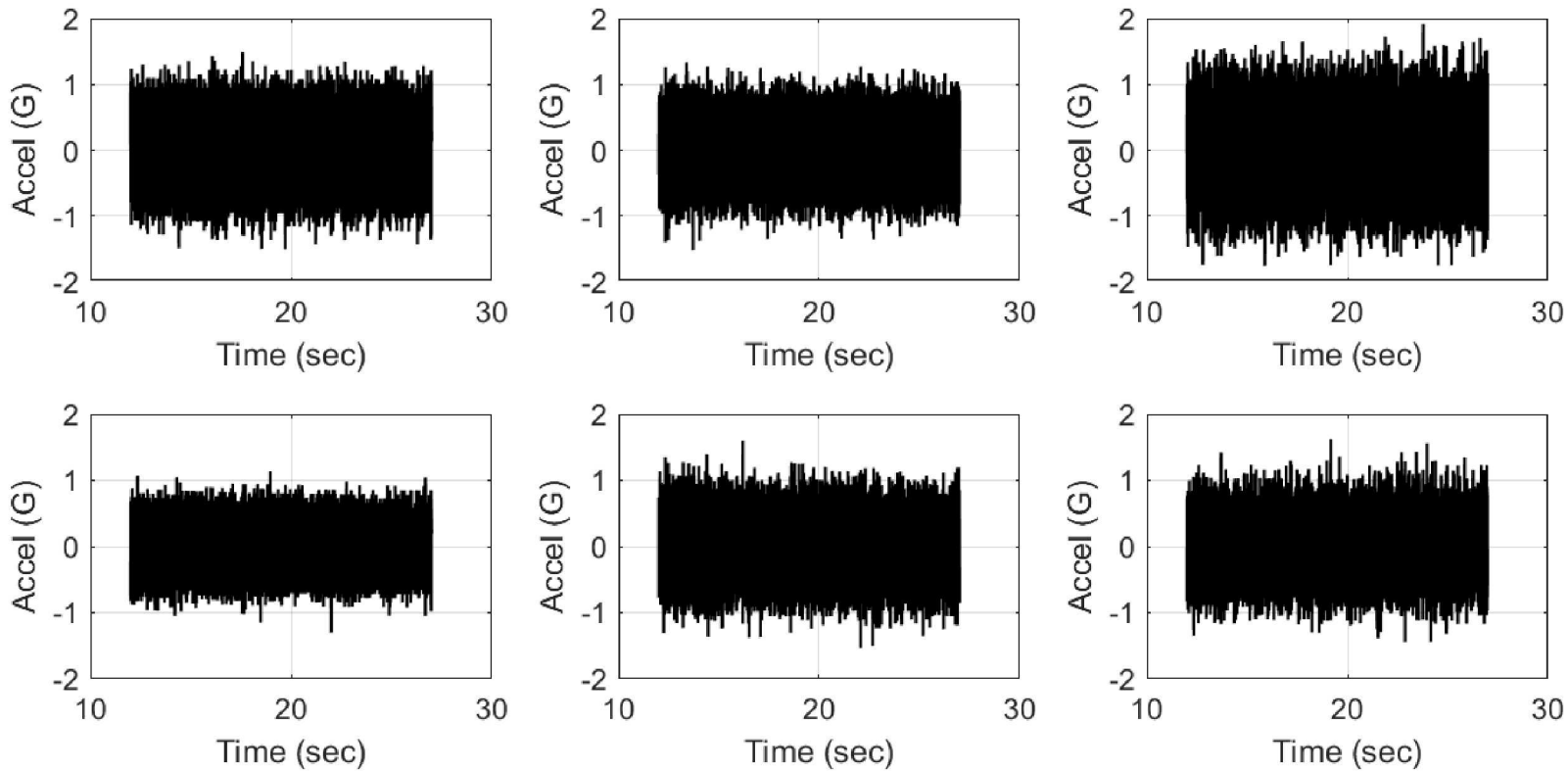
- TRFs for a four signature random tests spaced throughout a test series



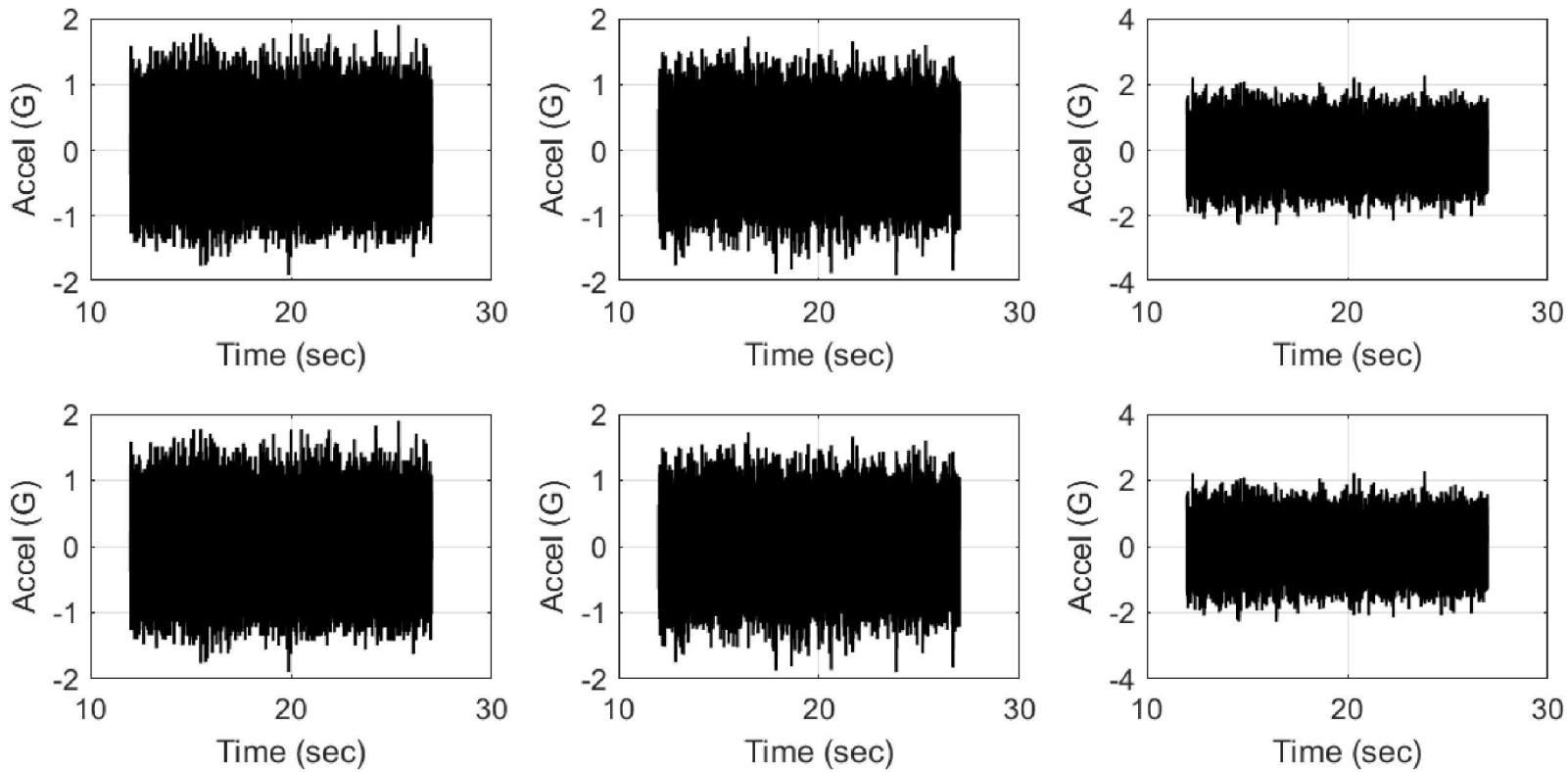
# Extrapolation Example

- It is often necessary to predict the response for a location that was not measured on a test
- This example discusses ways to do this using data from the location of interest and a nearby location

# Extrapolation Example (Case 1 Data)



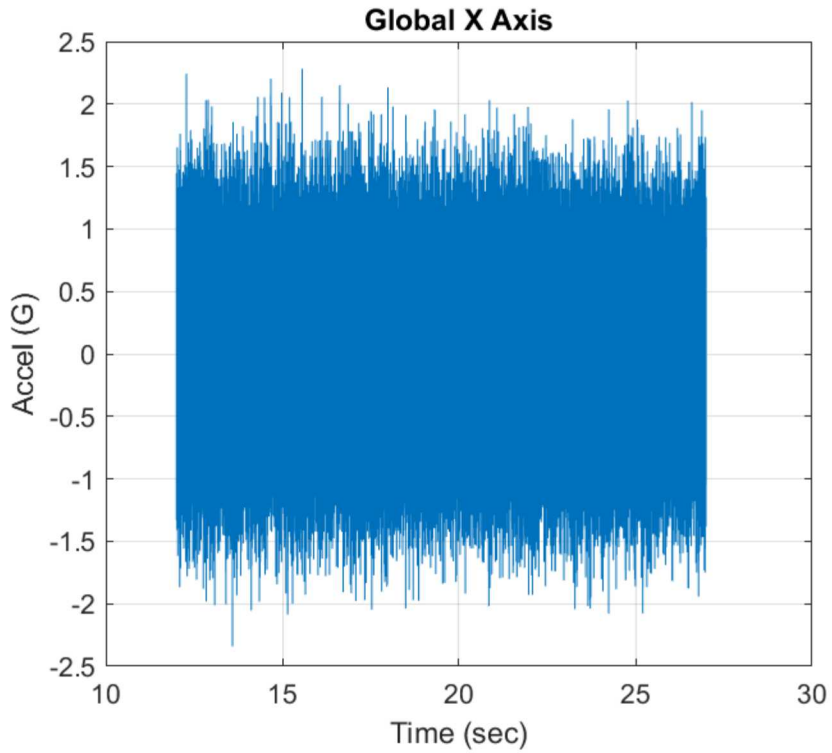
# Extrapolation Example (Case 2 Data)

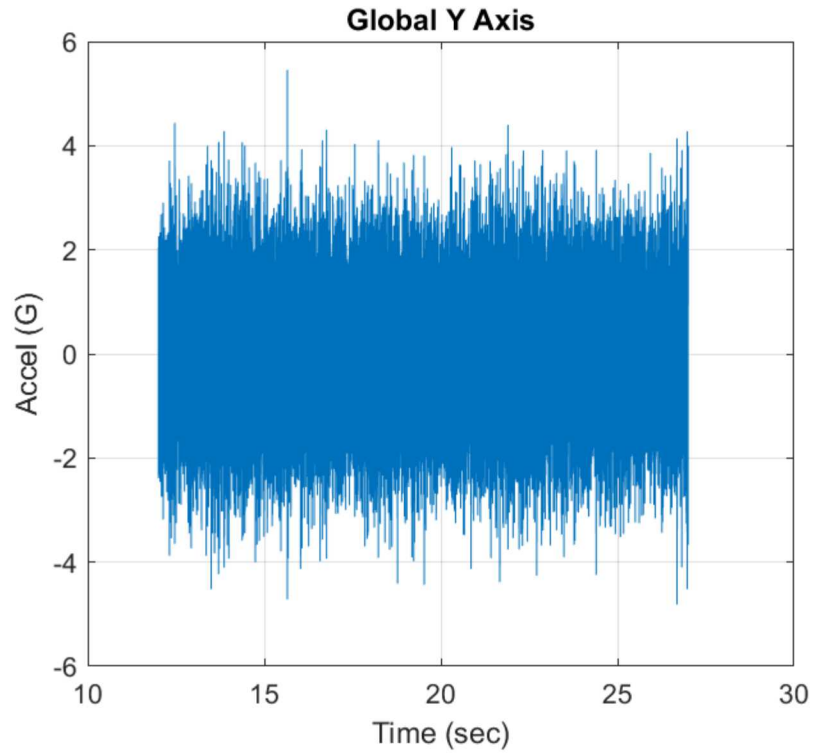


# Coordinate Transformation

- It is often necessary to rotate a set of biaxial or triaxial response data from the global coordinate system to the local coordinate system
- This example discusses ways to do this in both the time and frequency domains

# Coordinate Transformation (Case Data)



# Pseudo 3-D Responses

- It is important to address cross-axis responses for single axis testing
- Merging of Z responses for three orthogonal inputs (X, Y, and Z)
  - Enveloping the responses makes sense when the in-axis inputs were defined to produce the desired in-axis responses
  - Summing the responses makes sense when the inputs are uncorrelated