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June 19-23, Ottawa, Canada

The Thirty-third (2023) International Ocean and Polar Engineering Conference

(Offshore and Polar Engineering Conference)

Including *additional ISOPE symposia*:

- 1st Marine Transportation of H₂ & CO₂ Energy Carriers
LNG, LH₂, LCO₂
- 2nd Intelligent (AI, ML, NN) Hydrodynamics
2nd Smart Ship Technology
- 6th Environment Assisted Cracking
- 8th Underwater Technology
12th Tsunami & Safety
9th Asset Integrity
- 14th Arctic Sciences & Technology
10th Cryogenic/Arctic Materials
- 14th Renewable Energy & Environment
- 15th Sloshing Dynamics & Design
- 18th Deep Ocean Mining & Gas Hydrates
- 21st High Performance Materials Symposium

ISOPE-2023

Ottawa, Canada, June 19-23

(As of May 1, 2023)

Technical Program

Refereed papers from 40+ countries in 137 technical general
1 Plenary and 3 Keynotes and multiple Focus sessions
Full Program with General Information, Advance Registration and Venue
Hotel. Paper List, Reservations, and Updates on

<https://www.isopec.org/conferences-symposia-and-workshops/>

ISOPE-2023 Conference proceedings

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All ISOPE Publications: <https://www.isopec.org/proceedings/> :

<https://www.isopec.org/proceedings/>

Individual papers are available from www.onepetro.org/isopec

Organized and Sponsored by: Technical Program Committee,
International Society of Offshore and Polar Engineers (ISOPE)

With cooperating organizations (listed inside)

Co-host: Canadian Association of Petroleum Producers (CAPP)



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The 33rd Annual ISOPE-2023 Conference, Ottawa, Canada

ISOPE-2023



Ottawa, Canada, June 19-23
Ocean Arctic Energy
www.isope.org



ISOPE-2023 Corporate Members and Sponsors. Additional sponsors/supporters on the updated program and online.



ISOPE-2023 Conference Co-chairs

Jin S Chung (USA); Eva Loukogeorgaki (Greece); Sa Young Hong (Korea), Hiroyasu Kawai (Japan); Hua Liu (China), De Cheng Wan (China); Ivana Kubat (Canada), RH Knapp (USA)



Chung Loukogeorgaki SY Hong Kawai Liu Wan Kubat

ISOPE-2019 Honolulu Conference Secretariat: ISOPE, USA



Presentations at ISOPE-2019 Honolulu In-person Banquet
Awards: Scholarships, Best Organizer, Jin S Chung Award, C H Kim Award, 2019 Best Student Paper

Welcome to the ISOPE-2023 Conference

We greatly appreciate the excellent response, with **1000+** abstracts, and help we have received from colleagues around the world in the successful organization of the 33rd International Ocean and Polar (Arctic) Engineering Conference (**ISOPE-2023**), Ottawa, Ontario, Canada, June 19–23, 2023. The Conference features **137** sessions of peer-reviewed papers and 4 plenary and keynote presentations from more than **40+** countries, including the ISOPE specialty symposia as a part of the ISOPE-2023 Conference.

The conference program is issued in 2 versions: Session time and rooms printed and full conference program online (www.isopec.org).

The purposes of the ISOPE conference are to:

- * Promote technological progress and activities, international technological transfer and cooperation, and opportunities for engineers to maintain and improve technical competence; and
- * Provide a timely international forum for technical activities, cooperation, opportunity and fellowship among researchers and engineers by developing focused session topics with high-quality papers (in both originality and significance) accepted through peer-review, establishing high international standards for publication and worldwide distribution, and promoting interdisciplinary interaction between academia and industry.

The International Society of Ocean and Polar Engineers (ISOPE) has already held 65 successful international meetings with all peer-reviewed papers:

- 1st (1990) European Offshore Mechanics Symposium (**EUROMS-90**) Trondheim; EUROMS-99 Moscow; EUROMS-2012 Istanbul.
- 1st (1990) Pacific/Asia Offshore Mechanics Symposium (**PACOMS-90**) Seoul; Beijing; Pusan; Daejeon; Vladivostok; Dalian; Bangkok; Busan; Vladivostok; Shanghai; Gold Coast, Jeju Island, Dalian, 2020 .
- Annual **ISOPE** conferences, starting in Edinburgh, 1991, have been held in San Francisco, Singapore, Osaka, The Hague, Los Angeles, Honolulu, Montréal, Brest, Seattle, Stavanger, Kitakyushu, Honolulu, Toulon, Seoul, San Francisco, Lisbon, Vancouver, Osaka, Beijing, Maui, Rhodes, Anchorage, Busan and Hawaii Kona, Rhodes, San Francisco, Sapporo. Honolulu, three Hybrids Since 1992, the annual ISOPE conference program has been the world's largest of its kind with peer-reviewed papers.
- 1st (1995) ISOPE Ocean Mining & Gas Hydrates Symposium (**OMS-95**; **OMGH**), Tsukuba, 1995; Seoul; Goa; Szczecin; Tsukuba; Changsha; Lisbon; Chennai, Szczecin; Kona Hawaii, Sapporo, Honolulu, 2019, and three Hybrids..
- 1st (1996) International Deep-Ocean Technology (**IDOT-96**) Symposium and Workshop, 1996 Los Angeles; Stavanger, 2001; Beijing 2009.
- ISOPE **HPM** (High-Performance Materials) Symposium: Started in Honolulu 2003 and expanded every year with emerging topics.
- ISOPE Series of specialty symposia: **ANGT**; **SBD**; Nanotechnology **NANOS**; Frontier Energy; Sloshing & Dynamics; Renewable Energy/Environment; Tsunami; Arctic Sci & Tech; Arctic Materials; Asset Integrity; High-Mn/Cryogenic Materials; Materials Reliability, EAC, LH2, LCO2, Smart Ship, AI, NN, CFD,....

On behalf of the Technical Program Committee, it is our pleasure to welcome participants from all over the world to the ISOPE-2023 Conference in Ottawa, Canada.

Jin S Chung
USA
H Kawai
Japan
Ivana Kubat
Canada

Eva Loukogeorgaki
Greece
Hua Liu
China
Ronald H Knapp
USA

Sa Young Hong
Korea
Decheng Wan
China

Co-chairs of the ISOPE-2023 Conference

SUNDAY JUNE 18

09:00 ISOPE Board of Directors Meeting **Maple, EF**
10:30 ISOPE Executive Committee Meeting **Maple, EF**
EUROMS and PACOMS Executive Committees
14:00-17:00
CONFERENCE REGISTRATION **Ballroom Foyer, 4F**
17:00-18:00
WELCOME RECEPTION **Governor General, 4F**

Tour Information **Visit tour desk in Foyer or www.isopec.org**

MONDAY JUNE 19

On-Site Registration starts at 07:30 **Ballroom Foyer, 4F**
07:30 Session Chair/Co-chair Briefing **Ballroom Foyer, 4F**

08:30 Conference Opening **Confederation, 4F**
08:30
1. Plenary: *Low Carbon: ExxonMobil Low Carbon* **Confederation, 4F**
10:30
2. RENEWABLE ENERGY I: FOWT 1 **Provinces I**
3. AST I: Hydrogen & Nontraditional Propulsion 4 **Provinces II**
4. HYDRODYNAMICS I: Intelligent Hydro 1 **Ontario**
5. HPM I: Welding 1 **Oak**
6. SPRU I: Pipeline 1 **Les Saisons**
7. OCEAN TECH I: Offshore Installation, Simulation **Quebec**
8. COASTAL I: Wave Mechanics 1 **Newfoundland**
9. OMGH I: Gas Hydrates **Alberta**
10. POLAR TECH I: Ice and Iceberg 1 **Saskatchewan**

13:10 Keynote 1
LH2/ and LH2 Carrier (Keynote 1): HySTRA, KHI, Japan **Provinces II**

14:00
11. RENEWABLE ENERGY II: FOWT 2 **Provinces I**
12. AST II: Propulsion and Energy Management **Provinces II**
13. HYDRODYNAMICS II: Intelligent Hydro 2 **Ontario**
14. HPM II: Welding 2 **Oak**
15. SPRU II: Pipeline 2 **Les Saisons**
16. OCEAN TECH II: Floating Tunnel and Bridge **Quebec**
17. COASTAL II: Wave Mechanics 2 **Newfoundland**
18. OMGH II: Drilling **Alberta**
19. POLAR TECH II: Ice and Iceberg 2 **Saskatchewan**

16:20
20. RENEWABLE ENERGY III: FOWT 3 **Provinces I**
21. AST III: MaTCH 1: Materials I **Provinces II**
22. HYDRODYNAMICS III: Waves and F-S **Ontario**
23. HPM III: Crack, Fracture, Fatigue 1 **Oak**
24. SPRU III: Pipeline 3 **Les Saisons**
25. OCEAN TECH III: Bottom-Fixed Structures 1 **Quebec**
26. COASTAL III: Structures **Newfoundland**
27. OMGH III: Subsea Storage and Cement Slurry 1 **Alberta**
28. POLAR TECH III: Arctic Ship Test **Saskatchewan**

18:30 ISOPE Technical Committee Meetings: **Notice on bulletin board**
New members are welcome.

TUESDAY JUNE 20

07:30 Session Chair/Co-chair Briefing	Ballroom Foyer, 4F
08:00	
29. RENEWABLE ENERGY IV: FOWT 4	Provinces I
30. AST IV: MaTCH 2: Materials II	Provinces II
31. HYDRODYNAMICS IV: Forces 1	Ontario
32. HPM IV: Crack, Fracture, Fatigue 2	Oak
33. SPRU IV: Pipeline 4	Les Saisons
34. OCEAN TECH IV: Bottom-Fixed Structures 2	Quebec
35. COASTAL IV: AI, Remote Sensing	Newfoundland
36. OMGH IV: Subsea Storage and Cement Slurry 2	Alberta
37. POLAR TECH IV: Icebreakers and Operations 1	Saskatchewan
10:30	
38. RENEWABLE ENERGY V: FOWT 5	Provinces I
39. AST V: MaTCH 3: Containment System 1	Provinces II
40. HYDRODYNAMICS V: Forces 2	Ontario
41. HPM V: Crack, Fracture, Fatigue 3	Oak
42. SPRU V: Riser 1	Les Saisons
43. OCEAN TECH V: Floating Structures 1	Quebec
44. COASTAL V: Coastal Processes 1	Newfoundland
45. OMGH V: Minerals, Mining/Dredging, Processing	Alberta
46. POLAR TECH V: Icebreakers and Operations 2	Saskatchewan
13:10 Keynote 2	
<i>CO2 Ship Transport: Sea River Maritime, ExxonMobil, USA</i>	Provinces II
14:00	
47. RENEWABLE ENERGY VI: FOWT 6	Provinces I
48. AST VI: MaTCH 4: Containment System 2	Provinces II
49. HYDRODYNAMICS VI: Floating Dynamics 1	Ontario
50. HPM VI: Tubular Structure	Oak
51. SPRU VI: Riser 2	Les Saisons
52. OCEAN TECH VI: Floating Structures 2	Quebec
53. COASTAL VI: Coastal Processes 2	Newfoundland
54. OMGH VI: Hydraulic Dredging and Lifting	Alberta
55. POLAR TECH VI: Polar Workshop	Saskatchewan
16:20	
56. RENEWABLE ENERGY VII: FOWT 7	Provinces I
57. AST VII: Navigation and Maneuvering 1	Provinces II
58. HYDRODYNAMICS VII: Floating Dynamics 2	Ontario
59. HPM VII: Environment Assisted Cracking I: EAC 1	Oak
60. SPRU VII: Subsea	Les Saisons
61. OCEAN TECH VII: FPSO (Floating Structures 3)	Quebec
62. COASTAL VII: Ports & Ships	Newfoundland
63. OMGH VII: Deep Seabed System	Alberta
64. RENEWABLE ENERGY XVI: WEC 2	Saskatchewan
15:30 Awards Committee Meeting	Maple, EF
16:30 Board of Editors Meeting	Maple, EF
19:00 ISOPE-2019 Student Get-together	TBA
19:30 ISOPE-2023/2024 TPC Meeting	TBA

Find Digital Conference Program Updates in
<https://www.isopec.org/conferences-symposia-and-workshops/>

WEDNESDAY JUNE 21

07:30	Session Chair/Co-chair Briefing	Ballroom Foyer, 4F
08:00		
65.	RENEWABLE ENERGY VIII: FOWT 8	Provinces I
66.	AST VIII: Navigation and Maneuvering 2	Provinces II
67.	HYDRODYNAMICS VIII: Tsunami and Metocean	Ontario
68.	HPM VIII: Environment Assisted Cracking II: EAC 2	Oak
69.	SPRU VIII: Flow Assurance	Les Saisons
70.	OCEAN TECH VIII: Offshore Systems	Quebec
71.	HYDRODYNAMICS XVI: VIV 1	Newfoundland
72.	AST XVI: Ultimate Strength and Fatigue 1	Alberta
73.	RENEWABLE ENERGY XVII: WEC 3	Saskatchewan
10:30		
74.	RENEWABLE ENERGY IX: FOWT 9	Provinces I
75.	AST IX: Ship Hull and Optimization 1	Provinces II
76.	HYDRODYNAMICS IX: CFD 1	Ontario
77.	MECHANICS I: Structures and Vibration 1	Oak
78.	SPRU IX: Flexible/Umbilical	Les Saisons
79.	OCEAN TECH IX: Environment and Ecology 1	Quebec
80.	HYDRODYNAMICS XVII: VIV 2	Newfoundland
81.	AST XVII: Ultimate Strength and Fatigue 2	Alberta
82.	RENEWABLE ENERGY XVIII: WEC 4	Saskatchewan
12:00	ISOPE Board of Directors Meeting III	Maple, EF
13:10	Keynote 3 <i>Transition to Hydrogen: Augsburg U, Germany</i>	Provinces II
14:00		
101.	RENEWABLE ENERGY XII: TALOS 1 WED	Provinces I
84.	AST X: Ship Hull and Optimization 2	Provinces II
85.	HYDRODYNAMICS X: CFD 2	Ontario
86.	MECHANICS II: Structures and Vibration 2	Oak
87.	SPRU X: Power Cable	Les Saisons
88.	OCEAN TECH X: Environment and Ecology 2	Quebec
89.	GEOTECH I: Soil Properties and Liquefaction 1	Newfoundland
90.	AST XVIII: Resistance, Drag Reduction 1	Alberta
91.	MaTCH 5: H2 and CO2 Workshop	Saskatchewan
16:20		
110.	RENEWABLE ENERGY XIII: TALOS 2 WED	Provinces I
93.	AST XI: Smart Ship Tech 1	Provinces II
94.	HYDRODYNAMICS XI: Particle Methods	Ontario
95.	MECHANICS III: Risk and Reliability	Oak
96.	UNDERWATER I: Imaging & Acoustics	Les Saisons
97.	OCEAN TECH XI: Comparative Study 1	Quebec
98.	GEOTECH II: Soil Properties and Liquefaction 2	Newfoundland
99.	AST XIX: Resistance, Drag Reduction 2	Alberta
100.	UNDERWATER VI: Underwater Workshop	Saskatchewan

<p>19:00 Confederation, 4F</p> <p>The 33rd Annual Conference Banquet</p> <p>Cultural Event, ISOPE Best Paper, Best Student Paper, Outstanding Student Scholarships, Best Organizer(s) and ISOPE Awards</p> <p><i>Don't forget the banquet ticket.</i></p>

THURSDAY JUNE 22

07:30	Session Chair/Co-chair Briefing	Ballroom Foyer, 4F
08:00		
83.	RENEWABLE ENERGY X: FOWT 10	Provinces I
102.	AST XII: Smart Ship Tech 2	Provinces II
103.	HYDRODYNAMICS XII: Sloshing 1	Ontario
104.	MECHANICS IV: Collision 1	Oak
105.	UNDERWATER II: Vehicle & Hydrodynamics	Les Saisons
106.	OCEAN TECH XII: Comparative Study 2: WKSP	Quebec
107.	GEOTECH III: Pile and Anchor 1	Newfoundland
108.	AST XX: Smart Ship 1	Alberta
109.	AST XXIV: AST Workshop	Saskatchewan
10:30		
92.	RENEWABLE ENERGY XI: Wind Farm	Provinces I
111.	AST XIII: Hydrogen & Nontraditional Propulsion Fuel 1	Provinces II
112.	HYDRODYNAMICS XIII: Tank Sloshing 2	Ontario
113.	MECHANICS V: Collision 2	Oak
114.	UNDERWATER III: Vehicle & Strength	Les Saisons
115.	OCEAN TECH Workshop	Quebec
116.	GEOTECH IV: Pile and Anchor 2	Newfoundland
117.	AST XXI: Smart Ship 2	Alberta
118.	SPRU XI: SPRU Workshop	Saskatchewan
12:00	Student Forum: adv. reservation required	TBD, 6F
14:00		
119.	RENEWABLE ENERGY XIV: Tidal Current	Provinces I
120.	AST XIV: Hydrogen & Nontraditional Propulsion Fuel 2	Provinces II
121.	HYDRODYNAMICS XIV: Tank Sloshing 3	Ontario
122.	FOWT Workshop 1	Oak
123.	UNDERWATER IV: Vehicle & Control 1	Les Saisons
125.	GEOTECH V: Foundation	Newfoundland
126.	AST XXII: Cavitation and Cavity 1	Alberta
127.	RENEWABLE ENERGY XIX: Renew Workshop	Saskatchewan
16:20		
128.	RENEWABLE ENERGY XV: WEC 1	Provinces I
129.	AST XV: Hydrogen & Nontraditional Propulsion Fuel 3	Provinces II
130.	HYDRODYNAMICS XV: Sloshing 4	Ontario
131.	FOWT Workshop 2	Oak
132.	UNDERWATER V: Vehicle & Control 2	Les Saisons
133.	HYDRODYNAMICS XVIII: Hydro Workshop	Quebec
134.	GEOTECH VI: Pipe-Soil	Newfoundland
135.	AST XXIII: Cavitation and Cavity 2	Alberta
136.	HPM XIII: HPM Workshop	Saskatchewan

Sunday – Friday	
Author Practice	Individual Session rooms
On-site Registration	Ballroom Foyer, 4F
ISOPE Headquarters	Nunavut, 4F
Proceedings and Badge Pickup	Registration, Ballroom Foyer, 4F
Award, Editors Committee Meetings	Maple, EF

Tours (TBA)

<https://www.isopec.org/conferences-symposia-and-workshops/>

TECHNICAL PROGRAM

ISOPE-2023 Ottawa, Canada **The Thirty-third (2023) International** **Ocean and Polar Engineering Conference *in person*** **Ottawa, Canada, June 19–23, 2023**

This 33rd annual ISOPE conference features 137 technical and opening general sessions, 4 plenary presentation and keynote presentations from top experts from industry, academia and government. After peer review of the manuscripts selected from 1,000+ abstracts, 590 peer-reviewed-papers and additional 10+ presentations only are accepted and discussions by researchers, engineers and managers from 40+ countries: 590 for the Conference Proceedings, The ISOP580 E-2023 Conference Proceedings with peer-reviewed papers in PDF files will be available in a set of 4 volumes on USB (4,000 pp.) — paginated — during the conference and later for worldwide post-conference order from ISOPE: ISBN 978-1-880653-80-7; ISSN 1098-6189. Individual papers from www.onepetro.org /ISOPE and directly ISOPE and more. Only the changes in titles or authors the Technical Program Committee received in writing before May 1, 2023 are reflected in this program. Final update is reflected in the Final Program.

All ISOPE publications are indexed by Engineering Index, EI Compendex, Google Scholar, Scopus, Scientific and Technical Proceedings (ISTP/ISI), Web of Science and others.

FULL CONFERENCE PROGRAM WITH SESSION / PAPER LIST:

Updates at

<https://www.isopec.org/conferences-symposia-and-workshops/>

International Society of Ocean and Polar Engineers (ISOPE)

President (2022-2023): John N Niedzwecki, USA

Past President: Eva Loukogeorgaki, Greece

Executive Director: Jin S Chung, USA

Executive Committee: Jin S Chung, Ronald H Knapp, Wan C Kan, USA, H W Jin, USA, President John M Niedzwecki, USA

List of ISOPE Board of Directors, Officers Technical Program Committee members and Cooperating Organizations are listed on

<https://www.isopec.org/conferences-symposia-and-workshops/>.

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ISOPE Cooperating Organizations and
ISOPE-2023 Technical Program Committee

Members are listed in digital version of the program on

<https://www.isopec.org/conferences-symposia-and-workshops/>

SESSION LIST BY TOPICS

ISOPE (05/01/2023)

1 Conference Opening

Confederation, 4F

Opening /Plenary Session

Low Carbon (tentative),

Speaker TBA, ExxonMobil Low Carbon Solutions, USA

Keynote 1 Monday 13:10

Suiso Frontier, the First LH2 Carrier – Demonstration of Technologies and into Operational Phase

Yukichi Takaoka, HySTRA, Japan and Kentarou Mizumukai, Yuichi Kamenno, Kawasaki Heavy Industries, Japan

Keynote 2 Tuesday 13:10

LCO2 Ship Transport

Jesse Senkel, SeaRiver Maritime, USA

Keynote 3 Wednesday

Transition to Renewable Energies with focus on Hydrogen in Germany

Samar Ensenbach, GEOMAR Helmholtz Centre For Ocean Research; Andre Baeten, Somayeh Baeten, Augsburg University of Applied Sciences, Germany

OCEAN MINING, DREDGING, HYDRATES, DRILLING/CEMENTING

9. OMGH I: Gas Hydrates

18. OMGH II: Drilling

27. OMGH III: Subsea Storage and Cement Slurry 1

36. OMGH IV: Subsea Storage and Cement Slurry 2

45. OMGH V: Minerals, Mining/Dredging, Processing

54. OMGH VI: Hydraulic Dredging and Lifting

63. OMGH VII: Deep Seabed System

RENEWABLE ENERGY (Ocean and Wind)

2. RENEWABLE ENERGY I: FOWT 1

11. RENEWABLE ENERGY II: FOWT 2

20. RENEWABLE ENERGY III: FOWT 3

29. RENEWABLE ENERGY IV: FOWT 4

38. RENEWABLE ENERGY V: FOWT 5

47. RENEWABLE ENERGY VI: FOWT 6

56. RENEWABLE ENERGY VII: FOWT 7

65. RENEWABLE ENERGY VIII: FOWT 8

74. RENEWABLE ENERGY IX: FOWT 9

83. RENEWABLE ENERGY X: FOWT 10

92. RENEWABLE ENERGY XI: Wind Farm

101. RENEWABLE ENERGY XII: TALOS 1

110. RENEWABLE ENERGY XIII: TALOS 2

119. RENEWABLE ENERGY XIV: Tidal Current

122. FOWT Workshop 1

131. FOWT Workshop 2

- 128. RENEWABLE ENERGY XV: WEC 1
- 64. RENEWABLE ENERGY XVI: WEC 2
- 73. RENEWABLE ENERGY XVII: WEC 3
- 82. RENEWABLE ENERGY XVIII: WEC 4
- 127. RENEWABLE ENERGY XIX: Renewable Workshop

OFFSHORE MECHANICS AND OCEAN TECHNOLOGY

- 7. OCEAN TECH I: Offshore Installation, Simulation
- 16. OCEAN TECH II: Floating Tunnel and Bridge
- 25. OCEAN TECH III: Bottom-Fixed Structures 1
- 34. OCEAN TECH IV: Bottom-Fixed Structures 2
- 43. OCEAN TECH V: Floating Structures 1
- 52. OCEAN TECH VI: Floating Structures 2
- 61. OCEAN TECH VII: FPSO (Floating Structures 3)
- 70. OCEAN TECH VIII: Offshore Systems
- 79. OCEAN TECH IX: Environment and Ecology 1
- 88. OCEAN TECH X: Environment and Ecology 2
- 97. OCEAN TECH XI: Comparative Study 1
- 106. OCEAN TECH XII: Comparative Study 2: Workshop

GEOTECHNICAL ENGINEERING

- 89. GEOTECH I: Soil Properties and Liquefaction 1
- 98. GEOTECH II: Soil Properties and Liquefaction 2
- 107. GEOTECH III: Pile and Anchor 1
- 116. GEOTECH IV: Pile and Anchor 2
- 125. GEOTECH V: Foundation
- 134. GEOTECH VI: Pipe-Soil

SUBSEA, PIPELINE, RISER AND UMBILICAL (SPRU)

- 6. SPRU I: Pipeline 1
- 15. SPRU II: Pipeline 2
- 24. SPRU III: Pipeline 3
- 33. SPRU IV: Pipeline 4
- 42. SPRU V: Riser 1
- 51. SPRU VI: Riser 2
- 60. SPRU VII: Subsea
- 69. SPRU VIII: Flow Assurance
- 78. SPRU IX: Flexible/Umbilical
- 87. SPRU X: Power Cable
- 118. SPRU XI: SPRU Workshop

UNDERWATER TECHNOLOGY

- 96. UNDERWATER I: Imaging & Acoustics
- 105. UNDERWATER II: Vehicle & Hydrodynamics
- 114. UNDERWATER III: Vehicle & Strength
- 123. UNDERWATER IV: Vehicle & Control 1
- 132. UNDERWATER V: Vehicle & Control 2
- 100. UNDERWATER VI: Underwater Workshop

POLAR TECHNOLOGY

- 10. POLAR TECH I: Ice and Iceberg 1
- 19. POLAR TECH II: Ice and Iceberg 2

- 28. POLAR TECH III: Arctic Ship Test
- 37. POLAR TECH IV: Icebreakers and Operations 1
- 46. POLAR TECH V: Icebreakers and Operations 2
- 55. POLAR TECH VI: Polar Workshop

HYDRODYNAMICS

- 4. HYDRODYNAMICS I: Intelligent Hydro 1
- 13. HYDRODYNAMICS II: Intelligent Hydro 2
- 22. HYDRODYNAMICS III: Waves and F-S
- 31. HYDRODYNAMICS IV: Forces 1
- 40. HYDRODYNAMICS V: Forces 2
- 49. HYDRODYNAMICS VI: Floating Dynamics 1
- 58. HYDRODYNAMICS VII: Floating Dynamics 2
- 67. HYDRODYNAMICS VIII: Tsunami and Metocean
- 76. HYDRODYNAMICS IX: CFD 1
- 85. HYDRODYNAMICS X: CFD 2
- 94. HYDRODYNAMICS XI: Particle Methods
- 103. HYDRODYNAMICS XII: Sloshing 1
- 112. HYDRODYNAMICS XIII: Tank Sloshing 2
- 121. HYDRODYNAMICS XIV: Tank Sloshing 3
- 122. FOWT Workshop 1
- 130. HYDRODYNAMICS XV: Sloshing 4
- 71. HYDRODYNAMICS XVI: VIV 1
- 80. HYDRODYNAMICS XVII: VIV 2
- 133. HYDRODYNAMICS XVIII: Hydro Workshop

COASTAL HYDRODYNAMICS

- 8. COASTAL I: Wave Mechanics 1
- 17. COASTAL II: Wave Mechanics 2
- 26. COASTAL III: Structures
- 35. COASTAL IV: AI, Remote Sensing
- 44. COASTAL V: Coastal Processes 1
- 53. COASTAL VI: Coastal Processes 2
- 62. COASTAL VII: Ports & Ships

HIGH PERFORMANCE MATERIALS (HPM) MaTCH Symposium sessions listed in AST sessions

- 5. HPM I: Welding 1
- 14. HPM II: Welding 2
- 23. HPM III: Crack, Fracture, Fatigue 1
- 32. HPM IV: Crack, Fracture, Fatigue 2
- 41. HPM V: Crack, Fracture, Fatigue 3
- 50. HPM VI: Tubular Structure
- 59. HPM VII: Environment Assisted Cracking I: EAC 1
- 68. HPM VIII: Environment Assisted Cracking II: EAC 2
- 136. HPM XIII: HPM Workshop

MECHANICS, COLLISION, RELIABILITY, ANALYSIS

- 77. MECHANICS I: Structures and Vibration 1
- 86. MECHANICS II: Structures and Vibration 2
- 95. MECHANICS III: Risk and Reliability
- 104. MECHANICS IV: Collision 1
- 113. MECHANICS V: Collision 2

ADVANCED SHIP TECHNOLOGY (AST)

- 3. AST I: Hydrogen & Nontraditional Propulsion 4
- 12. AST II: Propulsion and Energy Management
- 21. AST III: MaTCH 1: Materials I
- 30. AST IV: MaTCH 2: Materials II
- 39. AST V: MaTCH 3: Containment System 1
- 48. AST VI: MaTCH 4: Containment System 2
- 91. MaTCH 5: H2 and CO2 Workshop
- 57. AST VII: Navigation and Maneuvering 1
- 66. AST VIII: Navigation and Maneuvering 2
- 75. AST IX: Ship Hull and Optimization 1
- 84. AST X: Ship Hull and Optimization 2
- 93. AST XI: Smart Ship Tech 1
- 102. AST XII: Smart Ship Tech 2
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