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June 5-10, Shanghai, China

The Thirty-second (2022) International
**Ocean and Polar
Engineering Conference**
(Offshore and Polar Engineering Conference)

Including *additional ISOPE symposia*:
1st Intelligent Hydrodynamics (AI, ML, NN)
Advanced Ship Technology
4th Environment Assisted Cracking
7th Underwater Technology
11th Tsunami & Safety
9th Asset Integrity
13th Arctic Science & Technology
10th Cryogenic/Arctic Materials
13th Renewable Energy & Environment
14th Sloshing Dynamics & Design
LNG Membrane, Processing, Bunkering
17th Deep Ocean Mining & Gas Hydrates
20th High-Performance Materials

ISOPE-2022

Shanghai, China, June 5-10

(as of May 5, 2022)

Final Program (Hybrid)

Refereed papers from 45+ countries in 150 technical sessions
3 Keynote and multiple Focus sessions

Full Program with General Information, Advance Registration and Venue
Hotel, Paper List, Reservations, and Updates on

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

ISOPE-2012 Conference proceedings

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The 32nd Annual ISOPE-2022 Conference, Shanghai, China,

ISOPE-2022 Shanghai
 Ocean, Arctic Energy



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ISOPE-2022 Conference Co-chairs

Ronald Knapp (USA); Jin S Chung (USA); Demos Angelides (Greece); Sa Young Hong (Korea), Hiroyasu Kawai (Japan); Hua Liu (China), De Cheng Wan (China)



Knapp Chung Angelides Hong Kawai Liu Wan

ISOPE-2019 Honolulu In-person Conference



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

Welcome to the ISOPE-2022 Conference

We greatly appreciate the excellent response—with **1038** abstracts—and help we have received from colleagues around the world in the successful organization of the 32nd International Ocean and Polar (Arctic) Engineering Conference (**ISOPE-2022**), Shanghai, China, June 5–10, 2022. The Conference features **150** sessions of some 590 peer-reviewed papers, 15 oral presentations only and **3** keynote presentations from more than **45+** countries, including the ISOPE specialty symposia as a part of the ISOPE-2022 Conference.

The conference program in 2022 is in 2 versions: Printed with session topics, and the full conference program online (www.iso-pe.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 rigorous 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 63 successful international meetings with fully 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; Busan; 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, Kona, Rhodes, San Francisco, Sapporo, Honolulu, Shanghai (hybrid), and Rhodes (2021/hybrid). 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).
- 1st (1996) International Deep-Ocean Technology (**IDOT-96**) Symposium and Workshop, 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: SBD; Nanotechnology; Frontier Energy; Sloshing & Dynamics; Renewable Energy, Environment; Tsunami; Arctic & Polar Tech; Asset Integrity; Arctic & Cryogenic Materials; Materials Reliability, EAC, Intelligent Hydrodynamics.

On behalf of the Technical Program Committee, it is our pleasure to welcome participants from around the world to the ISOPE-2022 Conference in Shanghai, China.

Ronald H Knapp
USA

Jin S Chung
USA

Demos Angelides
Greece

Sa Young Hong
Korea

H Kawai
Japan

Hua Liu
China

Decheng Wan
China

Co-chairs of the ISOPE-2022 Conference

ISOPE-2022 Shanghai, China

The Thirty-second (2022) International Ocean and Polar Engineering Conference Shanghai, China, June 5–10, 2022

SUNDAY JUNE 5

SUNDAY ZOOM PRESENTATION

Time: Jun 5, 2022 20:00 (Shanghai), 13:00 (UK), 07:00 (Houston)

Conference Opening Session

ISOPE-2022 Conference Report
by Technical Program Committee

ISOPE President's Message
Prof. Eva Loukogeorgaki, Greece

Welcome Address:

Professor Zhongqin Lin, President, Shanghai Jiao Tong University, Shanghai, China

Keynote 1

TurkStream Technological Advancements (Proceedings Only; Presentation cancelled 4/27)

Erich Jurdik, Oleg Aksyutin, South Stream Transport BV, Netherlands; Bjorn-Andrea Hugaas, DNV AS, Norway; Ping Liu, Intecsea BV, Netherlands;

Keynote 2

The Future of Intelligent Hydrodynamics

Prof. Michael Triantafyllou, MIT, Cambridge, MA, USA

Keynote 3

Technical Innovations and Challenges of Sanxia Navigator, First Semi-FOWT of China [Oral presentation Only]

Dr. Yifeng Lin, Chief Engineer, Shanghai Investigation, Design, and Research Institute Co., Ltd., Shanghai, China

MONDAY ZOOM SESSIONS

Comparative Study

Time: Jun 6, 2022 17:00 (Shanghai), 10:00 (UK), 04:00 (Houston)

Session Leaders: Shiqiang Yan (UK), V Sriram (India)

Particle Methods

Time: Jun 6, 2022 19:00 (Shanghai), 12:00 (UK), 06:00 (Houston)

Session Leader: Abbas Khayyer (Japan)

Program is linked from the Conference Proceedings USB of the ISOPE- 2022

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

TECHNICAL PROGRAM

ISOPE-2022 Shanghai, China The Thirty-second (2022) International Ocean and Polar Engineering Conference Shanghai, China, June 5–10, 2022

This 32nd annual conference features 150 technical and opening general sessions, 3 keynote presentations from top experts from industry, academia and government. After peer review of the manuscripts selected from 1,038 abstracts, 590 peer-reviewed-papers and additional 15 oral presentations only are accepted and discussions by researchers, engineers and managers from 45+ countries. The ISOPE-2022 Conference Proceedings with peer-reviewed papers in PDF files will be available in a set of 4 volumes on USB 3,997 pp.) — paginated — during the conference and later for worldwide post-conference order from ISOPE: ISBN 978-1-880653-81-4; ISSN 1098-6189. The number at end of the session title is the proceedings volume. Only the changes in titles or authors the Technical Program Committee received in writing before April 18, 2022 are reflected in this program. The 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

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

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ISOPE-2022 Shanghai Conference

Session List for Virtual Presentations

SUNDAY

ZOOM Meeting and Presentation

OPENING SESSION

Welcome Address

Professor Zhongqin Lin, President, Shanghai Jiao Tong University, Shanghai

Keynote 1

TurkStream Technological Advancements (Presentation Cancelled 4/27, Proceedings Only)

Erich Jurdik, Oleg Aksyutin, South Stream Transport BV, Netherlands; Bjørn-Andreas Hugaas, DNV AS, Norway; Ping Liu, Intecsea BV, Netherlands

Keynote 2

The Future of Intelligent Hydrodynamics [Oral presentation Only]

Prof. Michael Triantafyllou, MIT, Cambridge, MA, USA

Keynote 3

2022-TPC-1096

Technical Innovations and Challenges of Sanxia Navigator, First Semi-FOWT of China [Oral presentation Only]

Dr. Yifeng Lin, Chief Engineer, Shanghai Investigation, Design, and Research Institute Co., Ltd., Shanghai, China

DEEP OCEAN MINERALS, HYDRATES AND MINING TECHNOLOGY (Vol. 1)

DEEP-OCEAN MINING I: Deep Seabed Minerals: Crusts, Polymetallic

DEEP-OCEAN MINING II: Seabed Crust Breaking

DEEP-OCEAN MINING III: Seabed Vehicles and Hydraulic Transport

DEEP-OCEAN MINING IV: Hydraulic Solid Particle Transport

DEEP-OCEAN MINING V: Seabed Path Track-Keeping

DEEP-OCEAN MINING VI: Dynamic Behavior of Transport Pipe

RENEWABLE ENERGY (Vol. 1)

RENEWABLE ENERGY I: Floating Wind Turbines 1

RENEWABLE ENERGY II: Floating Wind Turbines 2

RENEWABLE ENERGY III: Floating Wind Turbines 3

RENEWABLE ENERGY IV: Wind Turbines 1

RENEWABLE ENERGY V: Wind Turbines 2

RENEWABLE ENERGY VI: Wind Turbines 3

RENEWABLE ENERGY VII: Wind Farm Platform

RENEWABLE ENERGY VIII: Wind Turbine Support

RENEWABLE ENERGY IX: Wind Turbines Support Platform

RENEWABLE ENERGY X: Wind Turbine Installation

RENEWABLE ENERGY XI: SIDRI Wind Farm

RENEWABLE ENERGY XII: Wind Turbines: Digital

RENEWABLE ENERGY XIII: Ocean Energy & Aqua Cage

RENEWABLE ENERGY XIV: Tidal Energy

RENEWABLE ENERGY XV: Wave Energy

RENEWABLE ENERGY XVI: MHD Generator and Innovative Energy

OFFSHORE MECHANICS AND OCEAN TECHNOLOGY (Vol. 1)

OCEAN TECHNOLOGY I: LNG Bunkering and Subsea Codes
OCEAN TECHNOLOGY II: Hydrates 1
OCEAN TECHNOLOGY III: Hydrates 2
OCEAN TECHNOLOGY IV: Drilling and Cement Slurry 1
OCEAN TECHNOLOGY V: Offshore Lifting and Floatover Operation 1
OCEAN TECHNOLOGY VI: Offshore Lifting and Floatover Operation 2
OCEAN TECHNOLOGY VII: Jackup Design and Analysis
OCEAN TECHNOLOGY VIII: Floating Platform Construction and Tow
OCEAN TECHNOLOGY IX: Analysis 1
OCEAN TECHNOLOGY X: Analysis 2
OCEAN TECHNOLOGY XI: FPSO 1
OCEAN TECHNOLOGY XII: FPSO 2
OCEAN TECHNOLOGY XIII: Offshore Systems in General

OCEAN ENVIRONMENT, POLLUTION (Vol. 1)

OCEAN ENVIRONMENT, POLLUTION I: Oil, Metal Pollutant 1
OCEAN ENVIRONMENT, POLLUTION II: Oil, Metal Pollutant 2
OCEAN ENVIRONMENT, POLLUTION III: Carbon, Physico Chem
OCEAN ENVIRONMENT, POLLUTION IV: Pollutant, Sludge, Sewage

COMPARATIVE STUDY and PARTICLE METHODS (Zoom)

COMPARATIVE STUDY (Zoom) (Vol. 3)

PARTICLE METHODS (Zoom) (Vol. 3)

Panel

OFFSHORE GEOTECHNICAL ENGINEERING (Vol. 2)

OFFSHORE GEOTECH I: Behavior of Soils and Rocks
OFFSHORE GEOTECH II: Pile Foundations
OFFSHORE GEOTECH III: Offshore Geotechnics 1
OFFSHORE GEOTECH IV: Offshore Geotechnics 2
OFFSHORE GEOTECH V: Marine and River Geotechnics
OFFSHORE GEOTECH VI: Pipelines and Anchors

SUBSEA, PIPELINE, RISER (Vol. 2)

Keynote 1 (Presentation Cancelled; Proceedings Only)

TurkStream Technological Advancements

SUBSEA/ PIPELINE/ RISER I: Pipeline 1

SUBSEA/ PIPELINE/ RISER II: Pipeline 2

SUBSEA/ PIPELINE/ RISER III: Pipeline 3

SUBSEA/ PIPELINE/ RISER IV: Pipeline 4

SUBSEA/ PIPELINE/ RISER V: Pipeline 5

SUBSEA/ PIPELINE/ RISER VI: Pipeline 6

SUBSEA/ PIPELINE/ RISER VII: Deepwater Riser 1

SUBSEA/ PIPELINE/ RISER VIII: Deepwater Riser 2

SUBSEA/ PIPELINE/ RISER IX: Deepwater Riser 3

SUBSEA/ PIPELINE/ RISER X: Flexible Pipe

SUBSEA/ PIPELINE/ RISER XI: Subsea, Flexible & Umbilical

SUBSEA/ PIPELINE/ RISER XII: Flow Assurance

SUBSEA/ PIPELINE/ RISER XIII: Subsea Structure

SUBSEA/ PIPELINE/ RISER XIV: Mooring System

UNDERWATER TECHNOLOGY (Vol. 1)

UNDERWATER TECHNOLOGY I: Deepsea Macro Hydrate, 3D
UNDERWATER TECHNOLOGY II: Degaussing, Sound absorbing/Wake
UNDERWATER TECHNOLOGY III: 3. Path Plan, Position, Topography
UNDERWATER TECHNOLOGY IV: Launch/ Recovery, Bio-mimetic
UNDERWATER TECHNOLOGY V: Underwater Design and CFD 1
UNDERWATER TECHNOLOGY VI: Underwater Design and CFD 2
UNDERWATER TECHNOLOGY VII: Underwater Design and CFD 3
UNDERWATER TECHNOLOGY VIII: Control, Manipulator, Tow

ARCTIC AND POLAR TECHNOLOGY (Vol. 1)

ARCTIC & POLAR I: Ice Ridges and Properties
ARCTIC & POLAR II: Ice Management and Iceberg Towing
ARCTIC & POLAR III: Ships Maneuvering and Icebreaking
ARCTIC & POLAR IV: Safety and EER (Escape, Evacuation, Rescue)
ARCTIC & POLAR V: Ice Loads
ARCTIC & POLAR VI: Arctic Region
ARCTIC & POLAR VII: Ice Physics and Ice Tests
ARCTIC & POLAR VIII: Ships in Ice and Vessel Design 1
ARCTIC & POLAR IX: Ships in Ice and Vessel Design 2
ARCTIC & POLAR X: Ships in Ice and Vessel Design 3

INTELLIGENT HYDRODYNAMICS (Vol. 3)

INTELLIGENT HYDRODYNAMICS I: Waves
INTELLIGENT HYDRODYNAMICS II: Flow
INTELLIGENT HYDRODYNAMICS III: Navigation and Seakeeping

HYDRODYNAMICS (Vol. 3)

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HYDRODYNAMICS III: Motions of Floating Structures 2
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HYDRODYNAMICS V: Motion 4
HYDRODYNAMICS VI: Impact, Slamming 1
HYDRODYNAMICS VII: Impact, Slamming 2
HYDRODYNAMICS VIII: Impact, Slamming 3
HYDRODYNAMICS IX: :Ship Dynamics 1
HYDRODYNAMICS X: Ship Dynamics 2
HYDRODYNAMICS XI: Ship Dynamics 3
HYDRODYNAMICS XII: Tsunami and Internal Waves 1
HYDRODYNAMICS XIII: Tsunami and Internal Waves 2
HYDRODYNAMICS XIV: Rogue Waves
HYDRODYNAMICS XV: Sloshing Dynamics and Design
HYDRODYNAMICS XVI: CFD 1
HYDRODYNAMICS XVII: CFD 2
HYDRODYNAMICS XVIII: CFD 3
HYDRODYNAMICS XIX: VIV and FIV 1
HYDRODYNAMICS XX: VIV and FIV 2

COASTAL HYDRODYNAMICS (Vol. 3))

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COASTAL HYDRODYNAMICS V: Seawall and Bridge
COASTAL HYDRODYNAMICS VI: Breakwater
COASTAL HYDRODYNAMICS VII: Structure Performance
COASTAL HYDRODYNAMICS VIII: Beach
COASTAL HYDRODYNAMICS IX: Coastal and River Environment

HIGH PERFORMANCE MATERIALS (HPM) (Vol. 4)

HPM I: Advanced Materials 1
HPM II: Advanced Materials 2
HPM III: Advances in Welding Technology 1
HPM IV: Advances in Welding Technology 2
HPM V: Fracture/Fatigue & Asset Integrity 1
HPM VI: Fracture/Fatigue & Asset Integrity 2
HPM VII: Fracture/Fatigue & Asset Integrity 3
HPM VIII: Non-metallic Materials

ENVIRONMENT ASSISTED CRACKING (EAC) (Vol. 4)

EAC I: Hydrogen Embrittlement 1
EAC II: Hydrogen Embrittlement 2
EAC III: Effect of Corrosive Environment

MECHANICS, RISK, SAFETY (Vol. 4)

MECHANICS, RISK, SAFETY I: Flexible Structures
MECHANICS, RISK, SAFETY II: Loads, Strength, Drilling
MECHANICS, RISK, SAFETY III: Fatigue and Crack

SAFETY, RELIABILITY (Vol. 4)

SAFETY, RELIABILITY I: Learning and Neural Network
SAFETY, RELIABILITY II: Stress and Risk
SAFETY, RELIABILITY III: Safety and Accident

IMPACT, COLLISION (Vol. 4)

IMPACT & COLLISION I: Impact on Water
IMPACT & COLLISION II: Impact on Solid
IMPACT & COLLISION III: Impact and Underwater Explosion

ADVANCED SHIP TECHNOLOGY (AST) (Vol. 4)

ADVANCED SHIP TECH I: Propeller Cavitation
ADVANCED SHIP TECH II: Hydrofoil Cavitation
ADVANCED SHIP TECH III: Ship Design
ADVANCED SHIP TECH IV: Ship Resistance & Added Resistance
ADVANCED SHIP TECH V: Drag and Resistance: Reduction
ADVANCED SHIP TECH VI: Hull Form Optimization
ADVANCED SHIP TECH VII: MHD and Hydrodynamics
ADVANCED SHIP TECH VIII: Machine Learning (ML) Application
ADVANCED SHIP TECH IX: Electric Ship and Subsystems
ADVANCED SHIP TECH X: Navigation

ADVANCED SHIP TECH XI: Propeller Performance
ADVANCED SHIP TECH XII: Ship Propulsion
ADVANCED SHIP TECH XIII: Finite Depth and Shallow Water
ADVANCED SHIP TECH XIV: High-Speed Vehicle Dynamics
ADVANCED SHIP TECH XV: Ship Structures, Strength and Design
ADVANCED SHIP TECH XVI: Ship Power Systems
ADVANCED SHIP TECH XVII: Waterjet Propulsion
ADVANCED SHIP TECH XVIII: Ship Shafting and Vibration

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The 33rd (2023) International
Ocean and Polar Engineering Conference
Ottawa, June 19-23, 2023

First

Call For Papers

Abstract Deadline

October 20, 2022

Manuscript (for review) Deadline

January 20, 2023

The International Society of Offshore and Polar Engineers (ISOPE) is organizing about 140+ sessions of refereed papers including special sessions of timely topics in cooperation with international technical program committee (TPC) members and cooperating organizations. Delegates from more than 50+ countries are expected. All manuscripts will be peer-reviewed prior to the final acceptance. The conference proceedings will be available at the conference. Papers of archival value may be further reviewed for possible publication in one of the ISOPE the *Journals*.

Main fields of interest are:

| | | |
|------------------------|---------------------------|---------------------------|
| AI, ML, ANN, Learning | Hydrodynamics | High Perform. Mats |
| Wind, Ocean Energy | Sloshing Dynamics | Strain-Based Design |
| Ocean Technology | AI, ML, NN, CFD, | Asset Integrity |
| Offshore Mechanics | MetOcean, Tsunami | Materials & Welding |
| Ocean Engineering | FPSO, TLP, SPAR | Risers, Pipelines, Cables |
| Arctic & Polar Tech | Advanced Ship Tech | Subsea & Umbilicals |
| Arctic Materials | Safety, Risk, Reliability | Cryogenic Materials |
| LNG, FLNG | Underwater Systems | Environment... Cracking |
| Deep Seabed Drilling | Nonlinear Waves | Tubular & Linepipe |
| Renewable Energy | Coastal Engineering | Composites |
| Environment, Pollution | Control, Simulation | VIV and Design |
| Gas Hydrates, Minerals | Offshore Geotech, | Emerging Topics |

The abstract should stress the originality and the significance of the results, and include the complete names, postal and e-mail addresses and fax numbers of all authors.

Send (E-mail, online) your abstract in 300–400 words to:

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