

# Sound localization for Sediment-Generated Noise (SGN) measurement

**J.R. Rigby**, Research Hydrologist, USDA-ARS, Oxford, MS,  
JR.Rigby@ars.usda.gov

**Daniel G. Wren**, Research Hydraulic Engineer, USDA-ARS, Oxford, MS,  
Daniel.Wren@ars.usda.gov

**Praveen Panickar**, Craft-Tech, Oxford, MS, [PPanickar@craft-tech.com](mailto:PPanickar@craft-tech.com)

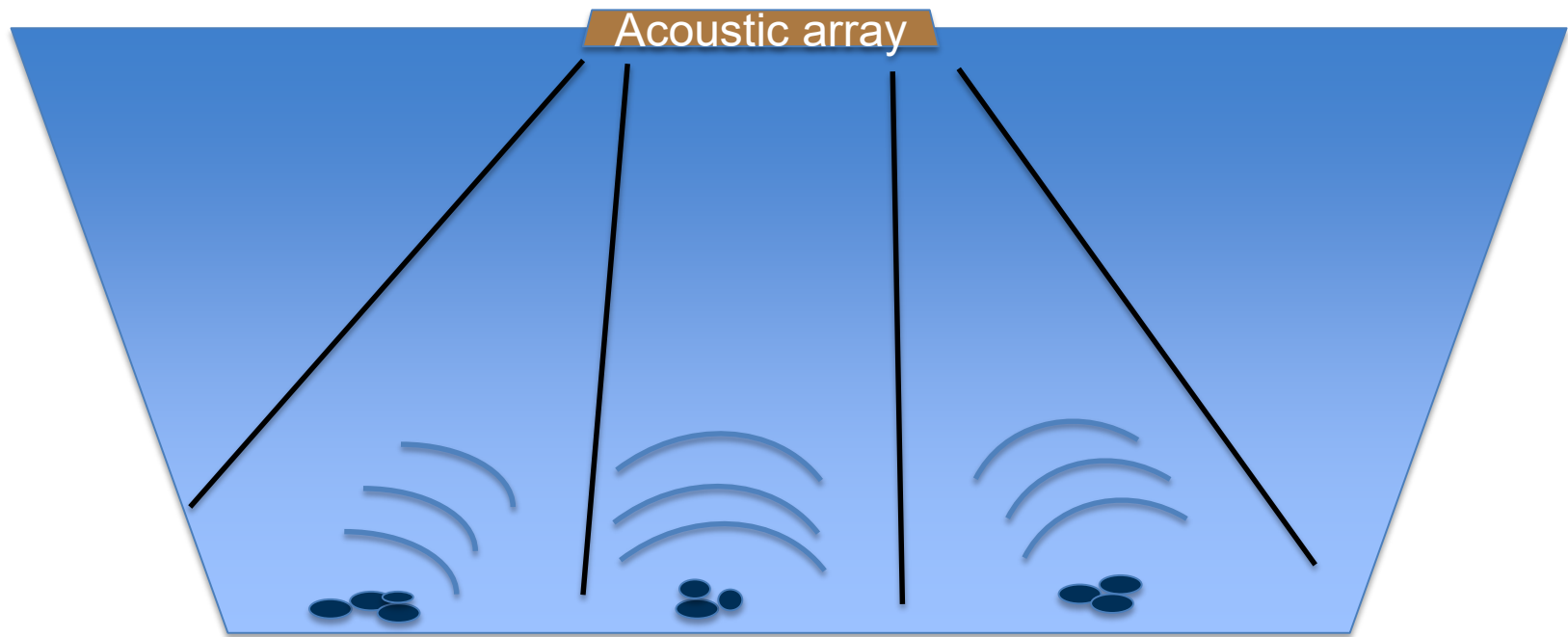
Partially funded by the Federal Interagency Sedimentation Project



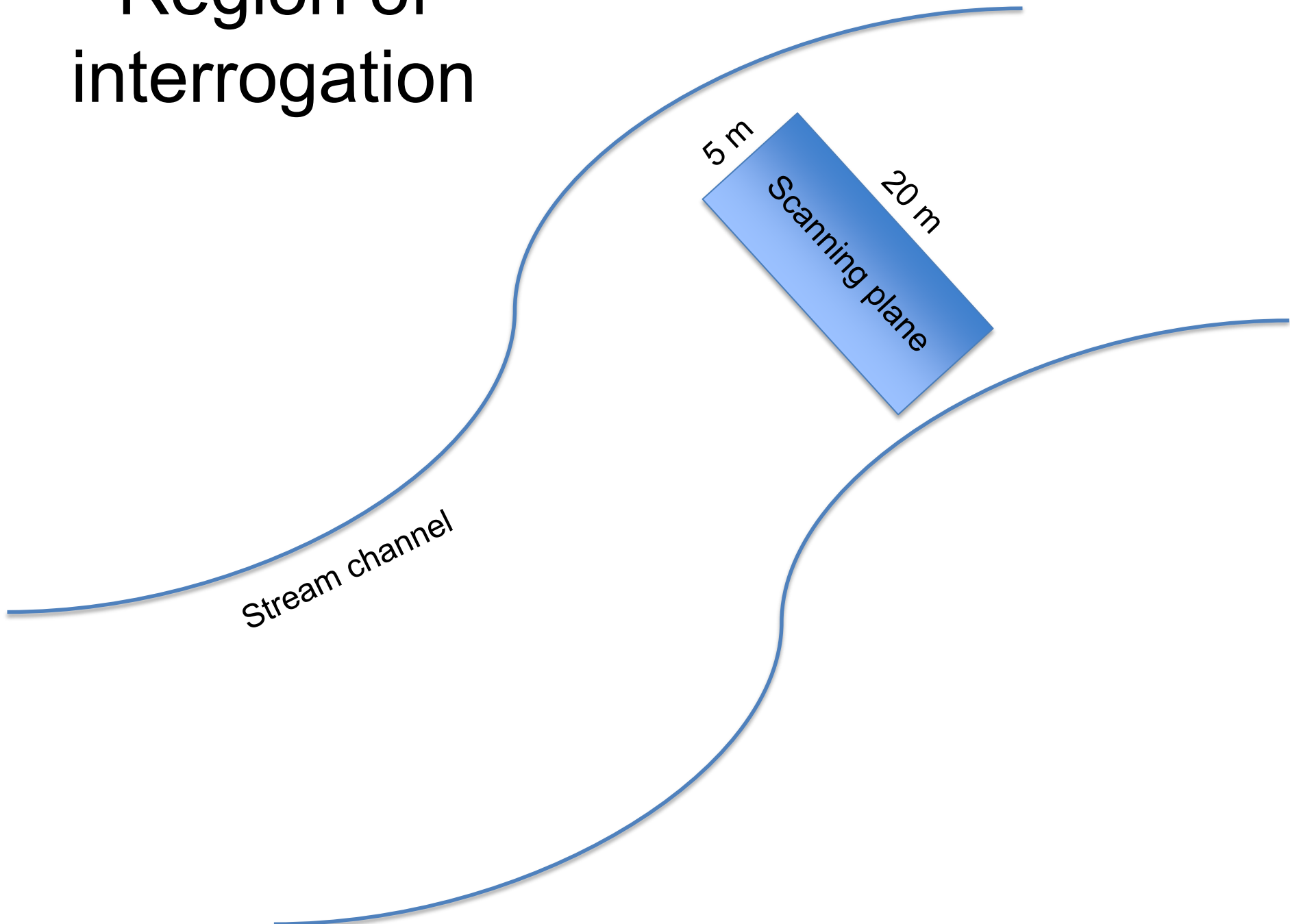
# Introduction

- Design specifications for phased array of hydrophones to localize sound in channels
- Why a phased array?
  - Development of SGN (Sediment Generated Noise) methodology
    - Definition of measurement volume
    - Signal/noise discrimination
  - Studies of bedload transport
    - Locating areas of transport along stream in cross-section
    - Augmentation of physical sampling

# SGN localization



# Region of interrogation



# Spiral arrays



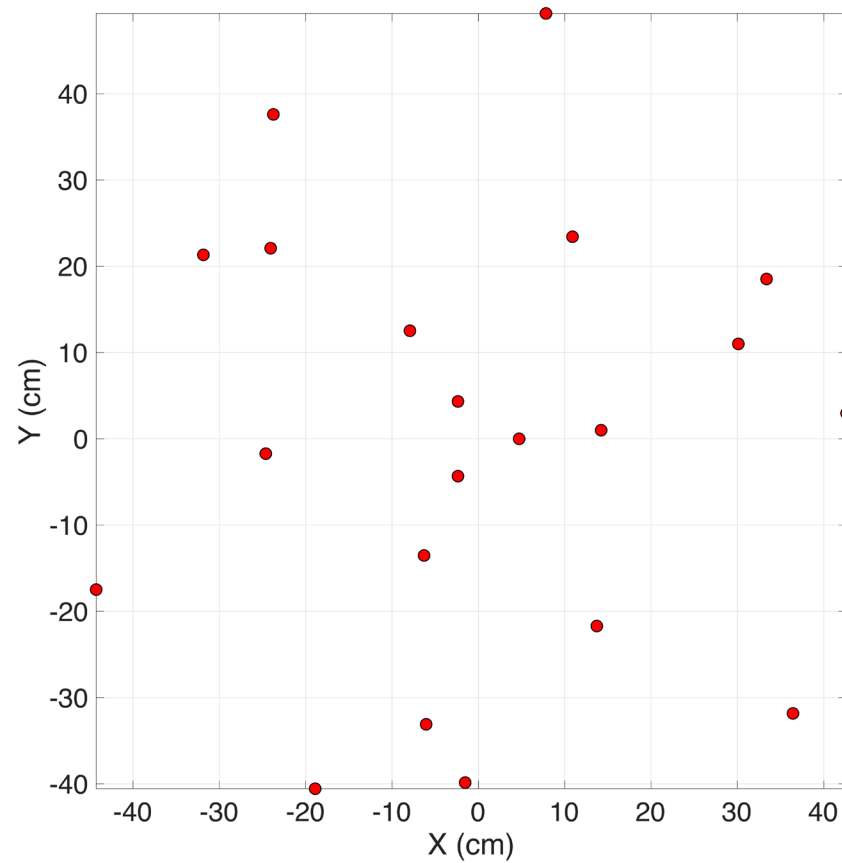
117-element Phased Array installed in the VT anechoic wind tunnel

From: <https://www.avec-engineering.com/products.html>

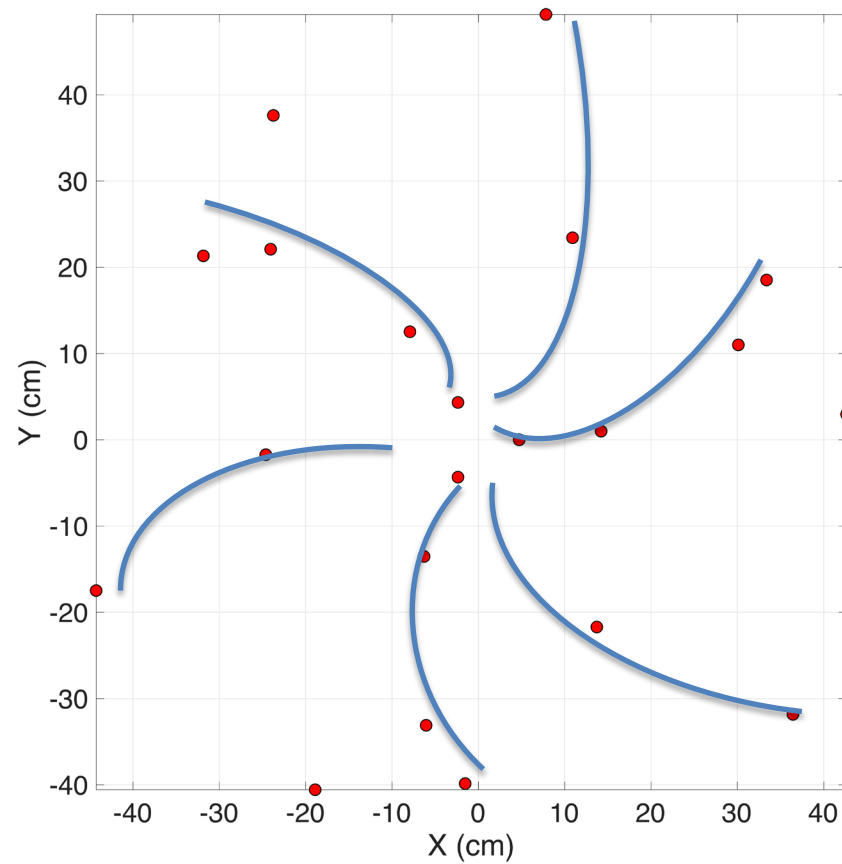


From: <http://geluid.eu/gb/set-capsule-voorversterker/microphone-array>

# Hydrophone locations



# Hydrophone locations



# Project status

- Design is complete
- Hydrophones for prototype array have been ordered (delayed)
- Next steps:
  - Prototype array
    - Acquire hydrophones
    - Set up data acquisition system
  - Laboratory testing
    - Conversion algorithms
  - Field testing
- BUT: JR Rigby is now at the USGS heading up the Mississippi Alluvial Plain Water Availability Study



A scenic landscape featuring a snow-capped mountain peak in the background, partially obscured by a dense forest of evergreen trees. In the foreground, a river flows through a lush green area, with some small figures of people visible on the banks. The sky is blue with scattered white clouds. The word "Questions?" is overlaid in a large, bold, blue font in the center of the image.

**Questions?**



# Specifications

- Optimized for 5-20 kHz
- 20 x 5 meter scanning plane oriented with long axis cross-stream
- 21 hydrophones
- Spatial resolution depends on range
  - About 1 m for 2 m depth