ADCP Measurement of Suspended Sediment in the Tidal Hudson River

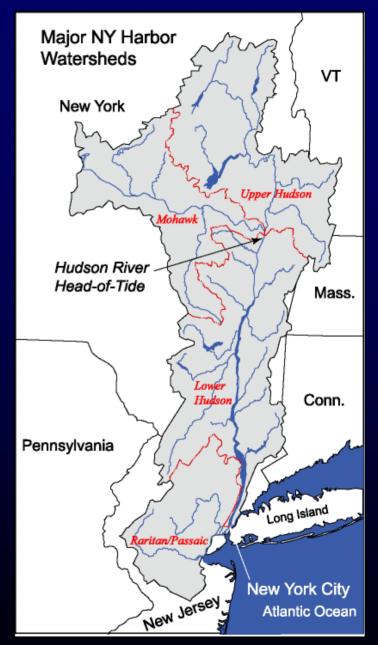
Elizabeth Nystrom Gary Wall

New York District

Hudson River Basin

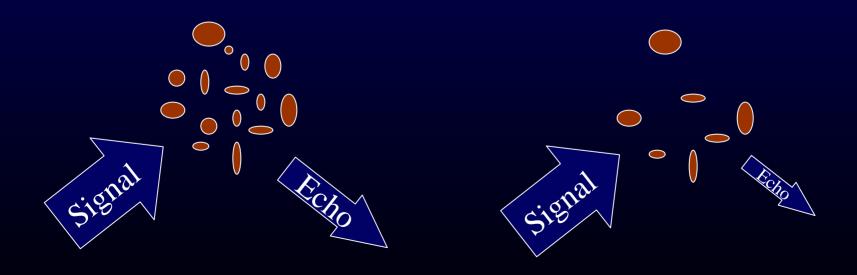


- \$89 billion of cargo went through the port of NY/NJ in 2002
- River is tidal 153 miles to Federal Dam at Troy
- Can't use conventional methods to measure suspended sediment load



Acoustic Backscatter as a Surrogate for Suspended Sediment

• Relate the signal echo strength to concentration of suspended sediment



Uplooking ADCP

- 600 kHz Sentinel
- 1 ensemble every15 min
- Transmit data over acoustic modem
- ~ 60 ft deep

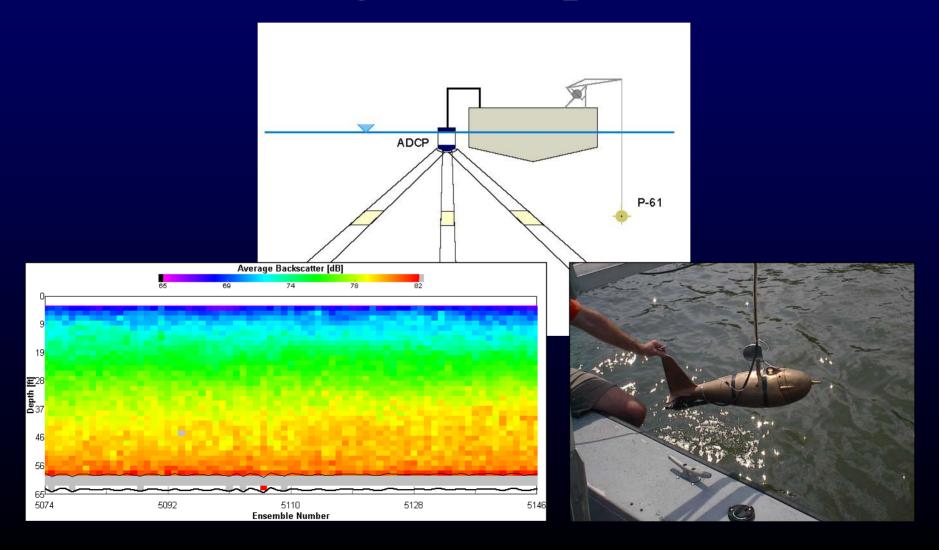


Load Computations

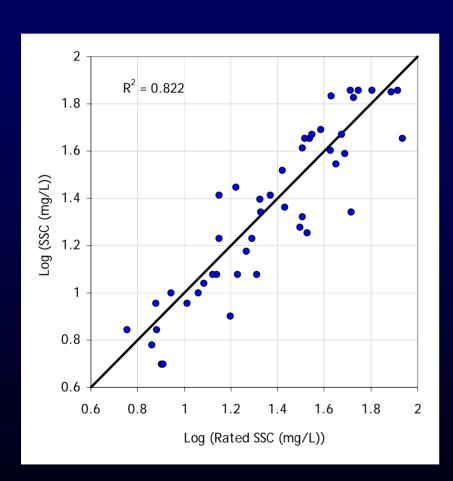
Suspended Sediment Load = SSC * Q

- Suspended Sediment Ratings
 - Acoustic Backscatter → Concentration
 - Uplooker ABS → Cross Section ABS
- Discharge Rating
 - Uplooker Velocity & Wind Stress → Discharge

Backscatter – Concentration Rating Development

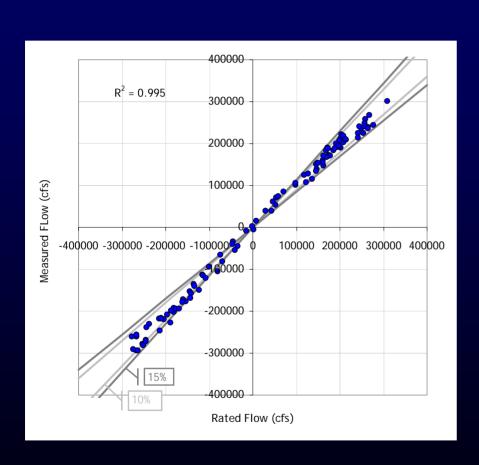


Backscatter-Concentration Rating



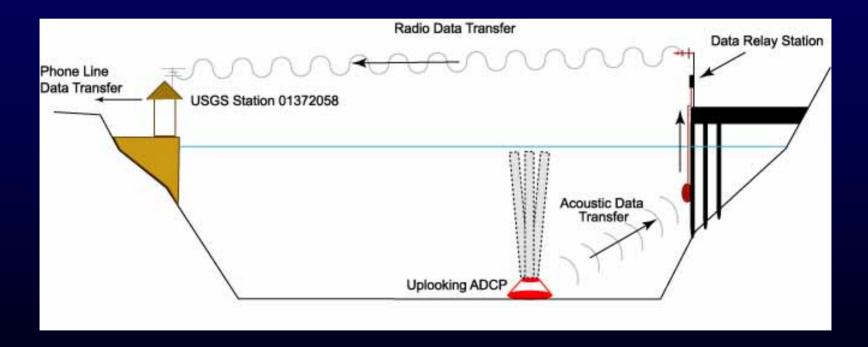
- Typical tidal range of ABS: ~15 dB
- Observed range of ABS:
 65 100 dB
- Typical concentration:
 25-100 mg/L
- Max concentration: ~200 mg/L

Discharge Rating



- Typical tidal range
 ± 300,000 cfs
- Peak flows:-345,000 & 380,000
- Max net flow:~125,000

Data Transfer



(not to scale)

Data Processing

Raw Data



WinRiver



ASCII



Atmospheric data

Excel



ADAPS

🖪 Real-time data for USGS 01372058 HUDSON RIVER BELOW POUGHKEEPSIE NY - Microsoft Interne... 🗖 🗖 🔀 File Edit View Favorites Tools Help Address Addres ∂Go Acoustic signal strength, units specified in data descriptor Most recent value: 85.6 11-13-2003 01:30 USGS 01372058 HUDSON RIVER BELOW POUGHKEEPSIE NY DATES: 11/06/2003 to 11/13/2003 05:42 Download a presentation-quality graph Parameter Code 99968; DD 30 Discharge, cubic feet per second Most recent value: -210,000 11-13-2003 01:30 USGS 01372058 HUDSON RIVER BELOW POUGHKEEPSIE NY 300000 200000 100000 cubic feet -100000 顲 Done Internet

Near Real Time Data

- Velocity,
 backscatter and
 discharge data
- Updated daily

Questions?

For more information:

Poster session later today

Project web page:

http://ny.water.usgs.gov/projects/poused/