

ISSN 1642-1817 (print)  
ISSN 2450-128X (online)

# HYDROACOUSTICS

Annual Journal

Volume 19

Gdańsk 2016

Committee on Acoustics of the Polish Academy of Sciences  
Section of Underwater Acoustics, Ultrasound and Medical Acoustics  
Polish Acoustical Society – Gdansk Division

---

ISSN 1642-1817 (print)

ISSN 2450-128X (online)

# **HYDROACOUSTICS**

**Annual Journal**

**Volume 19**

Gdańsk 2016

***Hydroacoustics* is the annual journal in which original papers, both theoretical and experimental, concerning problems in hydroacoustics and its application are published.**

### **EDITORIAL BOARD**

Grażyna Grelowska - Editor in Chief

Ignacy Gloza

Eugeniusz Kozaczka

Jacek Marszał

Roman Salamon

Andrzej Stepnowski

### **SECRETARY**

Alicja Salomon

### **ADVISORY EDITORIAL BOARD**

prof. Philippe Blondel

prof. David Bradley

prof. Grażyna Grelowska

prof. Halvor Hobaek

prof. Zygmunt Klusek

prof. Eugeniusz Kozaczka

prof. Tim Leighton

prof. Andrzej Nowicki

prof. John Papadakis

prof. Roman Salamon

prof. Andrey Serebryany

prof. Jean-Pierre Sessarego

prof. Andrzej Stepnowski

prof. Michael Taurodakis

prof. Peter Wille

### **Published under the auspices of:**

International Commission for Acoustics

European Acoustics Association Technical Committee on Hydroacoustics

Gdansk University of Technology Faculty of Electronics, Telecommunications and Informatics

Gdansk University of Technology Faculty of Ocean Engineering and Ship Technology

Polish Naval Academy Faculty of Navigation and Naval Weapons

### **PUBLISHER**

Polish Acoustical Society – Gdansk Division

Narutowicza 11/12, 80-233 Gdansk, Poland

Phone: (+48 58) 3472004, Fax: (+48 58) 3471535

e-mail: ggrel@wp.pl

# **HYDROACOUSTICS**

**Annual Journal**

**Volume 19**

## CONTENTS

<b>Jan BIELAŃSKI</b> Analysis of hydrodynamic pressure fields of motorboats and pontoons in shallow water .....	9
<b>Tomasz BIELIŃSKI, Andrzej CHYBICKI</b> Calibration of precipitation estimation algorithm with particular emphasis on the Pomeranian region using high performance computing .....	17
<b>Krystian BUSZMAN, Ignacy GLOZA</b> Signals parametrization method of sailing vessels .....	27
<b>Mateusz CELMER, Krzysztof J. OPIELIŃSKI</b> Model of multipath propagation of ultrasonic pulses generated in soft tissue by linear arrays .....	37
<b>Andrzej CHYBICKI, Zbigniew LUBNIEWSKI</b> Potential of Polish R&D industry in the context of prototyping, design, development and control of a dedicated national satellite SAR system for marine ecosystem monitoring. Technical paper - preliminary study .....	49
<b>Andrzej CHYBICKI, Zbigniew LUBNIEWSKI</b> Comparison of direct and inverse methods of satellite observations downscaling for the coastal zone area .....	55
<b>Jerzy DEMKOWICZ, Krzysztof BIKONIS</b> EGNOS-based GNSS receiver for precise positioning in restricted areas .....	65
<b>Jerzy DEMKOWICZ, Krzysztof BIKONIS</b> MEMS technology quality requirements as applied to multibeam echosounder ...	75
<b>Wioletta DOBKOWSKA-CHUDON, Mirosław WROBEL, Emilia FRANKOWSKA, Andrzej DABROWSKI, Paweł KARLOWICZ, Arkadiusz ZEGADLO, Andrzej KRUPIENICZ, Andrzej NOWICKI, Robert OLSZEWSKI</b> Comparison of the magnetic resonance imaging and acoustocerebrography signals in the assessment of focal cerebral microangiopathic lesions in patients with asymptomatic atrial fibrillation. Preliminary clinical study results .....	83
<b>Krzysztof DRYPCZEWSKI, Andrzej STEPNOWSKI</b> SOLAP GIS in maritime research .....	93
<b>Michael EHRHARDT, Franz Josef BECKER, Daniel SPEICHER, Heinrich FONFARA, Holger HEWENER, Christian DEGEL, Steffen TRETBAR</b> Development of a high-resolution real-time-capable 3D SONAR camera for deep sea operation .....	101

<b>Barbara GAMBIN, Eleonora KRUGLENKO, Michał BYRA</b> Relationships between acoustical properties and stiffness of soft tissue phantoms.....	111
<b>Barbara GAMBIN, Janusz WOJCIK, Olga Doubrovina</b> Differentiation of random structure properties using wavelet analysis of backscattered ultrasound .....	121
<b>Grażyna GRELOWSKA, Dominika WITOS</b> Investigation of the vertical distribution of the sound speed of the Gulf of Gdansk in the years 2000-2010 .....	129
<b>Natalie GRIGORIEVA, Mikhail KUPRIYANOV, Dmitriy OSTROVSKIY, Daria STEPANOVA</b> Diffraction of sound pulses on a spherical target in an oceanic waveguide covered with ice .....	139
<b>Jakub IDCZAK, Natalia GORSKA</b> Modelling of acoustic backscattering by southern Baltic herring .....	145
<b>Sven IVANSSON, Per-Axel KARLSSON</b> Sea-bed scattering and reflection contributions to the short-range acoustic impulse response: measurements and modelling .....	153
<b>Damian JAŚNIEWICZ, Natalia GORSKA</b> Influence of microphytobenthos photosynthesis on the spectral characteristics of the signal reflected from Baltic sandy sediments .....	165
<b>Damian JAŚNIEWICZ, Zygmunt KLUSEK, Sergio das NEVES</b> Underwater noise properties in waterway areas of the South Baltic Sea .....	173
<b>Andrzej JEDEL, Jacek MARSZAL, Roman SALAMON</b> Continuous wave sonar with hyperbolic frequency modulation keyed by pseudo-random sequence .....	185
<b>Kristoffer Johansen, Michiel POSTEMA</b> Lagrangian formalism for computing oscillations of spherically symmetric encapsulated acoustic antibubbles .....	197
<b>Witold KARDYŚ, Andrzej MILEWSKI, Paweł KOGUT, Piotr KLUK, Marcin KIELBASIŃSKI</b> A new type of high power ultrasonic generator for welding and cutting processes.....	209
<b>Piotr KARWAT, Tamara KUJAWSKA, Wojciech SECOMSKI, Barbara GAMBIN, Jerzy LITNIEWSKI</b> Application of ultrasound to noninvasive imaging of temperature distribution induced in tissue .....	219

<b>Iwona KOCHAŃSKA, Ivor NISSEN</b> Limitations of WSSUS modeling of stationary underwater acoustic communication channel .....	229
<b>Jakub KRAWCZYK, Krzysztof BIKONIS, Wojciech DOMINIK</b> Mobile inventory system for hydrotechnical objects using data from multiple sensors operating simultaneously .....	239
<b>Marek KULAWIAK, Zbigniew LUBNIEWSKI</b> Methods for quality improvement of multibeam and LiDAR point cloud data in the context of 3D surface reconstruction .....	251
<b>Marek KULAWIAK</b> Web-based 3D processing and dissemination of multibeam sonar data .....	259
<b>Wojciech LEŚNIAK</b> High-precision bearing estimation for active sonar with cylindrical array performed by interpolated array transformation .....	265
<b>Łukasz MARKIEWICZ, Paweł MAZUREK, Andrzej CHYBICKI</b> Coastline change-detection method using remote sensing satellite observation data .....	277
<b>Ivor NISSEN, Iwona KOCHAŃSKA</b> Stationary underwater channel experiment: Acoustic measurements and characteristics in the Bornholm area for model validations .....	285
<b>Andrzej NOWICKI, Wojciech SECOMSKI, Zbigniew TRAWIŃSKI, Marcin LEWANDOWSKI, Ihor TROTS, Michał SZUBIELSKI, Robert OLSZEWSKI</b> Estimation of radial artery reactive response using high frequency ultrasound .....	297
<b>Krzysztof J. OPIELIŃSKI, Tadeusz GUDRA</b> Bioacoustic range equation .....	307
<b>Hanna PIOTRZKOWSKA-WROBLEWSKA, Katarzyna DOBRUCH-SOBCZAK, Jerzy LITNIEWSKI, Eryk CHRAPOWICKI, Katarzyna ROSZKOWSKA-PURSKA, Andrzej NOWICKI</b> Differentiation of the breast lesions using statistics of backscattered echoes .....	319
<b>Aleksandra RAGANOWICZ, Kamil SADOWSKI, Michał DOLOT, Lech KILIAN</b> Optimizing of targets detection and tracking processes realized on consoles of passive sonar with linear towed antenna .....	329
<b>Mariusz RUDNICKI, Jacek MARSZAL</b> Signal conditioning for examination of shallow-water acoustic noise correlation properties .....	335
<b>Jan SCHMIDT</b> The development of an underwater telephone for digital communication purposes .....	341

<b>Aleksander SCHMIDT, Jan SCHMIDT</b>	
Digital microcontroller for sonar waveform generator .....	353
<b>Wojciech SECOMSKI, Andrzej NOWICKI</b>	
Generation and measurement of acoustic streaming in limited space .....	361
<b>Janusz WÓJCIK, Michał BYRA, Andrzej NOWICKI</b>	
A spectral-based method for tissue characterization .....	369

## INDEX OF AUTHORS

### **B**

<i>Becker F.J.</i> .....	101
<i>Bielanski J.</i> .....	9
<i>Bieliński T.</i> .....	17
<i>Bikonis K.</i> .....	65, 75, 239
<i>Buszman K.</i> .....	27
<i>Byra M.</i> .....	111, 369

### **C**

<i>Celmer M.</i> .....	37
<i>Chrapowicki E.</i> .....	319
<i>Chybicki A.</i> .....	17, 49, 55, 277

### **D**

<i>Dabrowski A.</i> .....	83
<i>Degel C.</i> .....	101
<i>Demkowicz J.</i> .....	65, 75
<i>Dobruć-Sobczak K.</i> .....	319
<i>Dobkowska-Chudon W.</i> .....	83
<i>Dolot M.</i> .....	329
<i>Dominik W.</i> .....	239
<i>Doubrovina O.</i> .....	121
<i>Drypczewski K.</i> .....	93

### **E**

<i>Ehrhardt M.</i> .....	101
--------------------------	-----

### **F**

<i>Fonfara H.</i> .....	101
<i>Frankowska E.</i> .....	83

### **G**

<i>Gambin B.</i> .....	111, 121, 219
<i>Gloza I.</i> .....	27
<i>Gorska N.</i> .....	145, 165
<i>Grelowska G.</i> .....	129
<i>Grigorieva N.</i> .....	139
<i>Gudra T.</i> .....	307

### **H**

<i>Hewener H.</i> .....	101
-------------------------	-----

### **I**

<i>Idczak J.</i> .....	145
<i>Ivansson S.</i> .....	153

### **J**

<i>Jaśniewicz D.</i> .....	165, 173
<i>Jedel A.</i> .....	185
<i>Johansen K.</i> .....	197

### **K**

<i>Kardyś W.</i> .....	209
<i>Karłowicz P.</i> .....	83
<i>Karlsson P.-A.</i> .....	153
<i>Karwat P.</i> .....	219
<i>Kielbasiński M.</i> .....	209
<i>Kilian L.</i> .....	329
<i>Kluk P.</i> .....	209
<i>Klusek Z.</i> .....	173
<i>Kochańska I.</i> .....	229, 285
<i>Kogut P.</i> .....	209
<i>Krawczyk J.</i> .....	239
<i>Kruglenko E.</i> .....	111
<i>Krupienicz A.</i> .....	83
<i>Kujawska T.</i> .....	219
<i>Kulawiak M.</i> .....	251, 259
<i>Kupriyanov M.</i> .....	139

### **L, Ł**

<i>Leśniak W.</i> .....	265
<i>Lewandowski M.</i> .....	297
<i>Litniewski J.</i> .....	219, 319
<i>Lubniewski Z.</i> .....	49, 55, 251

### **M**

<i>Markiewicz Ł.</i> .....	277
<i>Marszał J.</i> .....	185, 335
<i>Mazurek P.</i> .....	277
<i>Milewski A.</i> .....	209

### **N**

<i>Neves S.</i> .....	173
<i>Nissen I.</i> .....	229, 285
<i>Nowicki A.</i> .....	83, 297, 319, 361, 369

### **O**

<i>Olszewski R.</i> .....	83, 297
<i>Opieliński K.</i> .....	37, 307
<i>Ostrowskiy D.</i> .....	139

### **P**

<i>Piotrkowska-Wroblewska H.</i> .....	319
<i>Postema M.</i> .....	197

### **R**

<i>Raganowicz A.</i> .....	329
<i>Roszkowska-Purska K.</i> .....	319
<i>Rudnicki M.</i> .....	335

**S**

<i>Sadowski K.</i> .....	329
<i>Salamon R.</i> .....	185
<i>Schmidt A.</i> .....	353
<i>Schmidt J.</i> .....	341, 353
<i>Secomski W.</i> .....	219, 297, 361
<i>Speicher D.</i> .....	101
<i>Stepanova D.</i> .....	139
<i>Stepnowski A.</i> .....	93
<i>Szubielski M.</i> .....	297

**T**

<i>Trawiński Z.</i> .....	297
<i>Tretbar S.</i> .....	101
<i>Trots I.</i> .....	297

**W**

<i>Witos D.</i> .....	129
<i>Wojcik J.</i> .....	121, 369
<i>Wrobel M.</i> .....	83

**Z**

<i>Zegadlo A.</i> .....	83
-------------------------	----

## **REVIEWERS OF HYDROACOUSTICS**

prof. Philippe Blondel  
prof. Andrzej Dobrucki  
prof. Czesław Dyrz  
prof. Tim Leighton  
prof. Barbara Gambin  
prof. Ignacy Gloza  
prof. Grażyna Grelowska  
prof. Tadeusz Gudra  
prof. Christopher Jenkins  
prof. Arkadiusz Józefczak  
prof. Adam Kawalec  
prof. Zygmunt Klusek  
prof. Eugeniusz Kozaczka  
prof. Henryk Lasota  
prof. Bogumił Linde  
prof. Jacek Marszał  
prof. Krzysztof Naus  
prof. Andrzej Nowicki  
prof. Krzysztof Opiełiński  
prof. Marek Przyborski  
prof. Roman Salamon  
prof. Andrey Serebryany  
prof. Edward Sędek  
prof. Cezary Specht  
prof. Andrzej Stateczny  
prof. Andrzej Stepnowski  
prof. Joanna Szczucka  
prof. Mieczysław Szustakowski  
prof. Jarosław Tęgowski  
prof. Mariusz Wąż  
prof. Adam Weintrit  
prof. Margareta Wiciak  
prof. Janusz Wójcik  
prof. Adam Zieliński  
prof. Andrzej Żak  
dr Paweł Dymarski  
dr Tadeusz Leszczyński  
dr Ivor Nissen  
dr Tomasz Pałys  
dr Wojciech Secomski  
dr Marcin Szczegielniak  
dr Mateusz Weryk  
msc Wojciech Szymczak

## **STATISTICAL EDITOR**

dr Agata Załęska-Fornal

## **ENGLISH PROOFREADING**

Adam Green