# Data needs and motivation

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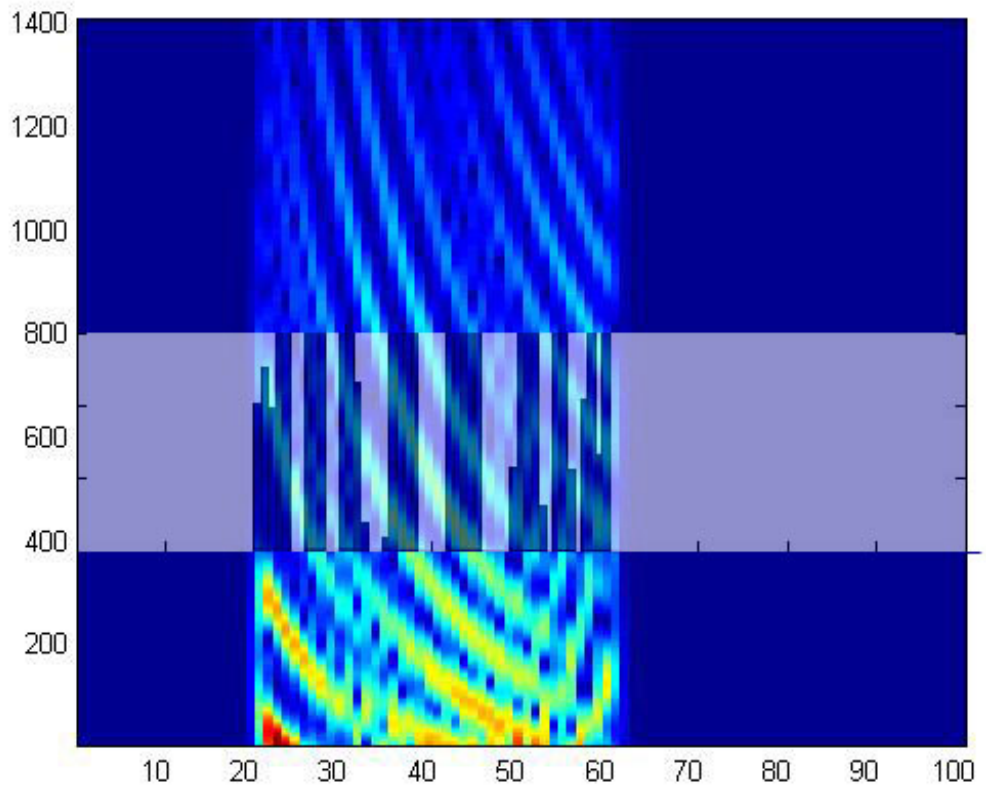
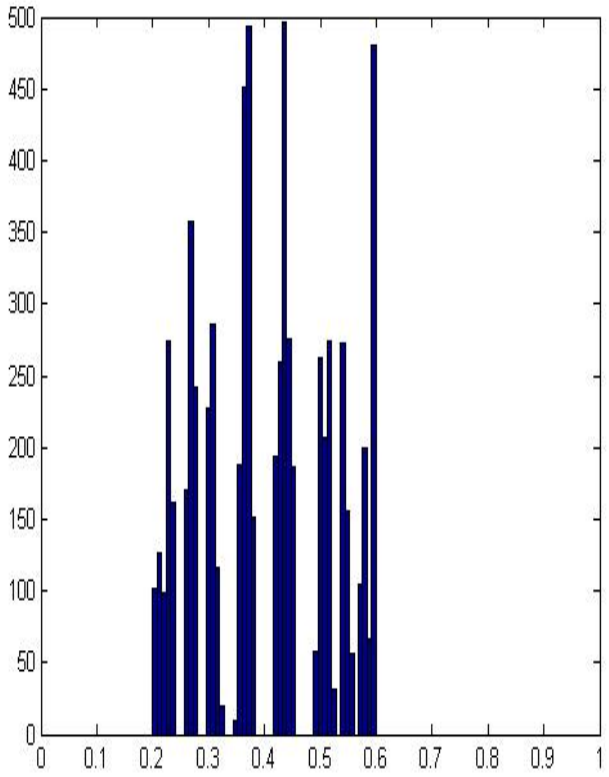
# Data Needs

- Wide range of frequencies: 10 Hz to 4 kHz. (Combustive source with power in low frequencies? Chirps, time domain signals are important.)
- Tracks (continuous measurements).
- Benign area.
- Ground truth.

# Dispersion Analysis - Time-Frequency




Time-frequency analysis




Which modes are identified?

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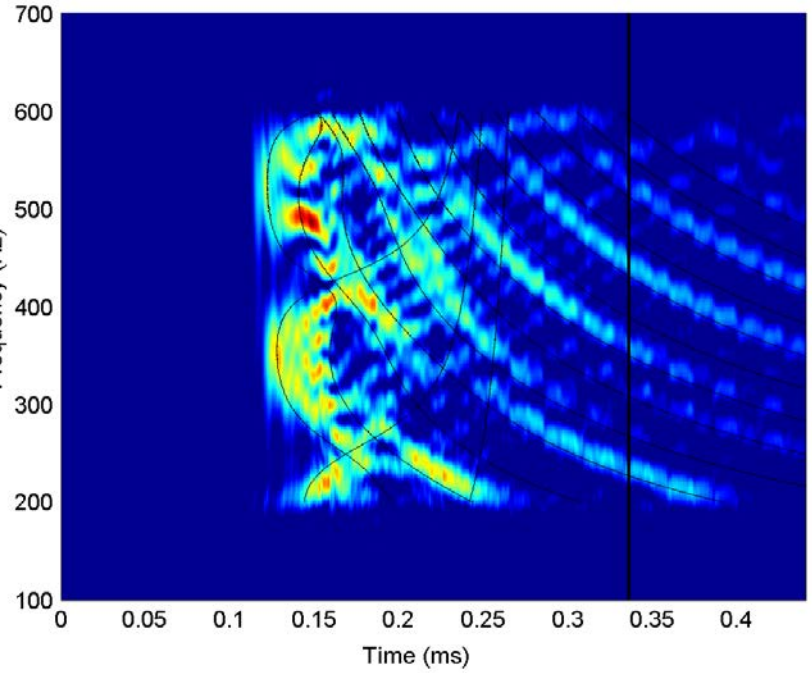
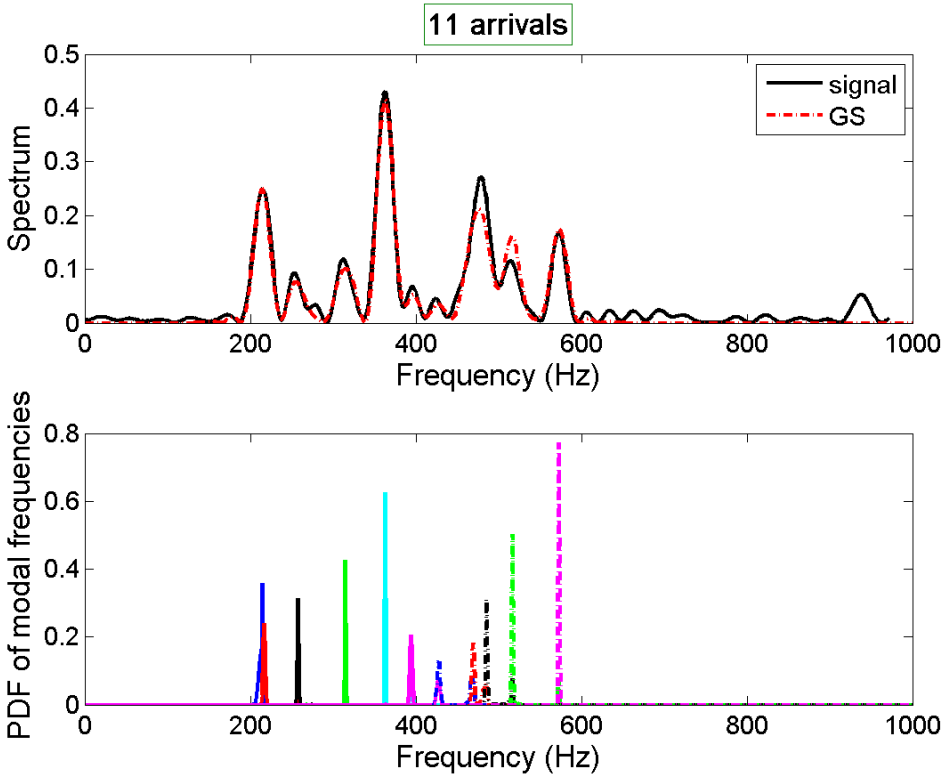
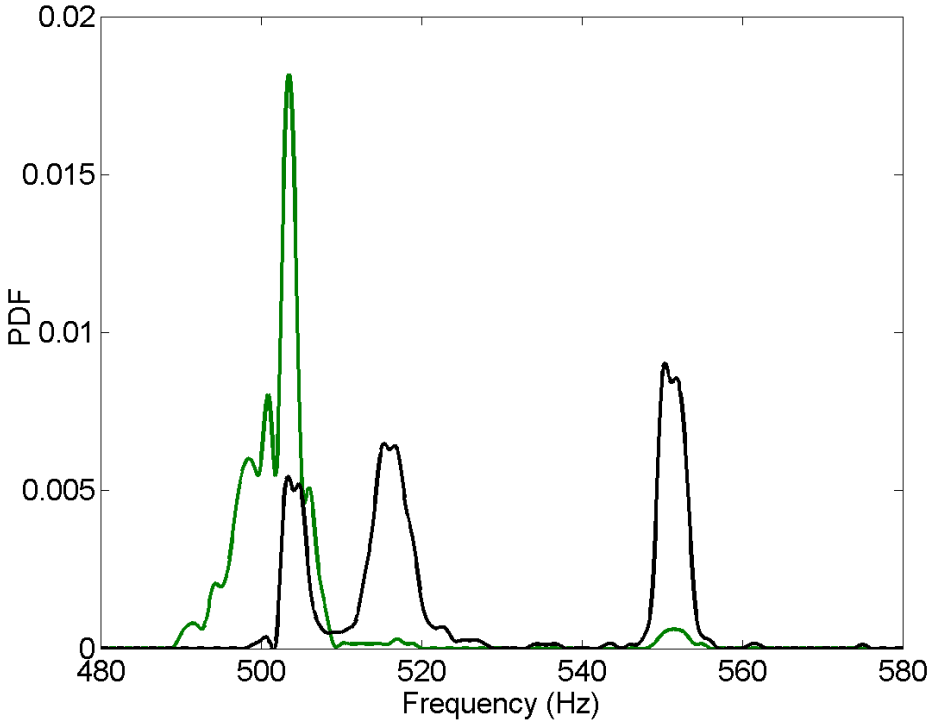
# Dispersion Analysis

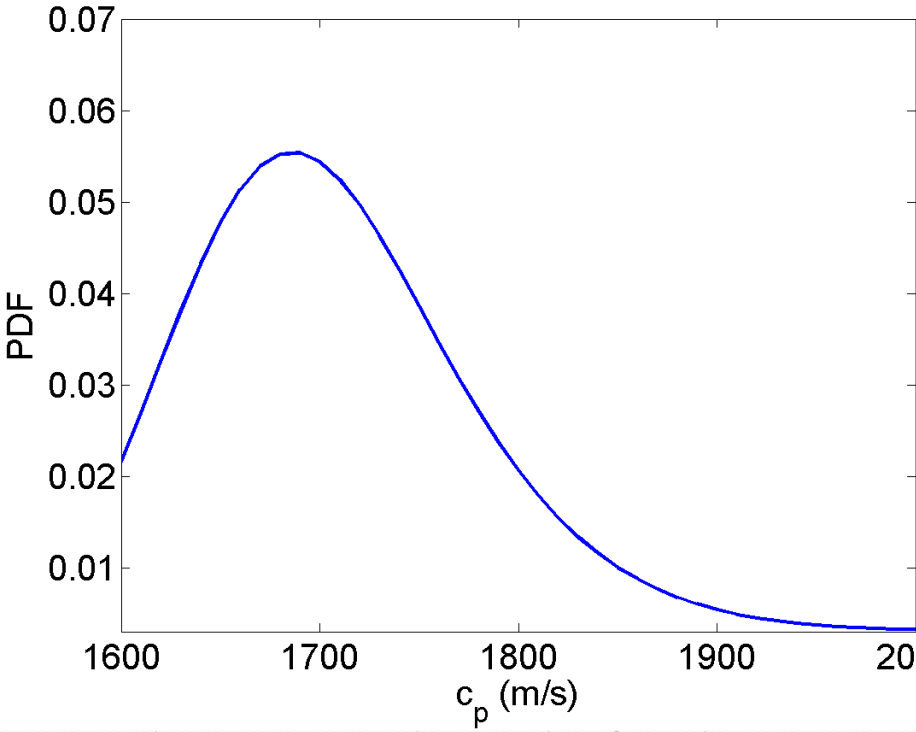


# Dispersion - Uncertainty



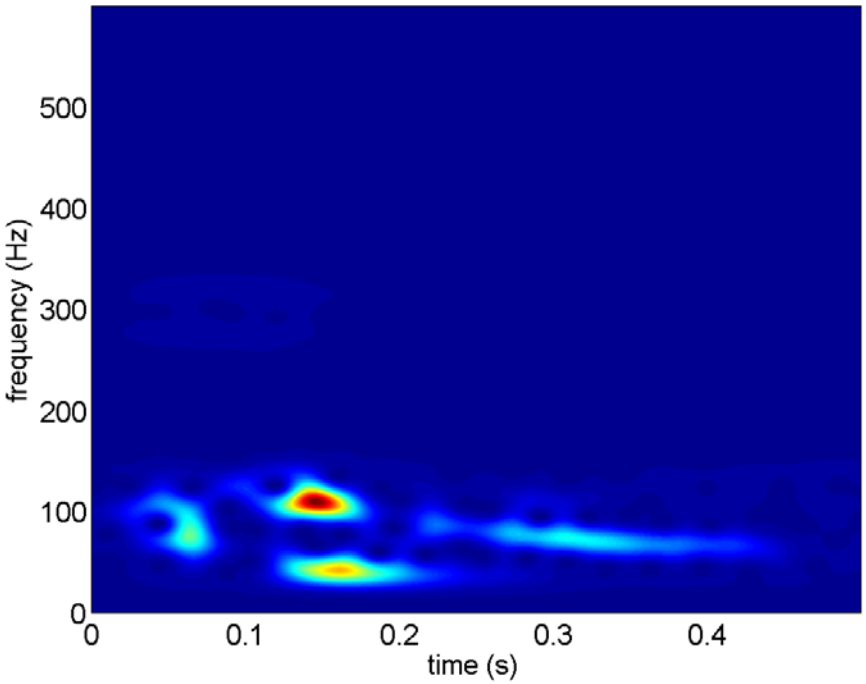

Modal frequency PDFs for two modes

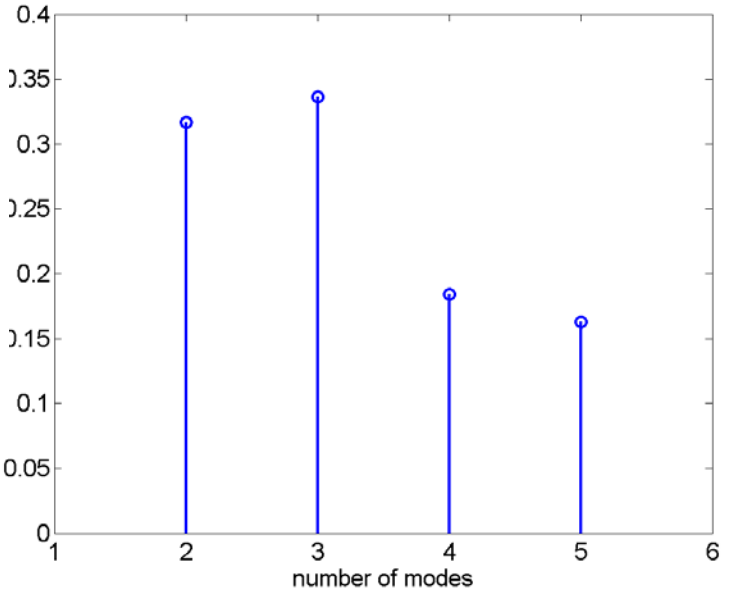



Sediment sound speed – first layer
True value: 1674 m/s

# Shallow Water-06

Dispersion (combustive source)

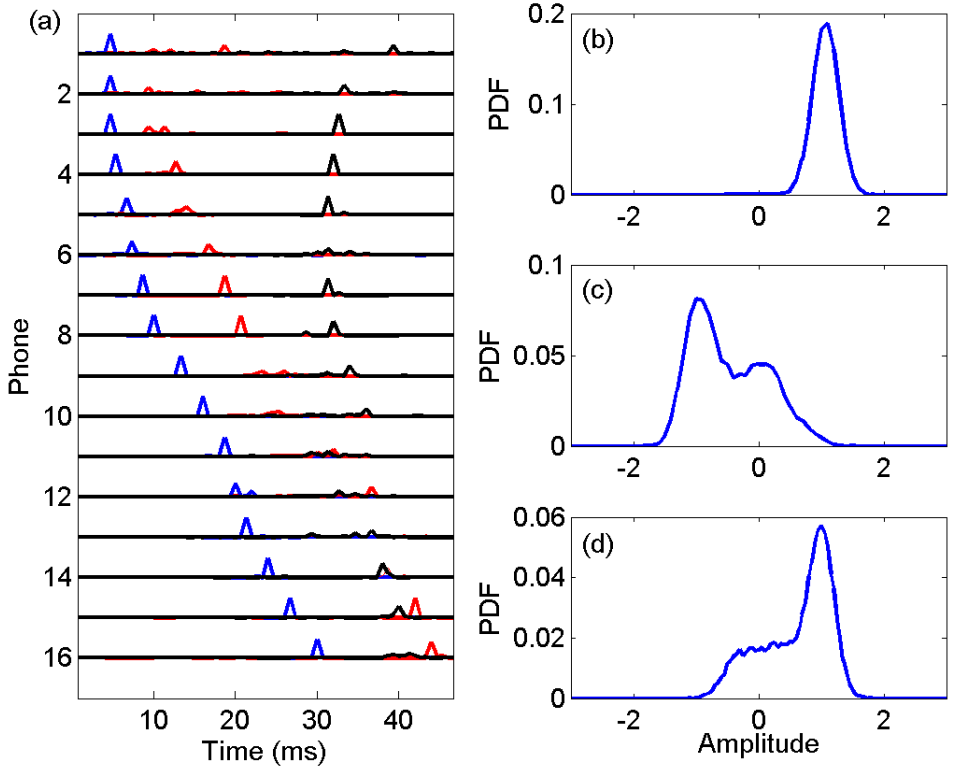


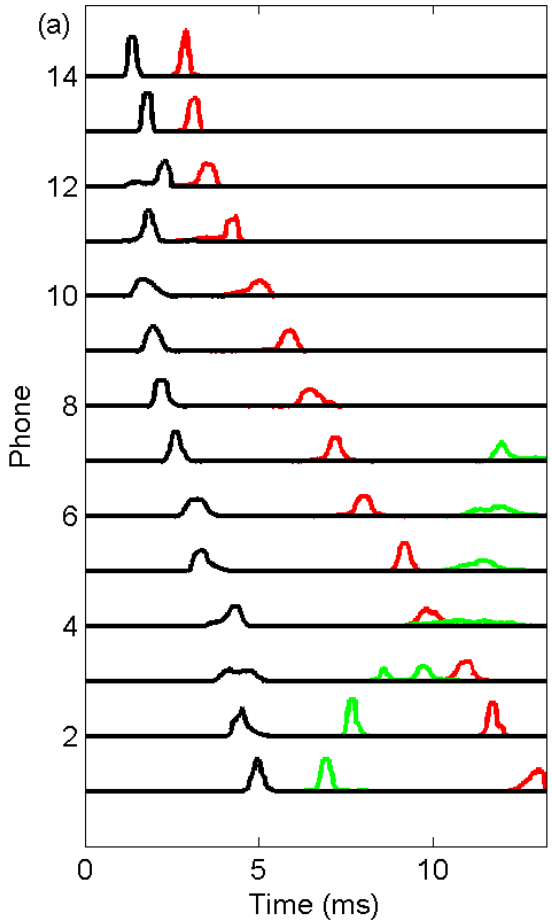




Schwartz-Rissanen criterion
*(Time delay estimation*
*Michalopoulou and Picarelli JASA 2006)*

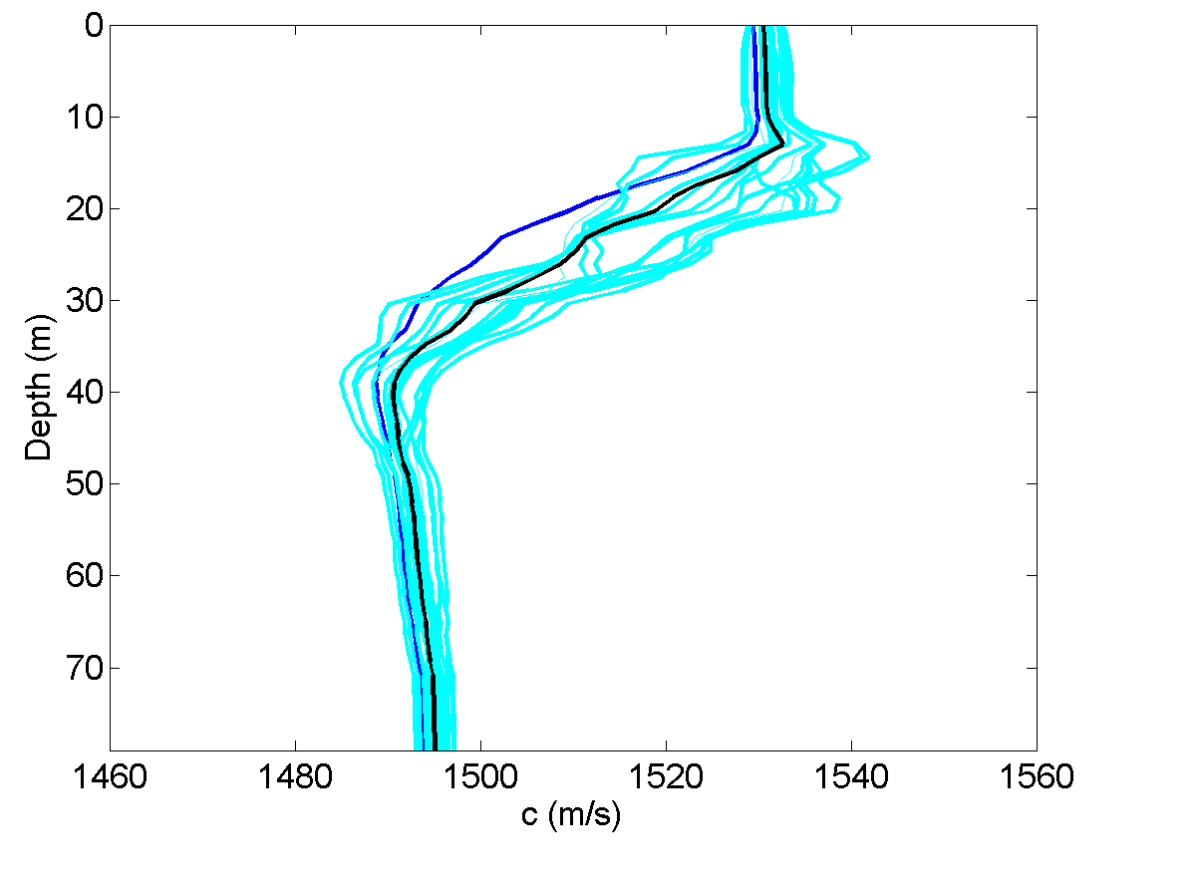
# Arrival time inversion

SW06



# Inversion for Sound Speed using arrival times – SW06

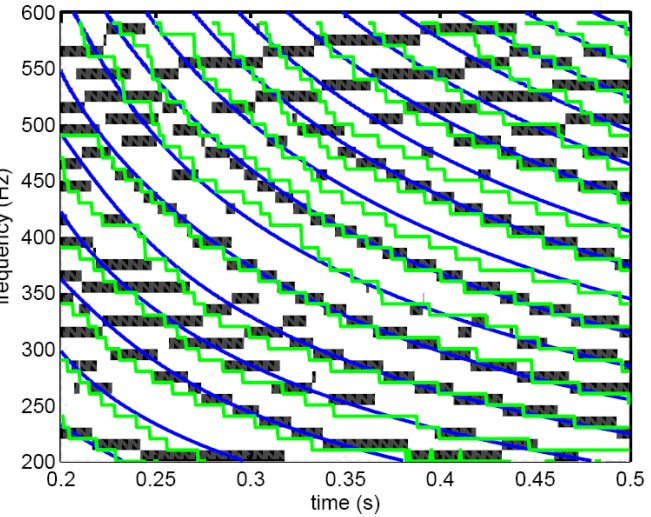


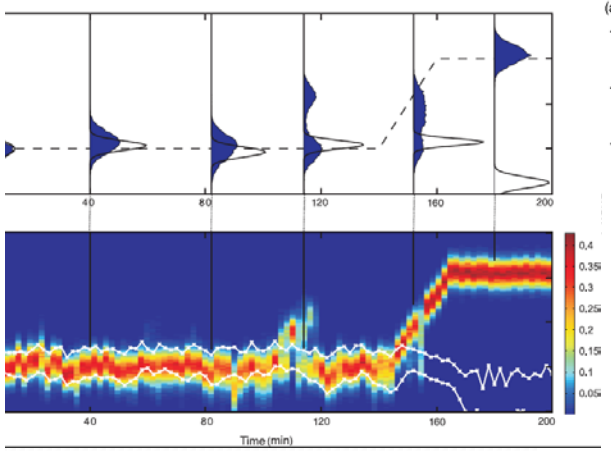

**Blue: mean ssp**
**Black: MAP ssp**
**Cyan : particles**

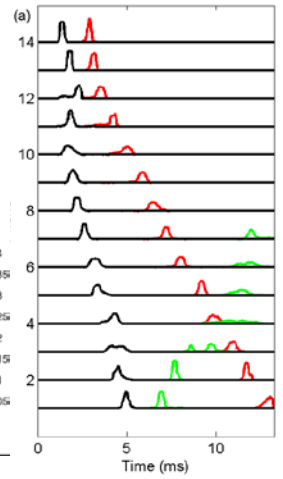
**EOF PDF relatively flat (short range)**

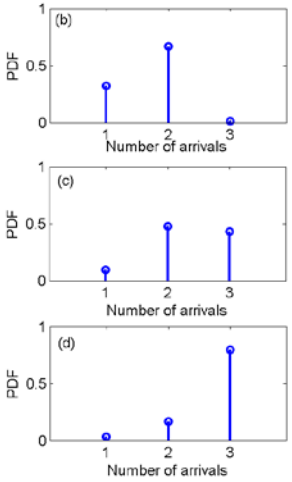
# Sequential filtering (successful in inversion)

- Successful inversion, arrival time estimation, and model order estimation with PFs in ocean acoustics.




Zorych, Michalopoulou, JASA-EL, 2008
Yardim, Gerstoft, Hodgkiss, JASA 2009
Yardim, Michalopoulou, Gerstoft, JOE 2011
Jain, Michalopoulou, JASA-EL, 2011

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