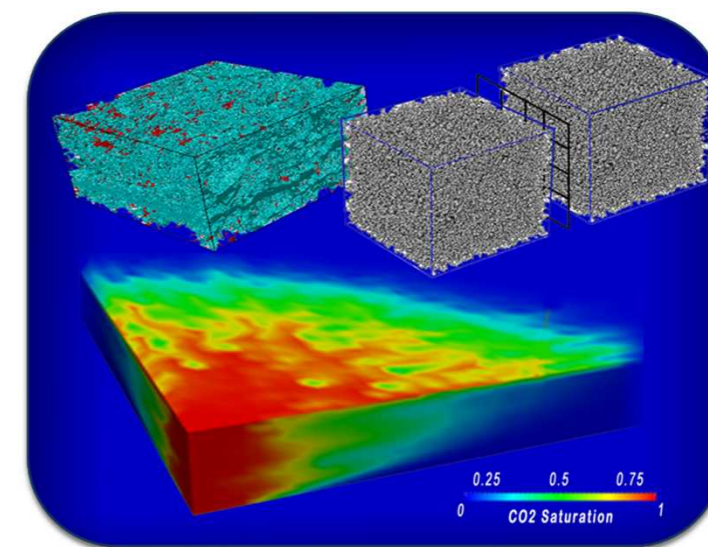
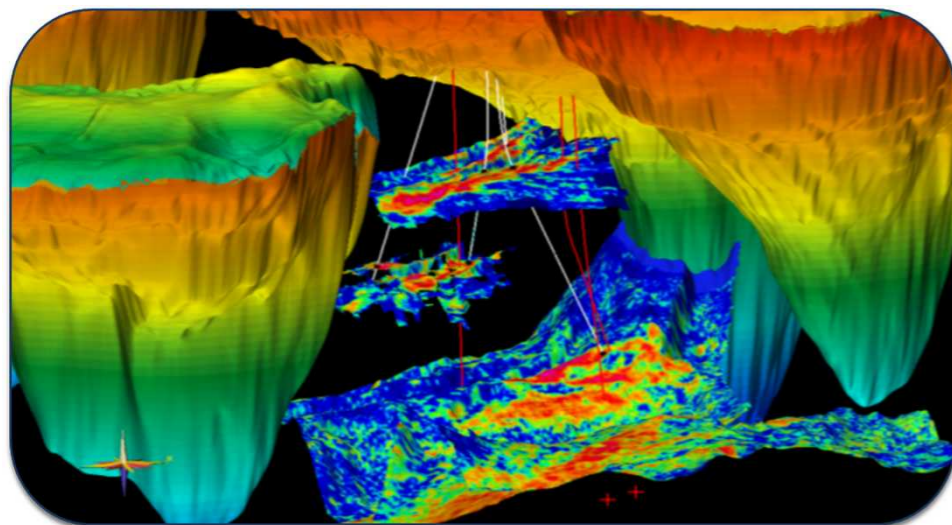


*Exceptional service in the national interest*



# SPE-5 Infrasound Predictions

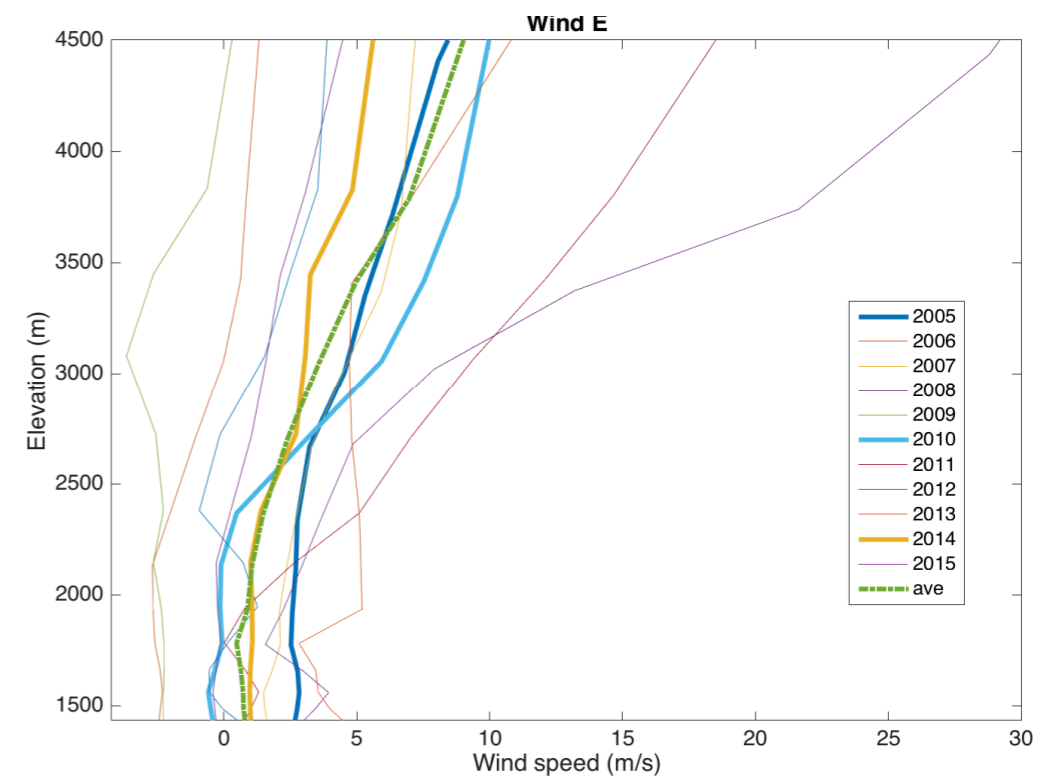
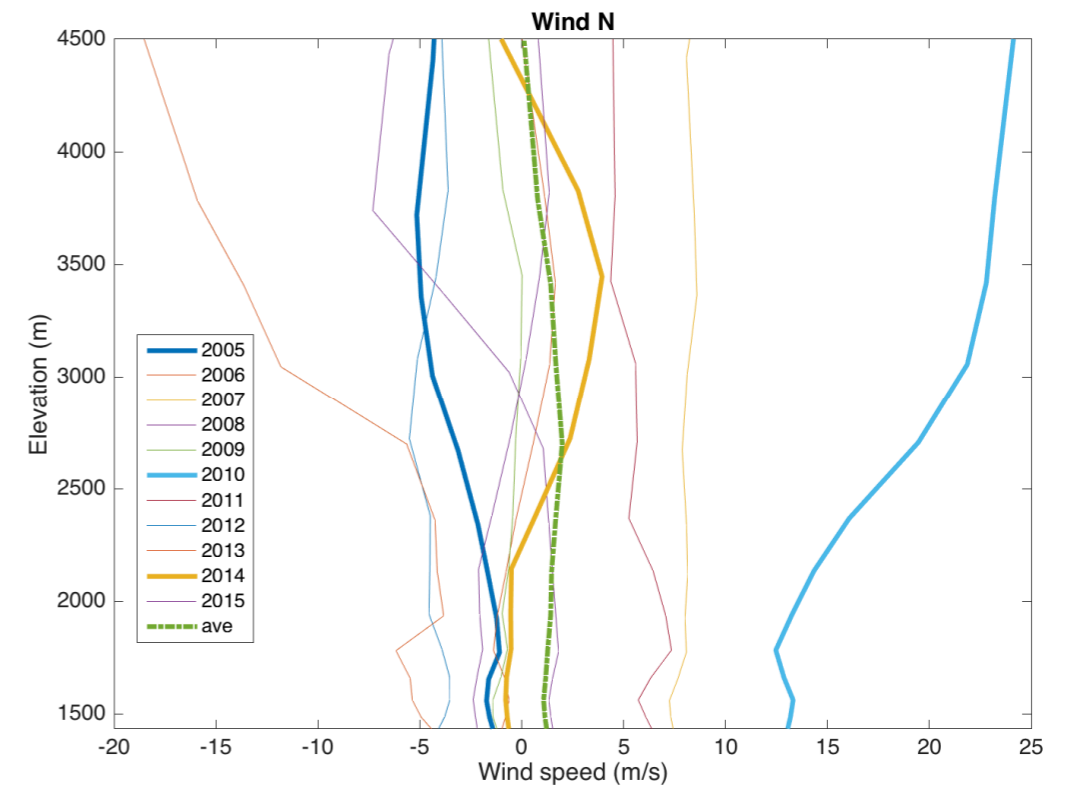
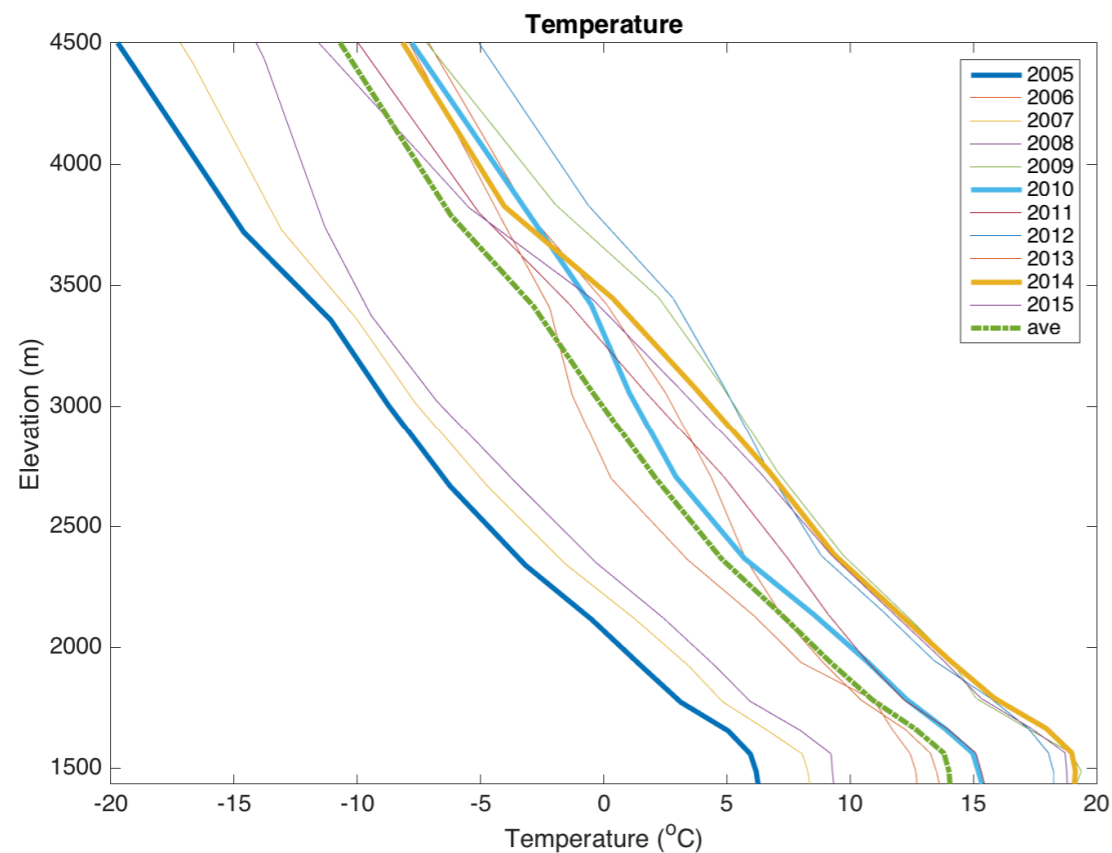
Leiph Preston

Geophysics Department

# Weather

- Collected NARR (North American Regional Reanalysis) data from the National Center for Atmospheric Research data repository
- Chose late April data from 2005-2015
- Ran WRF (Weather Research and Forecasting) suite for each year and for an average model over the 11 year period
- Selected outlier years and average to simulate SPE-5 shot

# Weather Variations



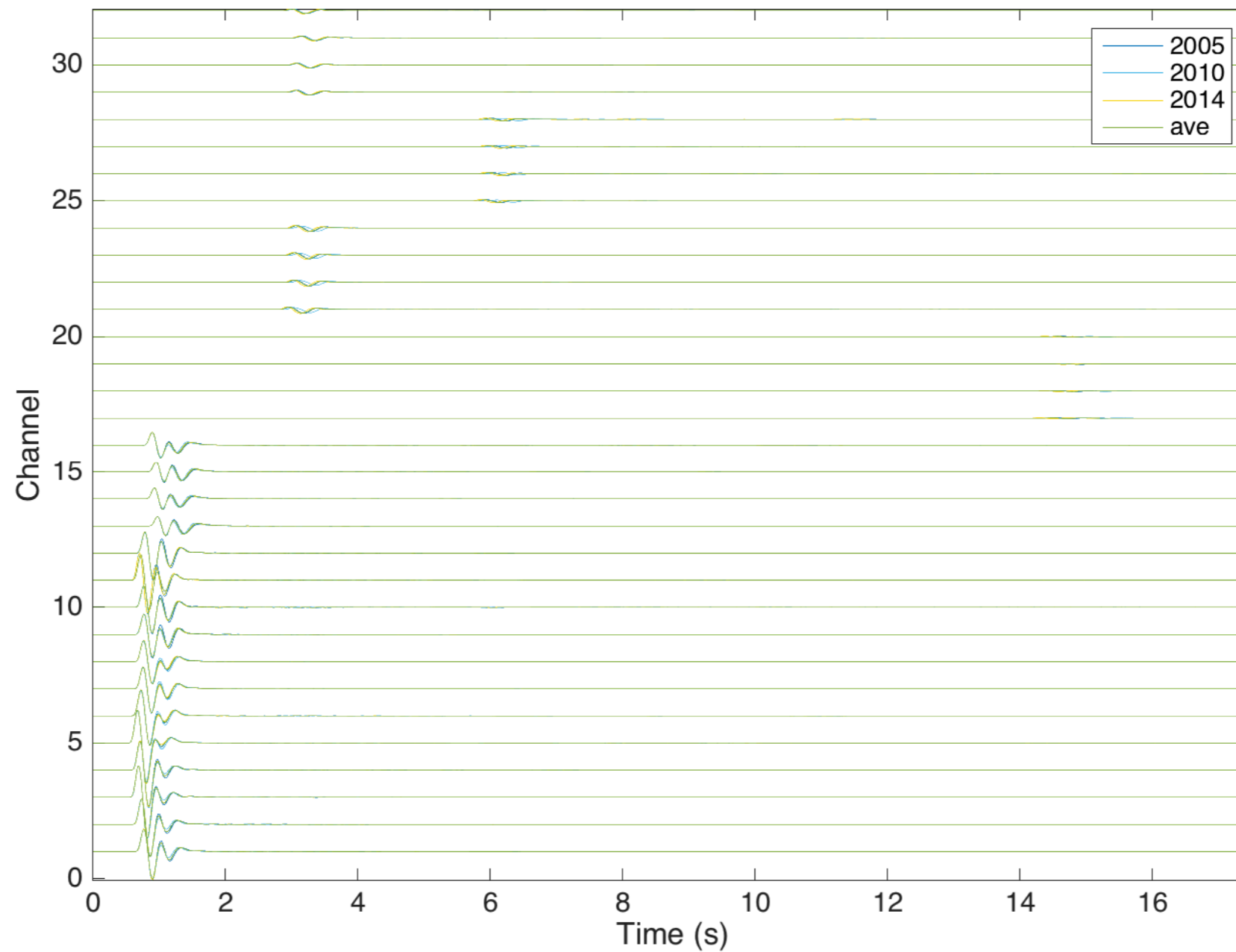
- Mean 1-D profiles of temperature and horizontal winds provide an idea of weather variations
- **2005**: Coolest, **2010**: Windiest, **2014**: Warmest and Calmest

# Modeling

- Used explosive source time functions derived from SPE-1 and SPE-4' scaled for SPE-5
- Used TDAAPS (Time Domain Atmospheric Acoustic Propagation Suite) to obtain synthetic pressure traces at all SPE infrasound arrays
- Accounts for 3-D variations in medium parameters, wind, and topography
- Linear propagation only - very near-source effects will not be accounted for

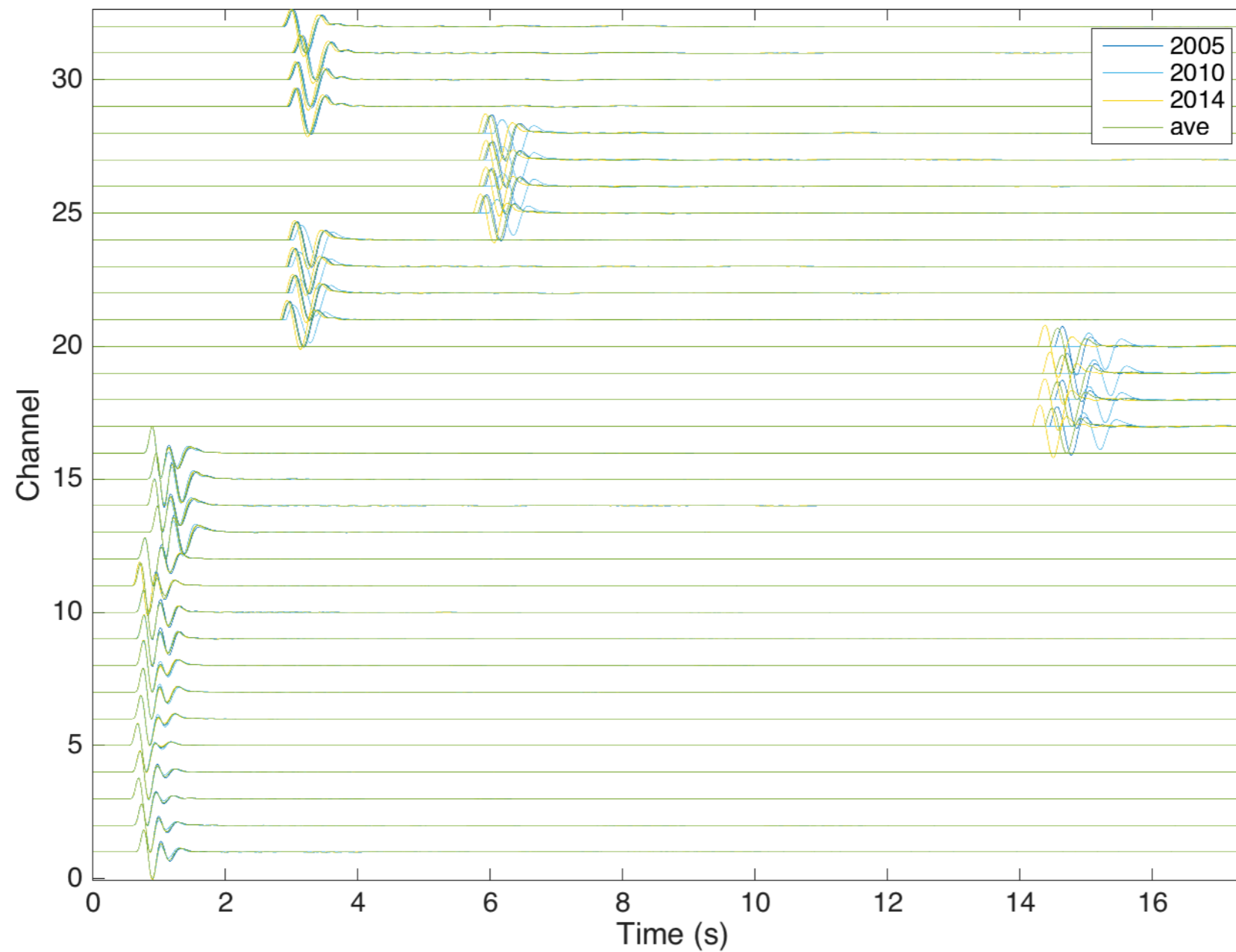
# Results

- Synthetics normalized to nearest sensor



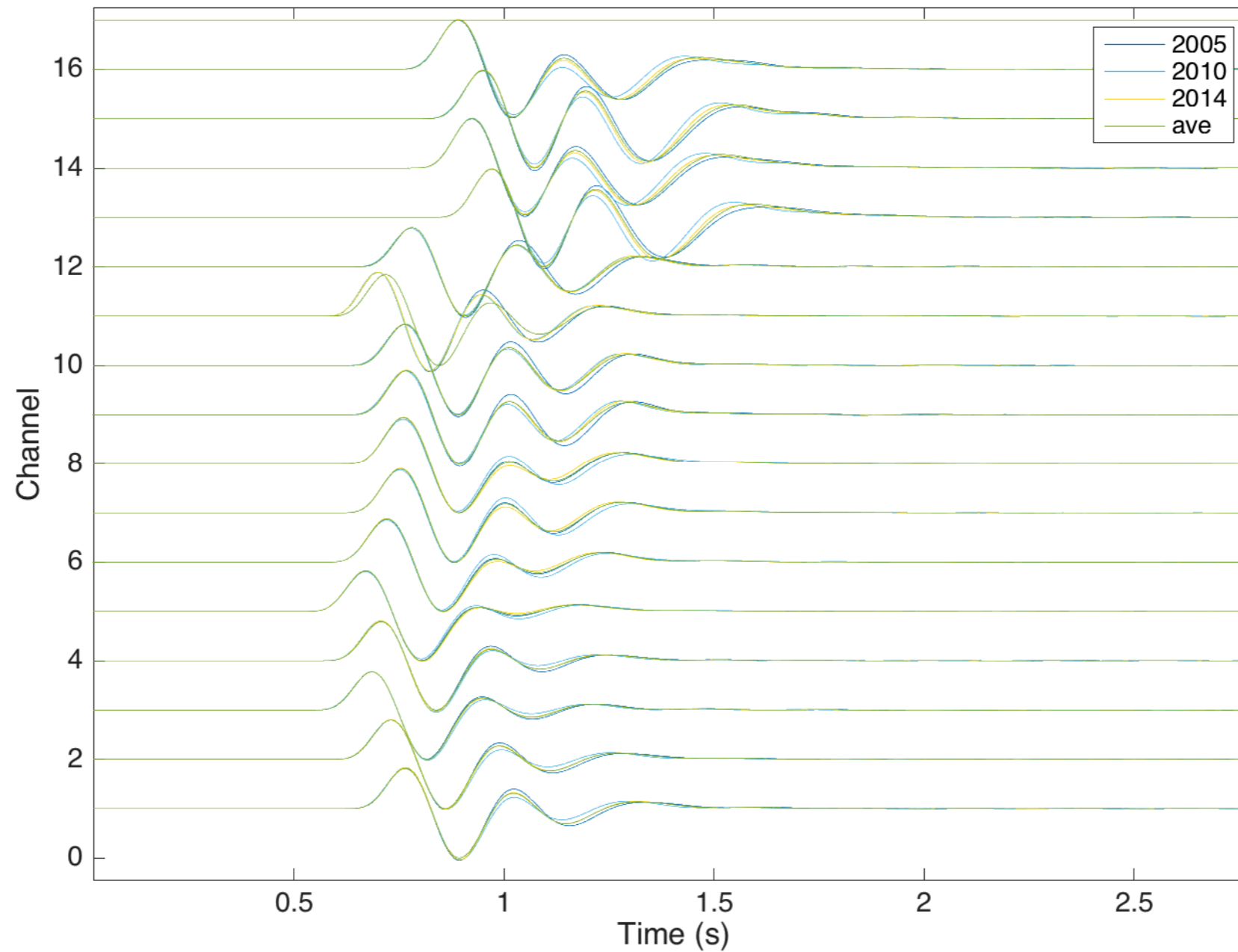
# Results

- Synthetics normalized for each trace

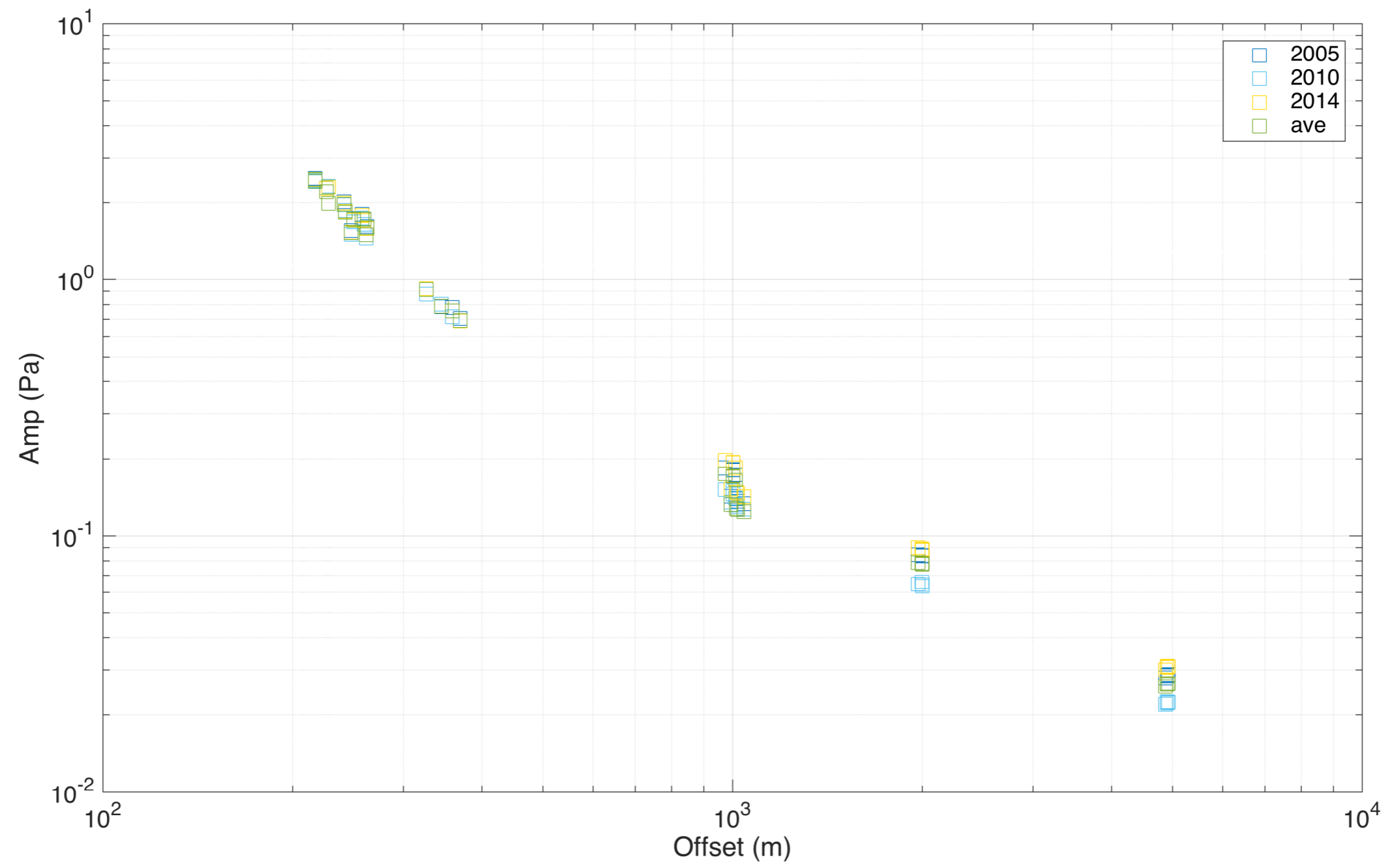


# Results

- Synthetics normalized for each trace for Arrays 1-4



# Amplitude Estimates



# Summary

- Weather variations are minimal for Arrays 1-4 (nearest sensors)
- Weather differences can cause fairly large variations in both arrival times and amplitudes, especially at distant receivers, but it depends on winds relative to the source-receiver azimuth
- Predicted peak amplitudes nearest the source are in the few Pascal range, dropping off faster than  $1/r$  primarily due to atmospheric effects
- Several factors could greatly affect this prediction including non-linear and other near-source effects (spall, etc.) and weather. The much larger source size than either SPE-1 or SPE-4' probably will make the source time function used inadequate.