



به نام خدا

FAT CAT Fluvial/Coastal Acoustic Tomography

Masoud Bahreinimotlagh

Co-founder Tomography Solution Ltd

&

Assistant Professor, Water Research Institute

Tomography
SOLUTION



Ministry of Energy

Water Research Institute

Contact

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+989173109360



Masoud Bahreinimotlagh



Professional Activities	Year
PhD, Hiroshima University	2014-2017
Marino Tomography LtD. Japan	2014-2017
Assistant Professor, Water Research Institute	2018-
Co-Founder, Tomography Solution	2017-

Number of ISI papers					
Quartiles	Q1	Q2	Q3	Q4	Sum
Num of papers	7	7	2	-	16



Developed

VS

Undeveloped

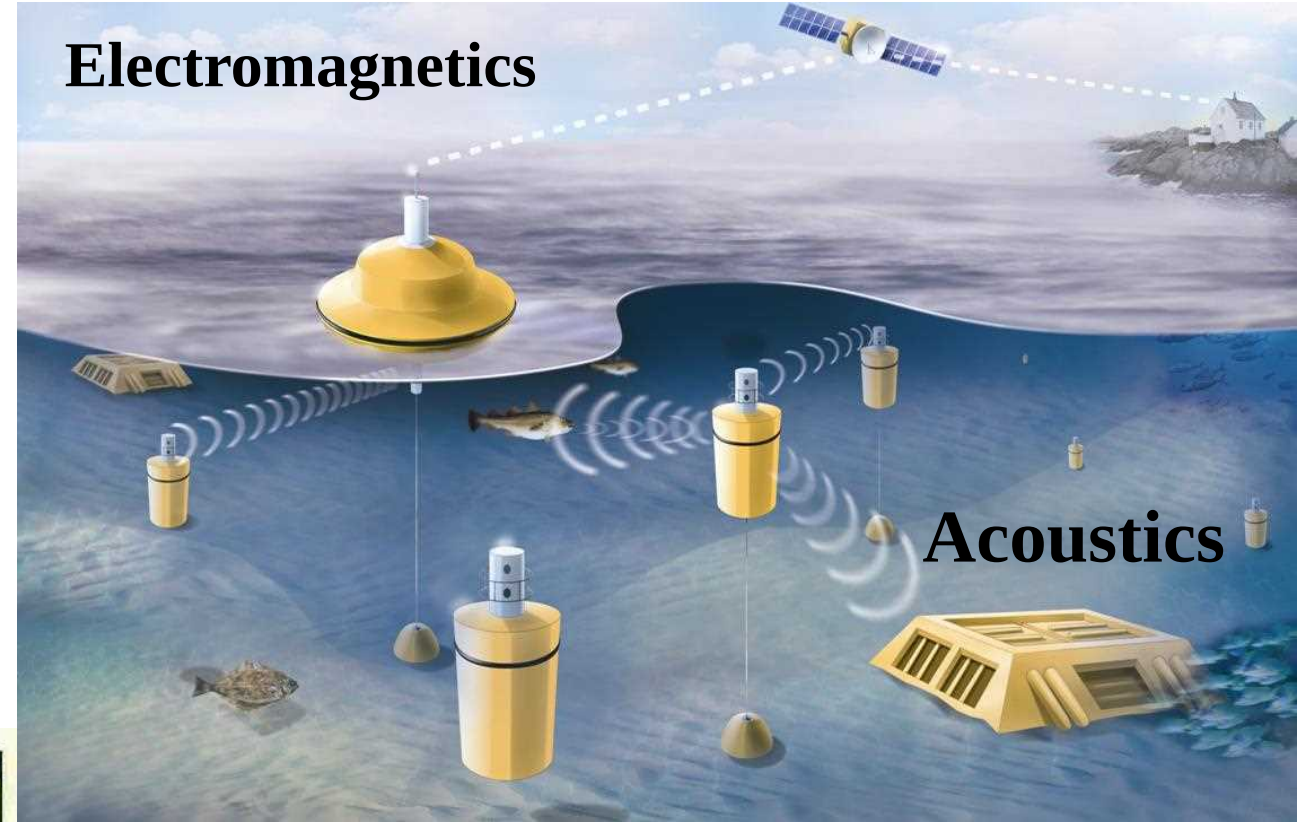


Waterbodies Monitoring ???



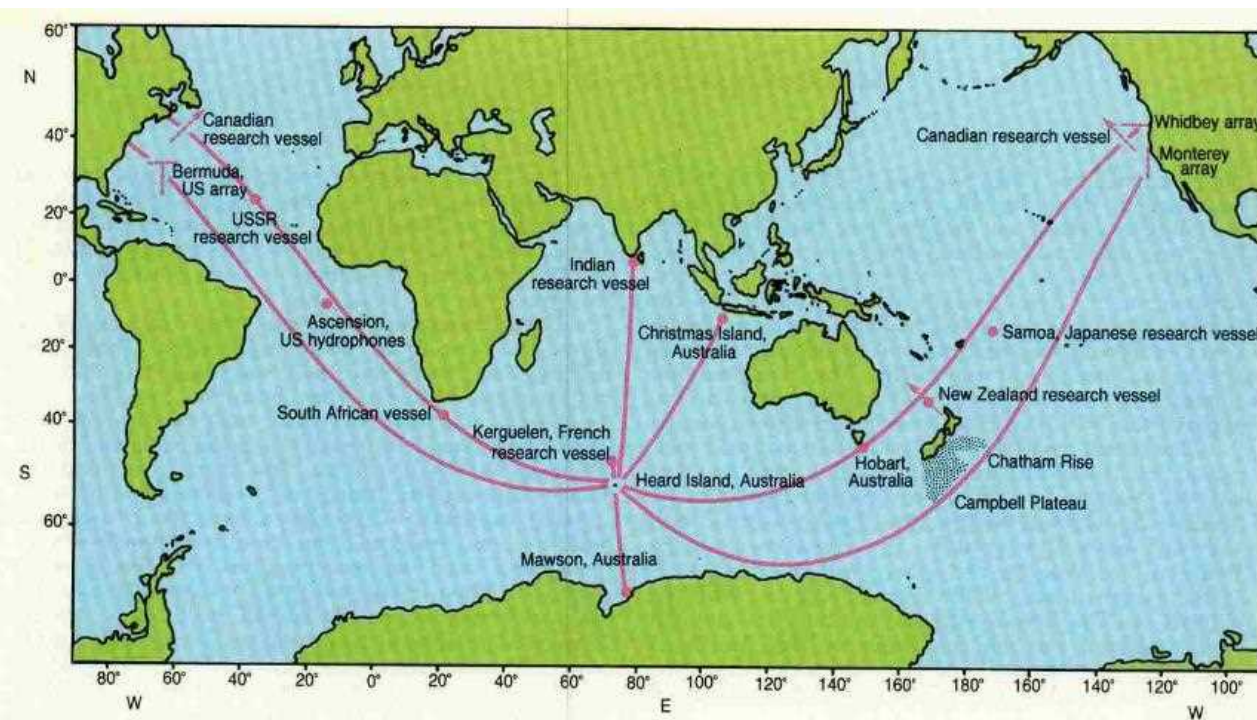
Remote Sensing

Electromagnetics



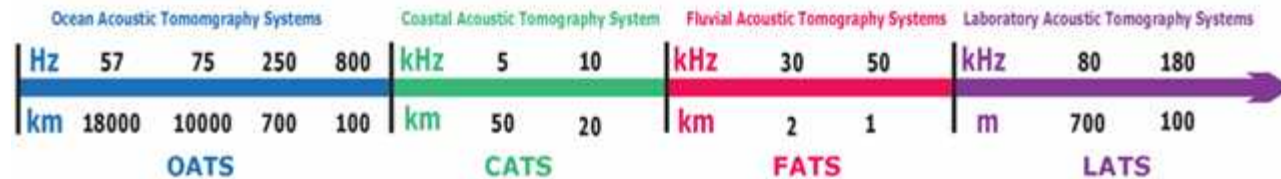
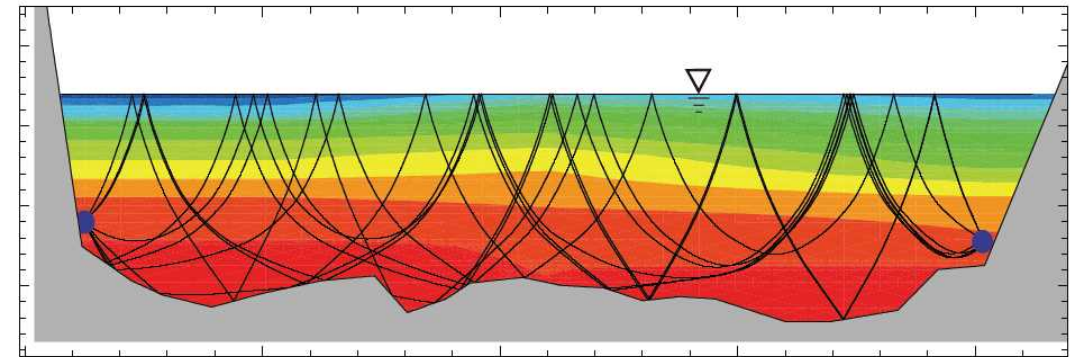
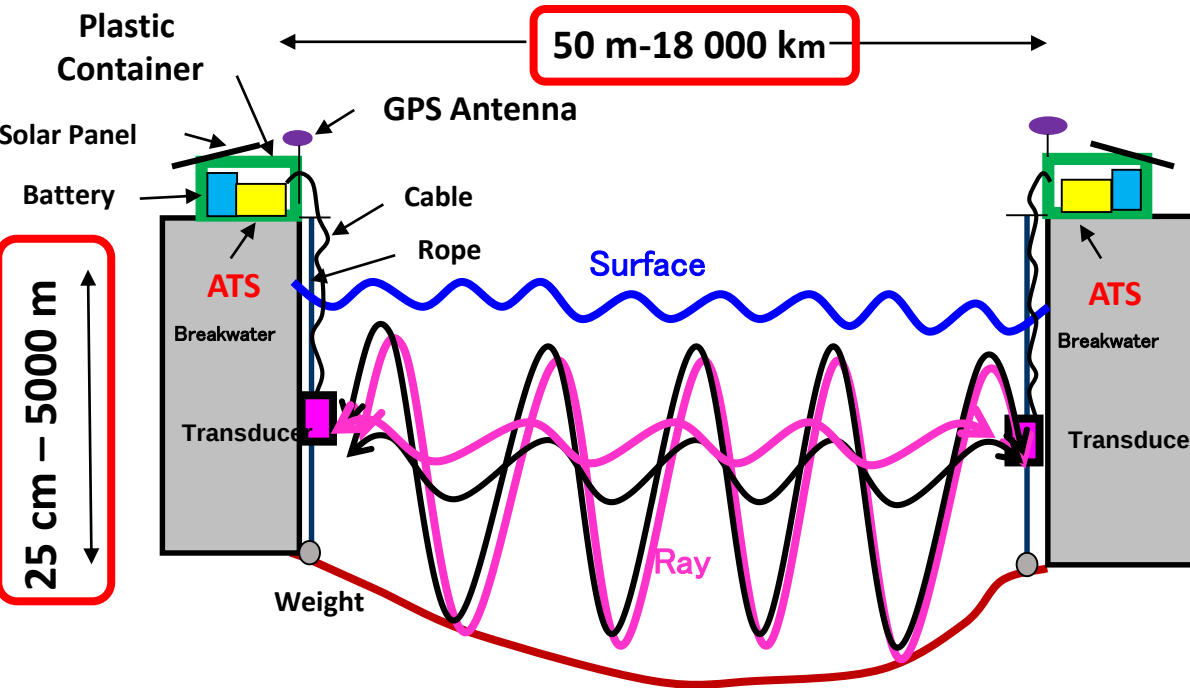
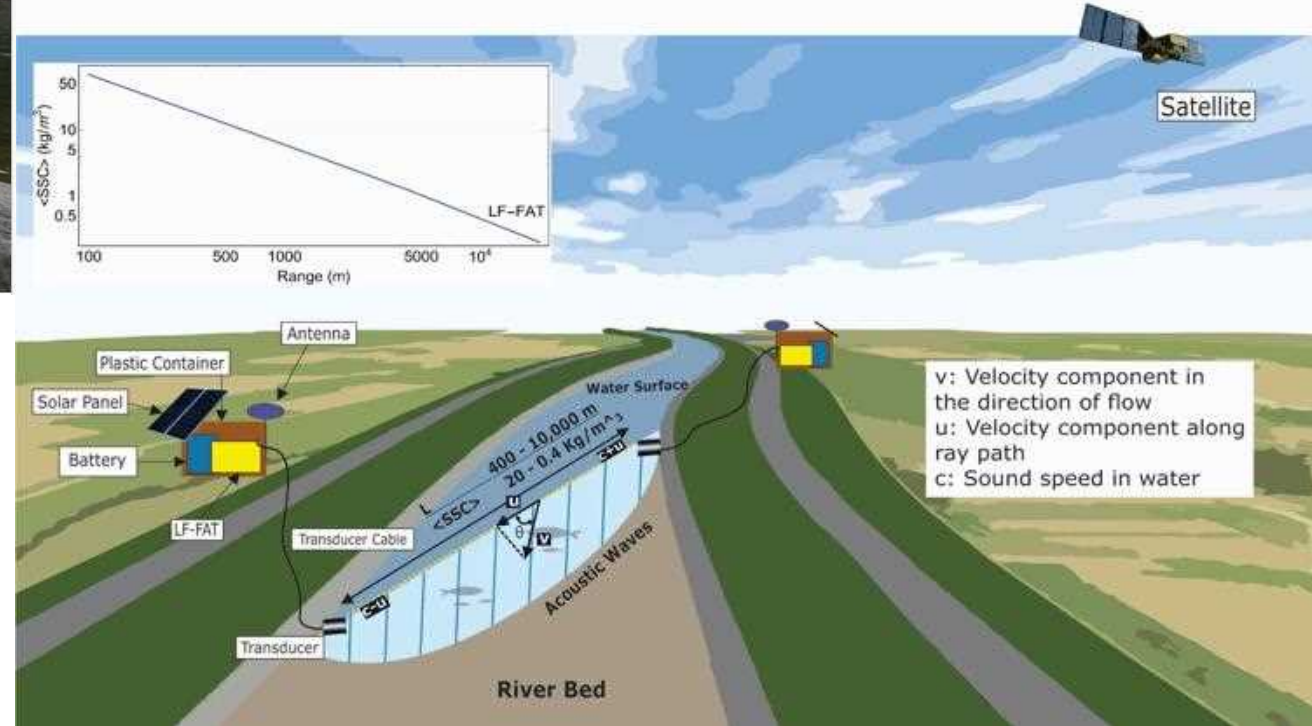
Acoustics

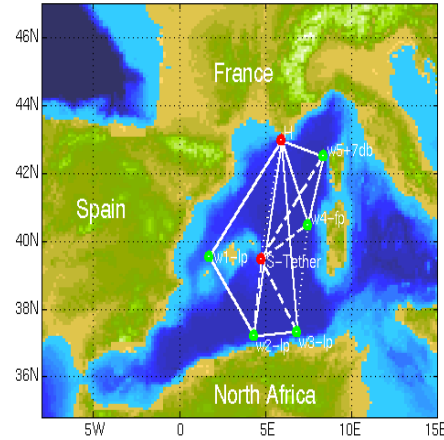
The longest Transmission Length?





Acoustic Tomography



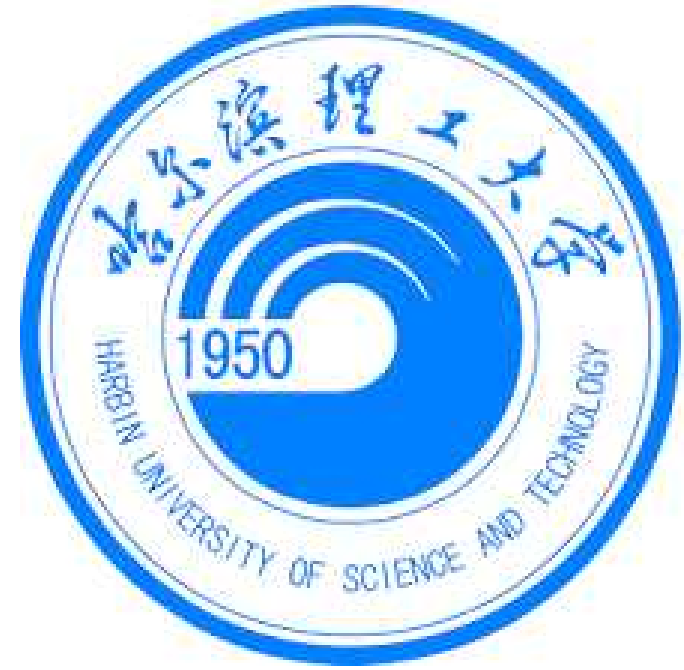


80 kHz
700 m



Importance of Underwater Acoustics

The College of Underwater Acoustic Engineering is the cradle of cultivating high-level underwater acoustic technicians and the source of new theories, technology, and methods of underwater acoustic technology. It originated from the first established sonar major **in China in 1953**. The discipline of underwater acoustic engineering ranks first in all previous discipline evaluations by the Ministry of Education. It is the first level discipline ship and ocean engineering to which underwater acoustic engineering belongs and ranked first in the fourth round of the first level discipline evaluation by the Ministry of Education.



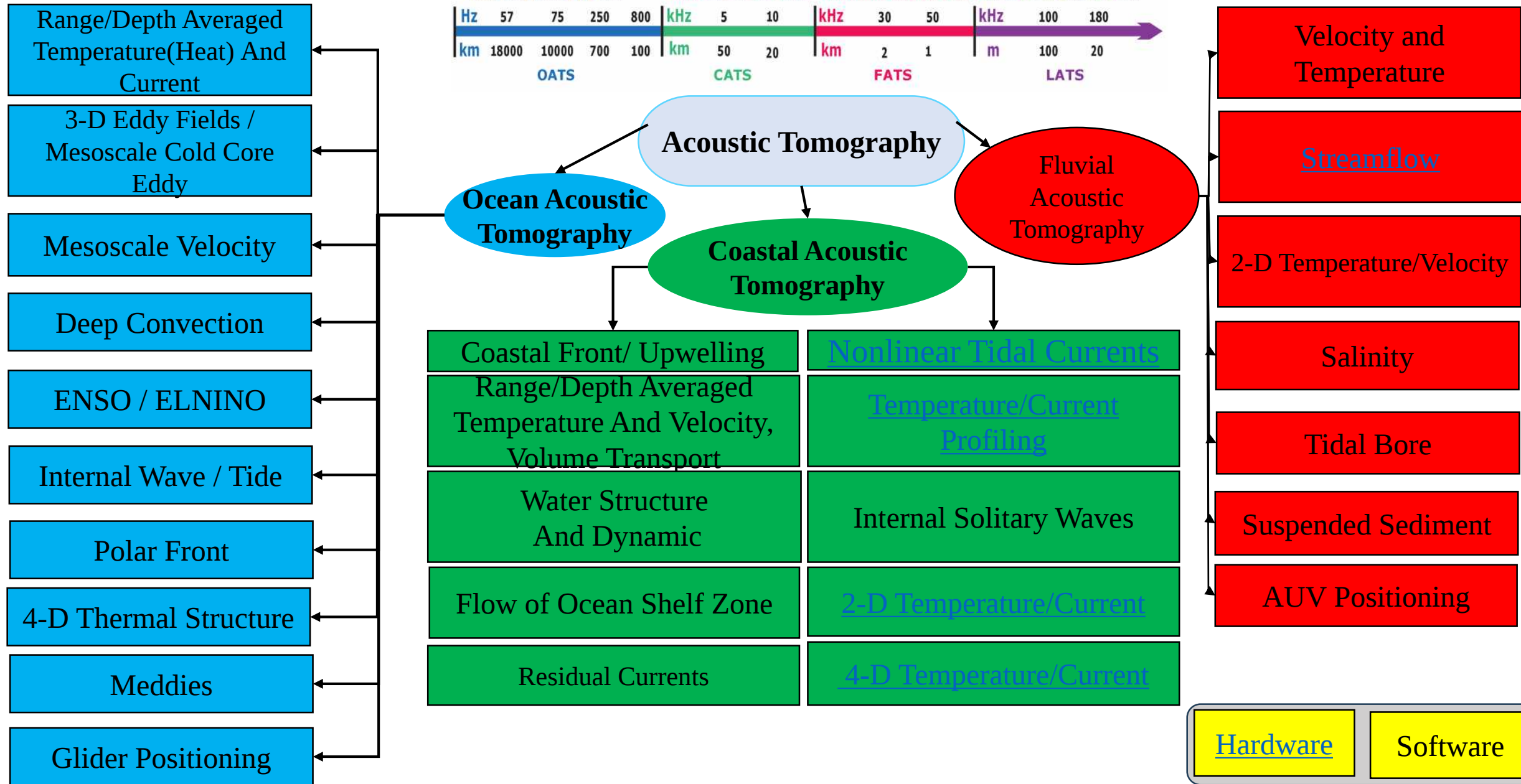
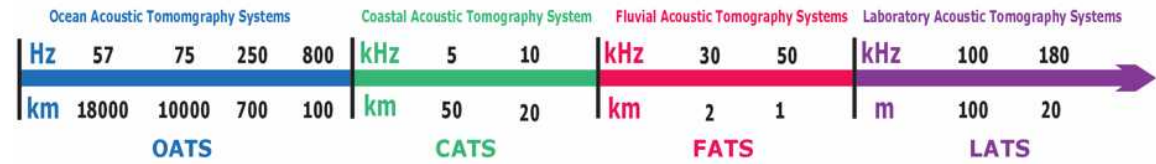
The college has 163 full-time teachers. Among them, there are two academicians of Chinese Academy of Engineering. The college has 2064 students, including 1252 undergraduates, 503 masters, 278 doctors, 17 overseas Graduate students and 14 overseas doctorate candidates. In 2020, the amount of newly signed scientific research contracts was nearly 500 million yuan. In 2021, the amount of scientific research funds received reached 315 million yuan, and the amount of scientific research funds per capita reached 1.93 million yuan.



Example of AT Projects

Reference	Organization	Target	Budget (\$)	Subject	Year
https://cordis.europa.eu/project/id/212887/reporting/it	Nansen Center, Norway	3-D measurement in Arctic	4 000 000	ACOBAR (Acoustic Technology for observing the interior of the Arctic Ocean)	2008-2012
https://www.highergov.com/grant/N000141912575/	California University	AI & Tomography	757 000	Machine learning-based tomography in ocean acoustics.	2019-2022
https://www.highergov.com/grant/N000141912575/	Washington University	Tidal current measurement	530 000	Internal Tides	2017-2023





[International Projects](#)

[National Projects](#)

[Master/ PhD. Thesis](#)

[References](#)

[Tomography Solution Ltd.](#)

[Operations](#)

اهمیت دقت اندازه گیری دبی رودخانه

امیرحسین حسن آبادی، پایان نامه کارشناسی ارشد دانشگاه علم و صنعت ایران



Journal of Hydrology 608 (2022) 127587

Contents lists available at ScienceDirect



Journal of Hydrology

journal homepage: www.elsevier.com/locate/jhydrol

Research papers

Improving the accuracy of streamflow data acquired from the acoustic tomography technique using data despiking algorithms

Amirhosein Hasanabadi^a, Masoud Bahreinimotlagh^{b,*}, Ebrahim Jabbari^a, Kiyosi Kawanisi^c, Hosein Alizadeh^a, Yousef Olfatmiri^a

^a Department of Civil Engineering, Iran University of Science & Technology, Tehran 13114-16846, Iran

^b Department of Water Resources Studies and Research, Water Research Institute, Tehran 1658954381, Iran

^c Graduate School of Advanced Science and Engineering, Hiroshima University, 1-4-1, Kagamiyama, Higashi Hiroshima 739-8527, Japan



مهاجرت به کانادا

۱۲/۶/۱۴۰۱



اهمیت دقت اندازه گیری دبی رودخانه



پیش بینی دبی جریان بر اساس داده های با کیفیت

یوسف الفت میری، پایان نامه کارشناسی ارشد دانشگاه علم و صنعت ایران

Journal of Hydrology 609 (2022) 127739



Contents lists available at ScienceDirect

Journal of Hydrology

journal homepage: www.elsevier.com/locate/jhydrol

Research papers

Application of Acoustic tomographic data to the short-term streamflow forecasting using data-driven methods and discrete wavelet transform

Yousef Olfatmiri^a, Masoud Bahreinimotlagh^{b,*}, Ebrahim Jabbari^a, Kiyosi Kawanisi^c, AmirHosein Hasanabadi^a, Mohamad Basel Al Sawaf^c

^a Department of Civil Engineering, Iran University of Science & Technology, Tehran 13114-16846, Iran

^b Department of Water Resources Studies and Research, Water Research Institute, Tehran 1658954381, Iran

^c Graduate School of Advanced Science and Engineering, Hiroshima University, 1-4-1, Kagamiyama, Higashi Hiroshima 739-8527, Japan



مهاجرت به کانادا

۲۰/۱۰/۱۴۰۲



پیش بینی دبی جریان بر اساس داده های با کیفیت

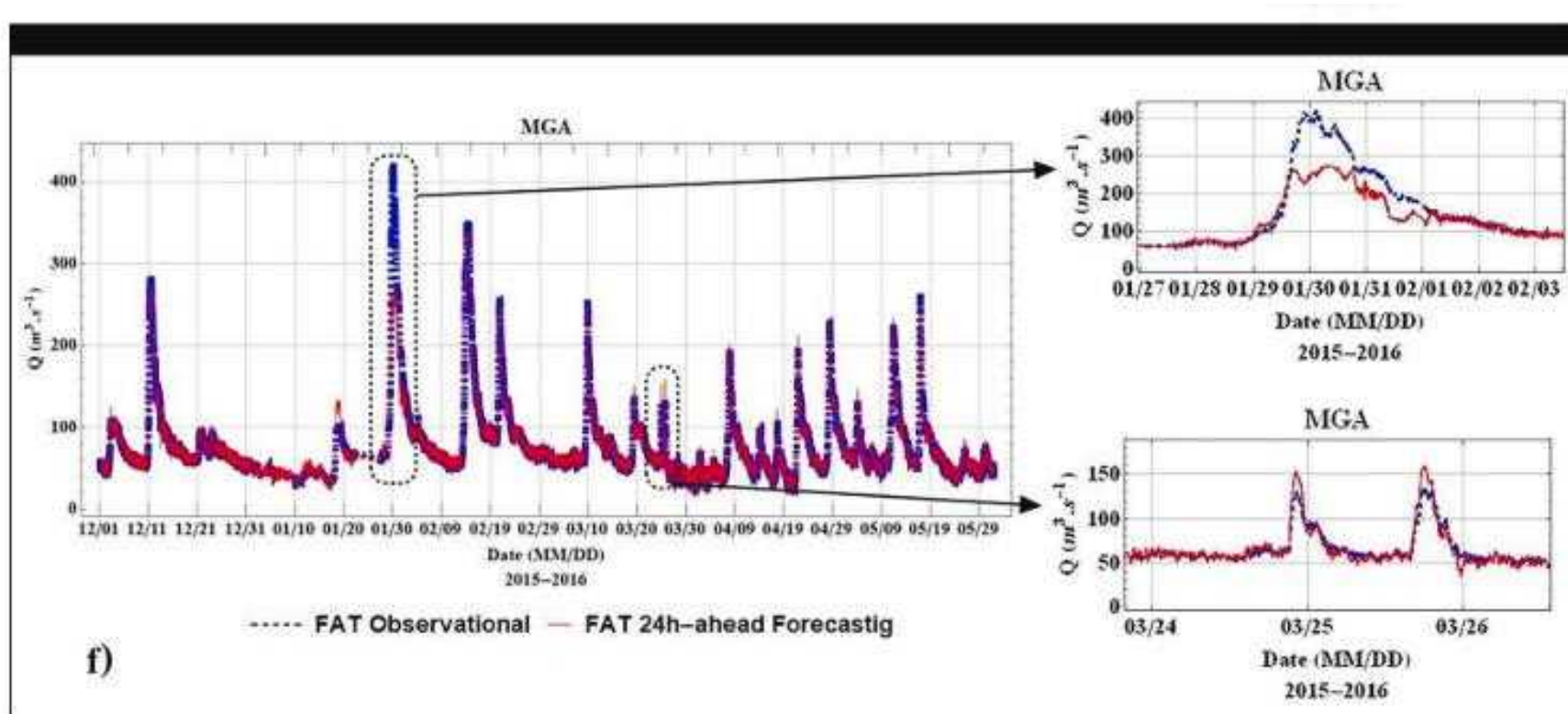


Fig. 11. (continued).



اندازه گیری نیم رخ خصوصیات جریان در عمق

رضا حسین زاده اصل، رساله دکتری دانشگاه تهران، پژوهشگر پسادکتر



UNIVERSITY OF TEHRAN COLLEGE OF AGRICULTURE & NATURAL RESOURCES

IRANIAN JOURNAL OF SOIL AND WATER RESEARCH

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Determining the layered flow velocity in the Latyan reservoir using acoustic tomography technology

Document Type : Research Paper

Authors
Reza Hosseinzadeh Asi¹; Mehdi Yasi²; Masoud Bahreini Motlagh³

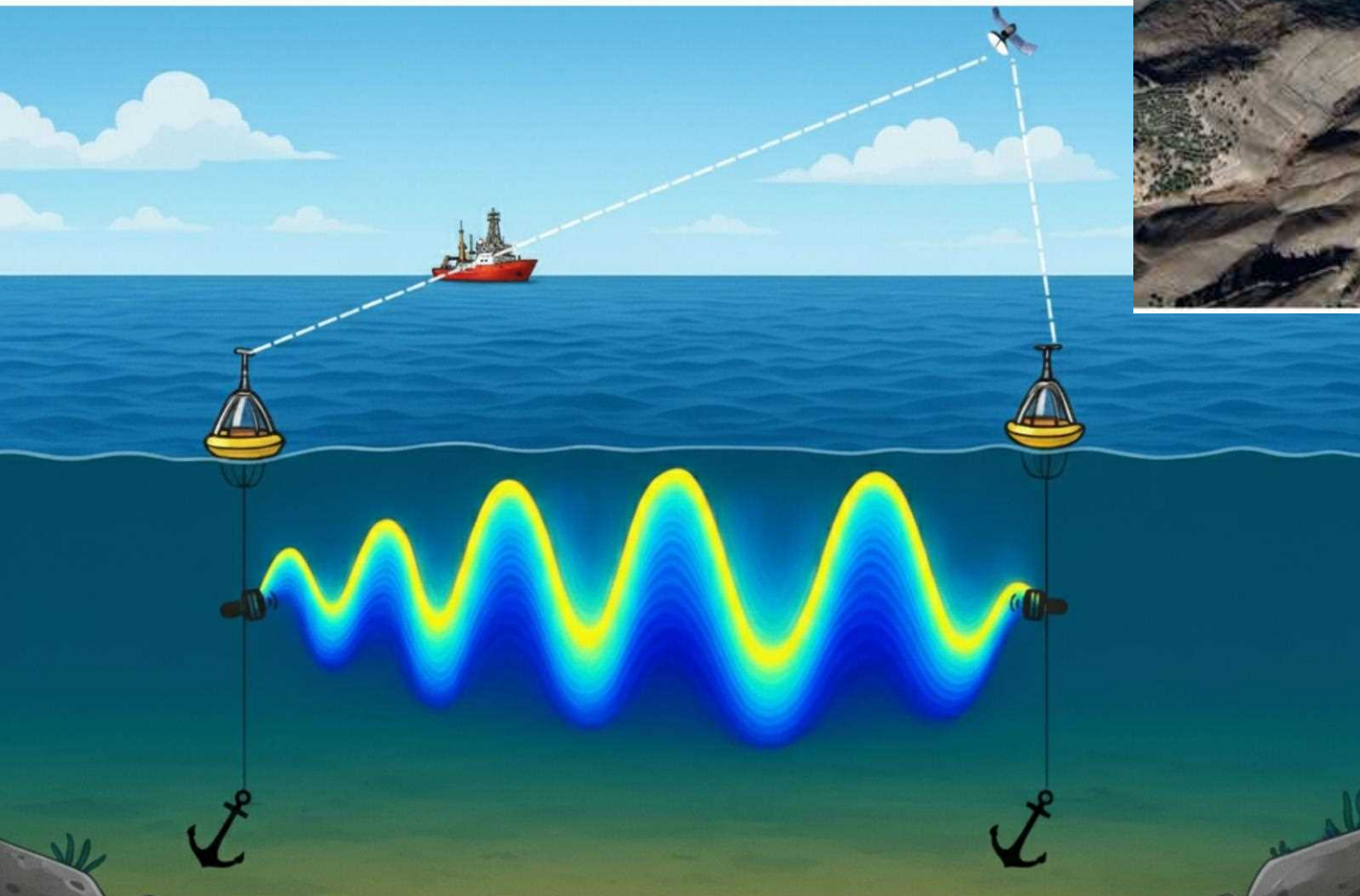
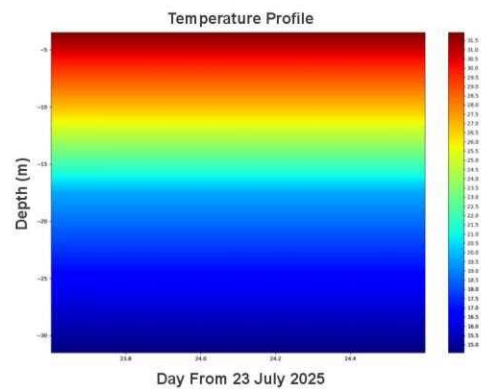
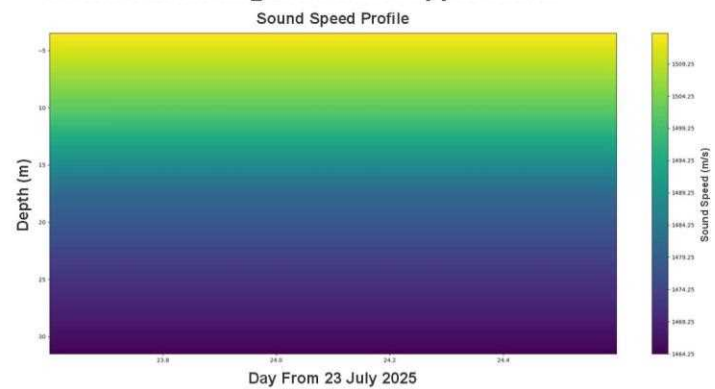
¹ Ph.D. Student of Hydraulic Structures, Department of Irrigation and Reclamation Engineering, College of Agricultural Engineering and Technology, University of Tehran, Karaj, Iran
² Associate Professor, Department of Irrigation and Reclamation Engineering, College of Agriculture and Natural Resources, University of Tehran, Karaj, Iran.
³ Assistant Professor, Water Research Institute, Tehran, Iran

doi 10.22059/IJSWR.2023.358568.669491

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September 2023
Pages 859-875

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PDF 2.17 M







اندازه گیری رسوبات معلق در رودخانه

مریم جمشیدنژاد، پایان نامه کارشناسی ارشد دانشگاه تهران





Journal of
Hydraulics

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Numerical modeling for estimating the mean particle size and concentration of suspended sediments in rivers using the acoustic tomography method

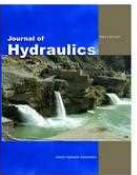
Document Type : Research Article

Authors

Maryam Jamshidnejad¹ Jaber Soltani² Masoud Bahreinimotlagh³ Reza Roozbahani⁴

¹ Master student, / College of Aburaihan - Tehran university
² University of Tehran
³ Assistant Professor / Water Research Institute (WRI)
⁴ Assistant Professor /Water Research Institute (WRI)

10.30482/jhyd.2022.341958.1623



Volume 18,
Issue 2 - Serial
Number 182
June 2023
Pages 67-85

Files

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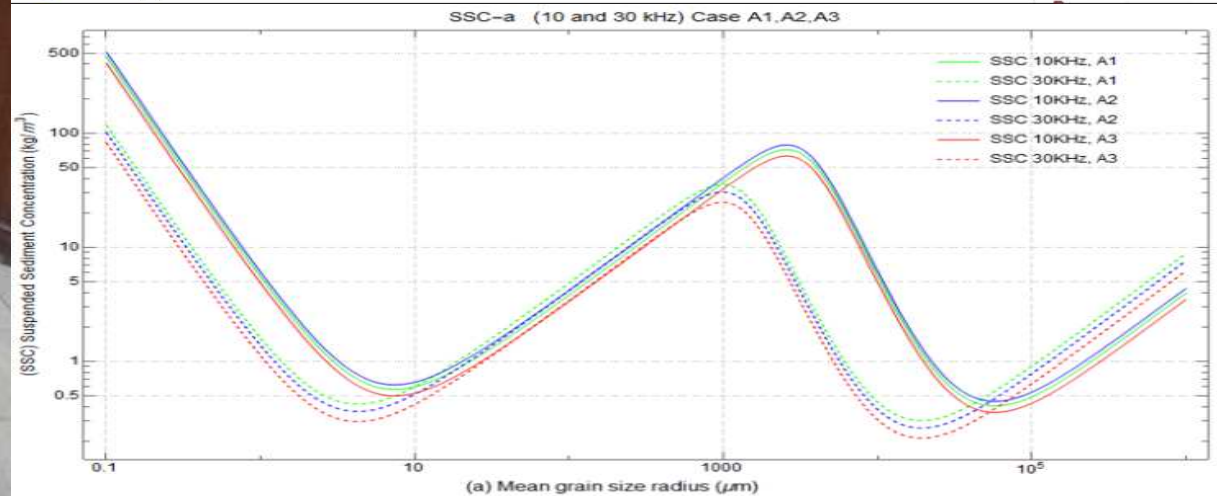


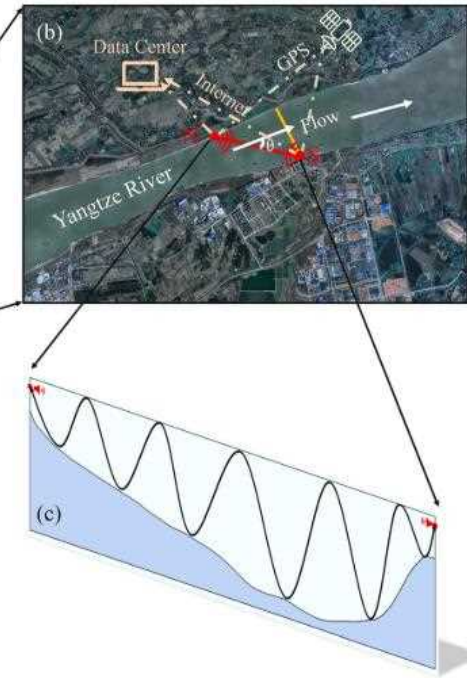
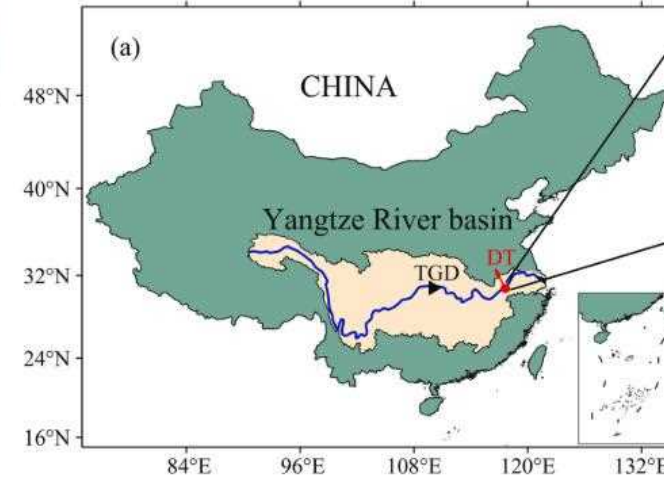
Fig. 6 Estimation of three pairs of (PS) mean particle size and (SSC) mean suspended sediment concentration in river section with two frequencies (10 and 30 kHz) in three hypothetical occurrences A1, A2, and A3.



Research papers

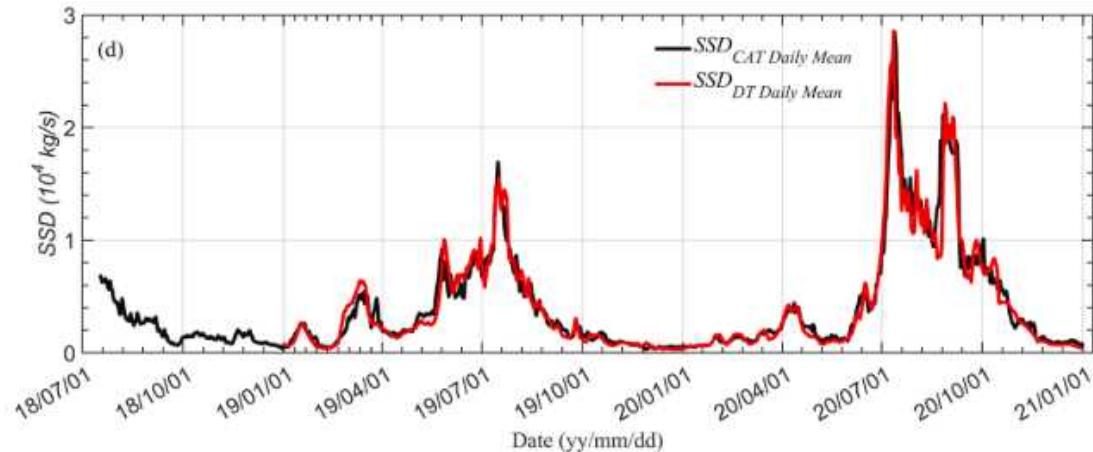
Coastal acoustic tomography system for monitoring transect suspended sediment discharge of Yangtze river

Cong Xiao^a, Xiao-Hua Zhu^{a,b,c} , Chuanzheng Zhang^a, Ze-Nan Zhu^a, Yun Long Ma^a, Ji Wen Zhong^d, Li Xin Wei^d

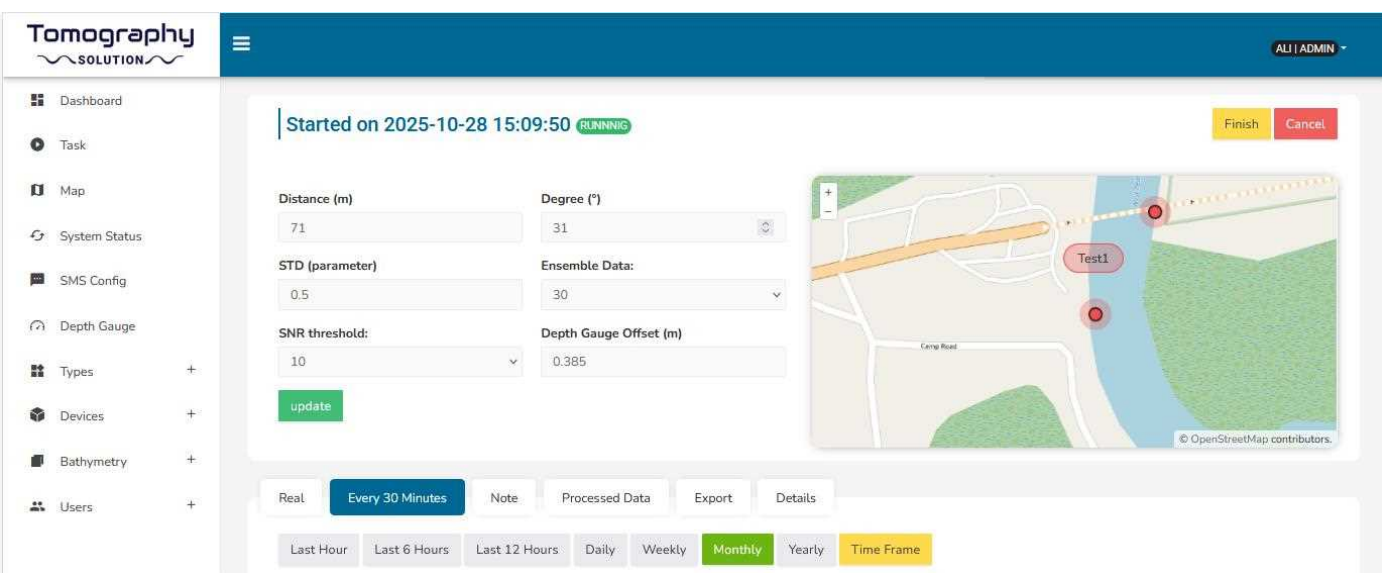


ABSTRACT

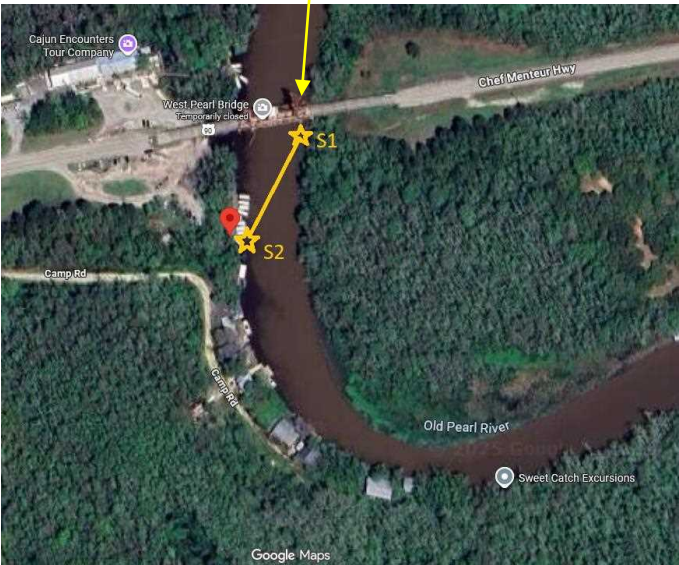
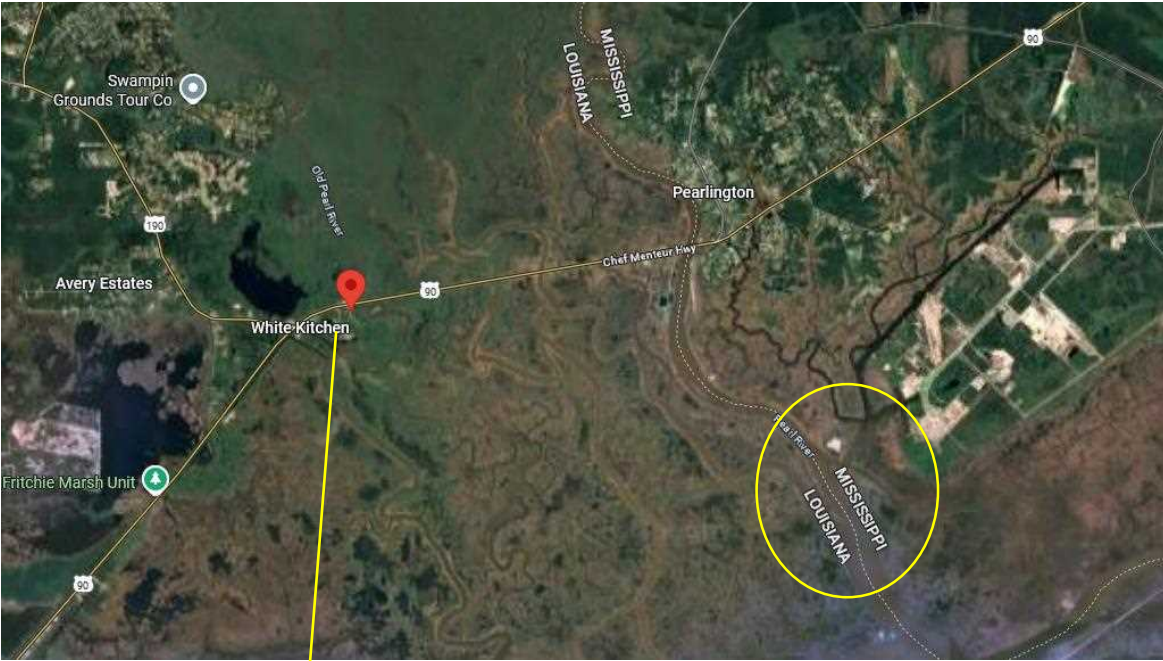
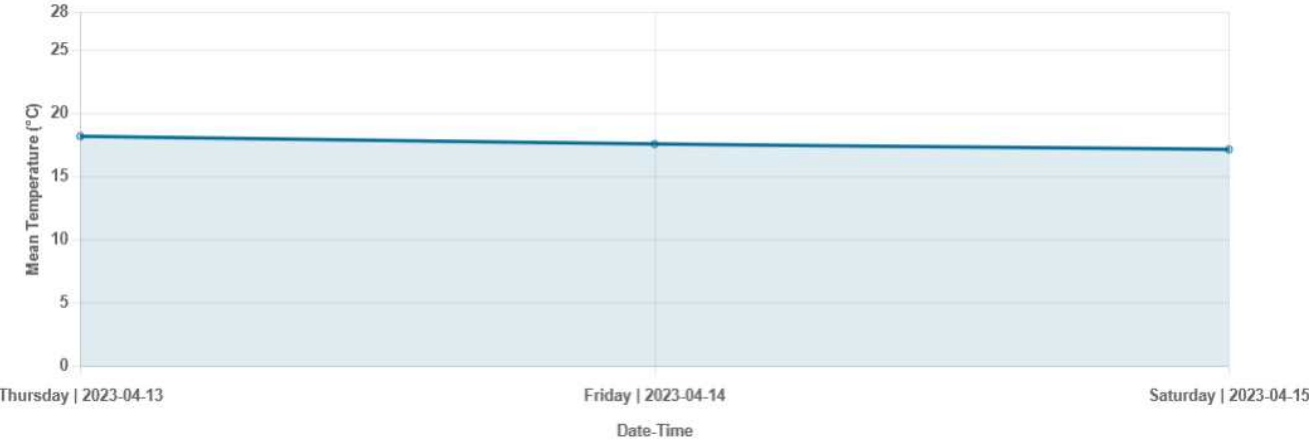
Suspended sediment discharge (SSD) in the Yangtze River (YR) plays a crucial role in transporting nutrients and sediment to the YR estuaries and the East China Sea. In order to gather information on suspended sediment concentration (SSC) and SSD across an entire river cross-section, we investigated a novel method supported by Coastal Acoustic Tomography (CAT). Consequently, two CAT systems were employed to estimate the cross-section averaged SSC and SSD at the Datong (DT) station of the YR over **approximately 2.5 years**. Low (0.02 kg/m^3), high (0.44 kg/m^3), and mean (0.10 kg/m^3) SSC values were successfully estimated. **The SSD was primarily driven by water discharge, exhibiting low values (204 kg/s) during the dry season and a maximum of $36,299 \text{ kg/s}$ during flood events, with the mean value of $3,903 \text{ kg/s}$ throughout the observation period.** The water sample and CAT results demonstrated high consistency, with correlation coefficients (R^2) of 0.92 for SSC between the water sample and CAT results, and 0.96 for SSD between the DT result and CAT results. This study established the ability to monitor transect SSC and SSD in the YR using the CAT sound attenuation approach, offering the advantage of continuous real-time monitoring of transect river flow, SSC, and SSD, even during extreme flood events. For the success of this method, factors such as particle size, sound frequency selection, and the measurable distance between instruments must be meticulously considered. This work highlights the potential of CAT for monitoring riverine transect SSC and SSD.



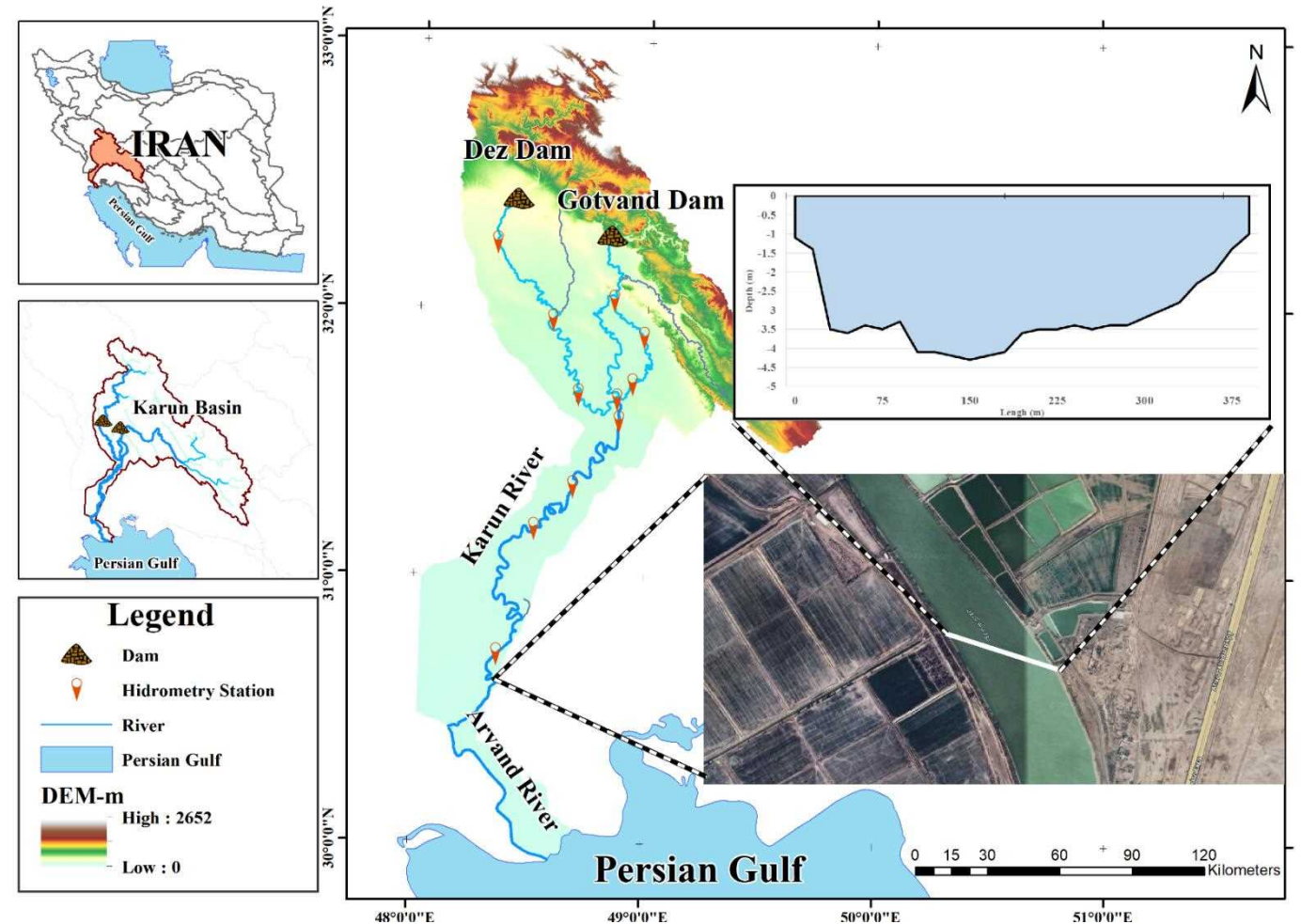
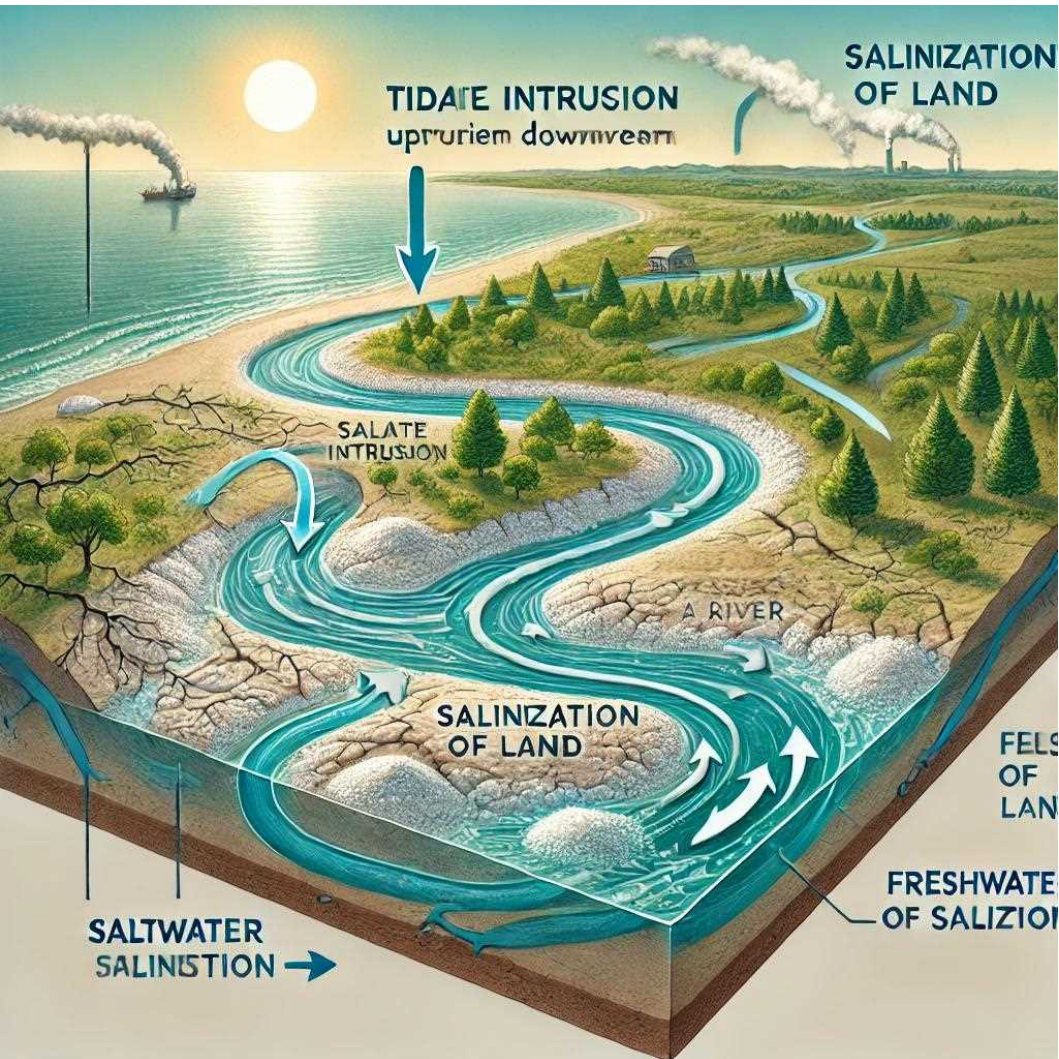
New Thesis/Dissertation Topic 1– Pearl River, USA



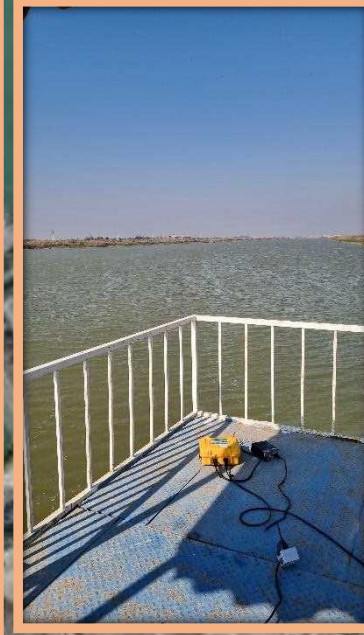
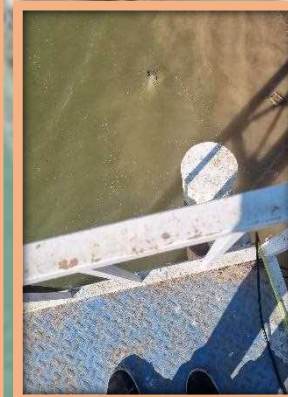
Mean Temperature: 17.64°C

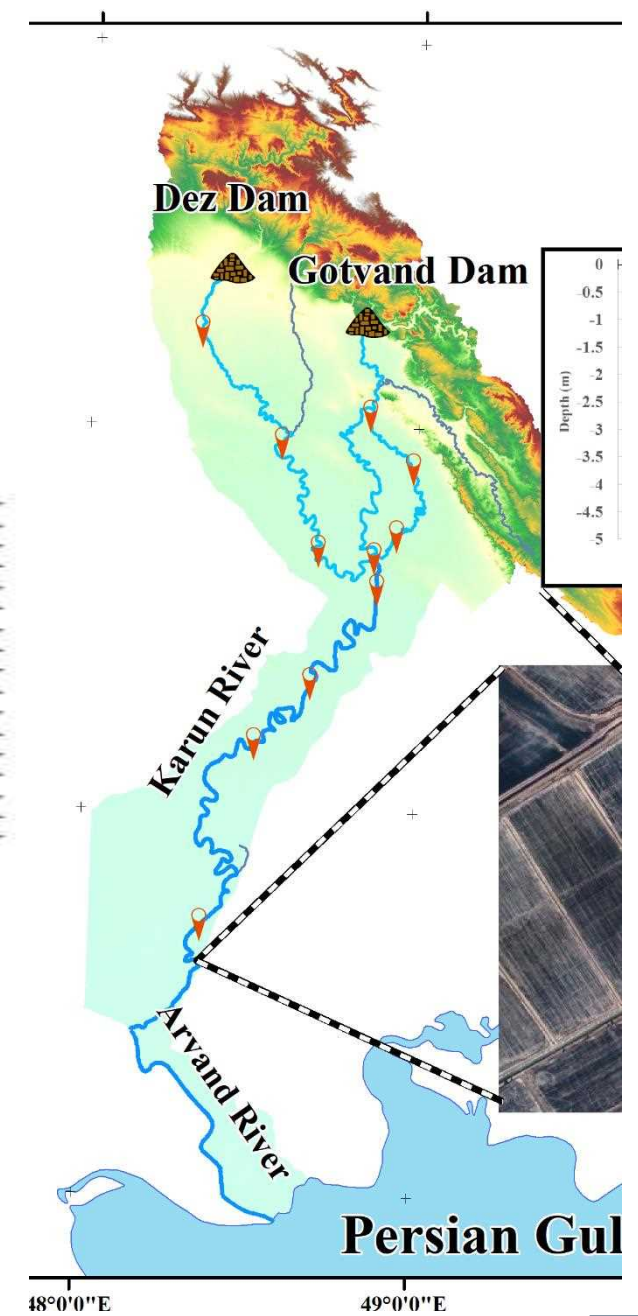
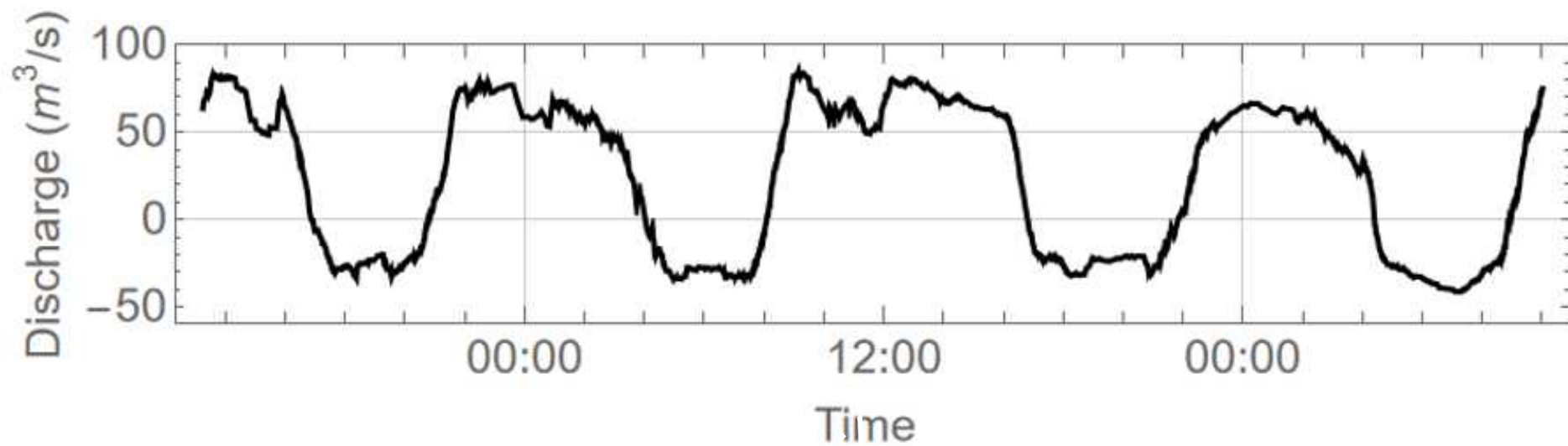


New Thesis/Dissertation Topic 2– Salinity Intrusion, Karun River (in collaboration with Khuzestan Water and Power Authority) Dr. Shahbazi



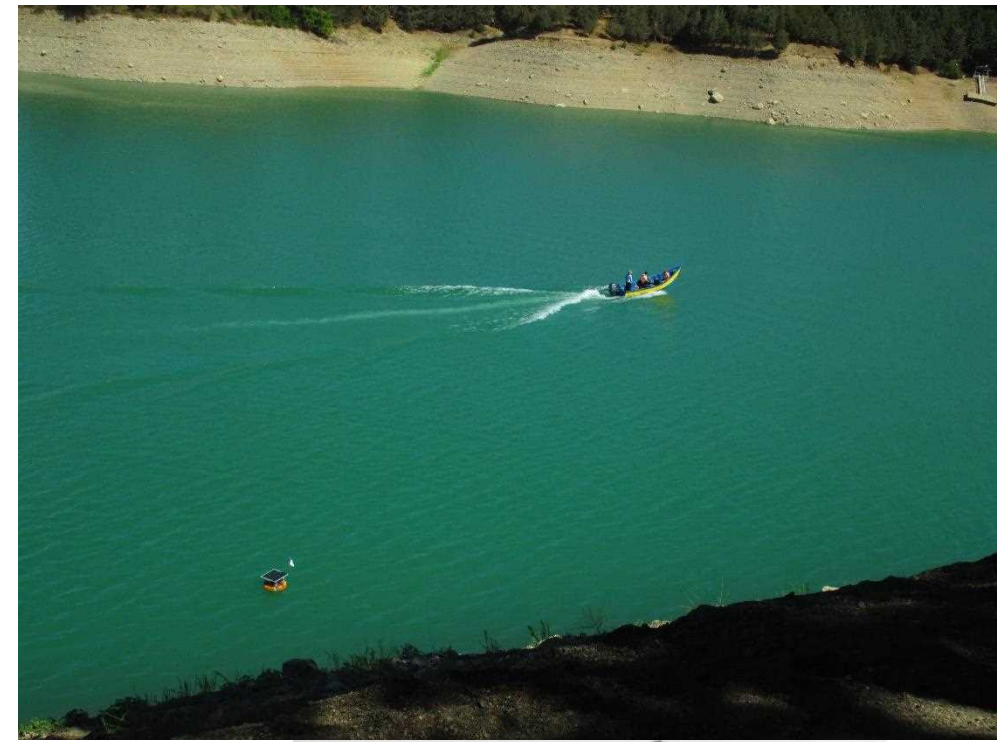
Salmaneh Hydrometric Station







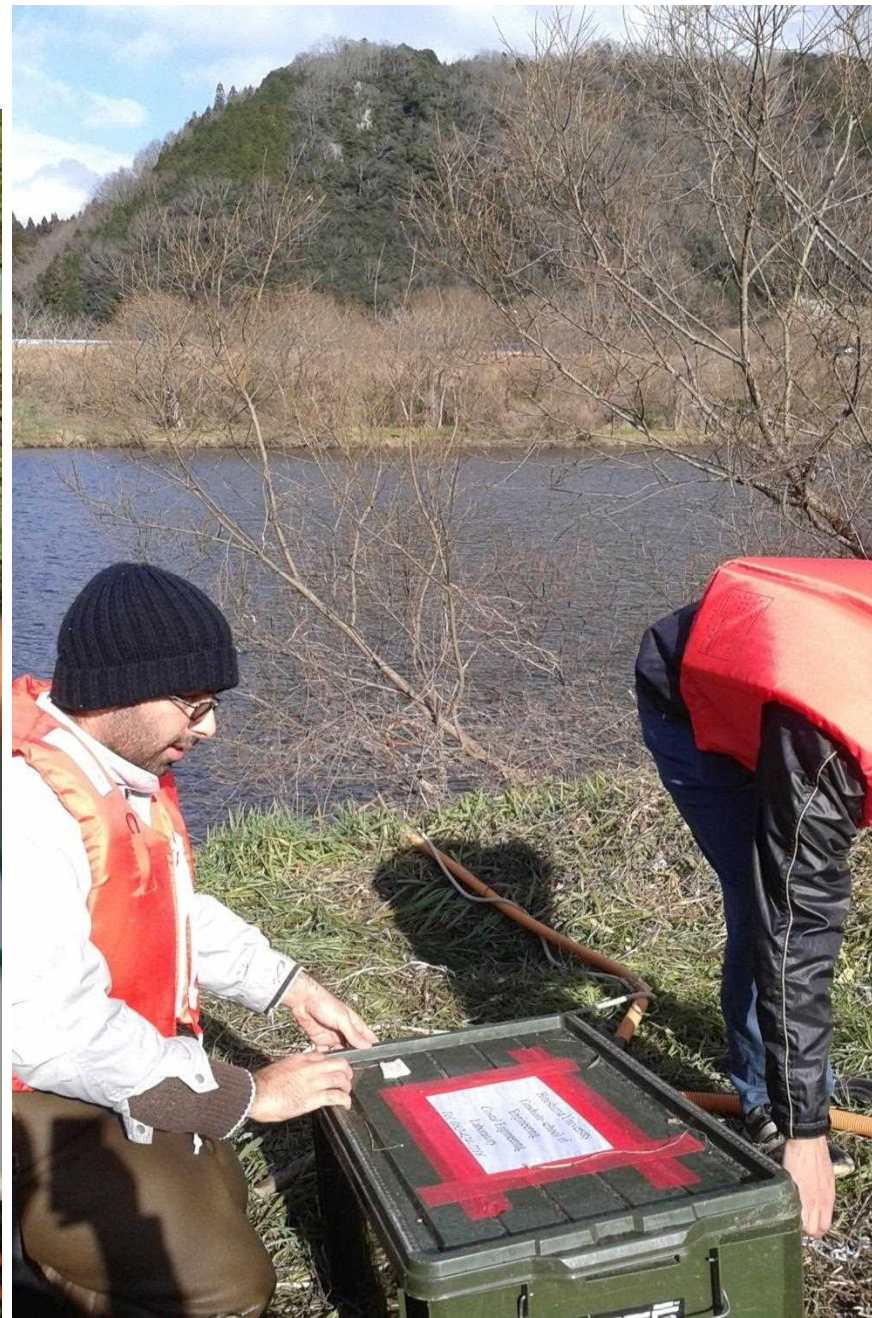
Operation



Operation & measurement Principle of AT (Portable- Short-Term Measurement)

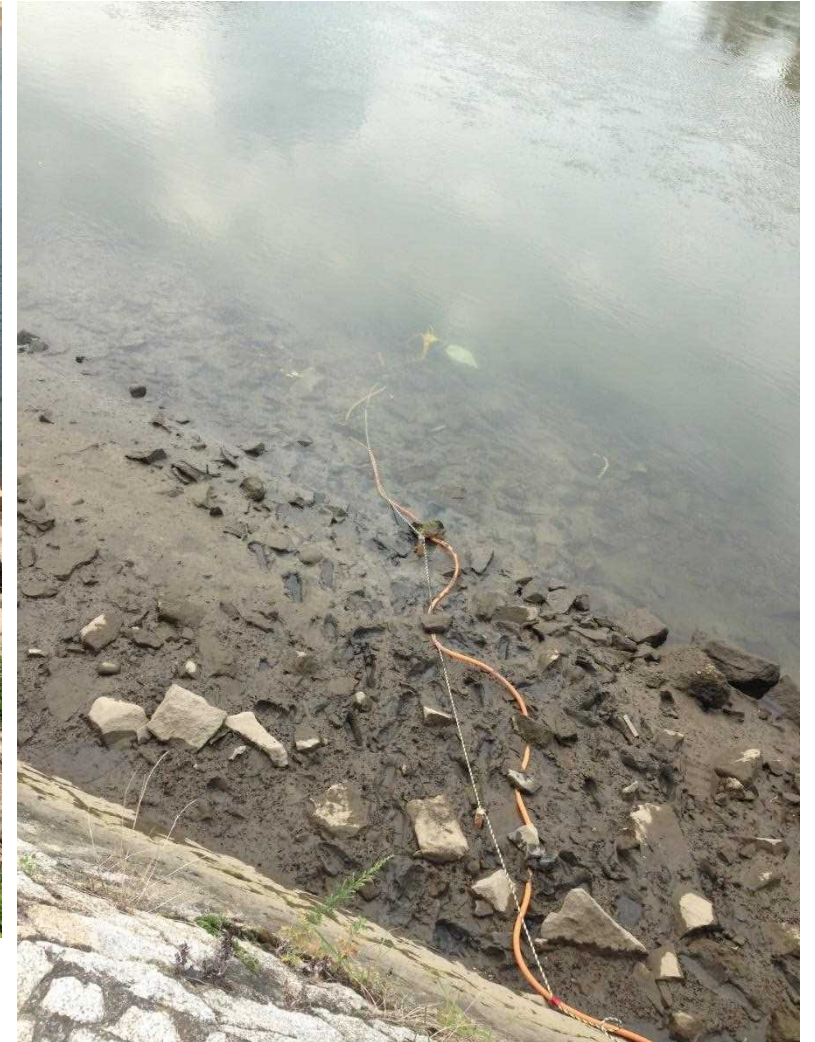
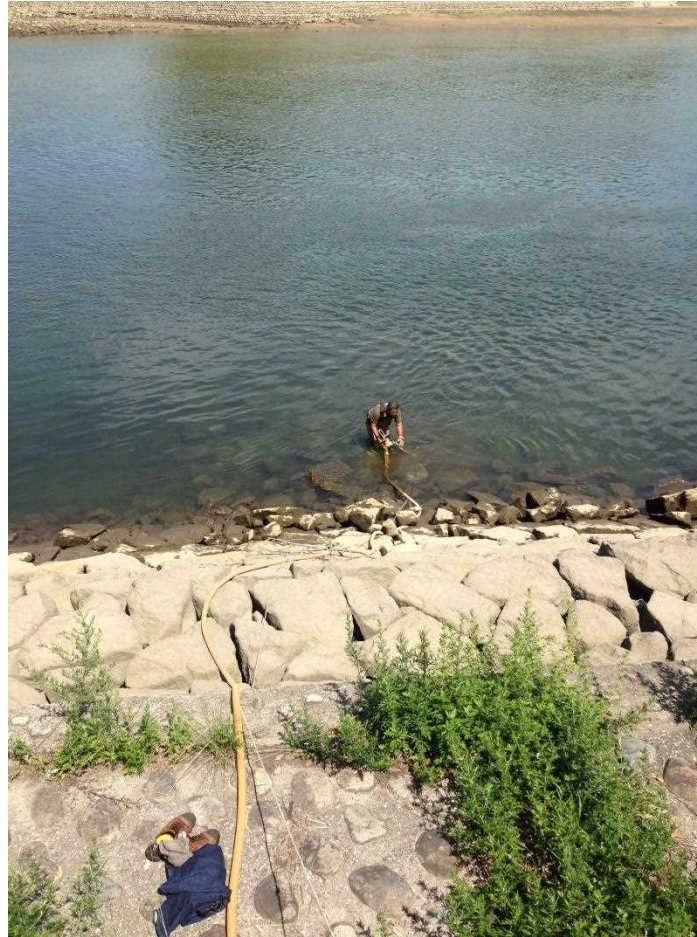
Transducer Deployment





Operation & measurement Principle of AT (Portable- Short-Term Measurement)

Transducer Deployment

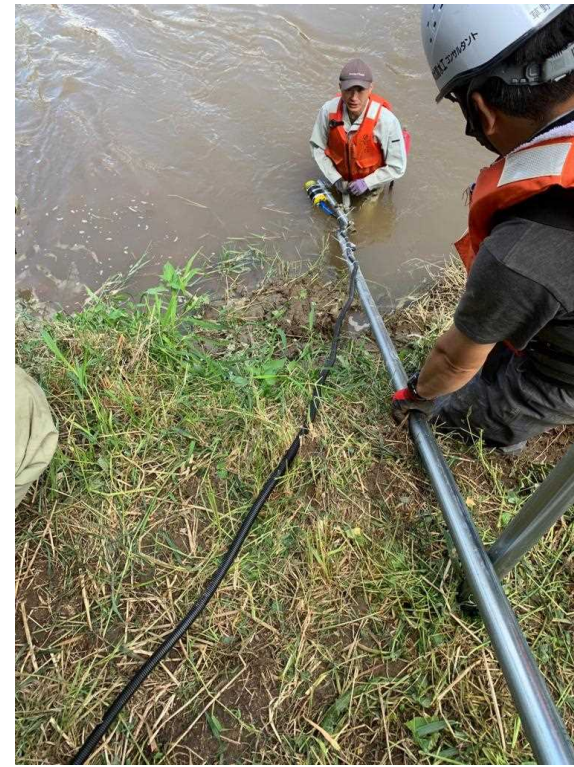


Operation & measurement Principle of AT (Portable- Short-Term Measurement)

Processing Unit



Operation & measurement Principle of AT (Permanent- Long-Term Measurement) Transducer Deployment



Operation & measurement Principle of AT (Permanent- Long-Term Measurement)

Processing Unit



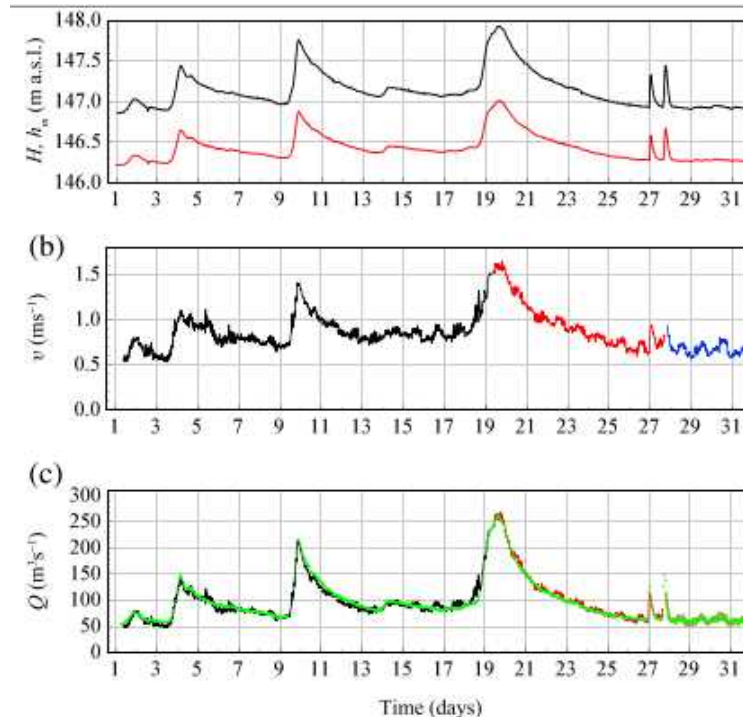
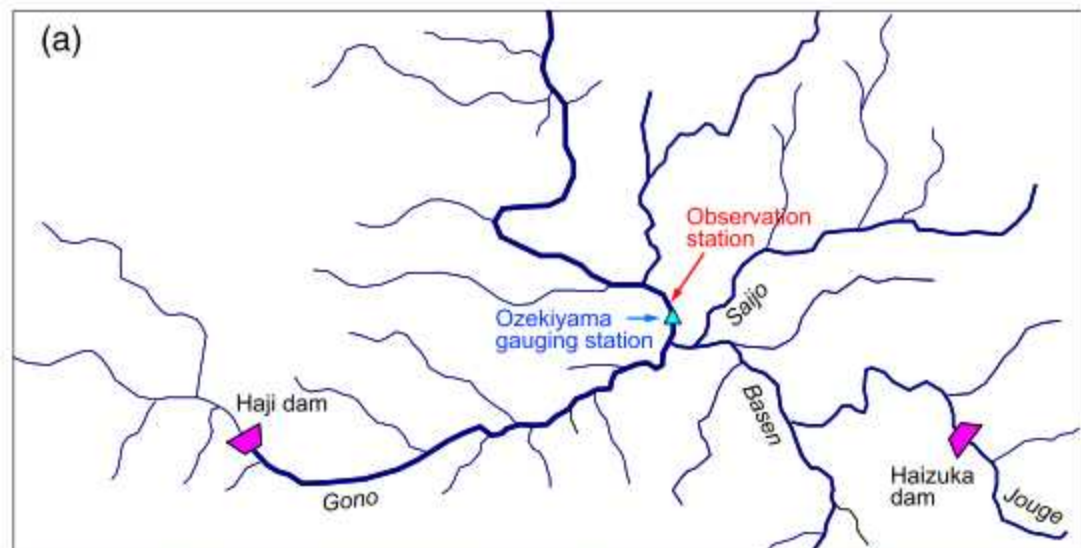
High-frequency streamflow acquisition and bed level/flow angle estimates in a mountainous river using shallow-water acoustic tomography

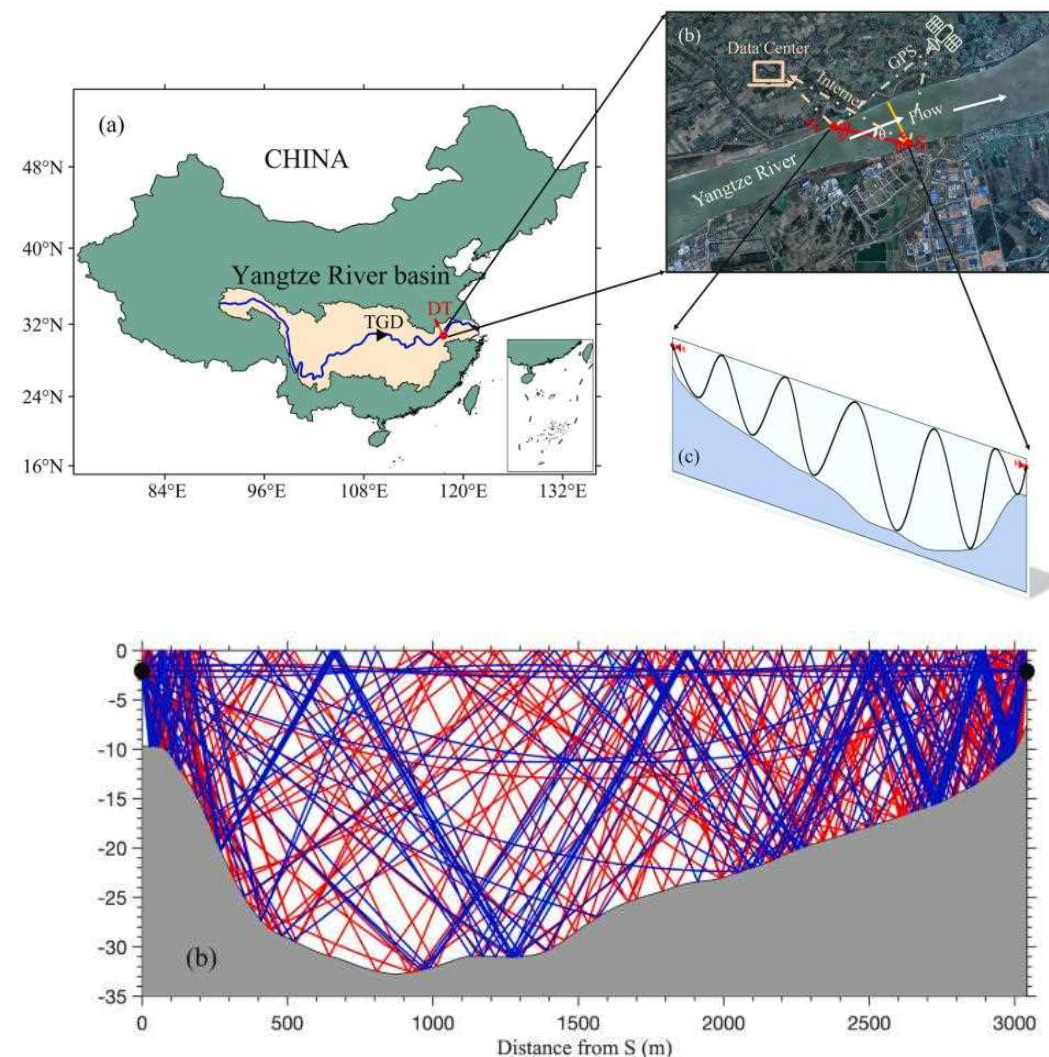
Kiyosi Kawanisi,^{1*} Masoud Bahrainimotlagh,² Mohamad Basel Al Sawaf² and Mahdi Razaz³

¹ Department of Civil and Environmental Engineering, Institute of Engineering, Hiroshima University, 1-4-1 Kagamiyama, Higashi, Hiroshima, 739-8527, Japan

² Department of Civil and Environmental Engineering, Graduate School of Engineering, Hiroshima University, 1-4-1 Kagamiyama, Higashi, Hiroshima, 739-8527, Japan

³ Department of Physical Oceanography, Memorial University of Newfoundland, 500 Prince Philip Dr., St. John's, NL, Canada





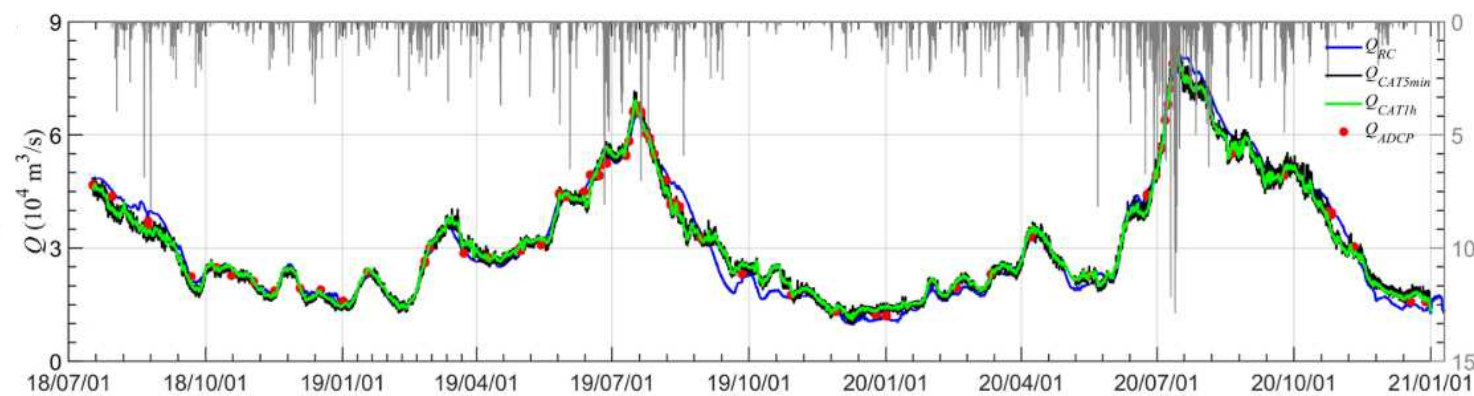
Question!

What is the discharge of the largest flood in Your country?

Yangtze River, China:

Width: 1,000 meters

Home to the world's largest power plant with a capacity of 22,000 megawatts of electricity generation.



Monitoring of River Discharge

Continuous and real-time observation for 2.5 years
Discharge range: 1,000 to 80,000 cubic meters per second





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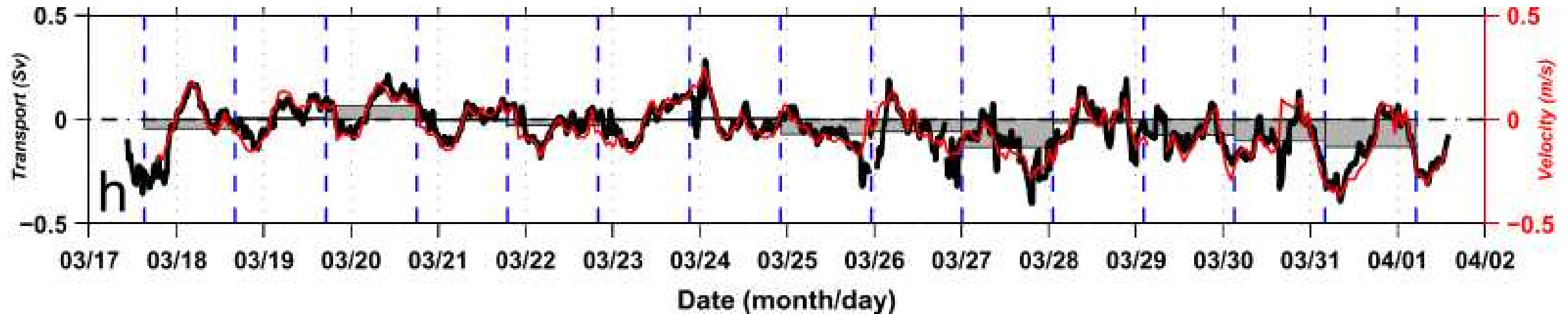
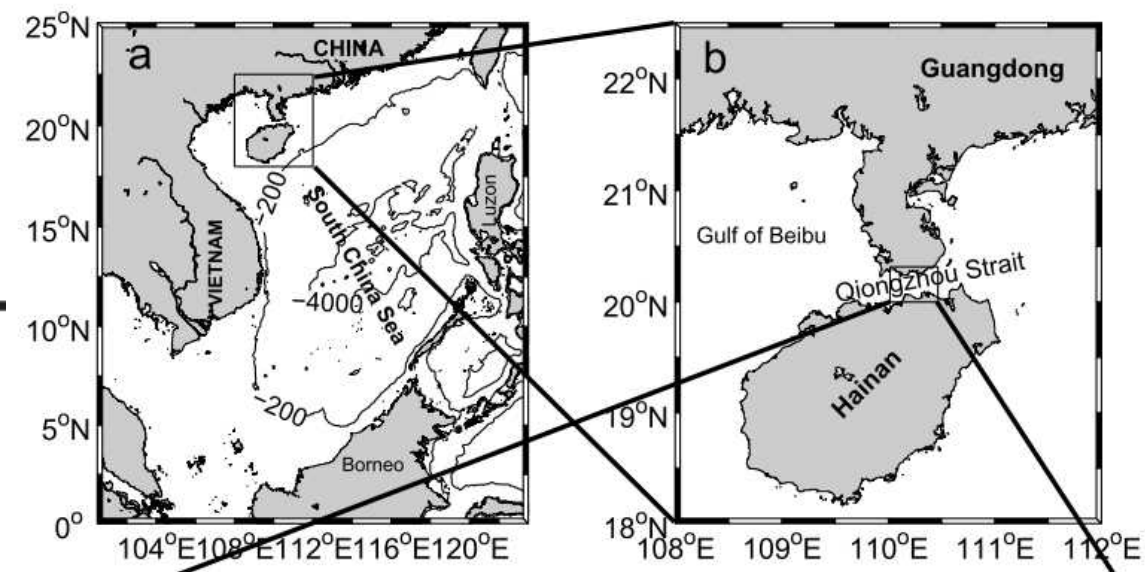
Measurement of tidal and residual currents and **volume** transport through the Qiongzhou Strait using coastal acoustic tomography

Xiao-Hua Zhu^{a,b,*}, Ze-Nan Zhu^{b,a}, Xinyu Guo^{a,c}, Yun-Long Ma^a, Xiaopeng Fan^a, Menghong Dong^a, Chuanzheng Zhang^a

^a State Key Laboratory of Satellite Ocean Environment Dynamics, Second Institute of Oceanography, State Oceanic Administration, Hangzhou 310012, China

^b Ocean College, Zhejiang University, Hangzhou 310058, China

^c Center for Marine Environmental Study, Ehime University, 2-5 Bunkyo-cho, Matsuyama 790-8577, Japan



A reciprocal acoustic transmission experiment for precise observations of tidal currents in a shallow sea

Naokazu Taniguchi^{a,*}, Toshiyuki Takahashi^b, Kengo Yoshiki^b, Hironori Yamamoto^b, Aruni Dinan Hanifa^a, Yuji Sakuno^a, Hidemi Mutsuda^a, Sheng-Wei Huang^c, Chen-Fen Huang^d, Jen-Hwa Guo^e

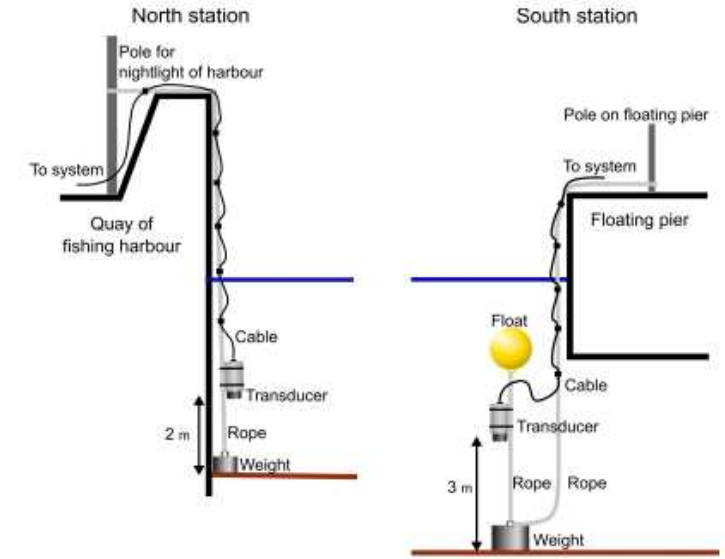
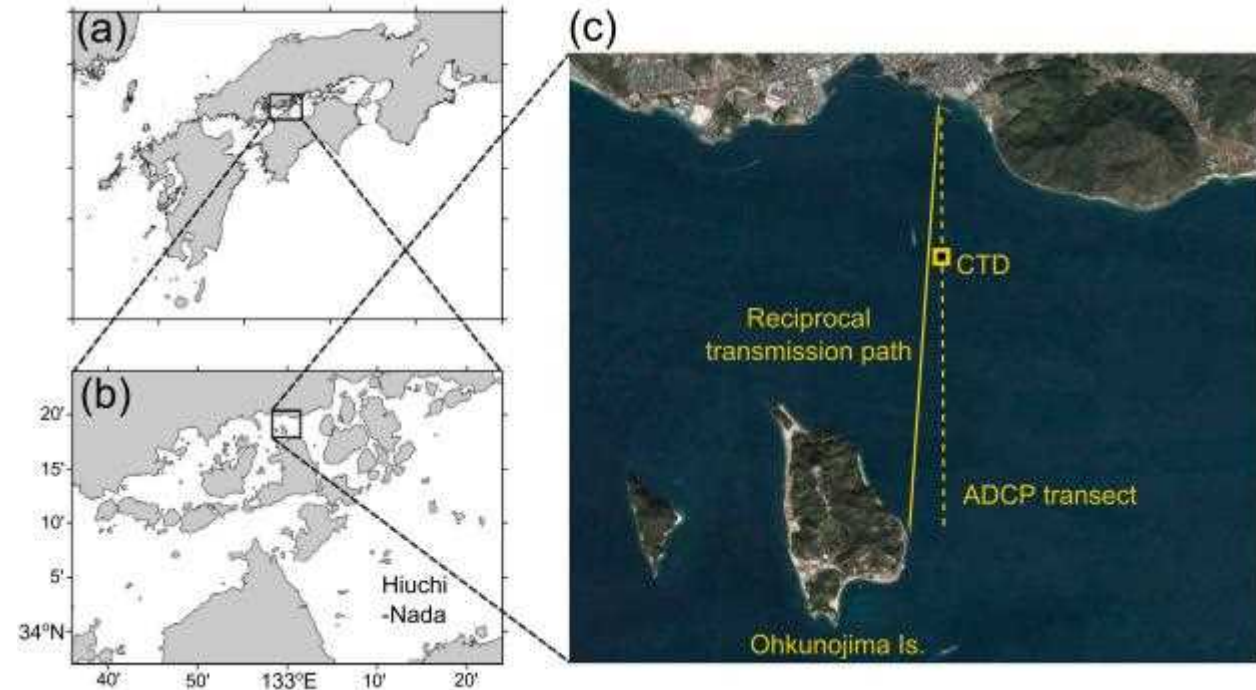
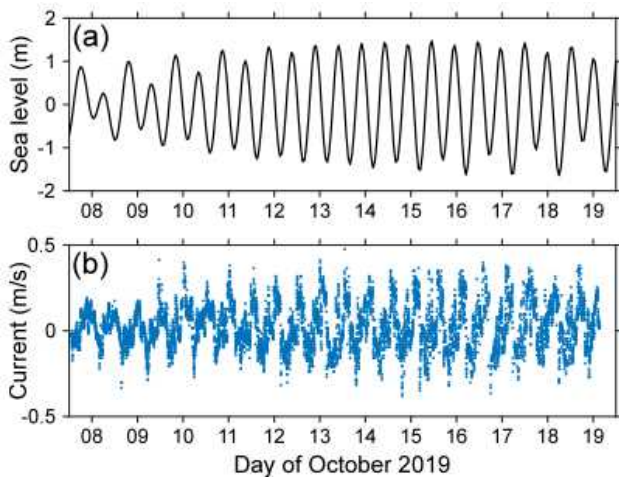
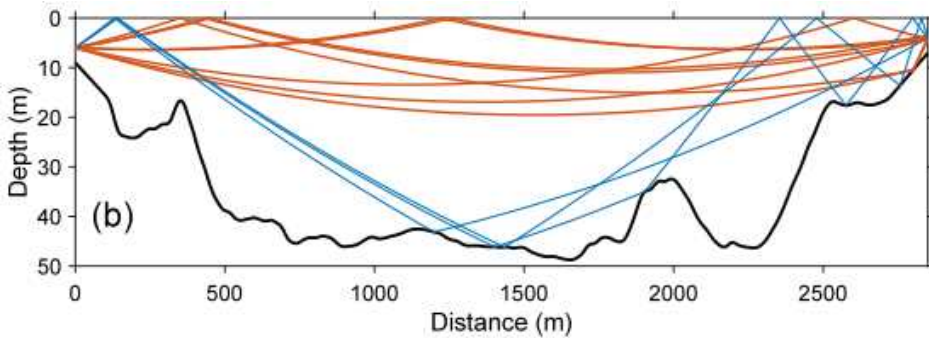
^a Graduate School of Advanced Science and Engineering, Hiroshima University, Higashi-Hiroshima, Japan

^b Fukken Co., LTD, Hiroshima, Japan

^c Ship and Ocean Technology Research Center, National Taiwan University, Taiwan

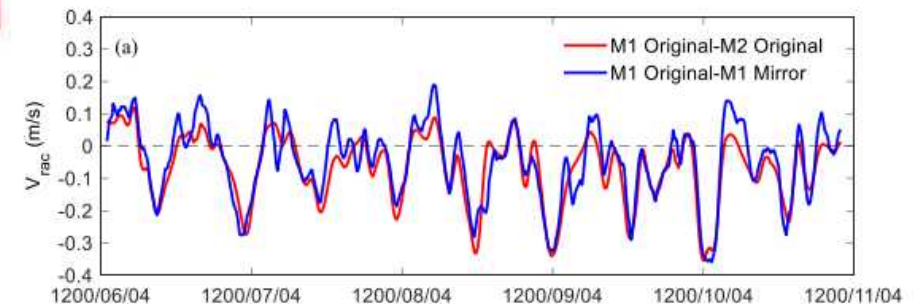
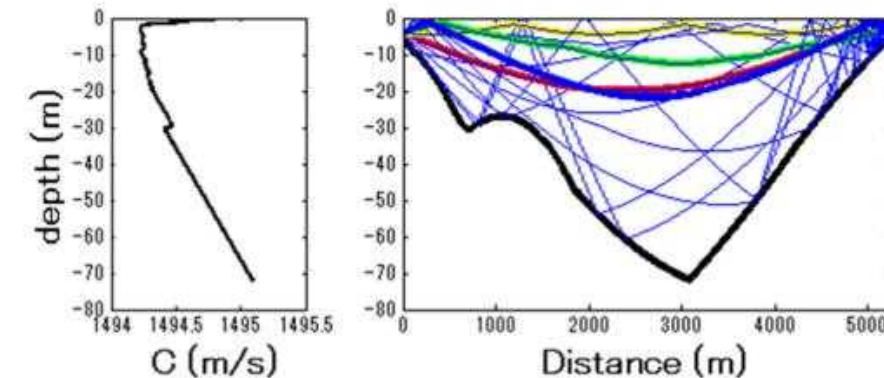
^d Institute of Oceanography, National Taiwan University, Taiwan

^e Department of Engineering Science and Ocean Engineering, National Taiwan University, Taiwan



Real-Time Offshore Coastal Acoustic Tomography Enabled With Mirror-Transpond Functionality

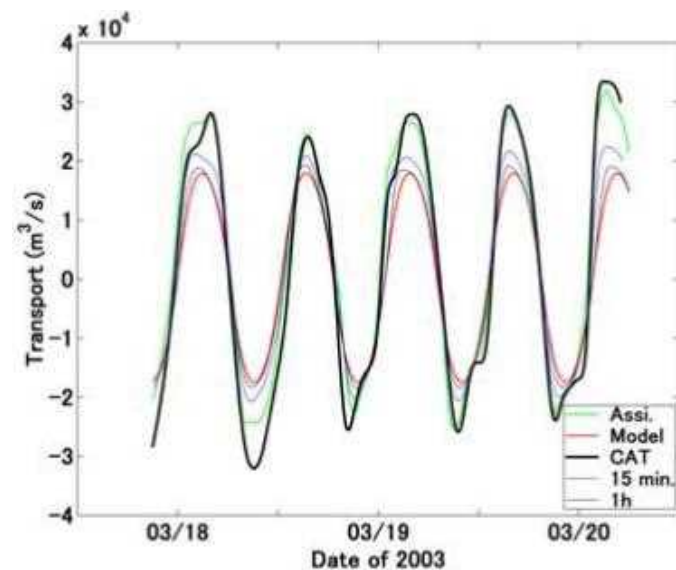
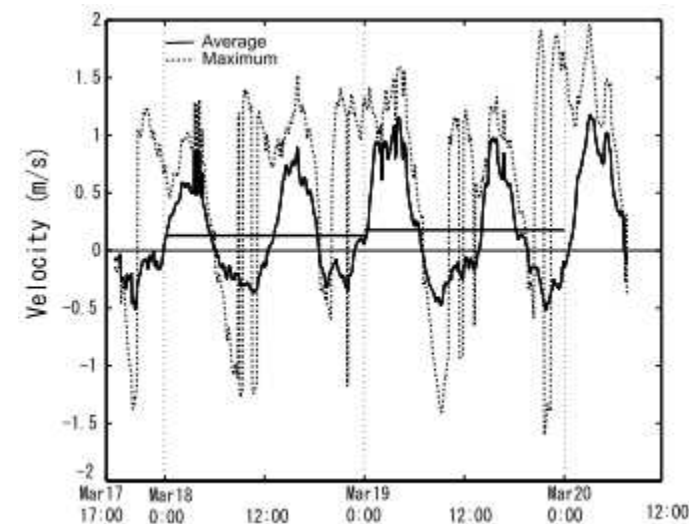
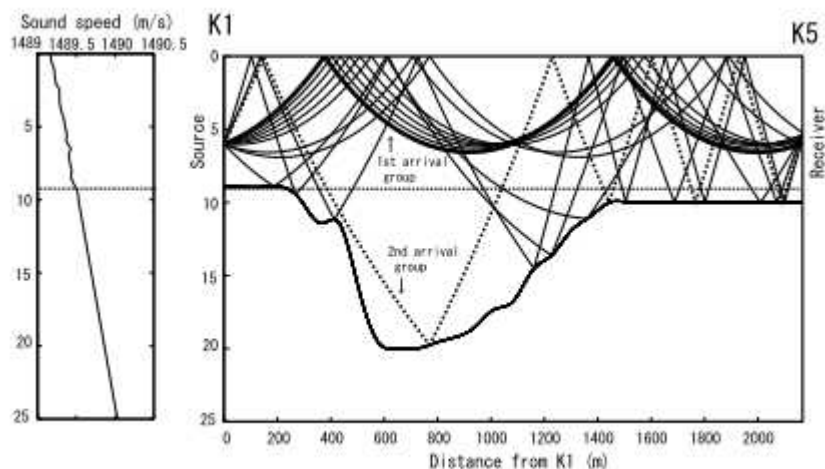
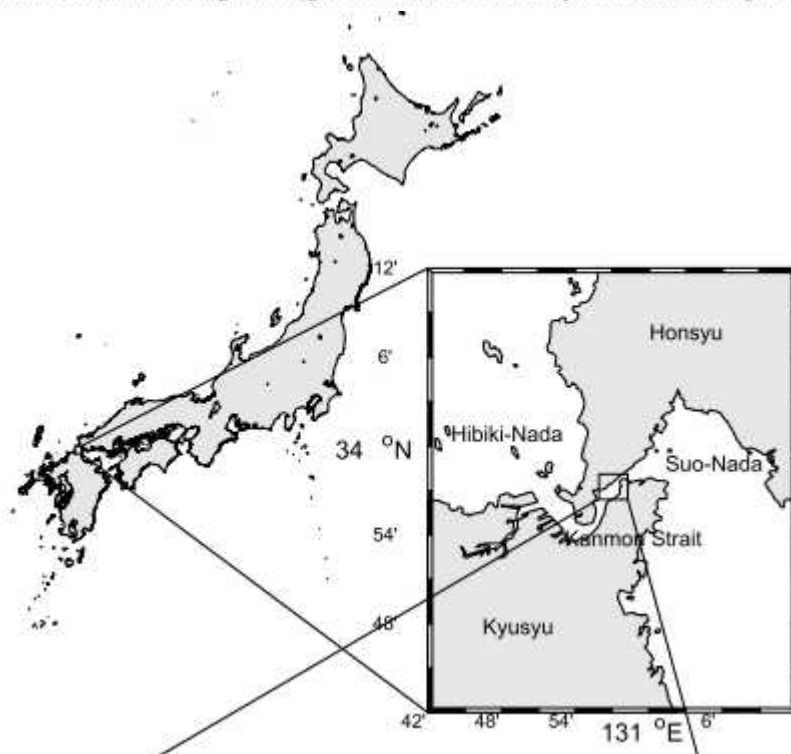
Minmo Chen, Fadli Syamsudin, Arata Kaneko, Noriaki Gohda, Bruce M. Howe, Hidemi Mutsuda, Aruni Hanifa Dinan, Hong Zheng, Chen-Fen Huang, Naokazu Taniguchi, Xiaohua Zhu, Yudi Adityawarman, Chuangzheng Zhang, and Ju Lin



Accurate imaging and prediction of Kanmon Strait tidal current structures by the coastal acoustic tomography data

Ju Lin, Arata Kaneko, Noriaki Gohda, and Keisuke Yamaguchi

Graduate School of Engineering, Hiroshima University, Hiroshima, Japan



PAPER

Tidal current measurement in the Kurushima Strait by the reciprocal sound transmission method

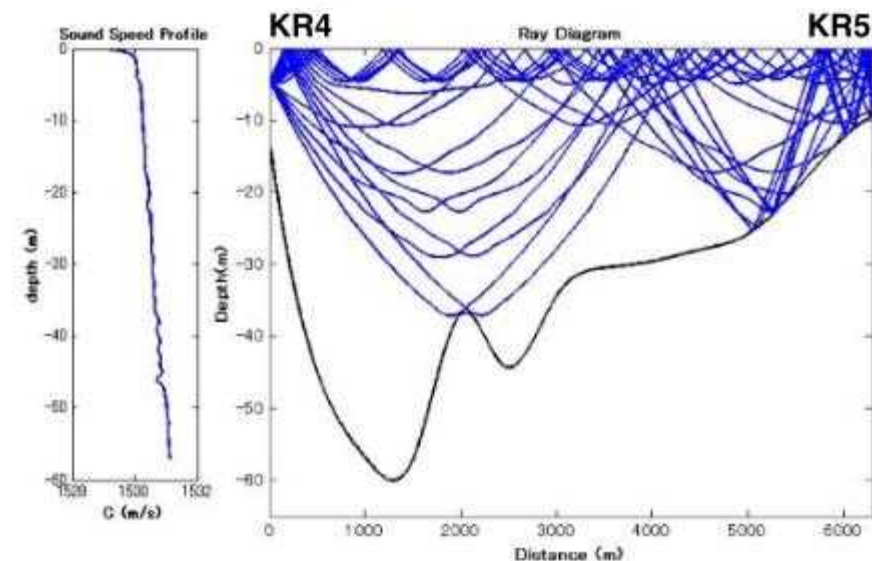
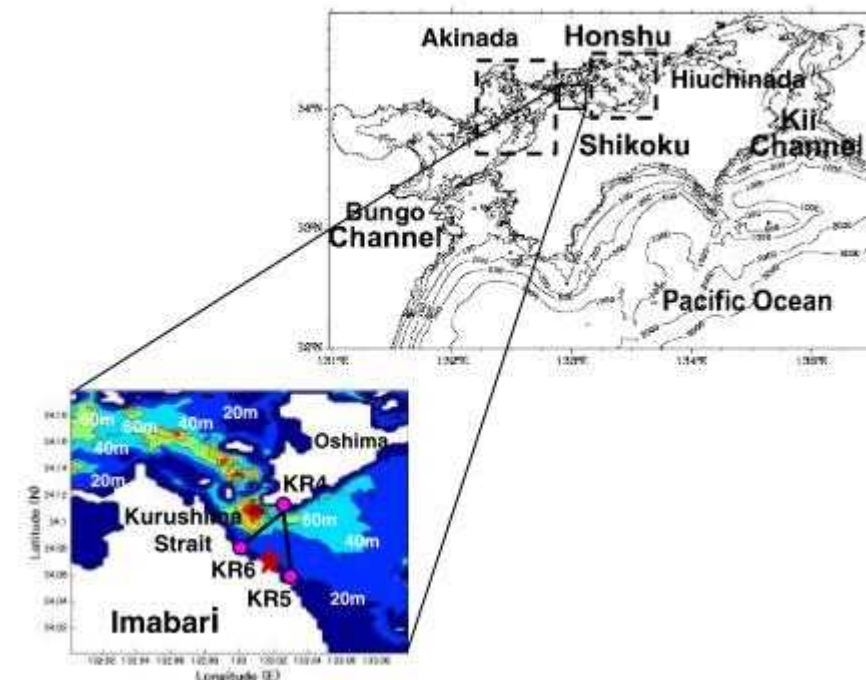
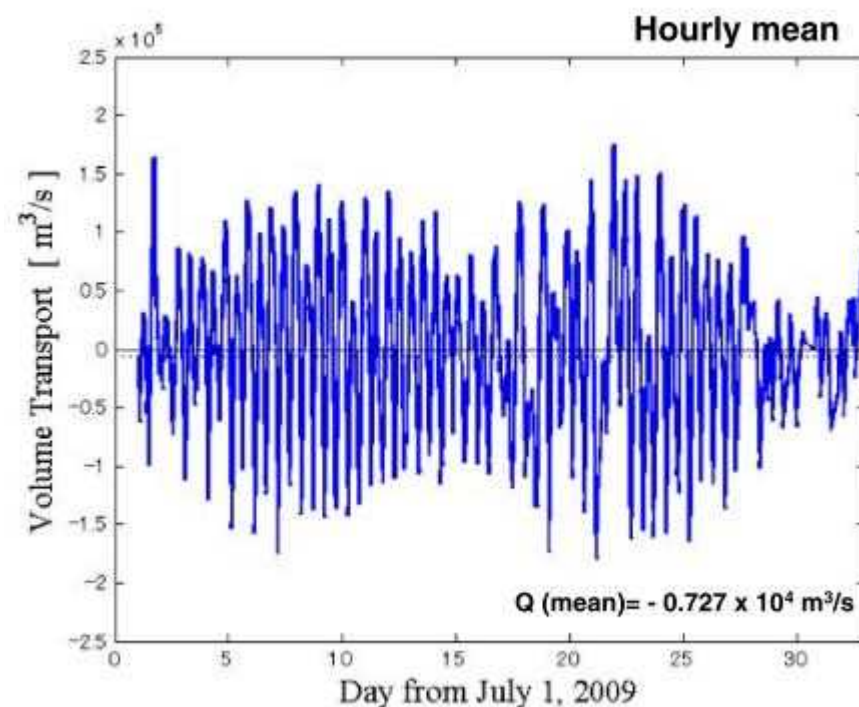
Yudi Adityawarman¹, Arata Kaneko^{1,*}, Naokazu Taniguchi¹,
Hidemi Mutsuda¹, Katsuaki Komai¹, Xinyu Guo² and Noriaki Gohda³

¹Graduate School of Engineering, Hiroshima University,
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(Received 13 May 2011, Accepted for publication 18 September 2011)



Long-term acoustic tomography measurement of ocean currents at the northern part of the Luzon Strait

Naokazu Taniguchi, Arata Kaneko  Yaochu Yuan, Noriaki Gohda, Hong Chen, Guanghong Liao, Chenghao Yang, Masanori Minamide, Yudi Adityawarman, Xiaohua Zhu, Ju Lin

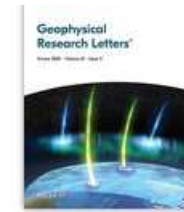
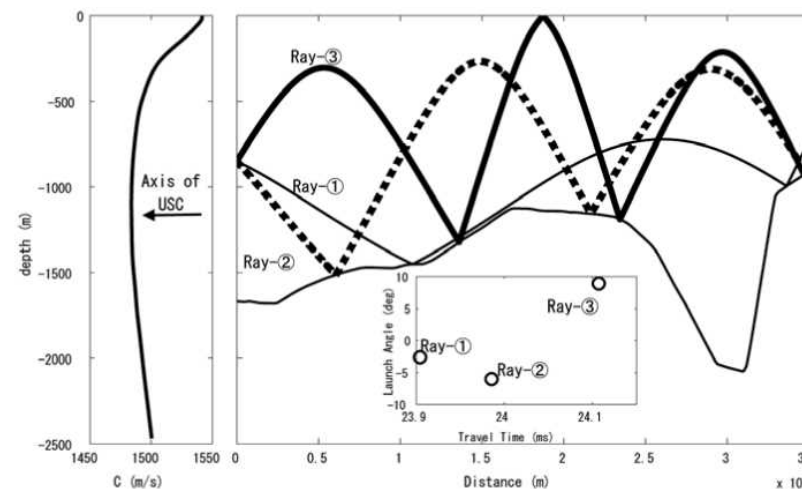
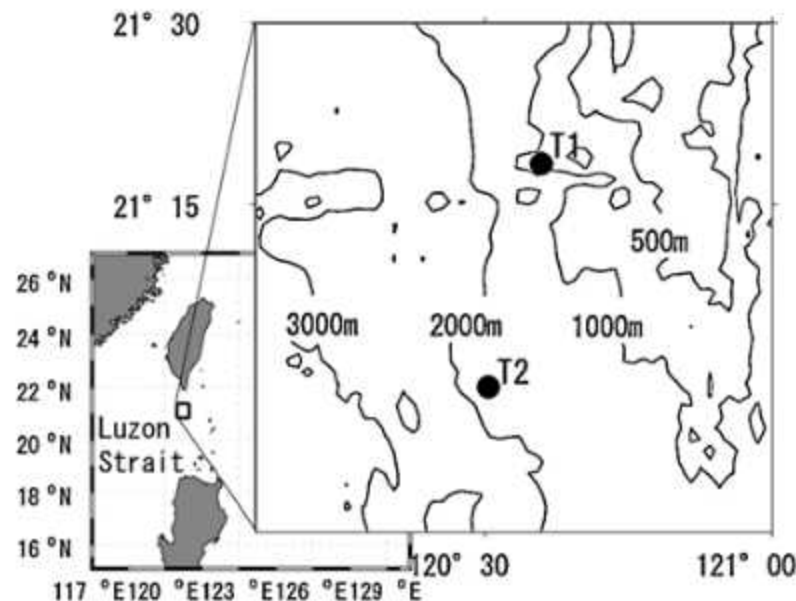
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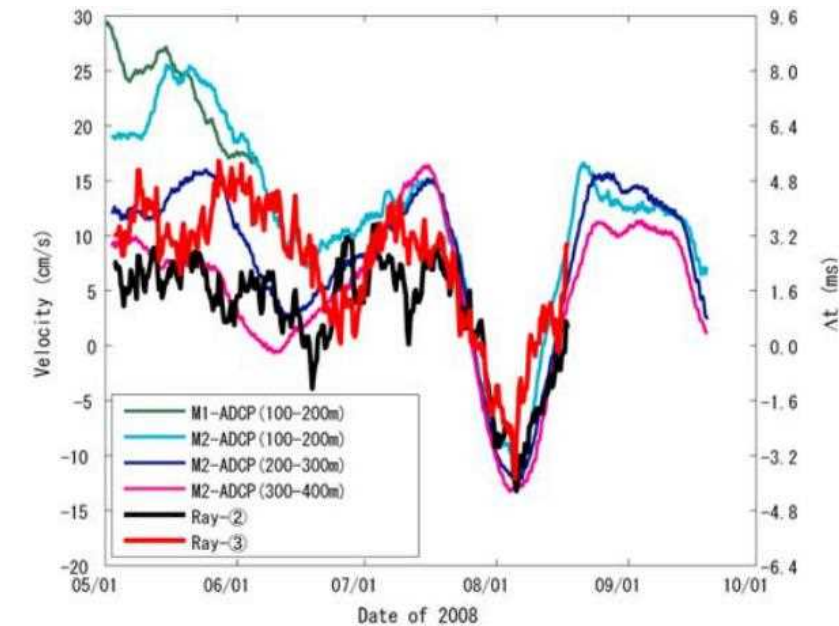
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Abstract

[1] An ocean acoustic tomography (OAT) experiment was conducted during May to September 2008 in the Luzon Strait where the Kuroshio sporadically intrudes and strong

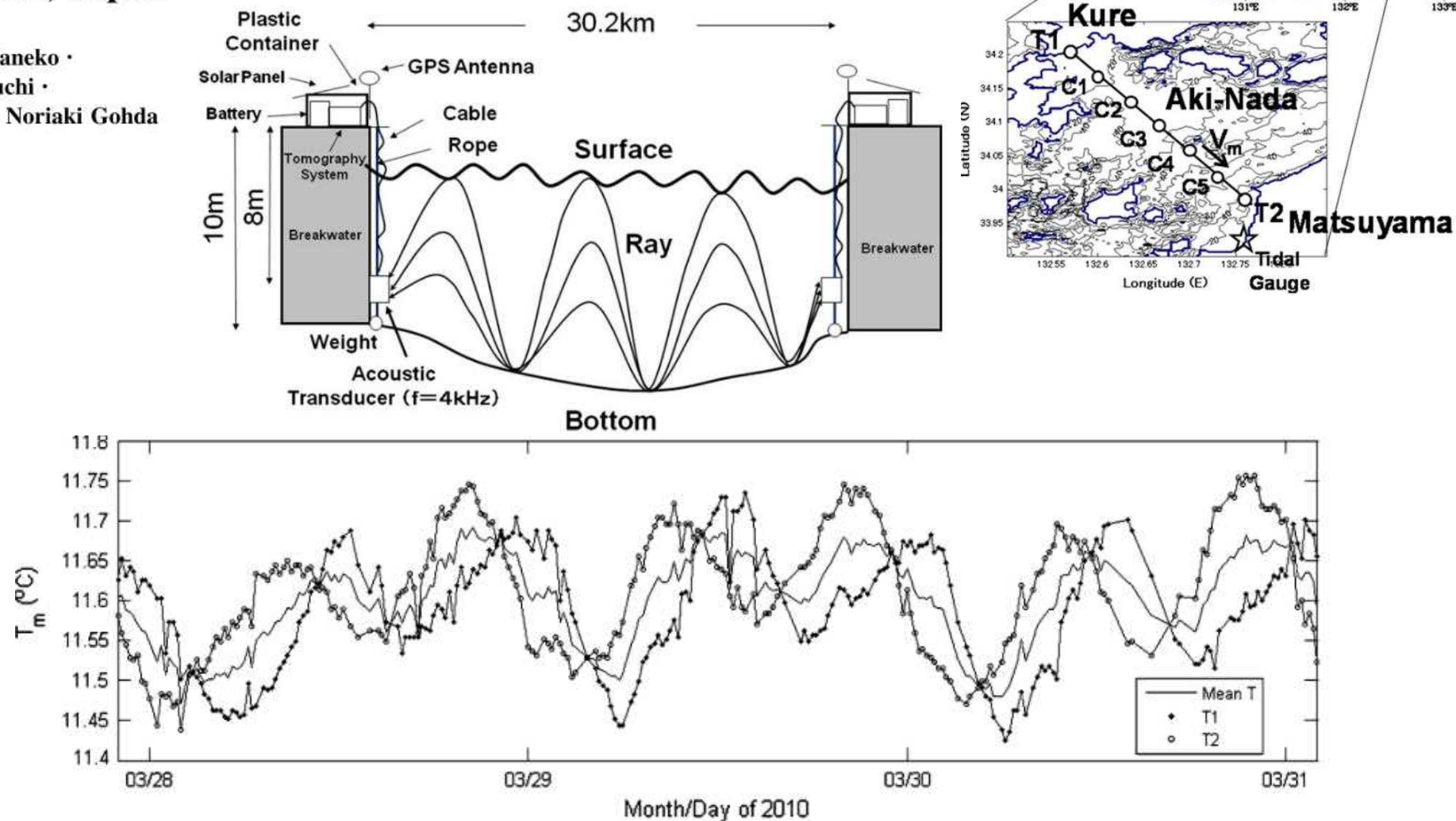


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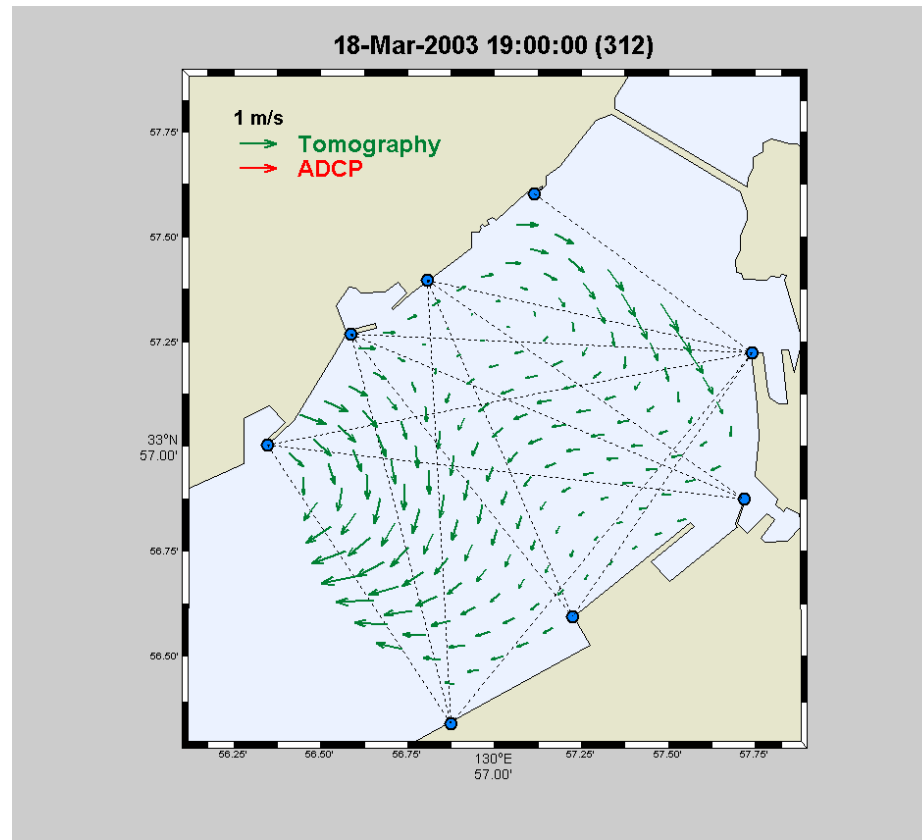
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Koji Nakano · Naokazu Taniguchi ·
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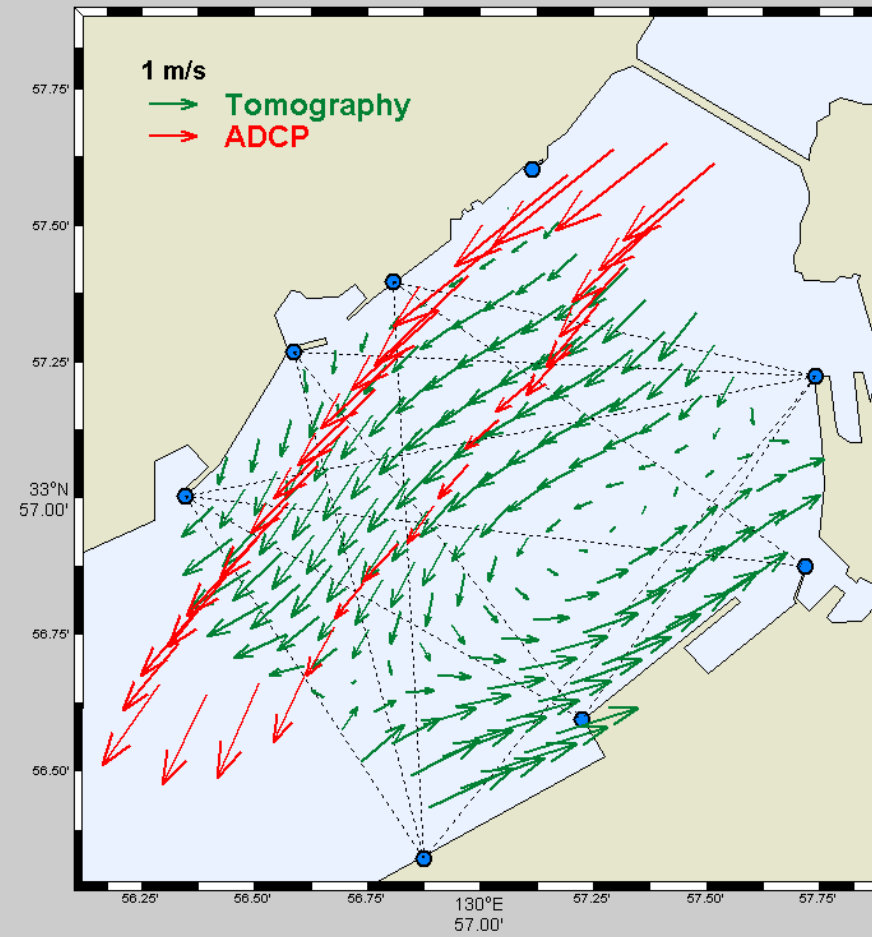
Accurate imaging and prediction of **Kanmon Strait** tidal current structures by the coastal acoustic tomography data

Ju Lin, Arata Kaneko, Noriaki Gohda, and Keisuke Yamaguchi

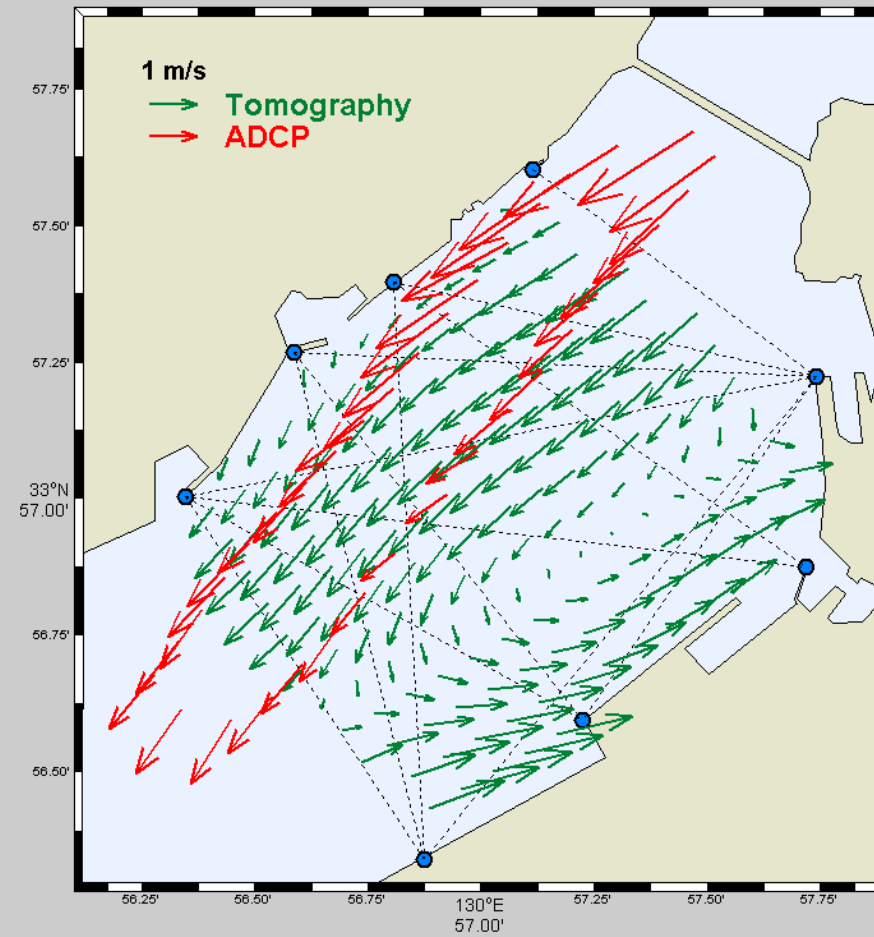
Graduate School of Engineering, Hiroshima University, Hiroshima, Japan



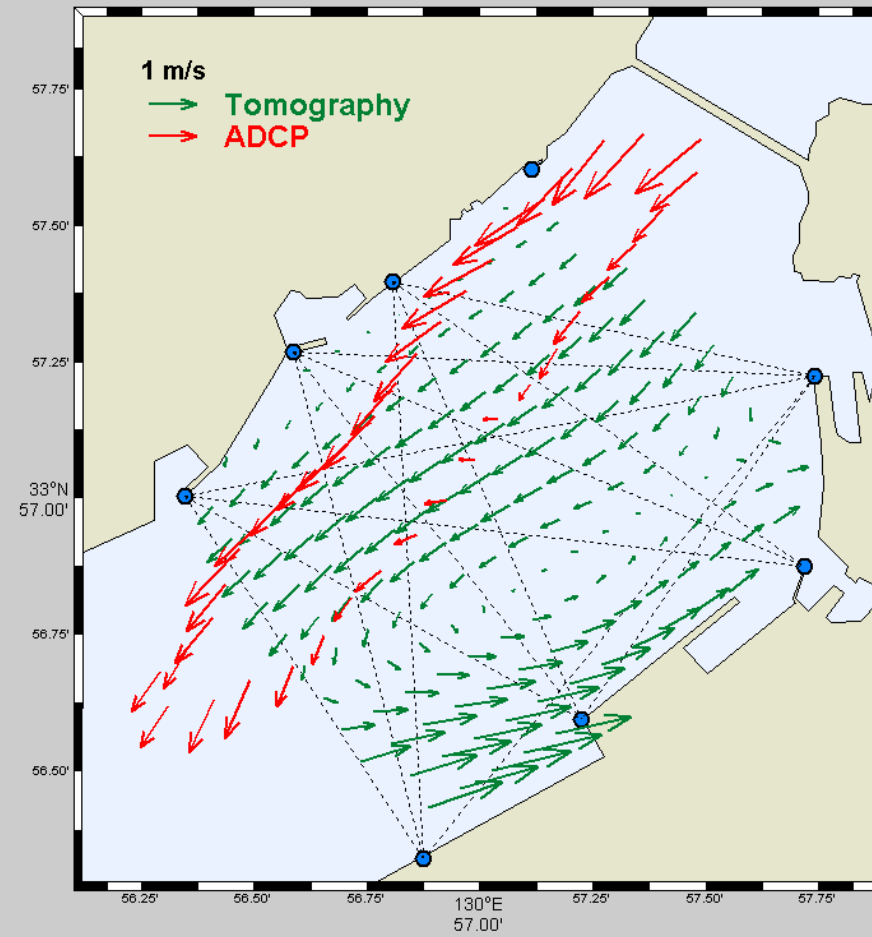
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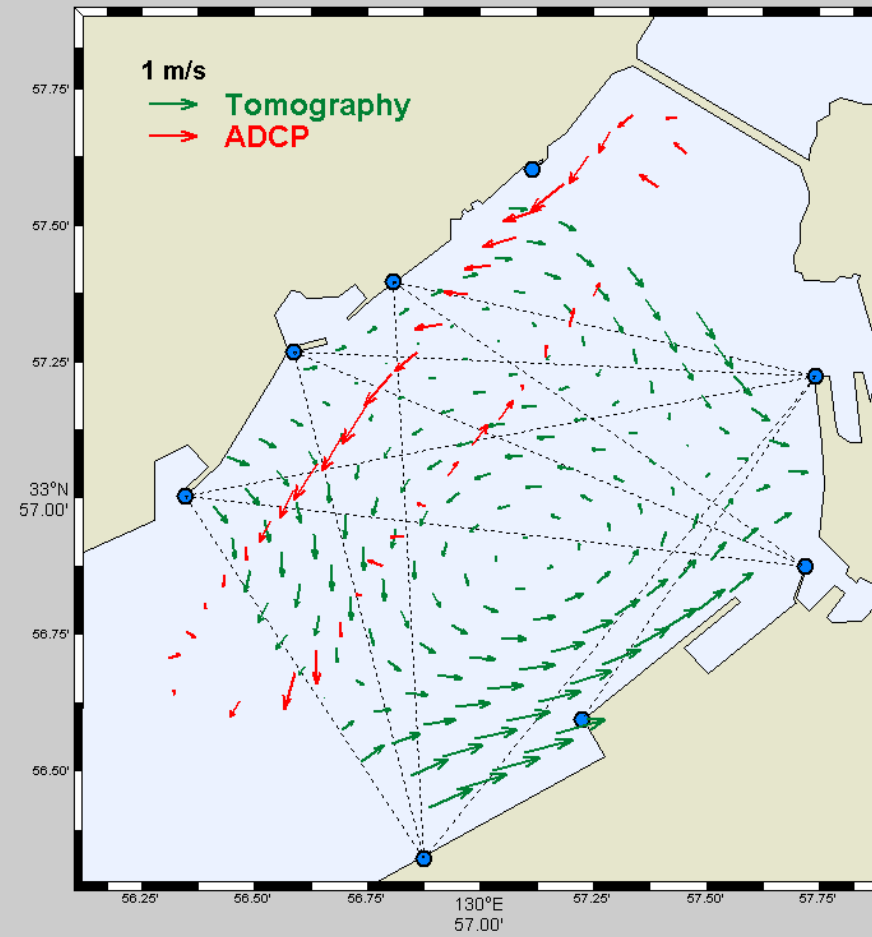
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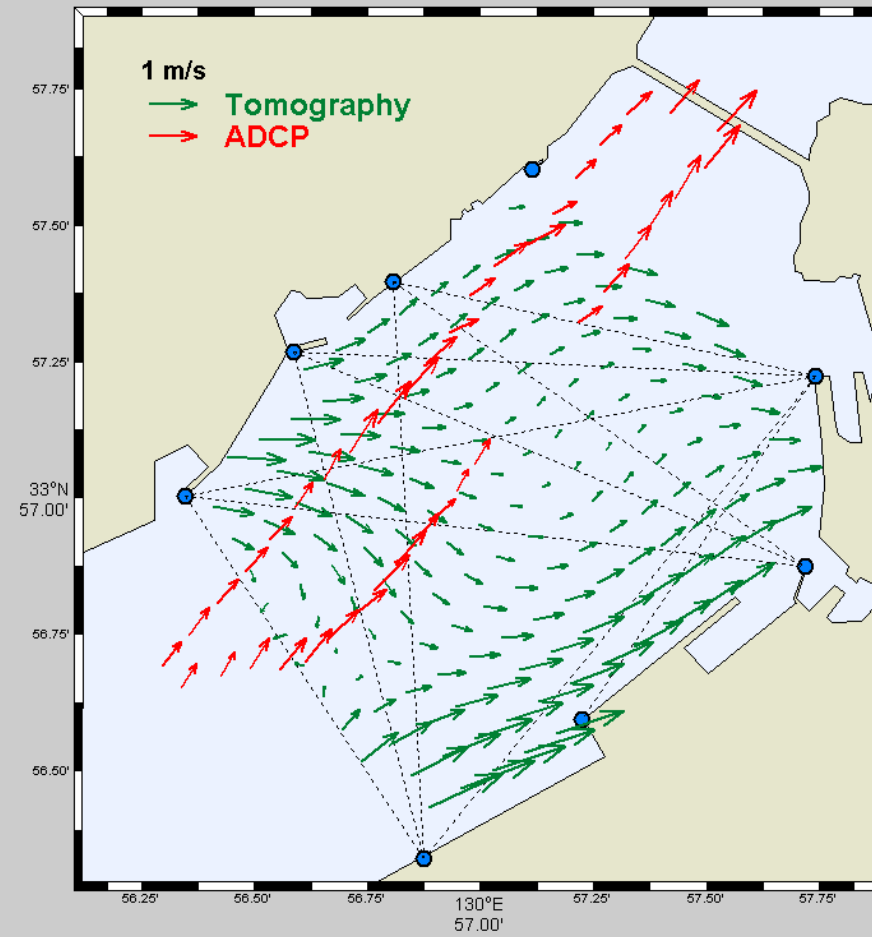
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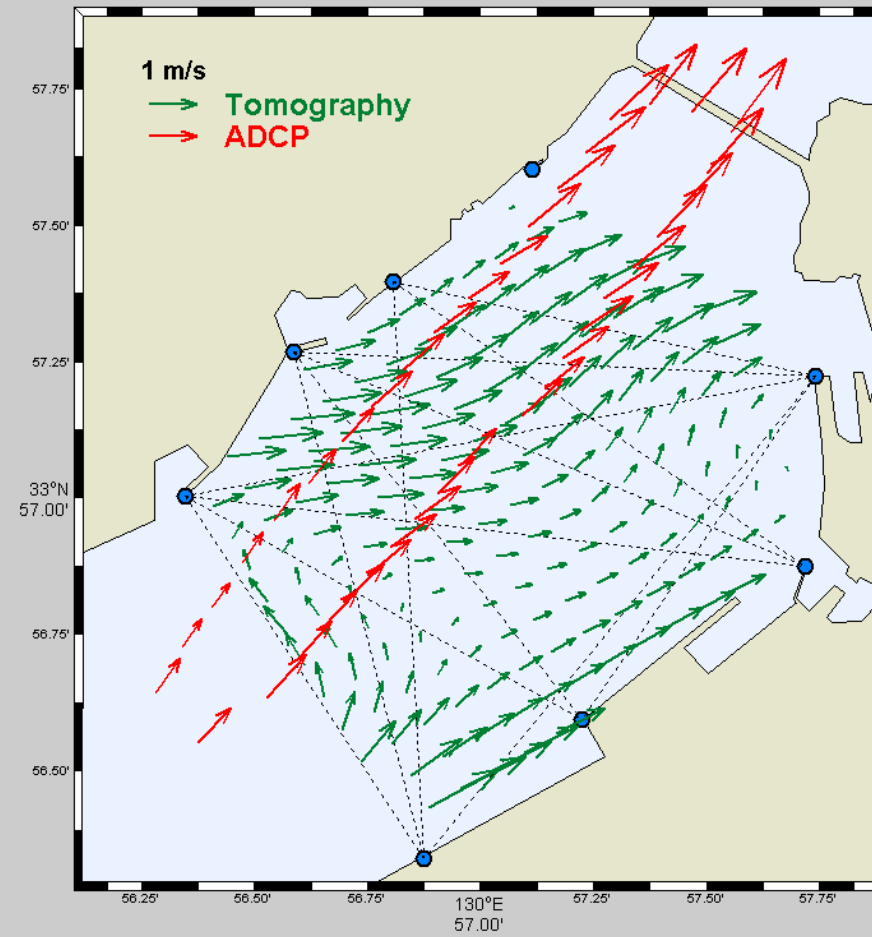
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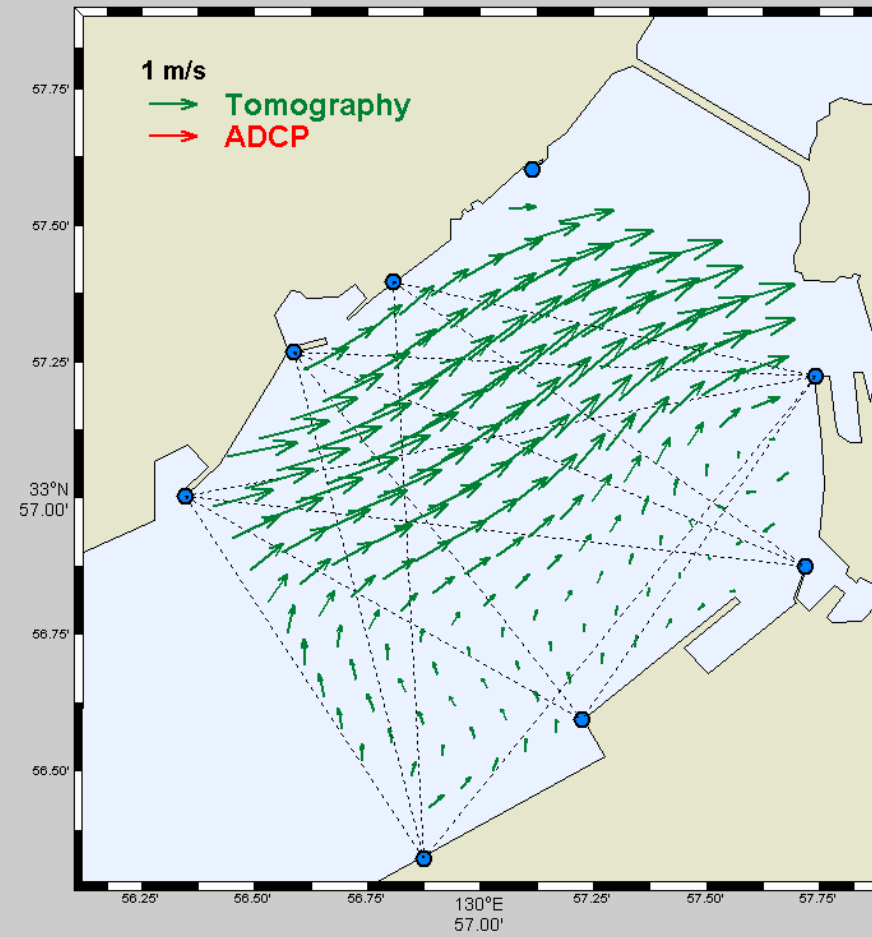
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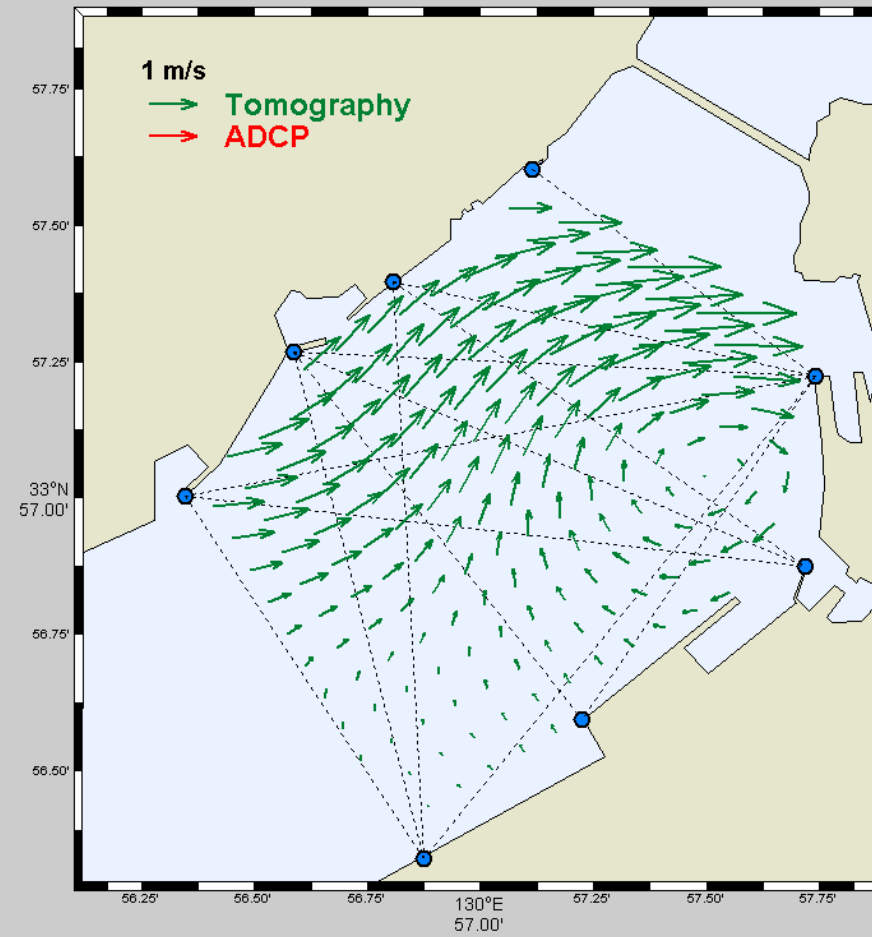
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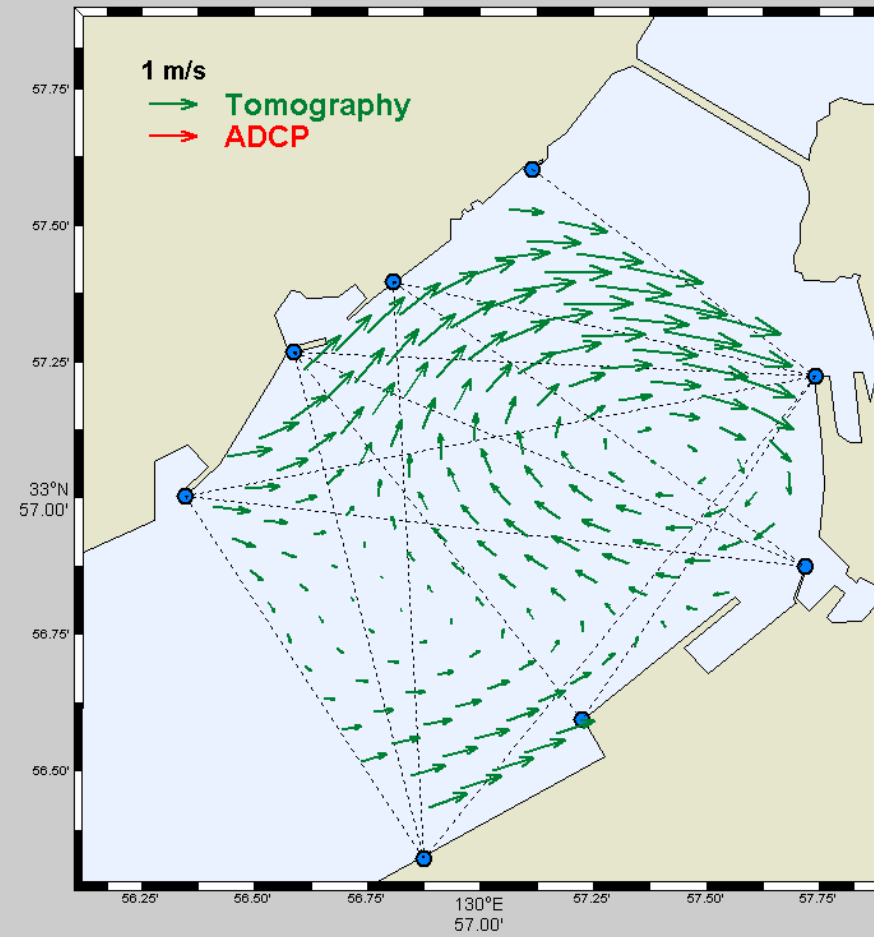
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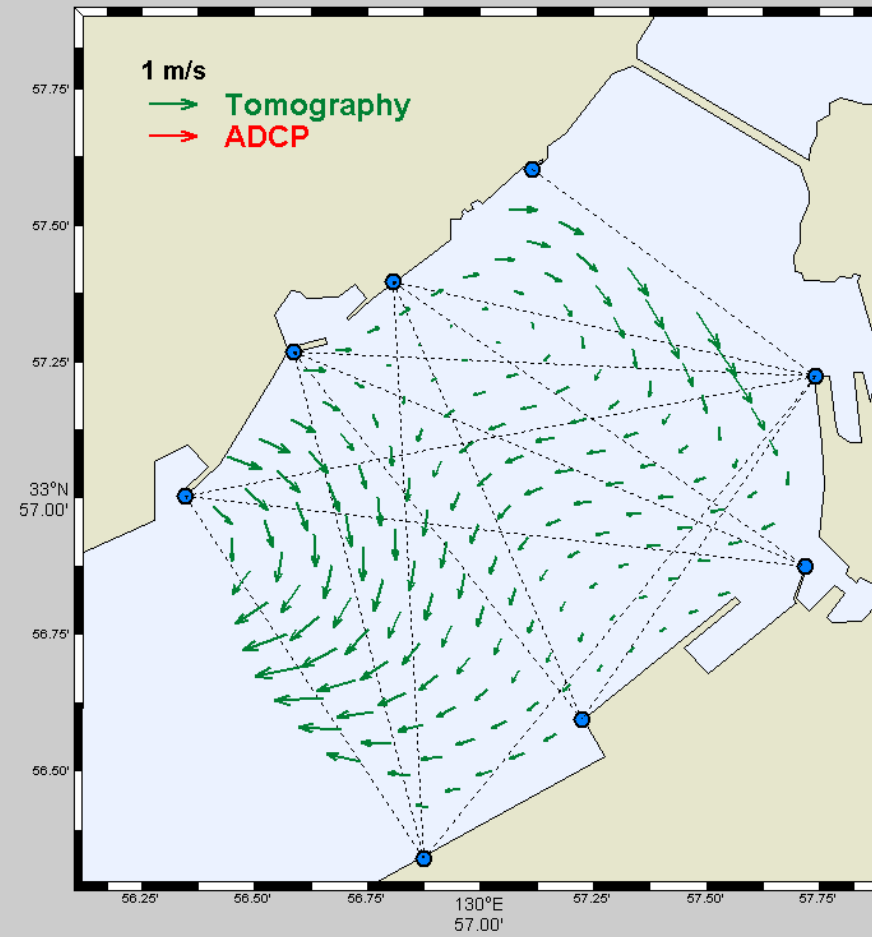
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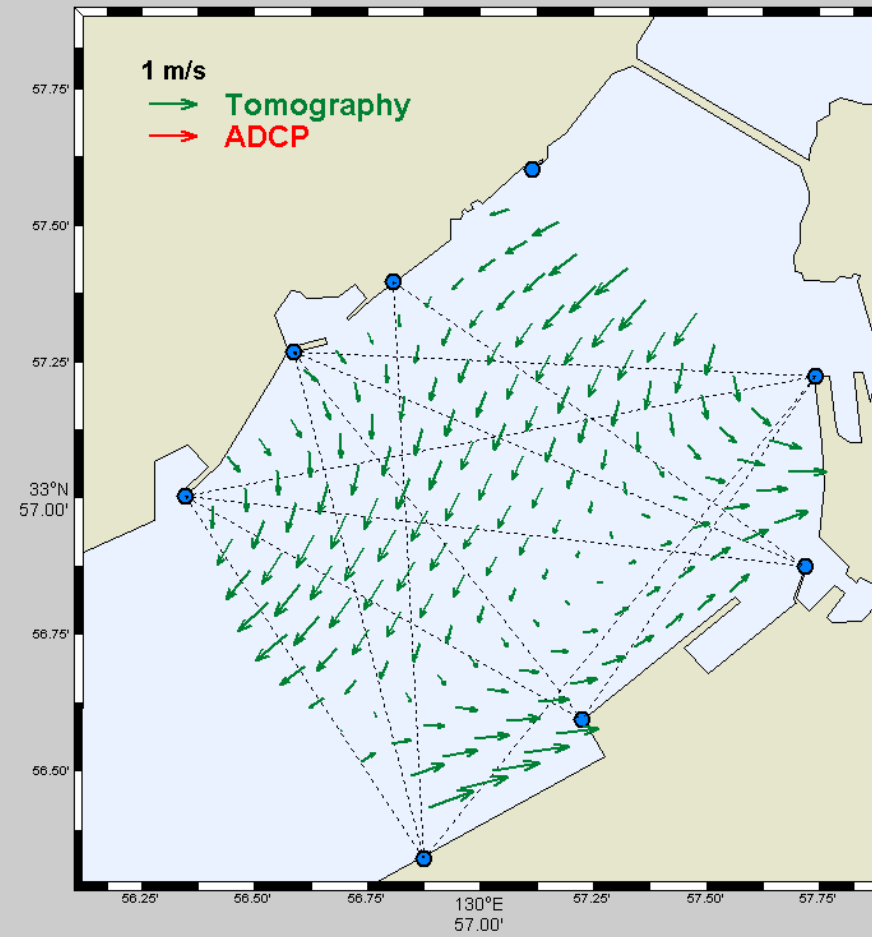
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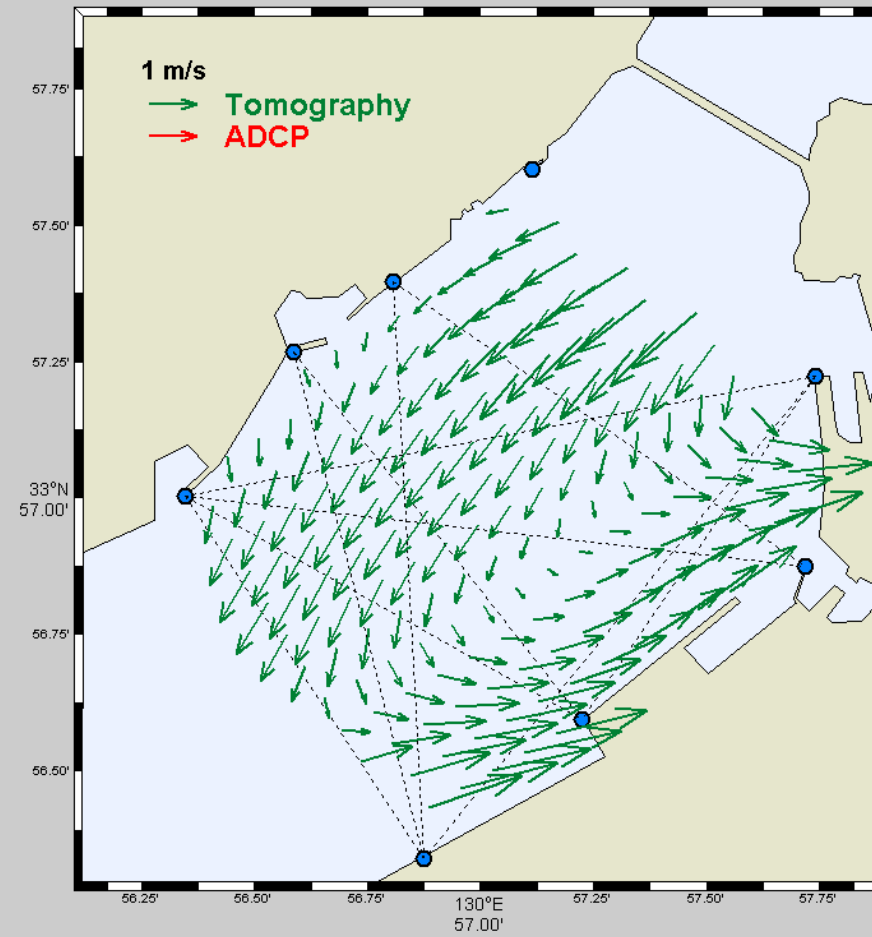
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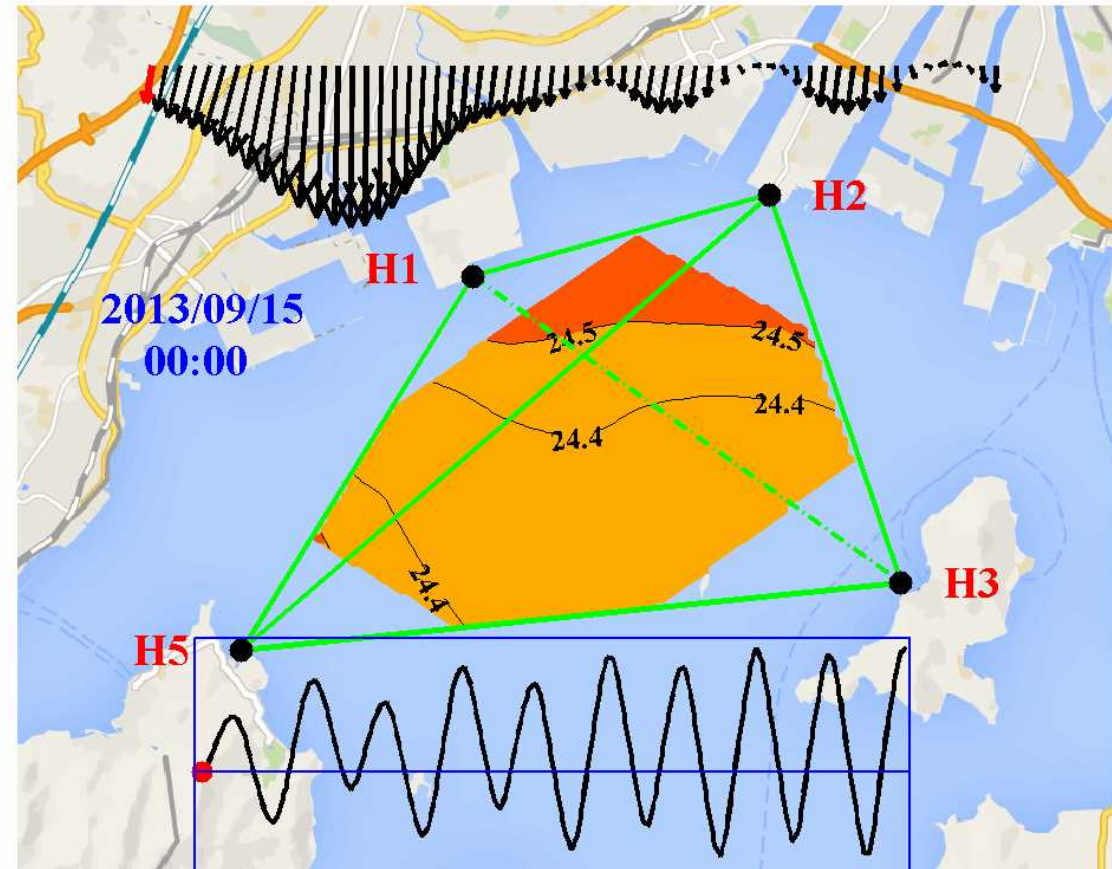
RESEARCH ARTICLE

10.1002/2014JC010676

Key Points:

- Mapping the horizontal structure of temperature by coastal acoustic tomography
- Coastal upwelling and the associated diurnal internal tide generated by

Tomographic mapping of a coastal upwelling and the associated diurnal internal tides in Hiroshima Bay, Japan

Chuanzheng Zhang¹, Arata Kaneko¹, Xiao-Hua Zhu^{2,3}, and Noriaki Gohda¹
¹Graduate School of Engineering, Hiroshima University, Hiroshima, Japan, ²State Key Laboratory of Satellite Ocean Environment Dynamics, Second Institute of Oceanography, State Oceanic Administration, Hangzhou, China, ³Ocean College, Zhejiang University, Hangzhou, China


High-precision measurement of tidal current structures using coastal acoustic tomography

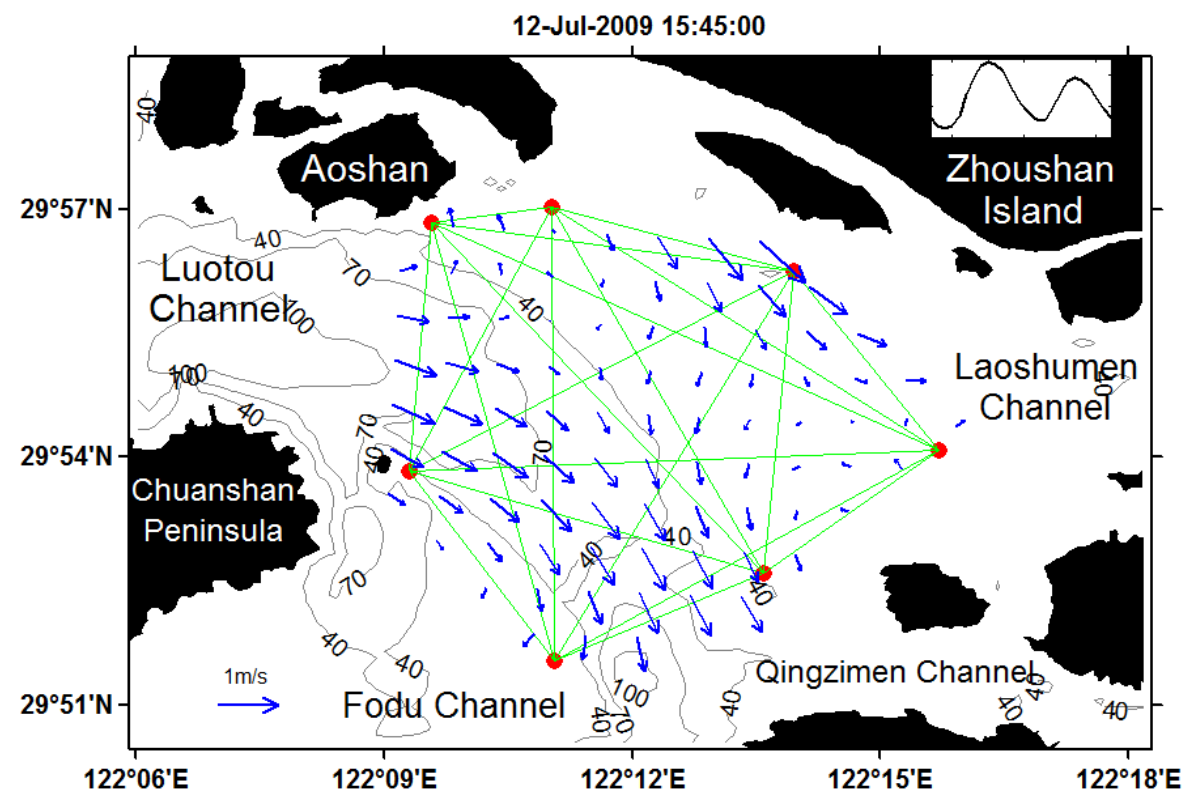


Chuanzheng Zhang^a, Xiao-Hua Zhu^{a, c, *}, Ze-Nan Zhu^a, Wenhui Liu^a, Zhongzhe Zhang^b, Xiaopeng Fan^a, Ruixiang Zhao^a, Menghong Dong^a, Min Wang^a

^a State Key Laboratory of Satellite Ocean Environment Dynamics, Second Institute of Oceanography, State Oceanic Administration, Hangzhou, 310012, China

^b College of Marine Science and Environment, Dalian Ocean University, Dalian, 116023, China

^c Ocean College, Zhejiang University, Zhoushan, 316021, China



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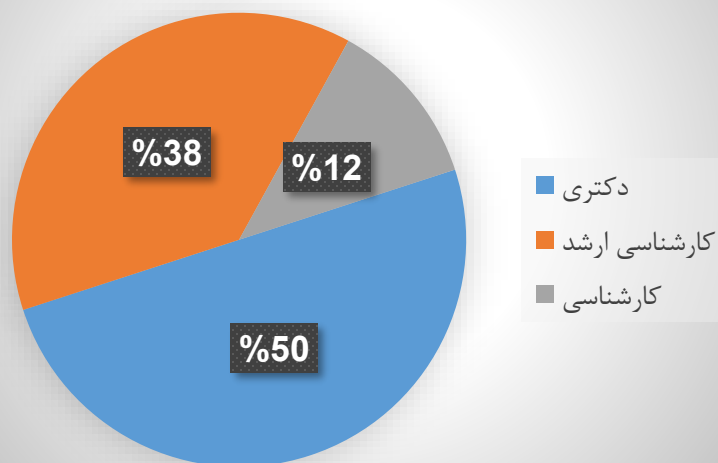
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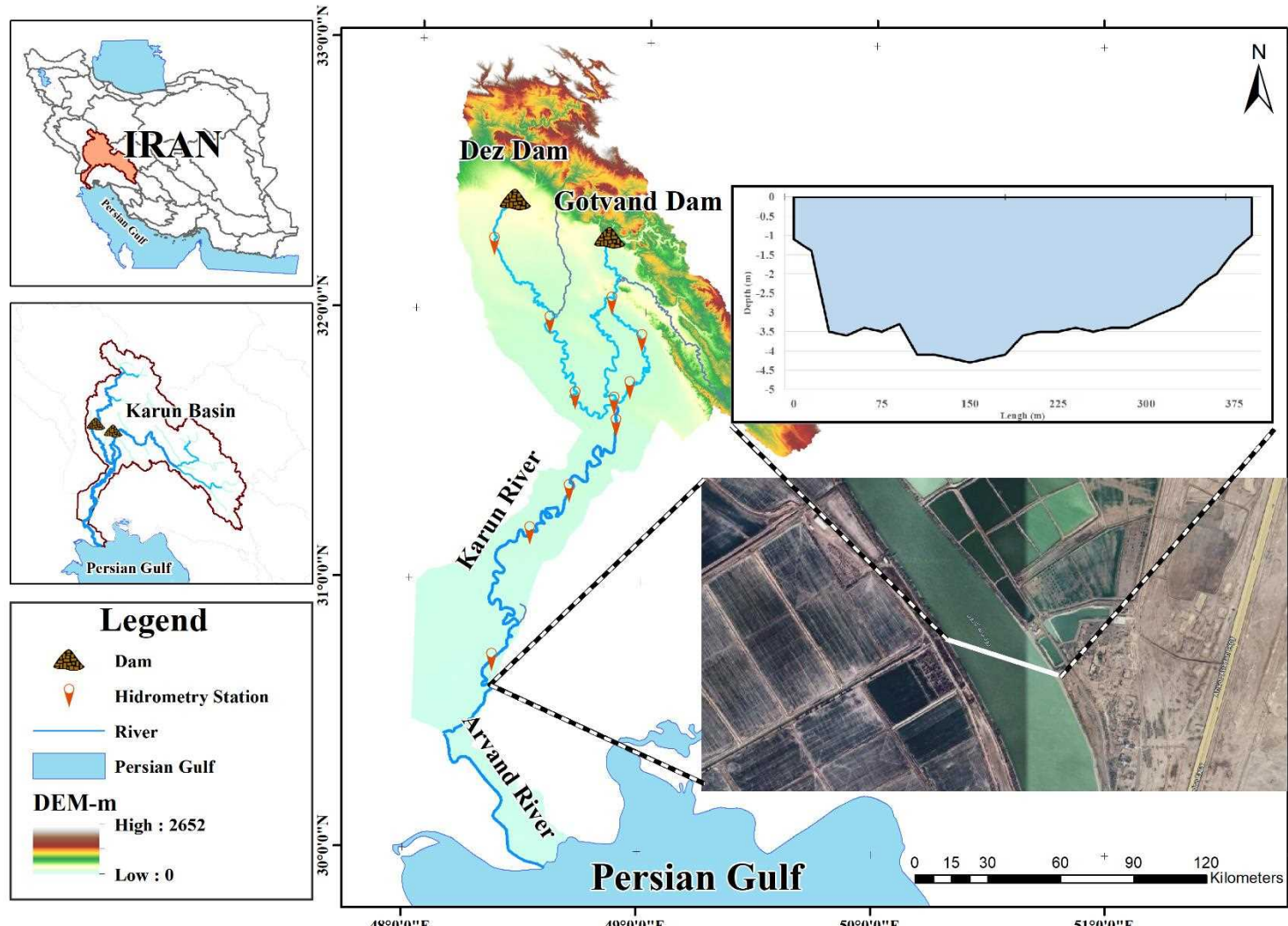
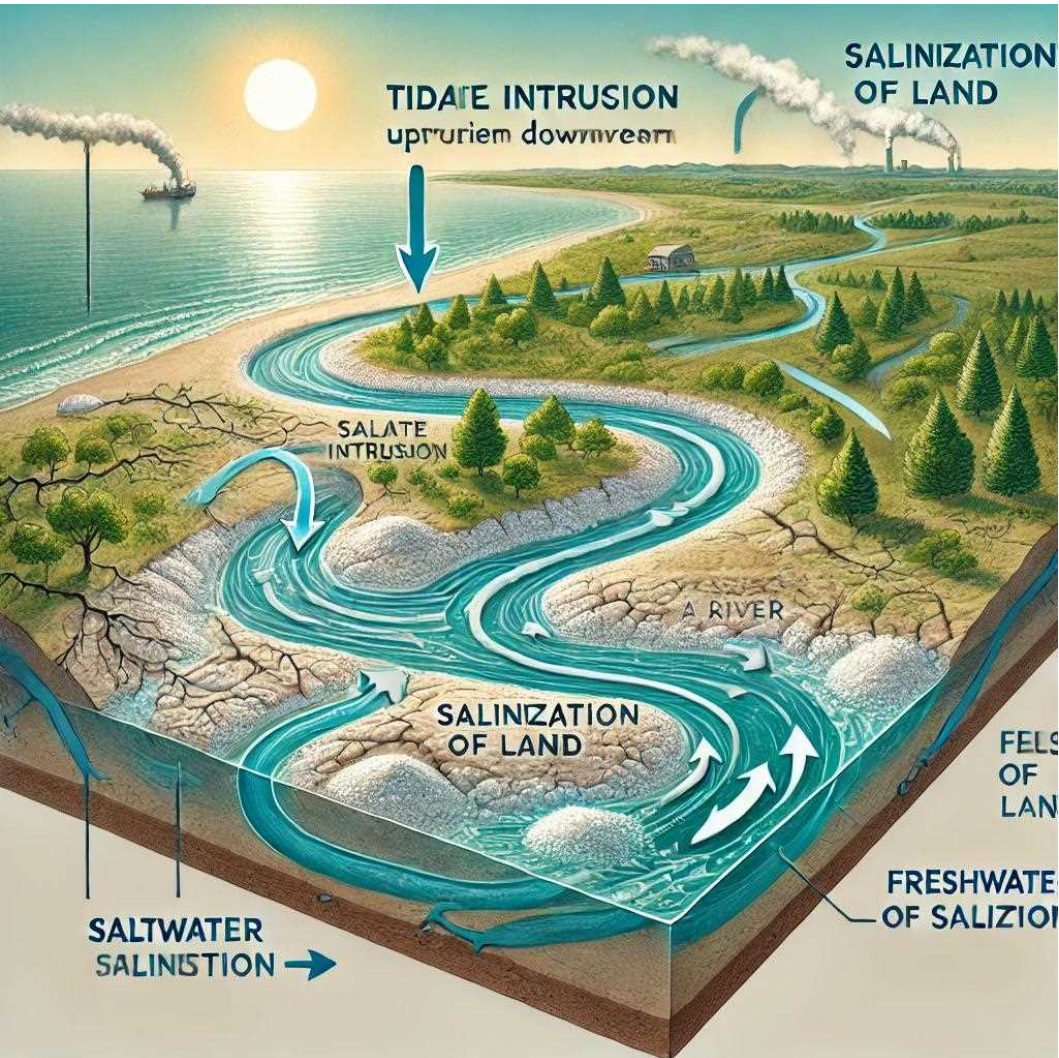
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SOLUTION



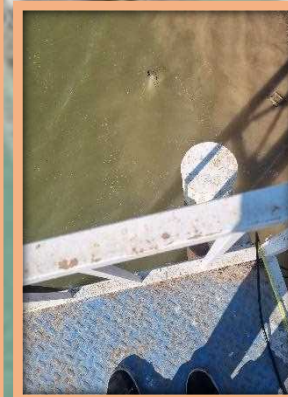


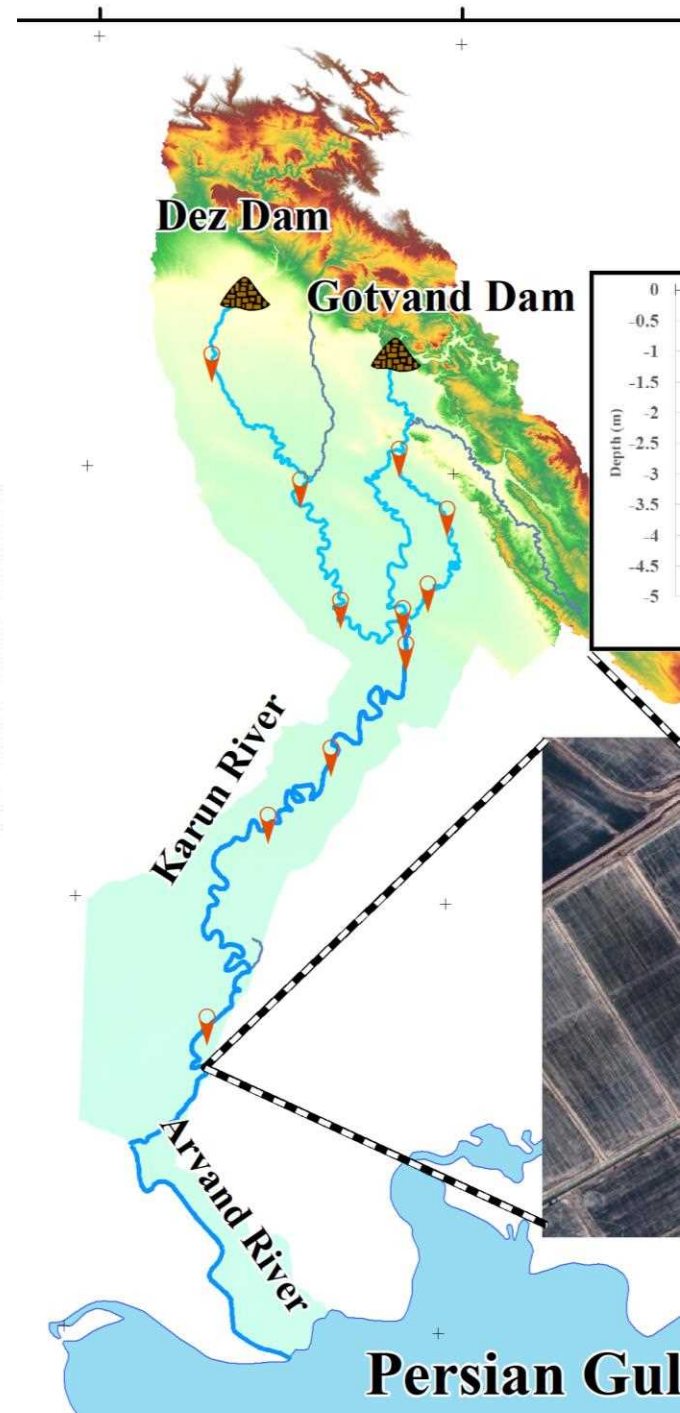
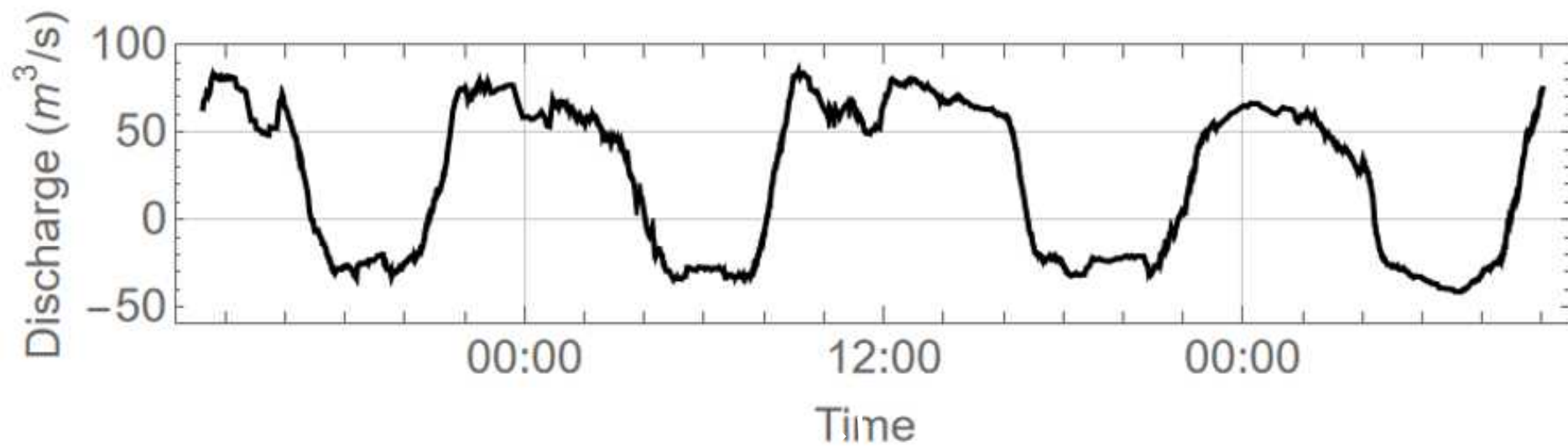
National Projects

Salinity Intrusion, Karun River



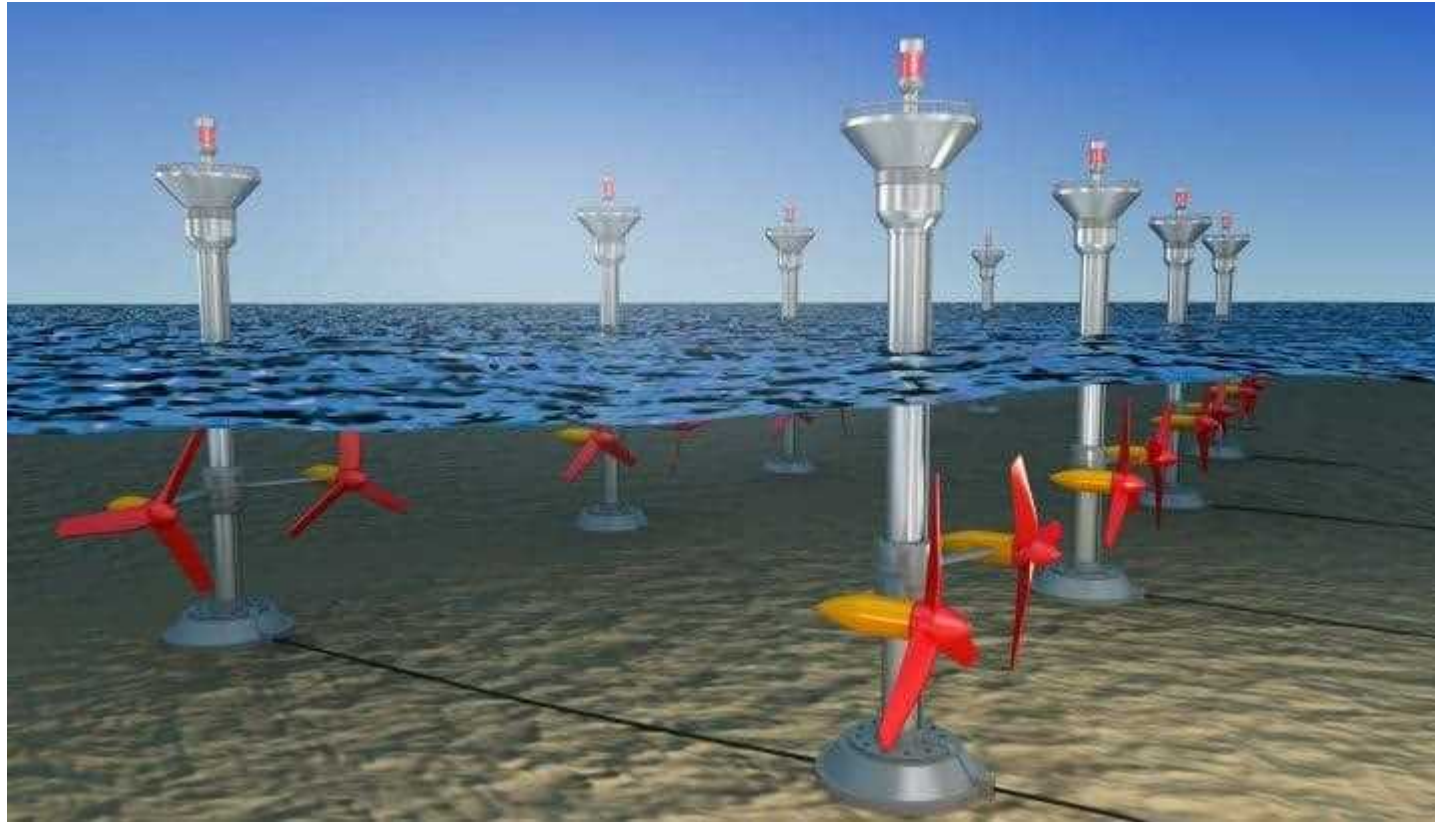
Salmaneh Hydrometric Station





National Projects

Site selection for tidal turbine installation to achieve maximum efficiency

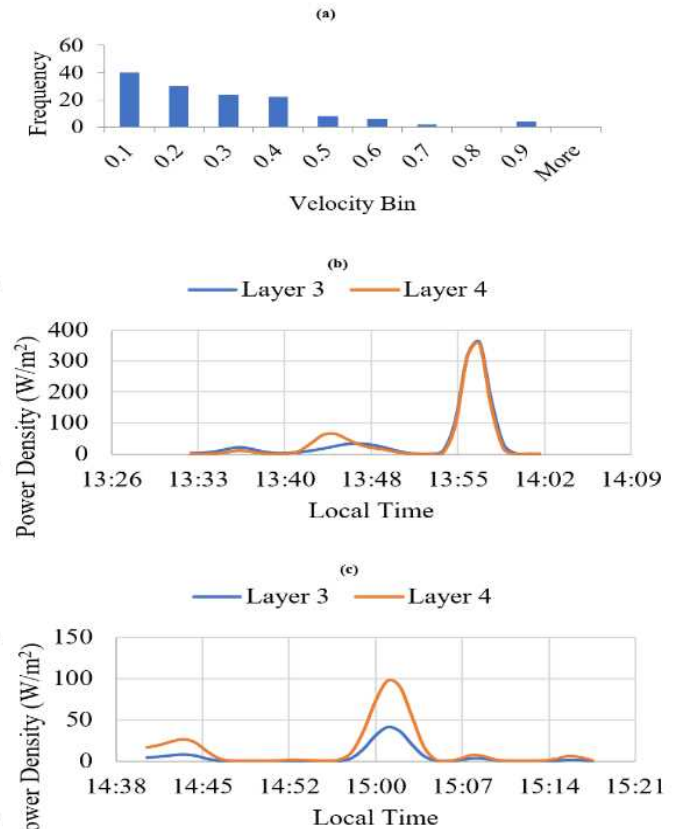
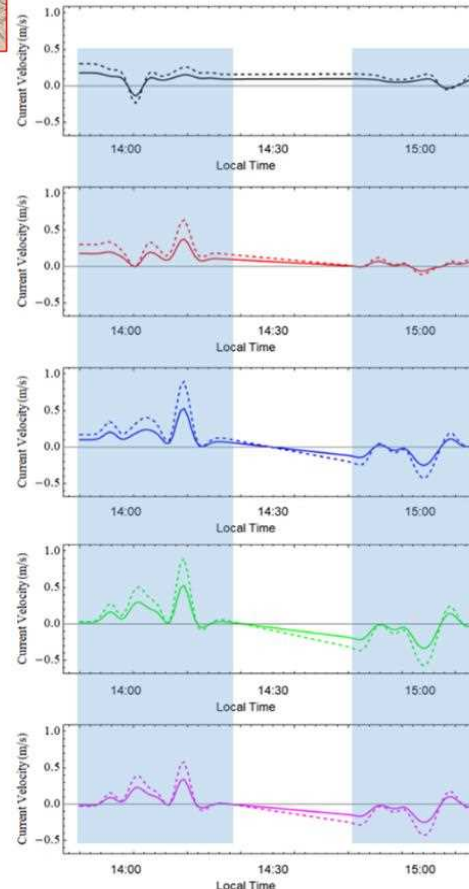
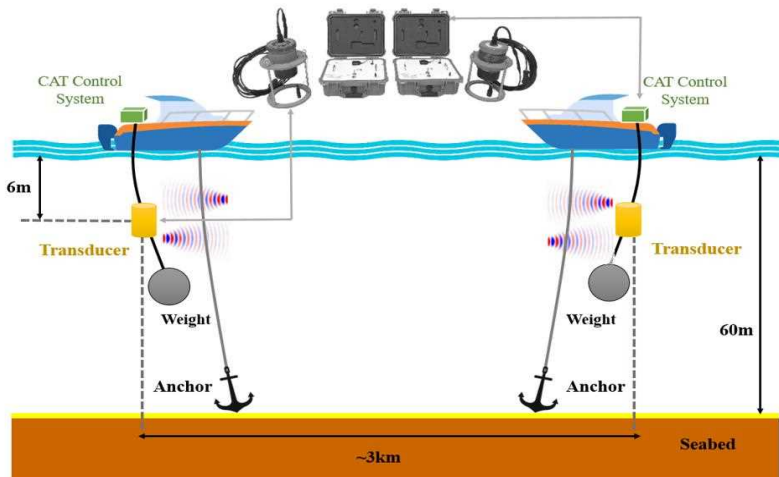


Long-range power density profiling measurement using Coastal Acoustic Tomography (Study area: Persian Gulf)

(a)



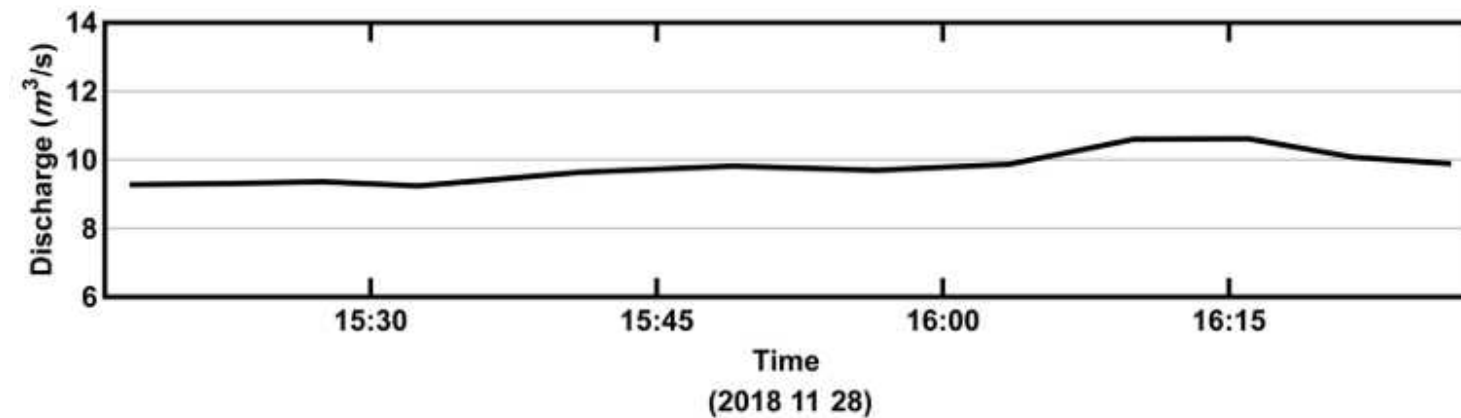
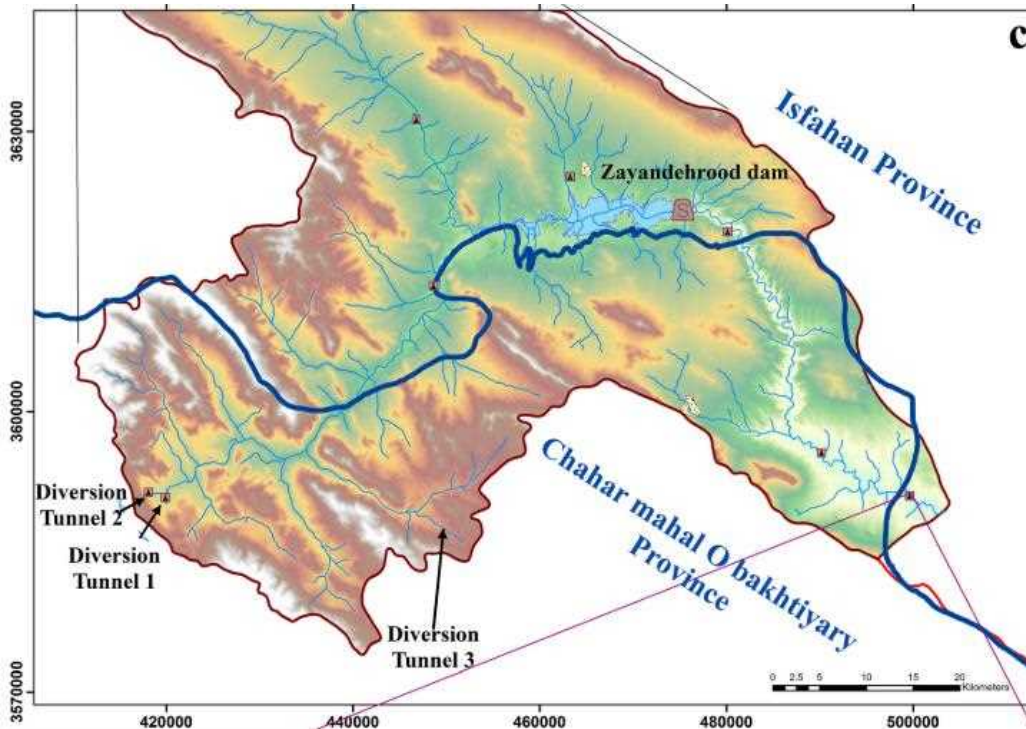
(b)

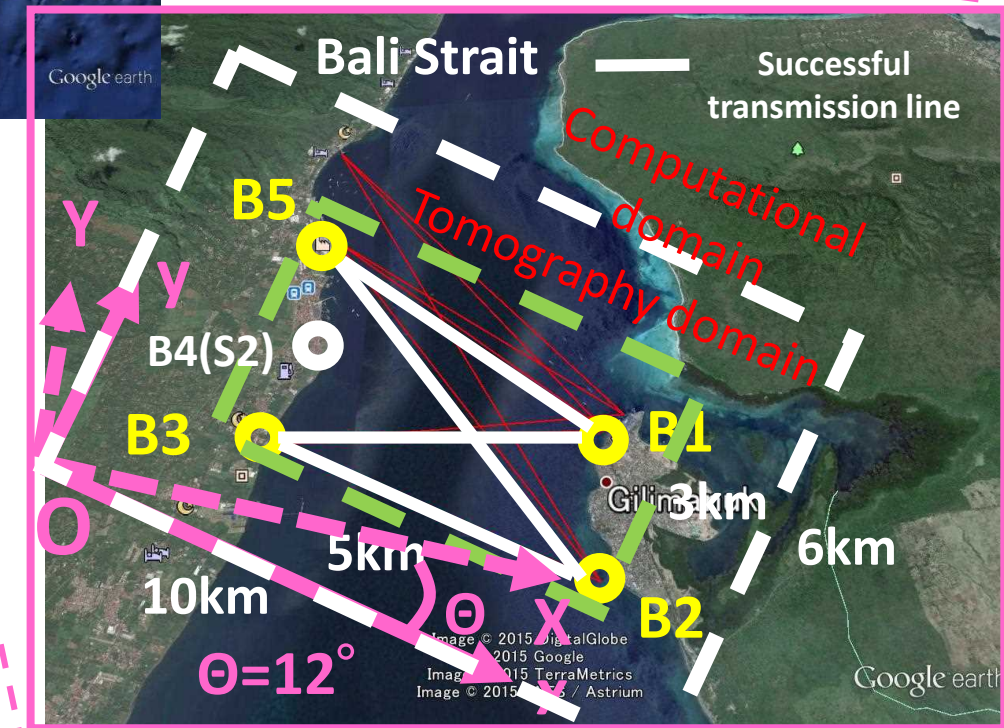
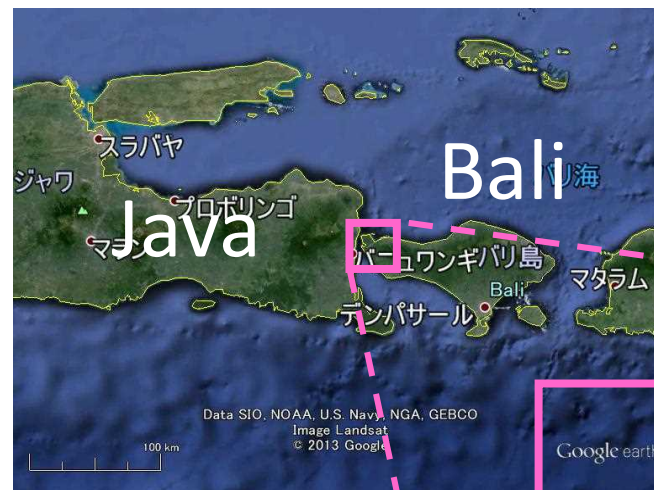




Continuous streamflow monitoring in shared watersheds using advanced underwater acoustic tomography system: a case study on Zayanderud River

Masoud Bahreinimotlagh • Kiyosi Kawanisi •
Mohammad Basel Al Sawaf • Reza Roozbahani •
Mortaza Eftekhari • Abbas Kazemi Khoshuie

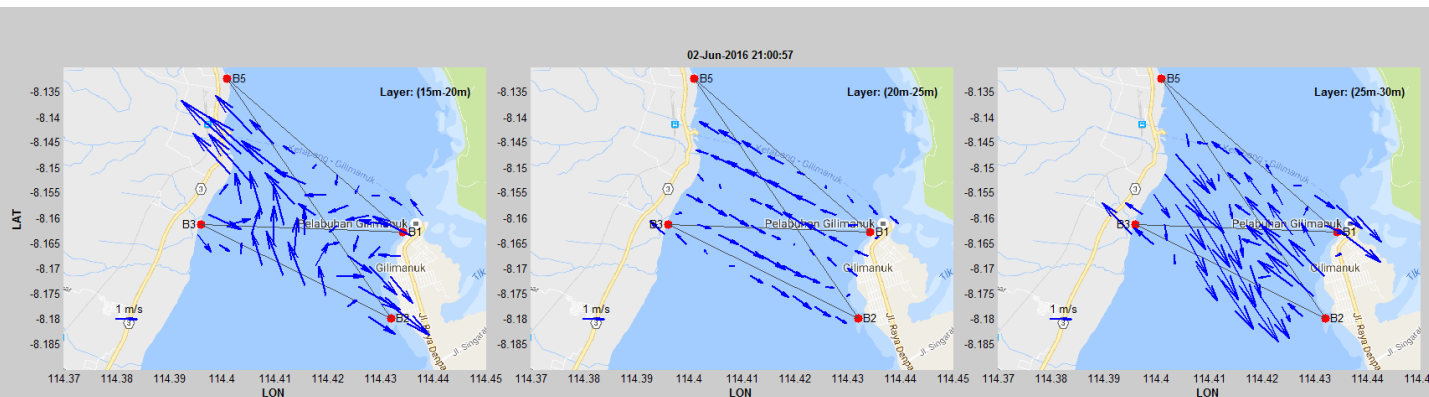


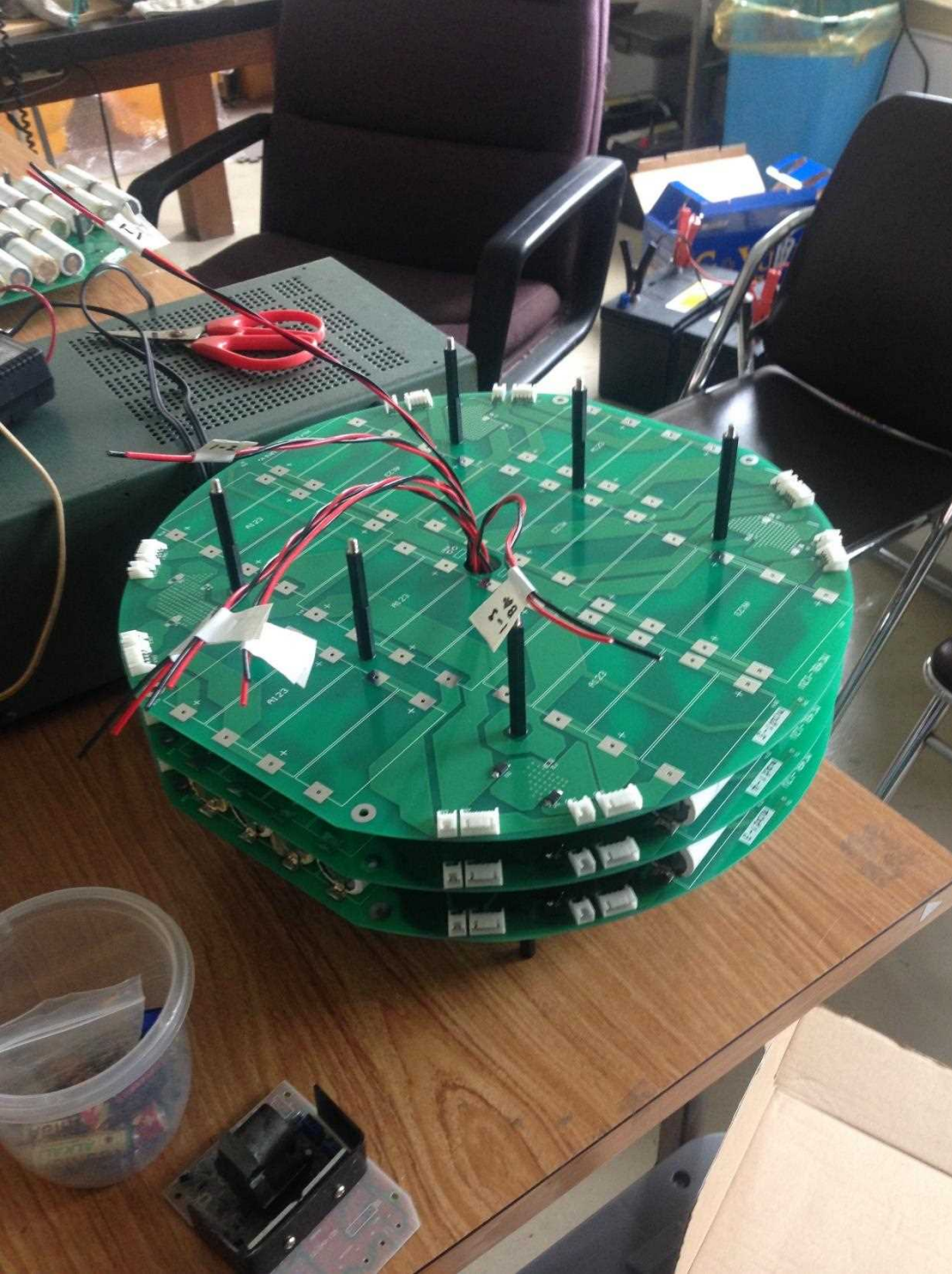


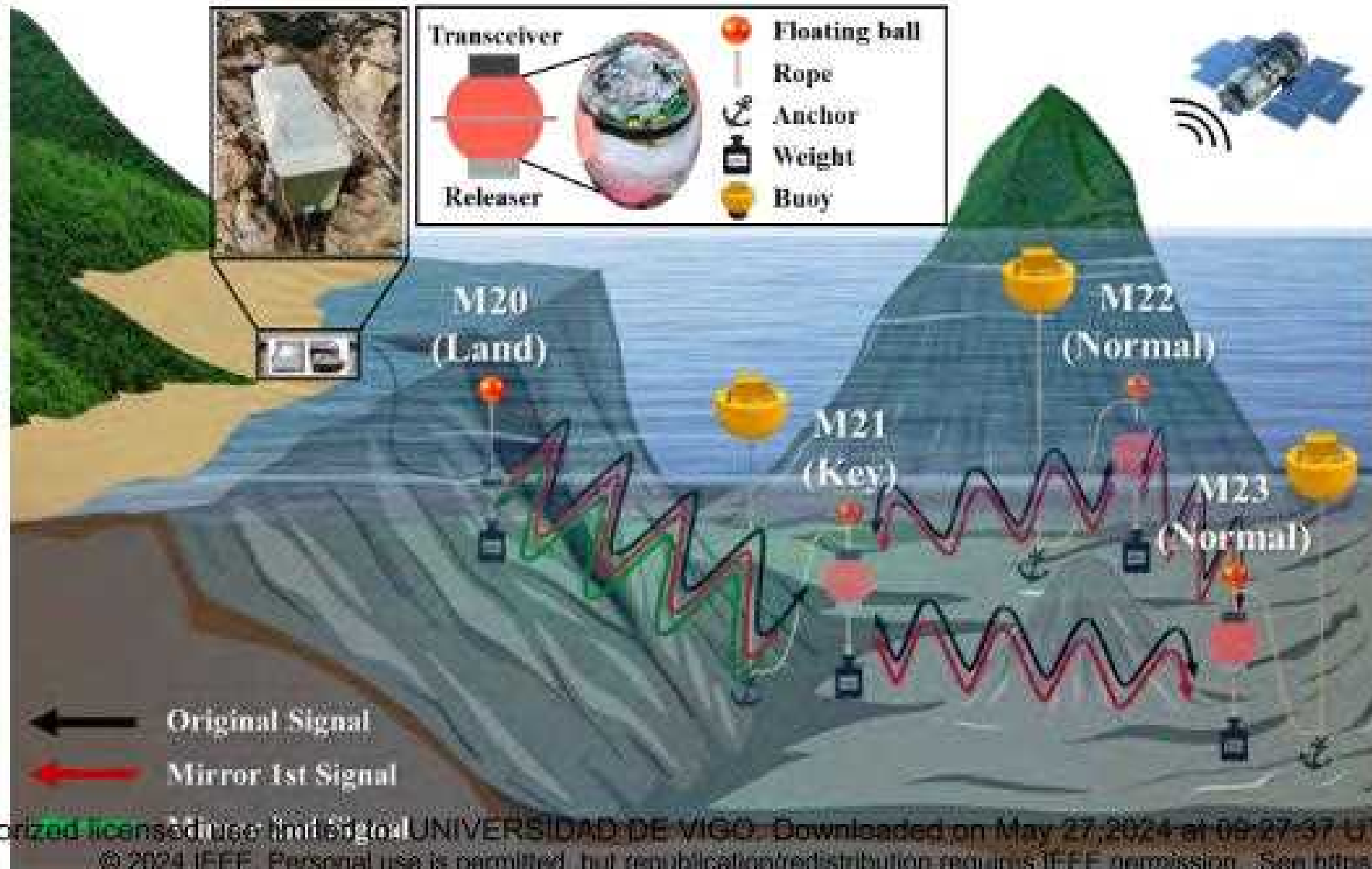
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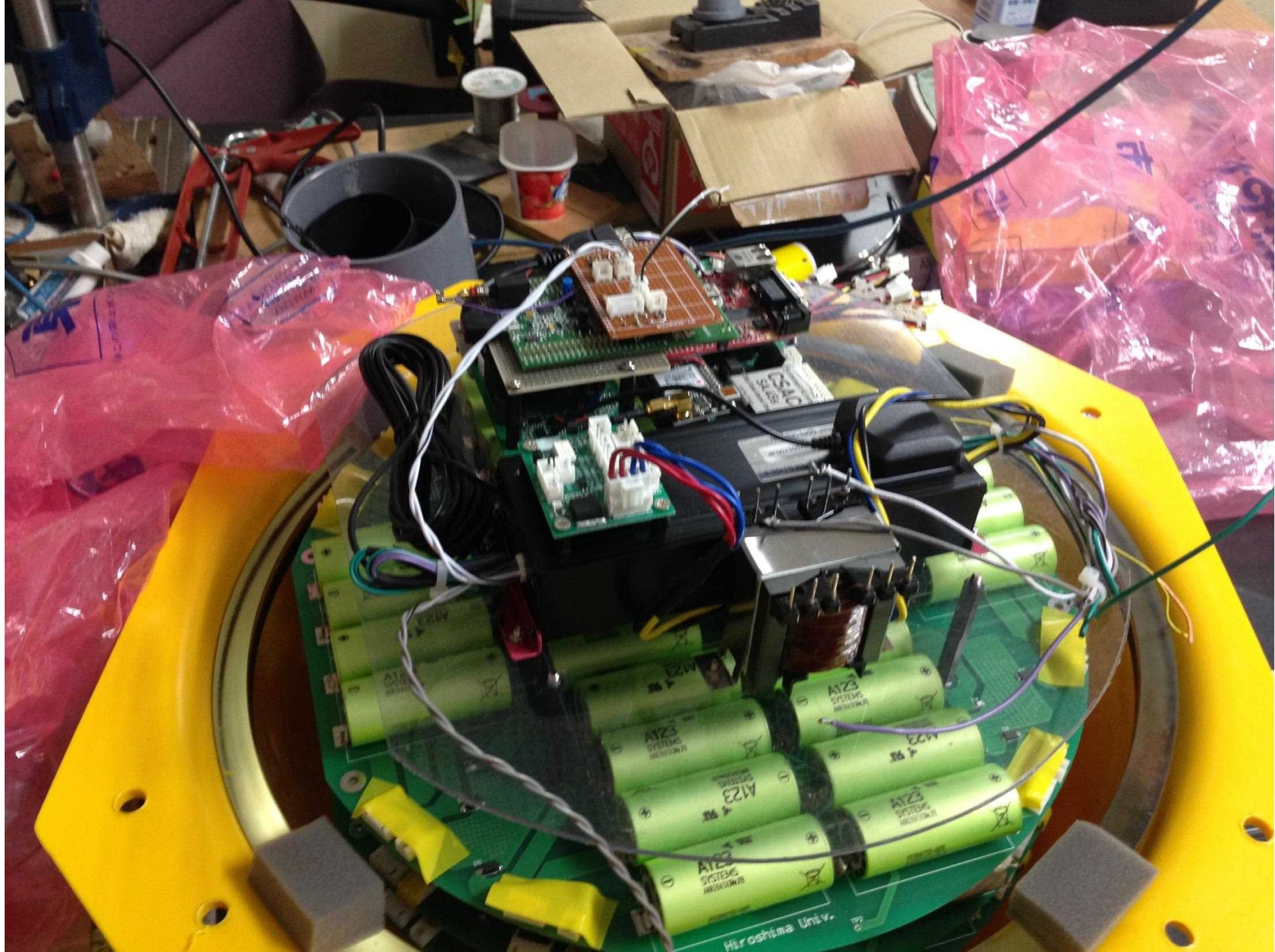
20-25 m

25-30 m

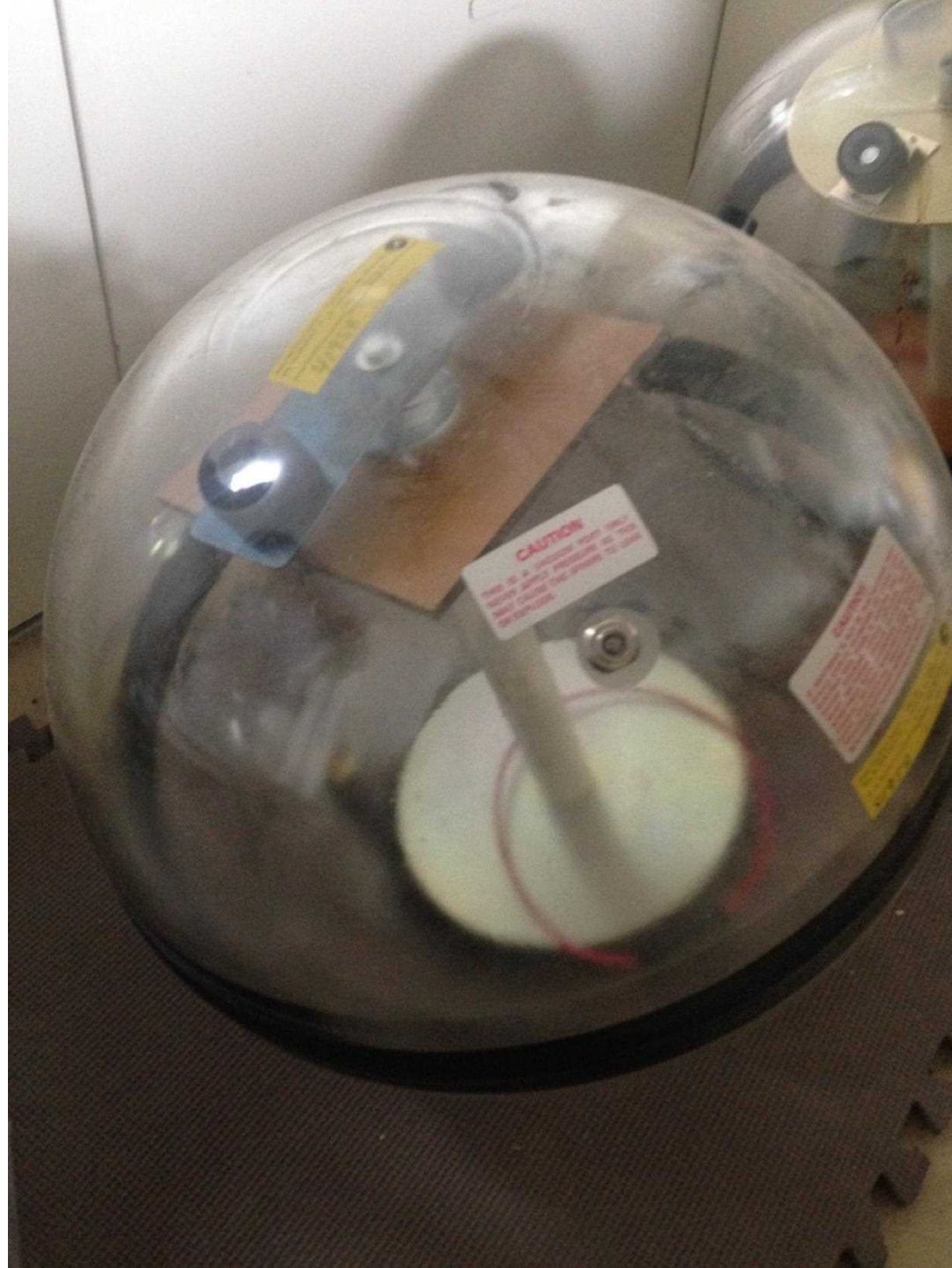






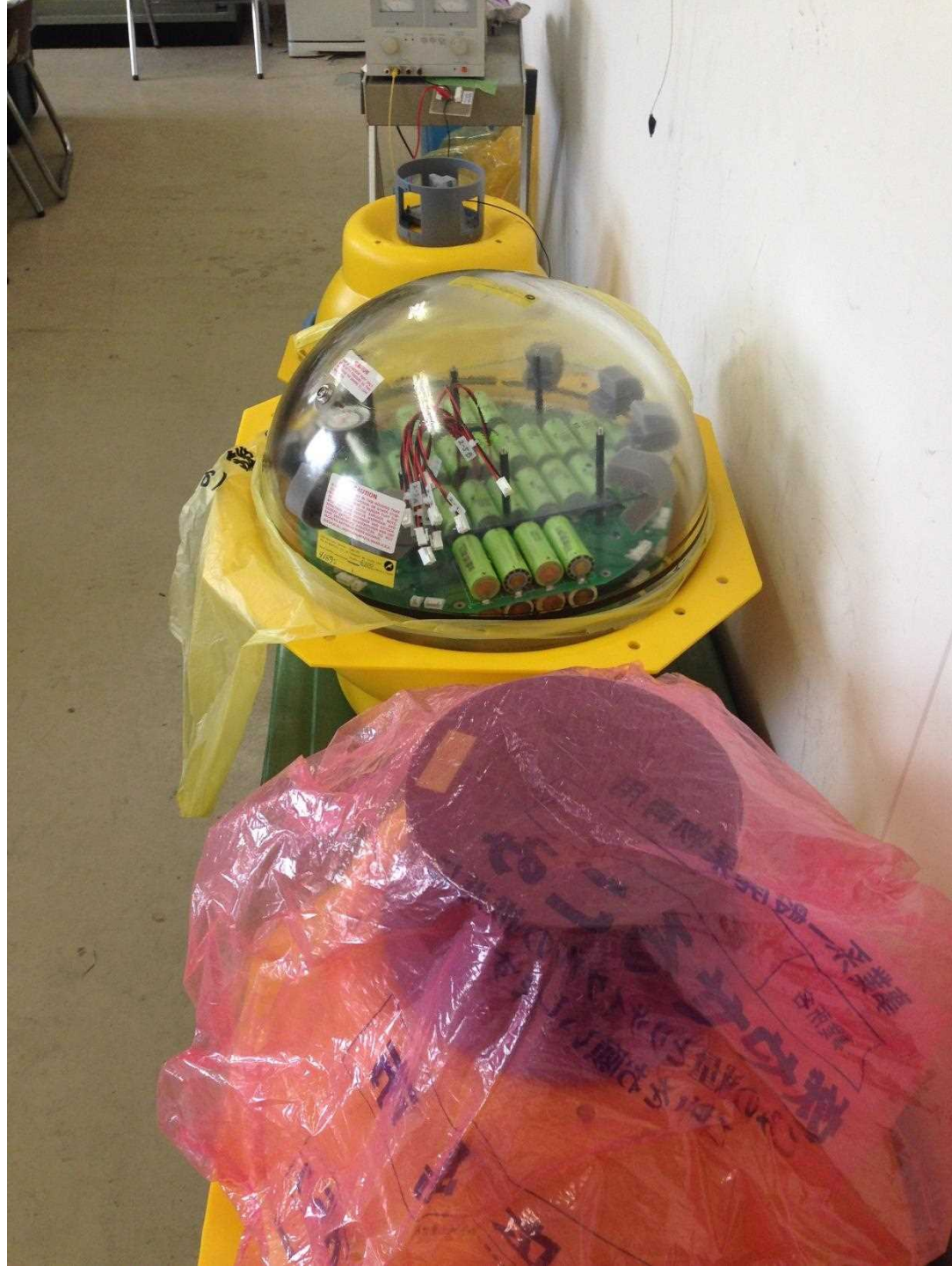




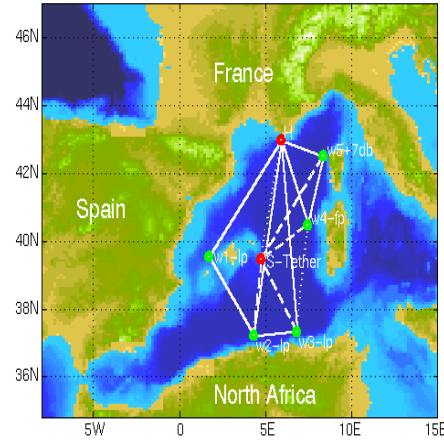










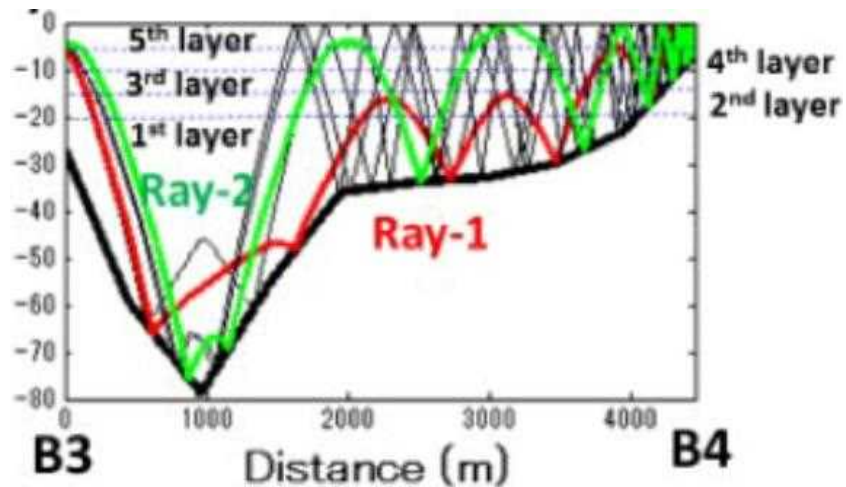
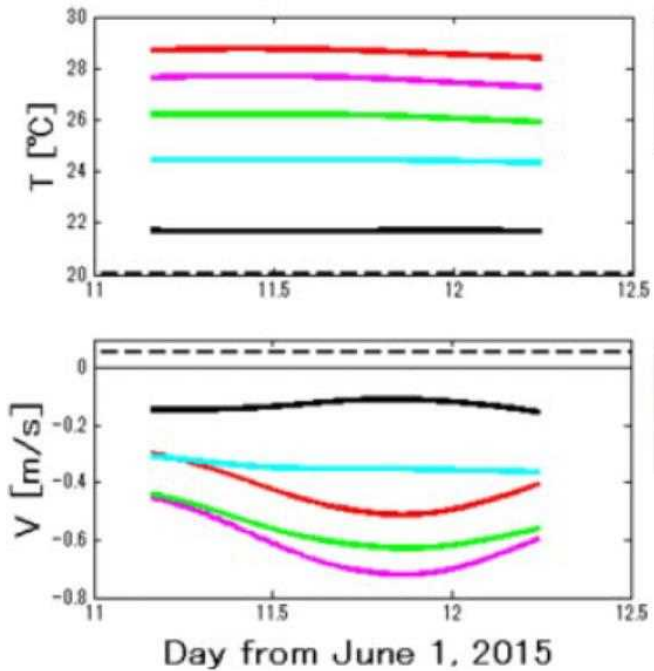
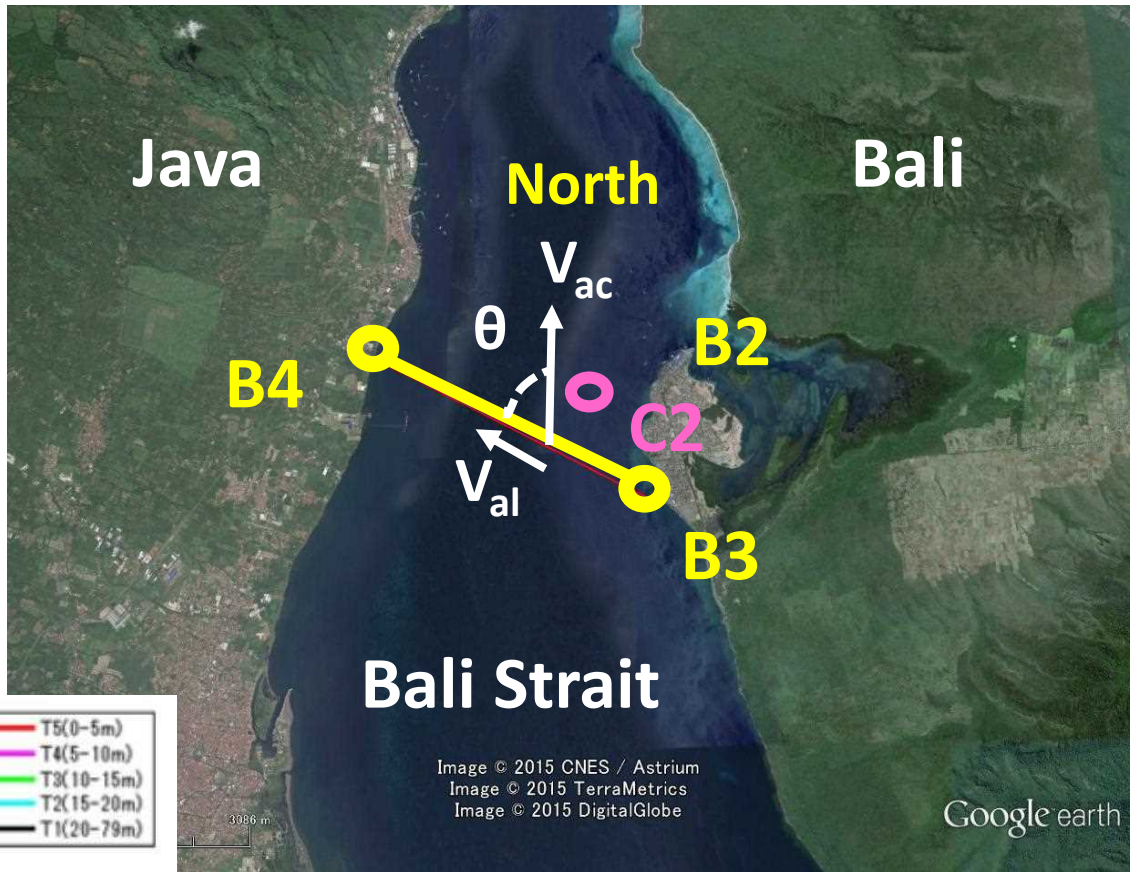


80 kHz
700 m



800 Hz
100 km







Research papers

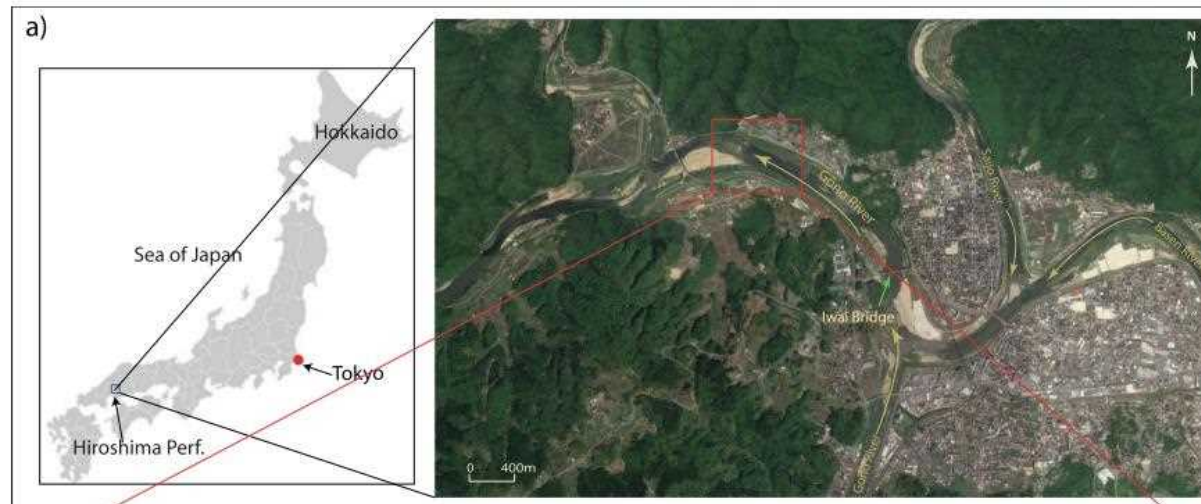
Continuous measurement of flow direction and streamflow based on travel time principles using a triangular distribution of acoustic tomography systems

Mohamad Basel Al Sawaf^{a,*}, Kiyosi Kawanisi^b, Gillang Noor Nugrahaning Gusti^b, Faruq Khadami^b, Cong Xiao^b, Masoud Bahreinimotlagh^c

^a Department of Engineering, Kitami Institute of Technology, Koen-chō 165, Kitami 090-8507, Japan

^b Department of Civil and Environmental Engineering, Graduate School of Advanced Sciences and Engineering, Hiroshima University, 1-4-1 Kagamiyama, Higashi-Hiroshima 739-8527, Japan

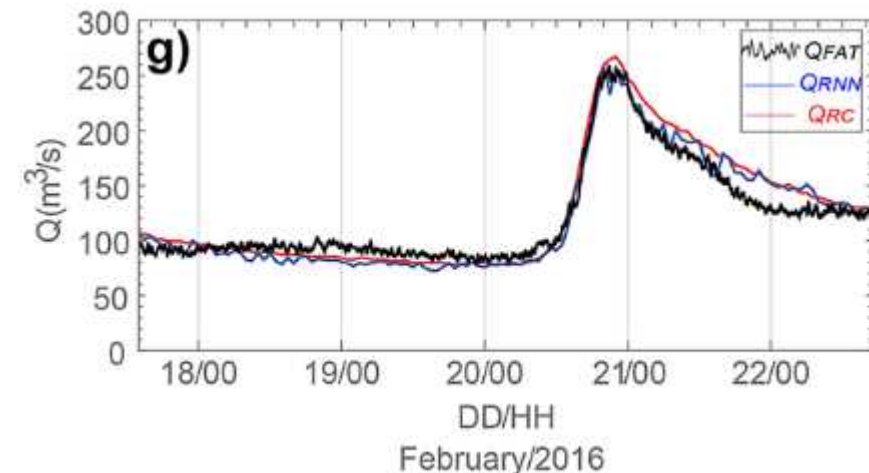
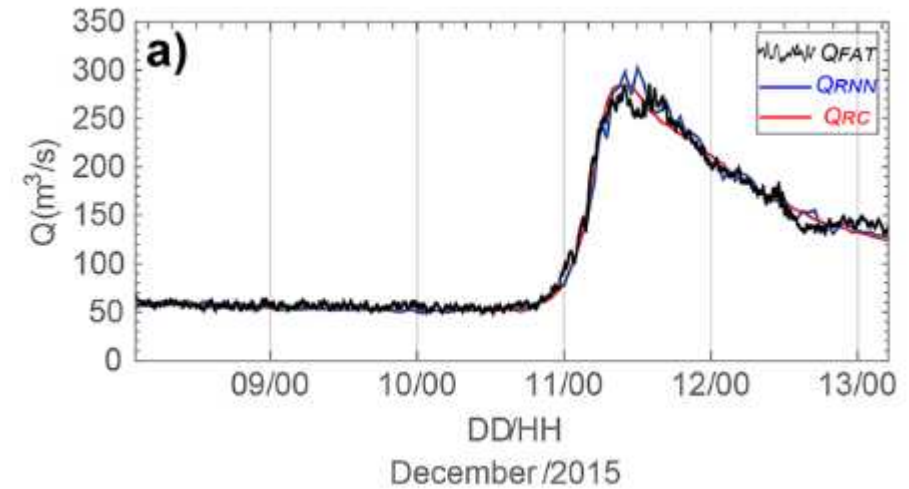
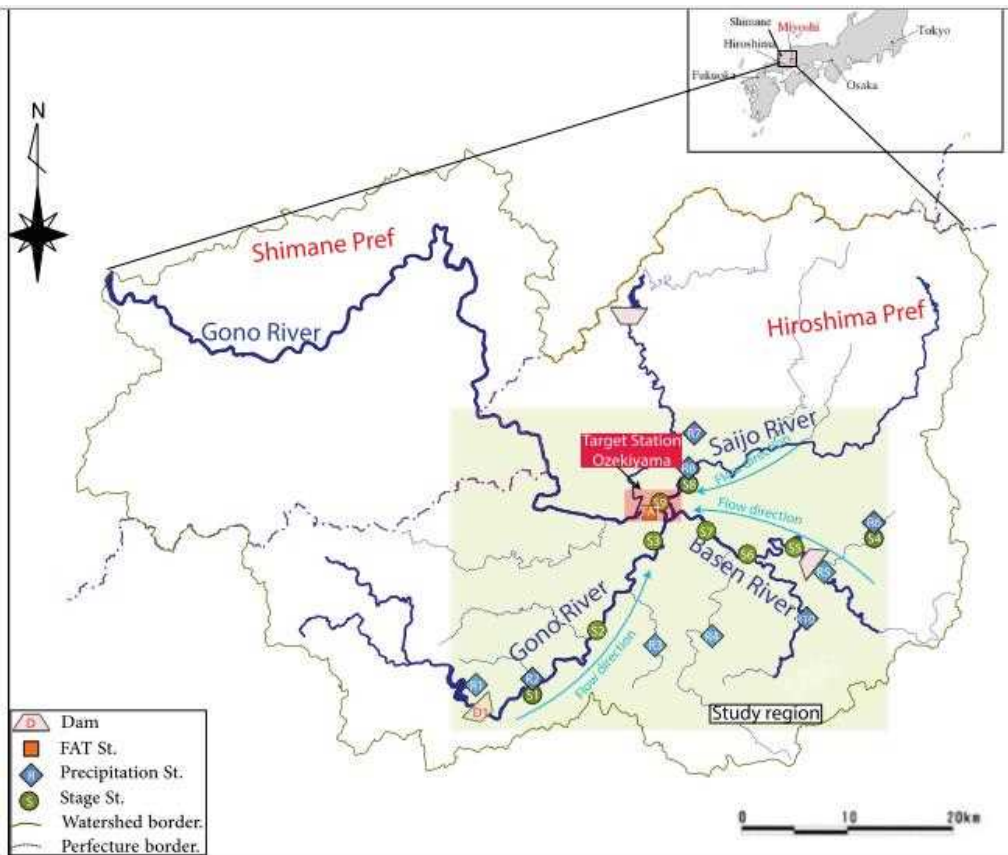
^c Department of Water Resources Studies and Research, Water Research Institute, Tehran, Iran





Extent of detection of hidden relationships among different hydrological variables during floods using data-driven models

Mohamad Basel Al Sawaf · Kiyosi Kawanisi ·
 Mohamad Nazieh Jilati · Cong Xiao ·
 Masoud Bahreinimotlagh



ENERGY FLUX MEASUREMENT OF TIDAL STREAM IN A STRAIT USING TWO CROSSING ULTRASONIC TRANSMISSION LINES

KIYOSI KAWANISI ⁽¹⁾, MASOUD BAHRAINI MOTLAGH ⁽²⁾ & MAHDI RAZAZ ⁽³⁾

⁽¹⁾ Institute of Engineering, Hiroshima University, Higashi Hiroshima, Japan,
kiyosi@hiroshima-u.ac.jp

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masoud.bahraini.motlagh@gmail.com

⁽³⁾ Physical Oceanography, Memorial University of Newfoundland, Newfoundland, Canada,
mrazaz@mun.ca

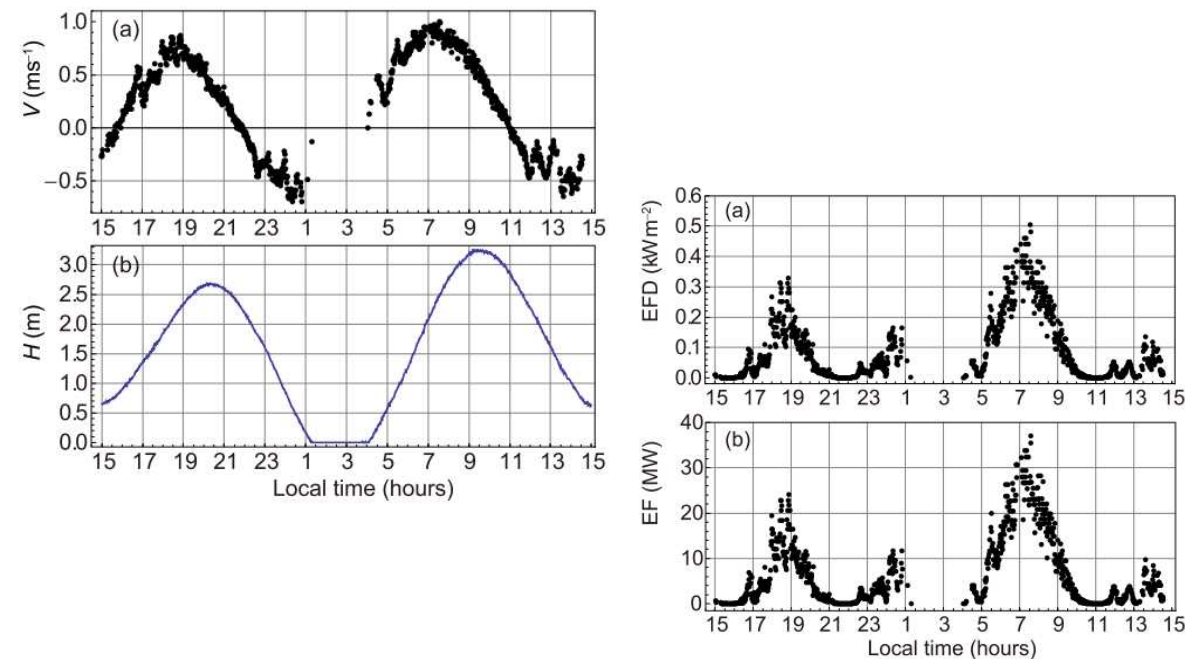
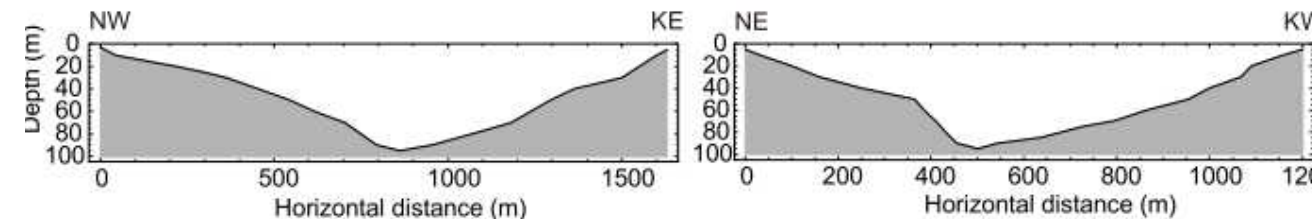
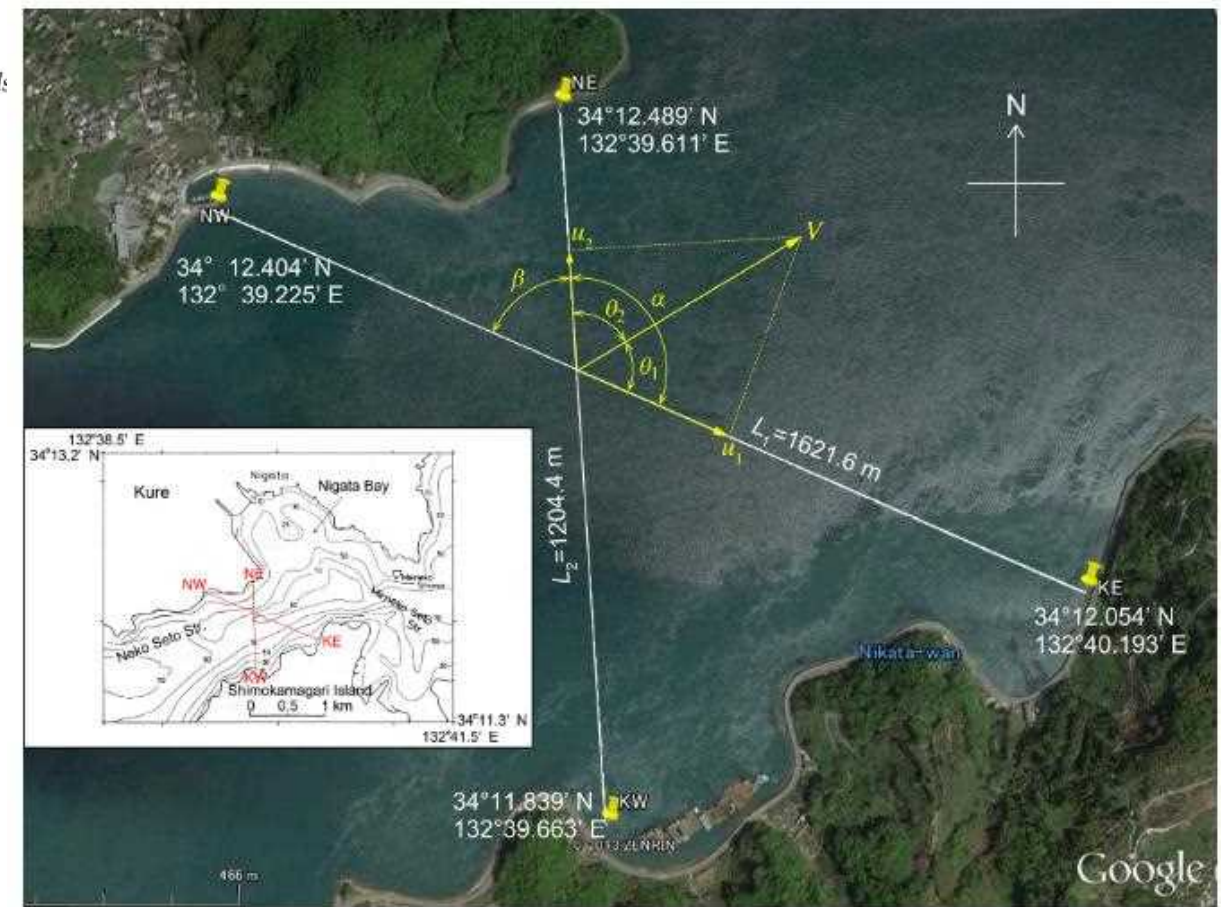


Figure 4. Temporal variations in (a) energy flux density (EFD) and (b) energy flux (EF) through the strait.



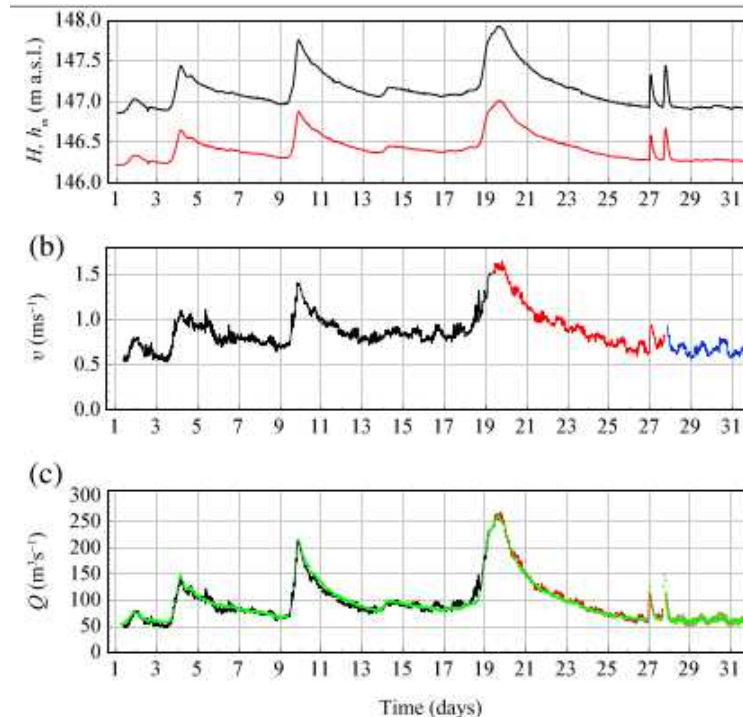
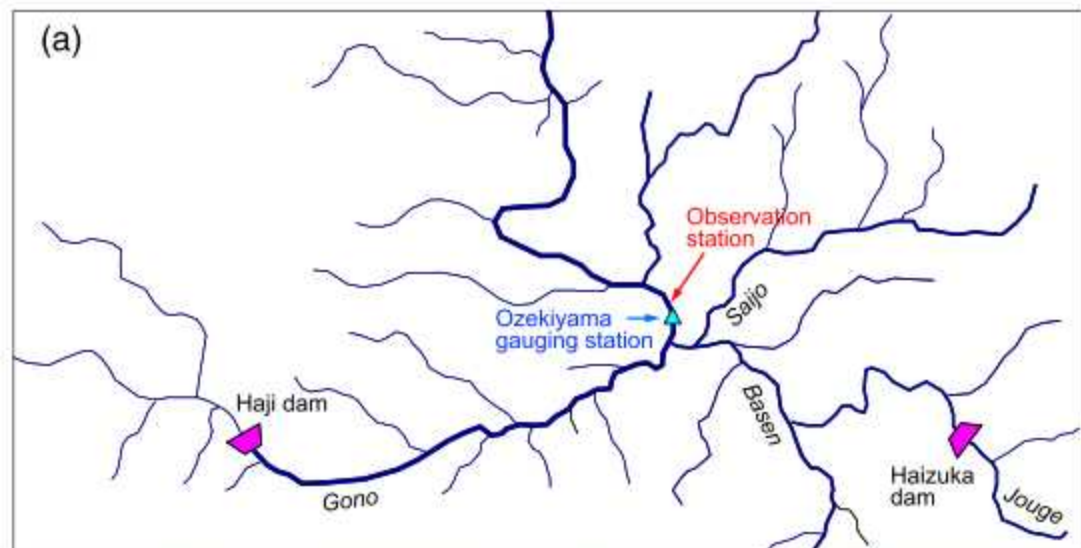
High-frequency streamflow acquisition and bed level/flow angle estimates in a mountainous river using shallow-water acoustic tomography

Kiyosi Kawanisi,^{1*} Masoud Bahrainimotlagh,² Mohamad Basel Al Sawaf² and Mahdi Razaz³

¹ Department of Civil and Environmental Engineering, Institute of Engineering, Hiroshima University, 1-4-1 Kagamiyama, Higashi, Hiroshima, 739-8527, Japan

² Department of Civil and Environmental Engineering, Graduate School of Engineering, Hiroshima University, 1-4-1 Kagamiyama, Higashi, Hiroshima, 739-8527, Japan

³ Department of Physical Oceanography, Memorial University of Newfoundland, 500 Prince Philip Dr., St. John's, NL, Canada



ACOUSTIC INVESTIGATIONS OF TIDAL BORES IN QIANTANG RIVER

Masoud Bahreini Motlagh¹, Kiyosi Kawanisi² and Xiao-Hua Zhu³

¹Member of JSCE, Dr. Student., Coastal Engineering, Dept. of Civil and Environmental Engineering, Hiroshima University (Kagamiyama 1-4-1, Higashi Hiroshima, 739-8527, Japan) and Faculty Member of Zabol University, Iran

²Member of JSCE, Dr. of Eng., Assoc. Professor., Coastal Engineering, Dept. of Civil and Environmental Engineering, Hiroshima University (Kagamiyama 1-4-1, Higashi Hiroshima, 739-8527, Japan)

³Professor, State Key Laboratory of Satellite Ocean Environment Dynamics, Second Institute of Oceanography (Hangzhou 310012, China)

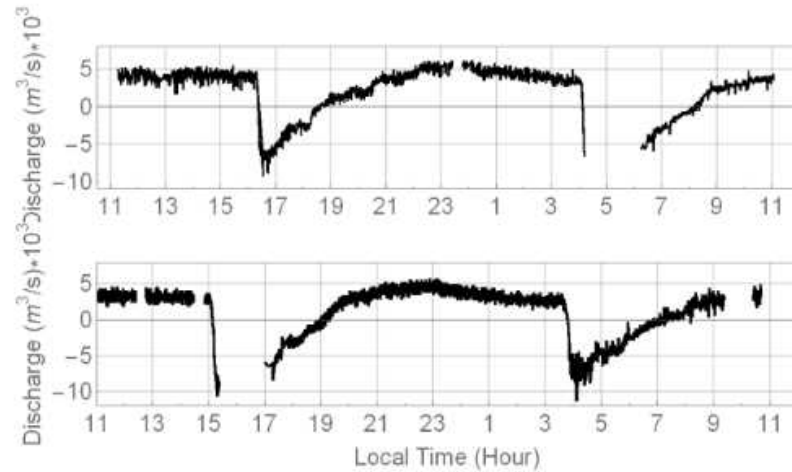


Fig.12 Flow rates of May and November

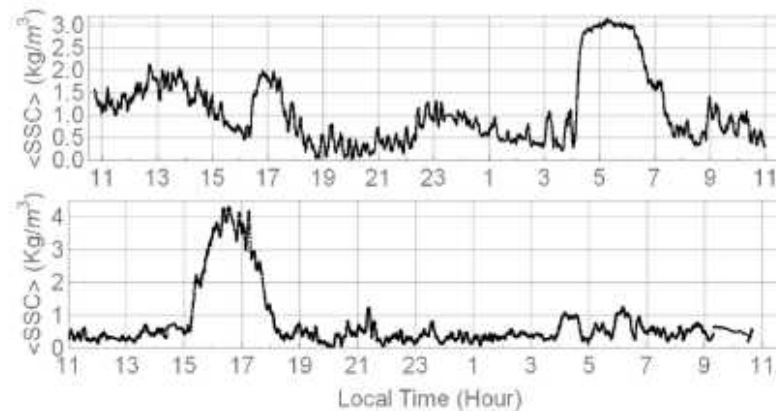
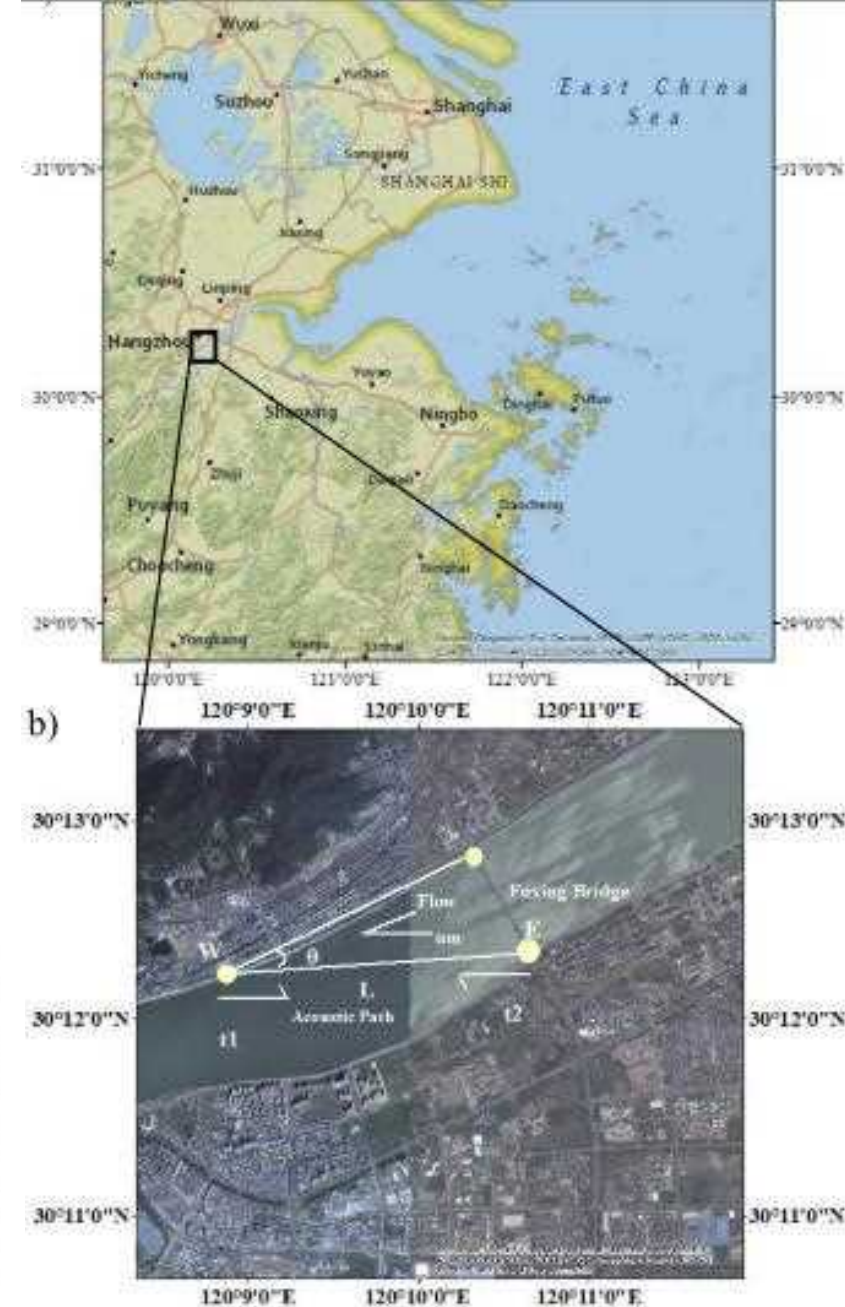


Fig.10 <SSC> estimated by acoustic tomography (AT) in May and November respectively.



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Mapping knowledge structure and research frontiers of underwater acoustic tomography: a scientometric study

Masoud Bahreinimotlagh ^{A*}, Reza Roozbahani^A, Mohammad Amin Fayz Chakab^B, Mohamad Basel Al Sawaf^C, Mortaza Eftekhari^A and Seyyed Ahmad Sajjadi^D

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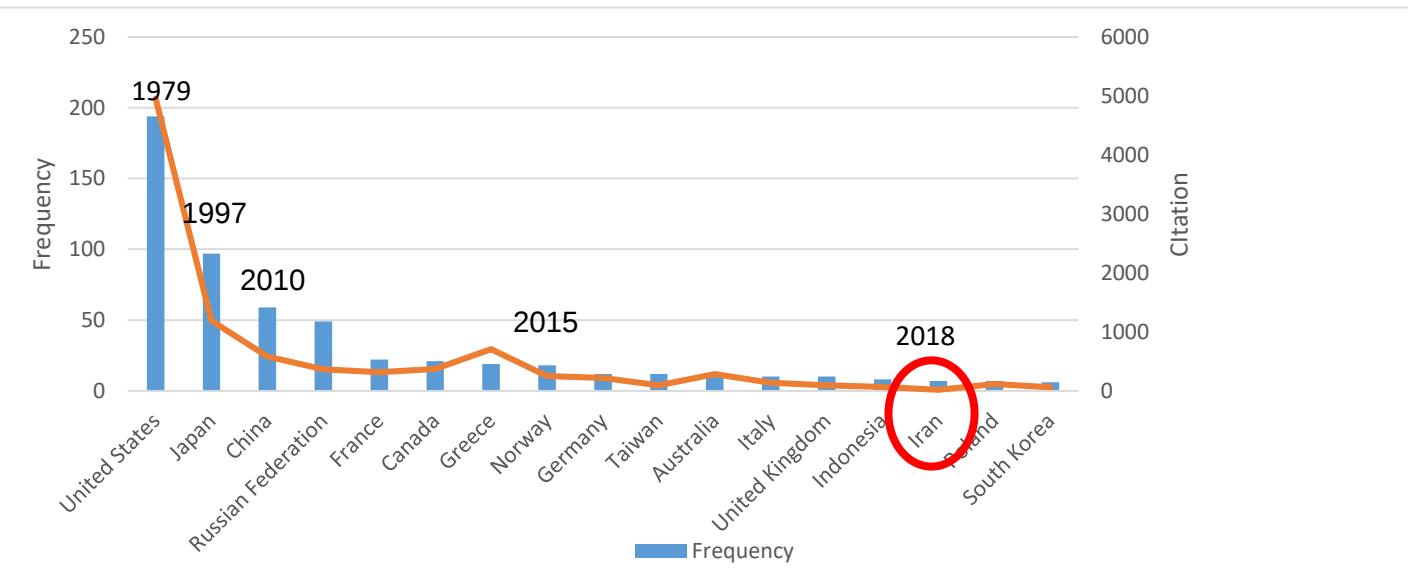
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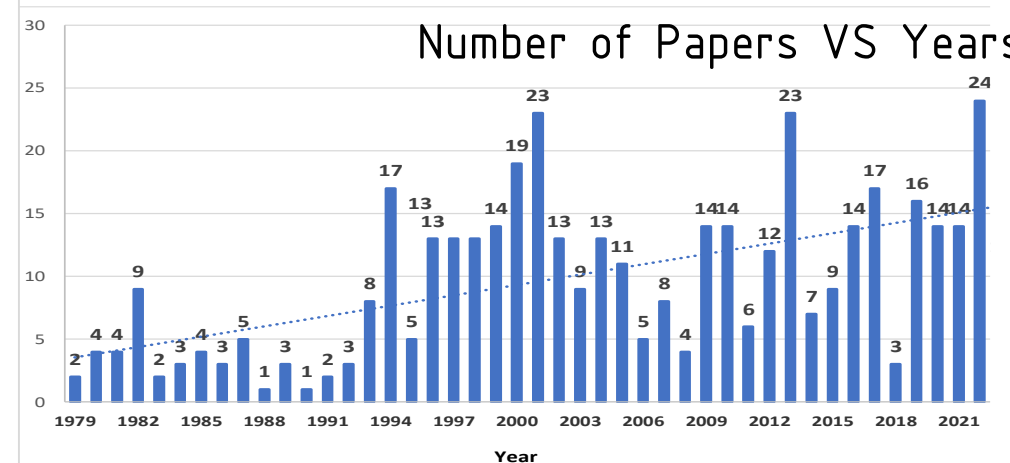
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The next generation of Acoustic Tomography Systems

Acoustic Tomography (AT) is proposed as a robust solution to monitor rivers, estuaries, seas and oceans, lakes, and dam reservoirs, as well as irrigation channels or laboratory flumes. measurement of aquatic bodies was a permanent challenge in

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水環境モニタリング有限責任事業組合

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Water environment monitoring a limited liability partnership (Aqua Environmental Monitoring Limited Liability Partnership) is, as a venture company of Hiroshima University onset 2007 year 2 May 5 was established in days. And we manufacture and sell Coastal Acoustic Tomography System (CATS) which is an innovative measurement method of coastal marine environmental change. CATS makes it possible to measure various objects such as coastal ocean, lake and river flow velocity field and water temperature field monitoring, marine environment assessment and ocean warming measurement / prediction. In the union, we transfer technology to Hiroshima University, Japan, East Asia and Southeast Asia.

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