

HYDRO-21 Committee An Update of Activities

Ralph T. Cheng, BRR, WR



Hydroacoustics Workshop
Tampa, Florida
June 14-18, 1999



Introduction:

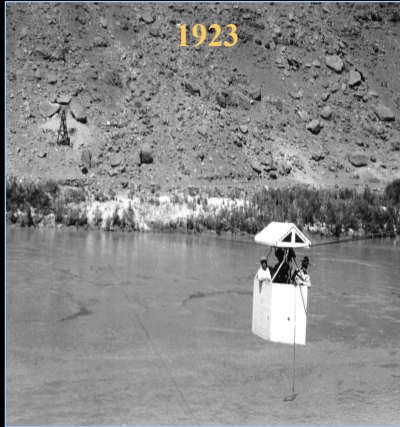
Defining Hydrologic Instrumentation for the
21st Century

- **Why:** Background and Motivations
- **Who:** Hydro-21 Committee
- **What:** Objectives

Introduction:

Defining Hydrologic Instrumentation for the 21st Century

Why: Background and Motivations



Colorado River at Lees Ferry

Introduction:

Defining Hydrologic Instrumentation for the 21st Century

Why: Background and Motivations

Heart Surgery Looks Different Now.....

The image shows two human figures from the chest up. The figure on the left has a large, open incision in the chest, labeled 'Conventional Open-Chest Heart Surgery'. The figure on the right has a much smaller, vertical incision, labeled 'Minimally Invasive Heart Surgery'.

San Francisco Minimally Invasive Heart Surgery Center

Surgeons can provide the health benefits of open heart surgery without a large chest incision. Usually patients experience less discomfort, a shorter recovery, and much less noticeable scarring.

Call for a free brochure and to find out if you are a candidate for less invasive heart surgery.

SAN FRANCISCO MINIMALLY INVASIVE HEART SURGERY CENTER
1600 Sullivan Avenue, Suite 3C2, Daly City, Ca., 94116

CALL TOLL-FREE 1-877-642-4222 or 1-650-992-8200

**Will Stream Gaging in the USGS
Look Different in the 21st Century?**

Introduction:

Defining Hydrologic Instrumentation for the 21st Century



Who: Hydro-21 Committee

Nick Melcher, Chairman, Arizona Dist. Chief

Ralph T. Cheng, BRR, WR, SWH

Frederick P. (Pete) Haeni, OGW, Geophysicist

Earl M. Thurman, Kansas Dist., Geochemist

John Costa, OSW

Jerry Ross, HIF Liaison

Introduction:

Defining Hydrologic Instrumentation for the 21st Century

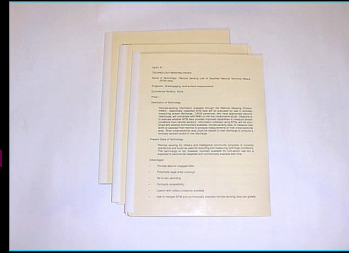


What: Objectives

To provide vision and leadership in WRD, USGS for identifying and evaluating new technologies and methods that might have the potential to change the paradigm in WRD data collection program.

Hydro-21 Activities:

- Workplan
- Web search
- Conferences and symposia
- Contacts with research groups
- Internal solicitation for stream gaging
- Research selected topics
- Explore Small Business Administration
- Briefing papers



Accomplishments To Date

- Improved technology awareness
- Established external contacts
- Identified new instrumentation
- Identified new technologies
- Initiated Proof-of-the-Concept projects



USGS Stream Gaging:

WRD operates ~7000 Gaging Stations
(~\$80 M Program)

Stream Gaging:

Q = Discharge;

\vec{V} = Velocity; \vec{A} = Area

$$Q = \int_{\vec{A}} \vec{V} \cdot d\vec{A}$$

Present Shortcomings and Difficulties:

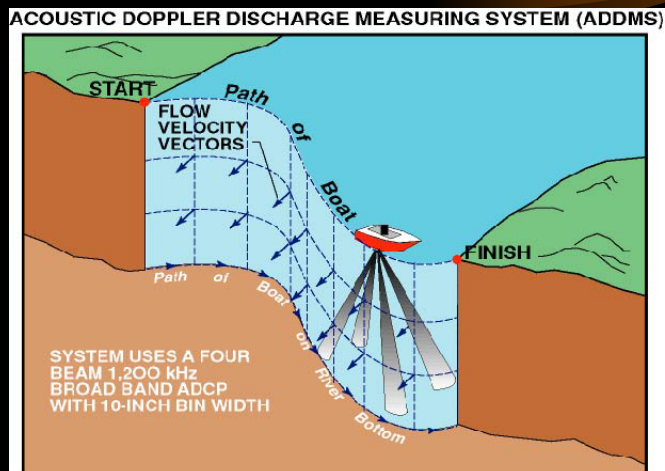
**Extensive labor, Travel, Service,
Potential Hazards**

Inadequate Stage-Discharge Relations

Commonly used methods for discharge measurements



Other Methods for River Discharge Measurement: UVM, ADCP,.....



Stream Gaging -- Diverse Conditions

Discharge Data -- Diverse Usage

Measurement -- Diverse Methods

Interim Findings

- ➔ There are technologies that may be extended to hydrologic applications
- ➔ Most existing technologies are only suitable for specific circumstances
- ➔ Implementation will be incremental
- ➔ Technology firms expect up-front financial support



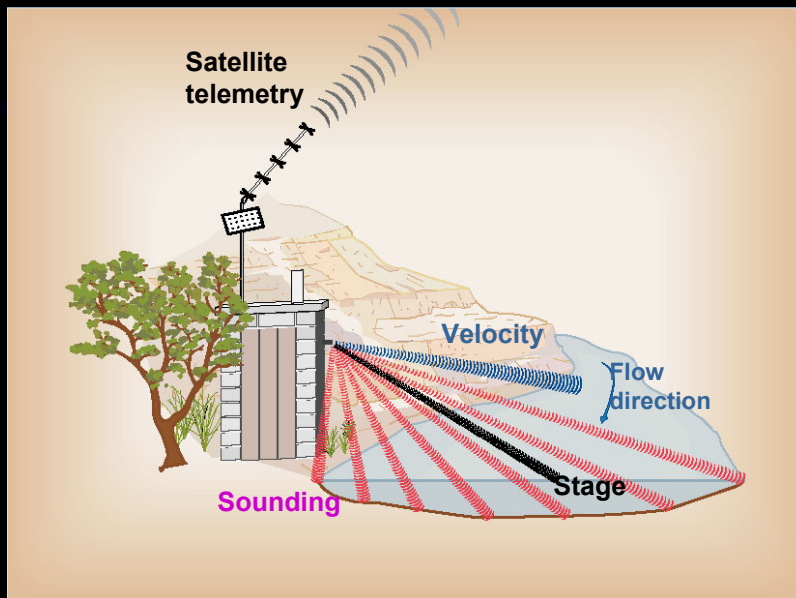
Interim Recommendations

(Stream Gaging)

- ➔ Consider Remote and Non-Contact Methods for Future River Discharge Measurement
- ➔ Evaluate All Advanced Technologies: Acoustics, Laser, Radar, PIV, ... etc.
- ➔ Establish a Research Gage Site
- ➔ Conduct Proof-of-the-Concept Experiment
- ➔ Conduct Further Field Experiments as Proposed in White Papers



Non-Contact Measurement of River Discharge



USGS
United States Geological Survey

Radar Technologies Contacts and White Papers

Dr. Bill Plant, Applied Physics Laboratory
University of Washington, Microwave Radar

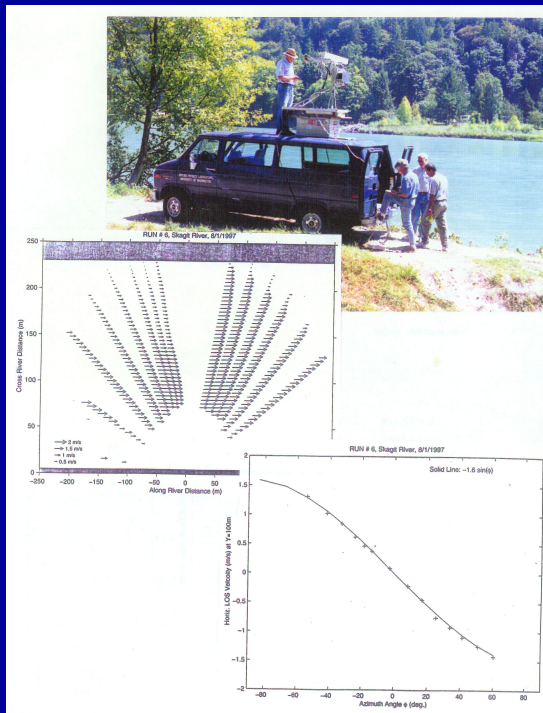
Metratek, Inc., Major Radar Contractor for Navy

CODAR Sensor Ltd.,
Ocean Surface Current Measurement

USGS
United States Geological Survey

**Dr. Bill Plant
Applied Physics
Laboratory
Univ. of Wash.**

**Surface Velocity
Measurements
(radar-based)**



METRATEK, Inc.

September 4, 1998
Revision A

**RADAR-BASED
VOLUME FLOW METER**

A White Paper

Prepared for

U.S. Geological Survey

Branch of Geophysical Application and Support
11 Sherman Place U-5015
Storrs-Mansfield, CT 06269

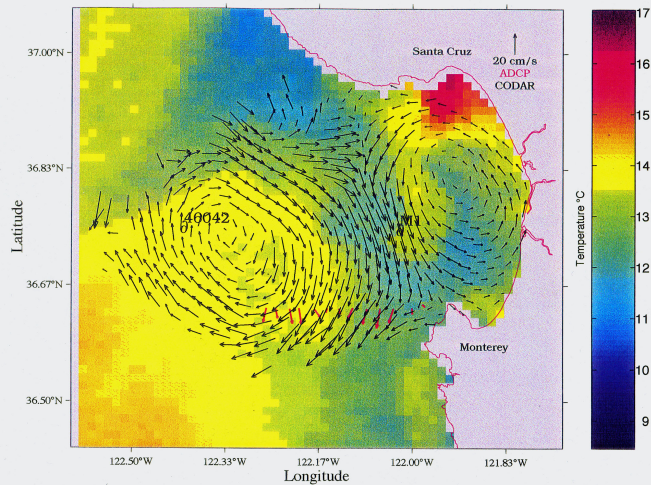
by

METRATEK, Inc.

9858 Main Street
Fairfax, VA 22031-3908
(703-293-9040)
<http://www.metratek.net>

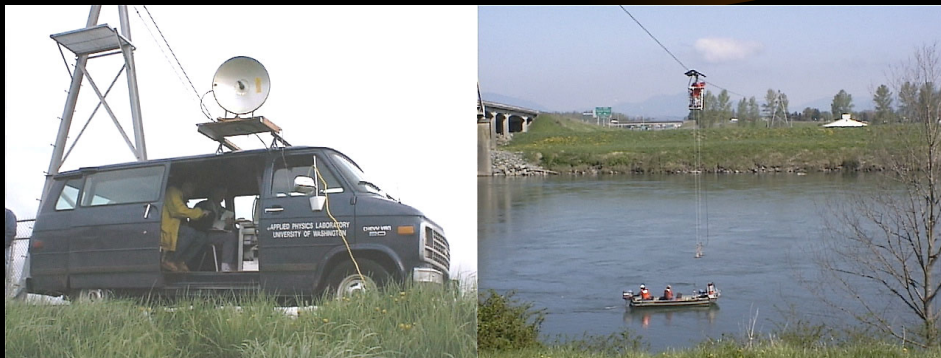
Radar Measured Ocean Surface Velocities, Monterey Bay, Calif.

From: Remotely sensed surface currents in Monterey Bay from shore-based HF radar (CODAR), Jeffrey D. Paduan and Leslie K. Rosenfeld, *J. Geophys. Res.*, vol. 101, no. C9, pp. 20,669 - 20,686.



Average radar-derived surface-current vectors for the period 0900 UT August 6 to 0700 UT August 7, 1994 (black arrows); average VM-ADCP vectors for the period 1016 UT August 6 to 0524 UT August 7, 1994 (red arrows), shown with uncorrected AVHRR Channel 4 surface temperatures at 0300 UT August 6, 1994.

HYDRO-21 Committee The 1st USGS Proof-of-the-Concept Non-Contact Stream Gaging



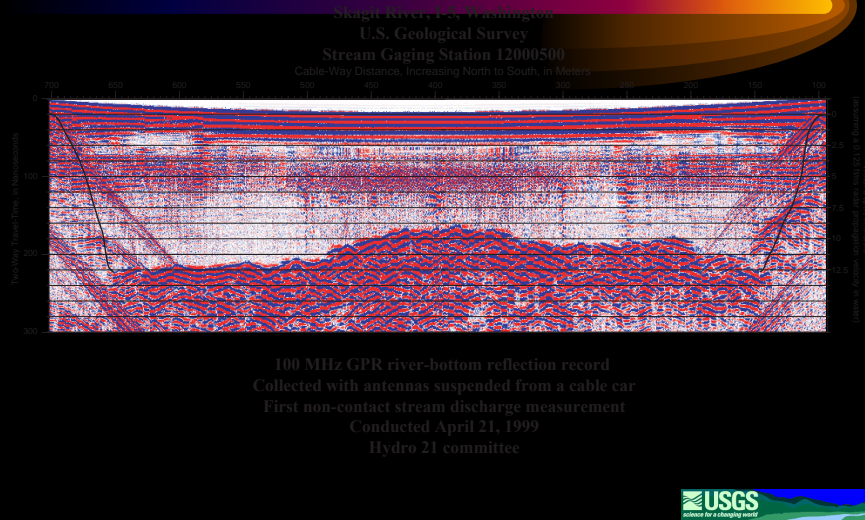
Field Experiment Coordinated by
John Costa, OSW

Skagit River, WA
April 20-21, 1999



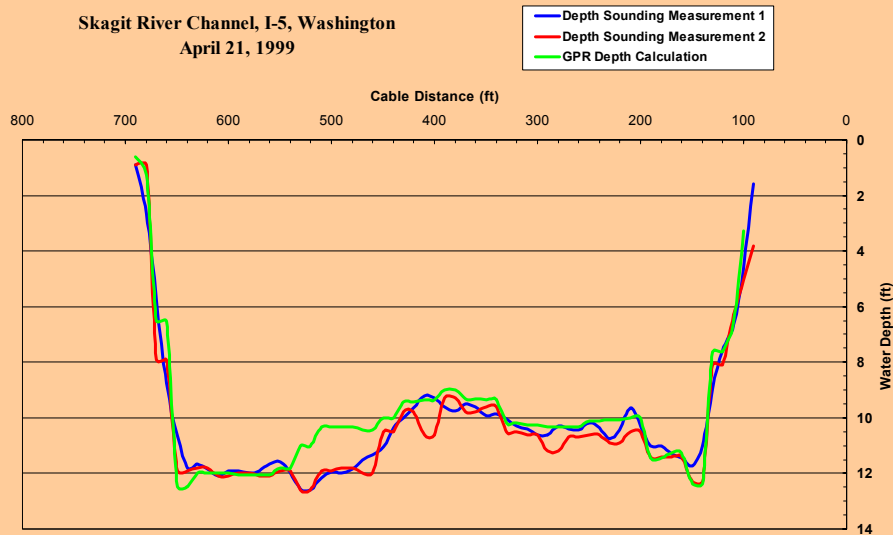
U.S. Geological Survey Hydro 21

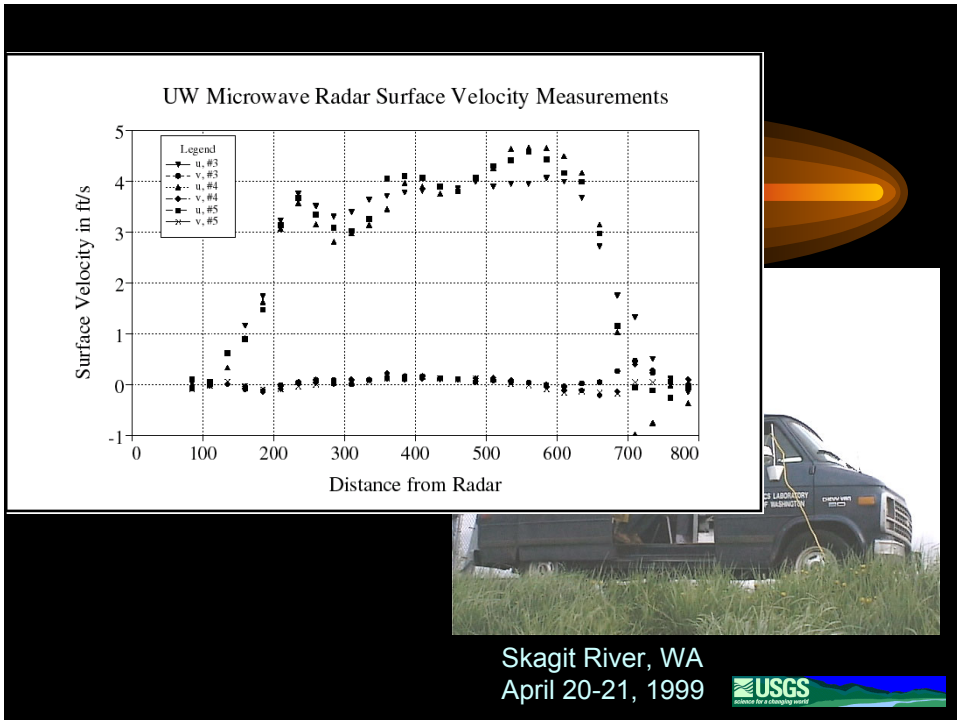
HYDRO-21 Committee The 1st USGS Proof-of-the-Concept Non-Contact Stream Gaging



Comparison of Depth Sounding and GPR Measurement

Skagit River Channel, I-5, Washington
April 21, 1999





HYDRO-21 Committee
The 1st USGS
Proof-of-the-Concept
Non-Contact Stream Gaging



Provisional Results: April 21, 1999		in k-cfs
Conventional Method (.2 & .8)	=	18.6
Stage-Discharge Rating Curve	=	18.2
ADCP Discharge Measurement	=	18.3
Non-Contact Discharge Measurement	=	18.0

Field Experiment Coordinated by
John Costa, OSW

Skagit River, WA
April 20-21, 1999



Where do we go from here?

Continue Searching for Technologies



External Review of the White Papers



Conduct Phase Two Proof-of-the-Concept



Establish research gage



Evaluate Phase Two Results



Recommendation to WRD

