MARIN

BETTER SHIPS, BLUE OCEANS

STA2

STA-2

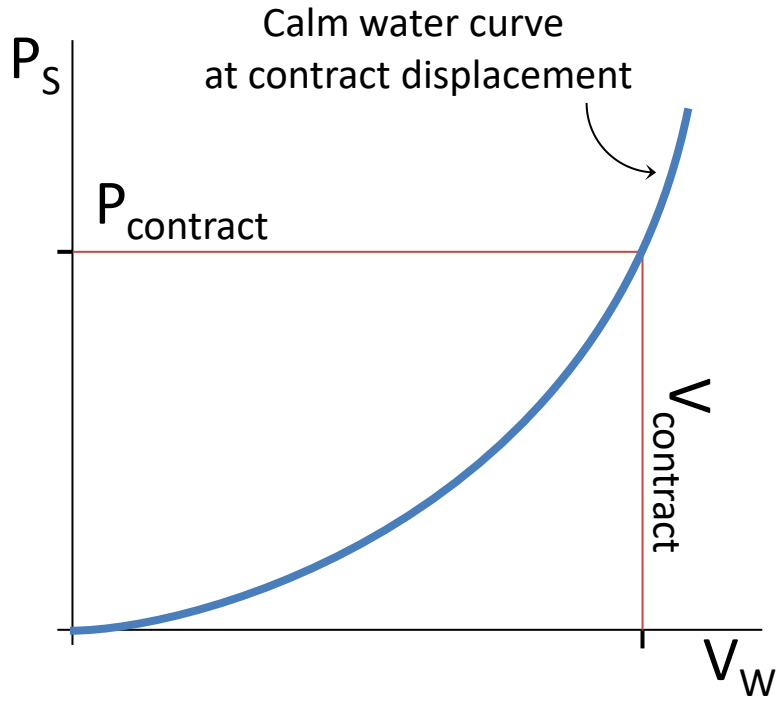
Joint Industry Project

Content

- Background
- Overview of present-day status
- Proposed project scope
- Project costs and fee
- JIP process

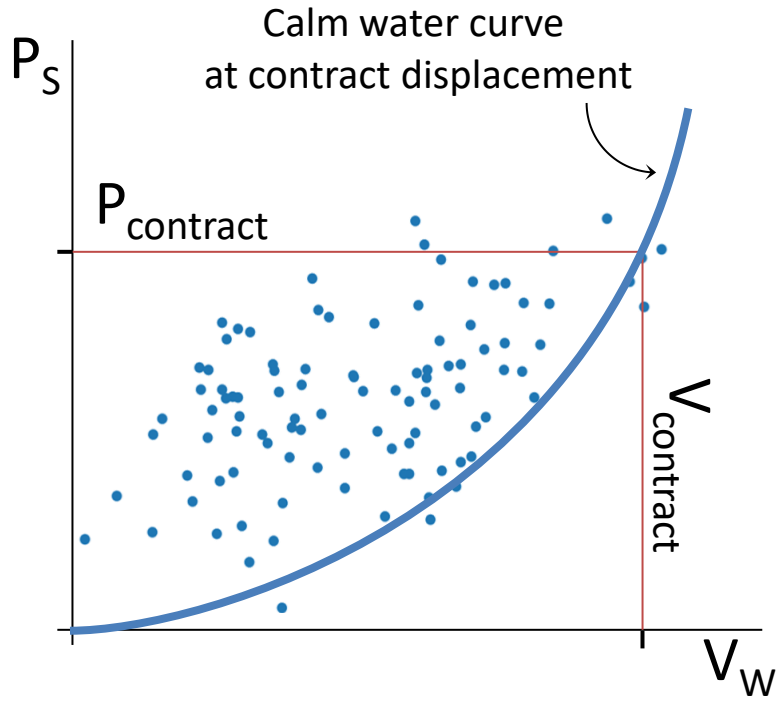
Background: full-scale ship performance

- Speed/power contract trials using reciprocal runs



Background: full-scale ship performance

- Speed/power contract trials using reciprocal runs
- In-service data, relying on speed log for STW



Background: S/P trial standards

- Taniguchi-Tamura 1966
- BSRA 1964, 1978
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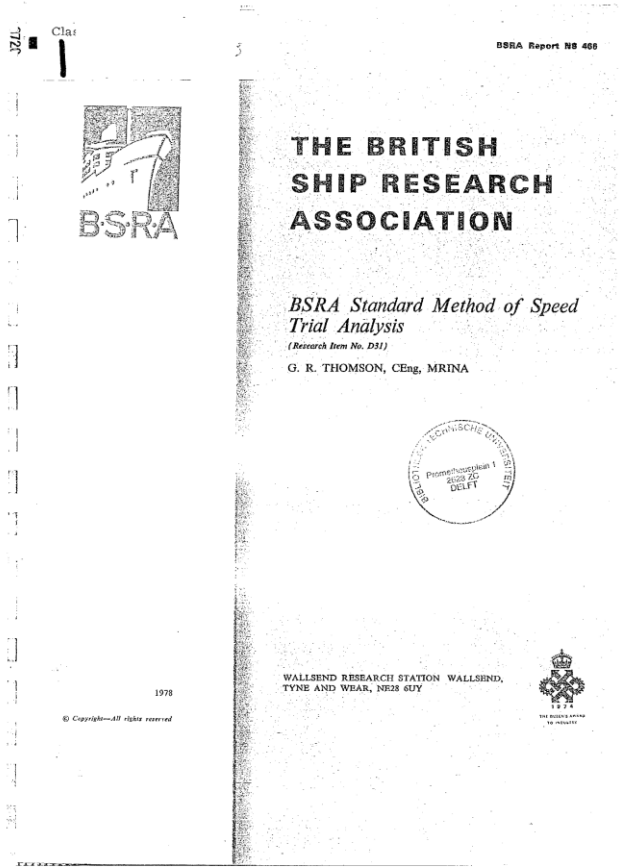
- ISO15016 2002
- ITTC …,2005



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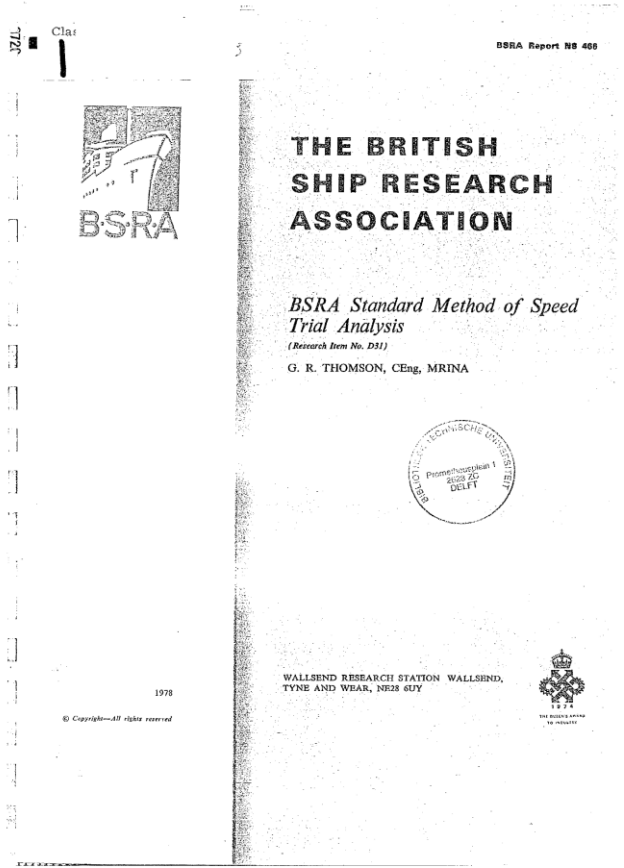

! Sea trial performance was not observed in-service…

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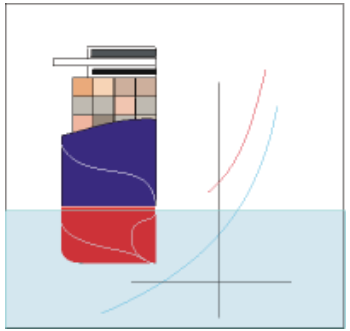
Background: Sea Trial Analysis JIP: STA-JIP

- JIP 2004-2006
- 34 participants



Background: Sea Trial Analysis JIP: STA-JIP

Delivered:

- Improved methods for trial conduct
- Improved methods for trial analysis
- Validation cases
- STAIMO software

Achieved:

Resulted in clear, pragmatic and transparent guidelines for the reliable speed/power assessment of ships worldwide

Background: Sea Trial Analysis JIP: STA-JIP

Impact:

- 2012: ITTC recommended procedures
- IMO adaptation
- ISO15016:2015, now the standard for contracts

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Present-day status

- Work on S/P trial methods continued in
  - ITTC committees on full scale ship performance
  - ISO WG17

30th ITTC - FSSPC

Full Scale Ship Performance Committee (FSSPC)

Chairman:

1- Hideo Orihara, JMUC, Japan

Secretary:

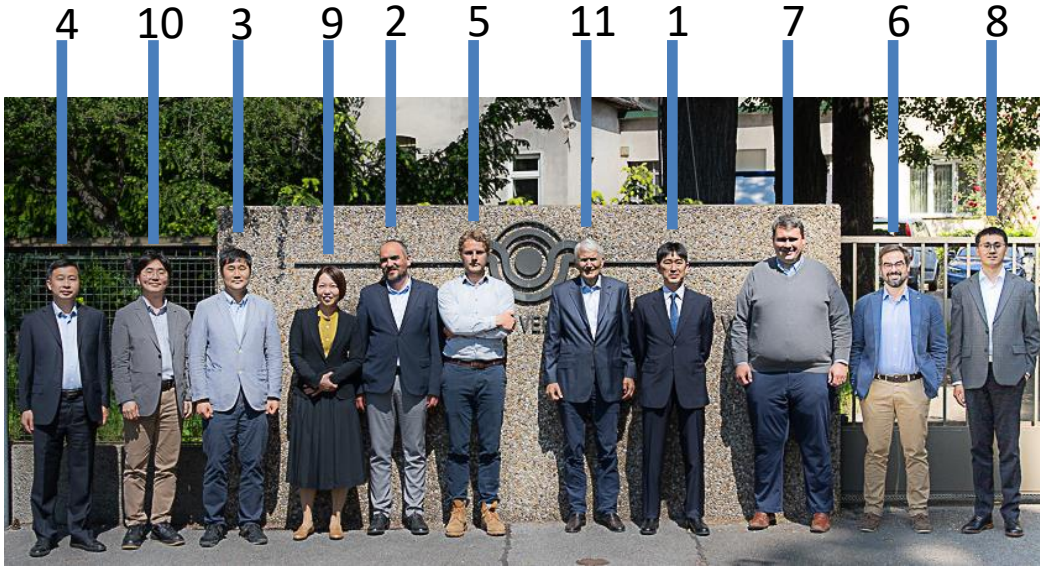
2- Sebastian Bielicki, CTO, Poland

Members:

3- Se-Myun Oh, SHI, Korea
4- Gongzhen Xin, CSSRC, China
5- Gijs Struijk, MARIN, NL
6- Giuliano Vernengo, U. Genova, Italy
7- Stephen Minnich, NSWCCD, USA
8- Peiyuan Feng, MARIC, China
9- Mariko Kuroda, NMRI, Japan
10- Min Woo Kim, HHI, Korea

Observer:

11- Prof. Gerhard Strasser, SVA, Austria

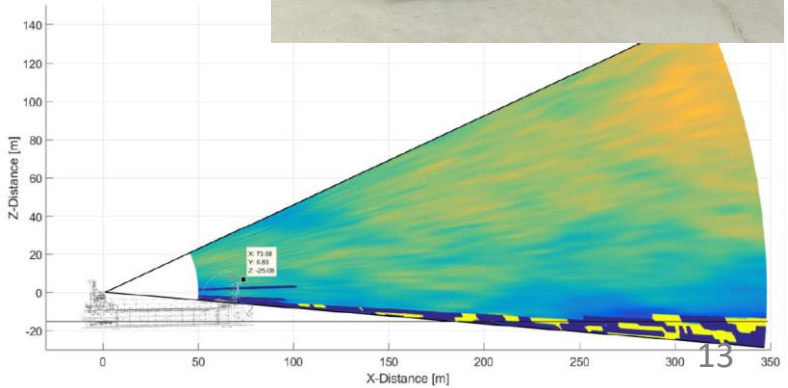


30th ITTC - FSSPC main findings & recommendations

- Review of new measurement techniques: wave radar, wind LiDAR, thrust, …
- Roughness effects
- Fouling effects
- Shallow water corrections
- Yaw & rudder angle corrections
- Wave corrections
- Wind corrections

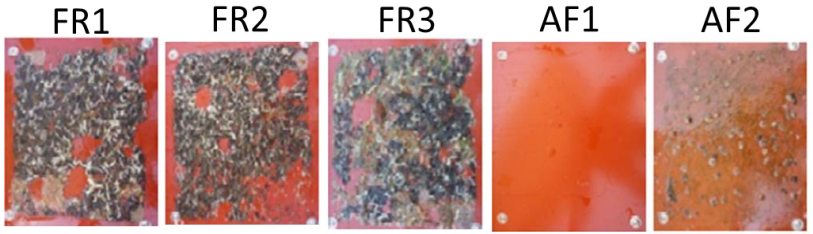
30th ITTC - FSSPC main findings & recommendations

- Review of new measurement techniques: wave radar, wind LiDAR, thrust, …
  - Wave radar (& buoys) superior to gauging by eye, but not often applied
  - Wind LiDAR best technique for obtaining undisturbed wind
  - Thrust measurements still proven difficult (strain guage, distance sensors)



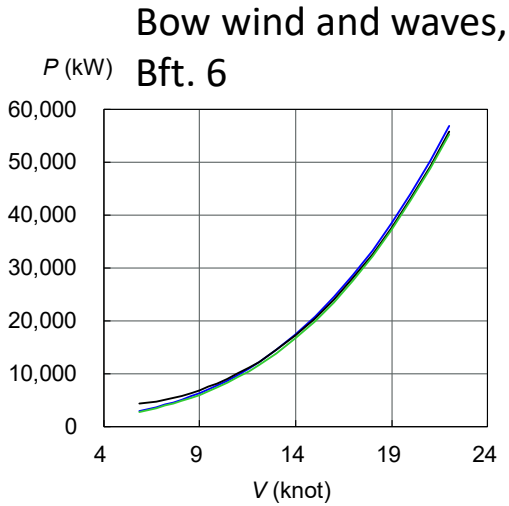
30th ITTC - FSSPC main findings & recommendations

- Roughness effects
  - Need for definition of roughness (height, length, non-uniformity, height in relation to viscous sublayer)
  - No reliable correction method
- Fouling effects
  - Difficult to define different types (how to quantify/measure a slime layer?)
  - No reliable correction method



30th ITTC - FSSPC main findings & recommendations

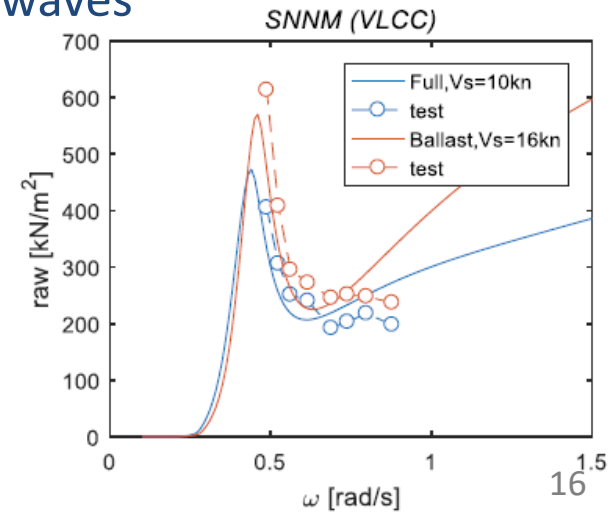
- Shallow water corrections
  - ‘New’ Raven method currently implemented in latest ITTC & new ISO a stark improvement over previous Lackenby method.
  - Still exists a need for more validation, but has proven difficult to organize…
- Yaw & rudder angle corrections
  - In trial situations (around design speeds, into dominant weather), influence is limited.
  - No correction needed for trials



Difference depending on the estimation of resistance due to drifting and its effects on power curves

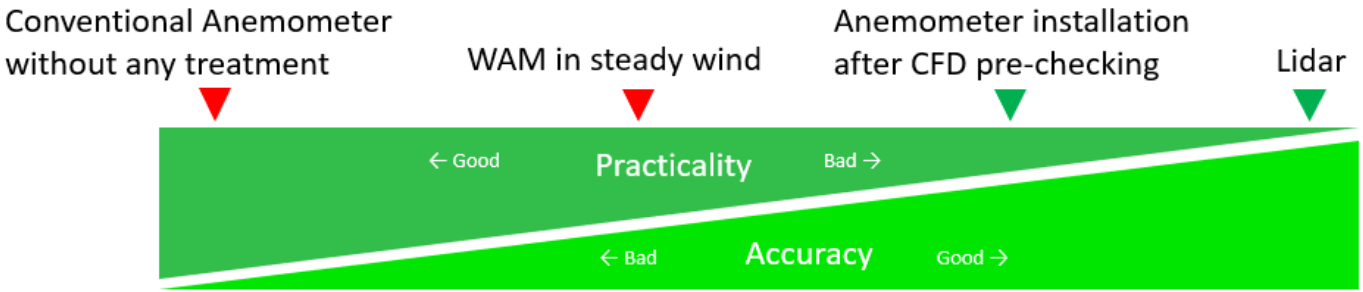
30th ITTC - FSSPC main findings & recommendations

- Wave corrections
  - Review of different present-day methods (STAWAVE-1&2, SPAWAVE, SNNM, NMRI, simple-NMRI)
  - Discrepancies, mainly in short-wave period range (relevant for most trials!)
  - More work needed to improve methods in short waves



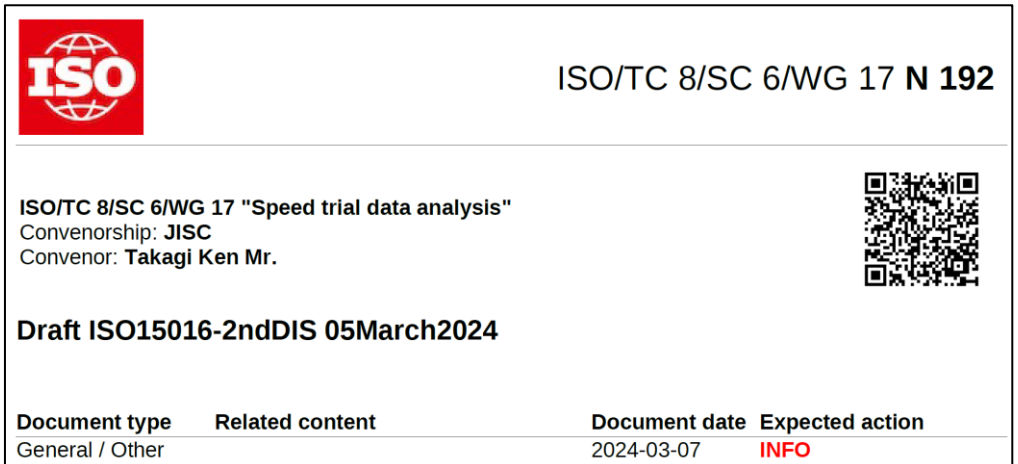
30th ITTC - FSSPC main findings & recommendations

- Wind
  - Discussion on wind averaging method (WAM) increases uncertainty in changing wind conditions.
  - Discussion on CFD pre-scan method to find best anemometer position.
  - More ship types needed in database of wind coefficients (STAWIND/ITTC)



ISO WG17: updating ISO15016

- Will be published end of 2024
- Main changes: wind, waves, shallow water
- STAIMO v3.0 to be released to reflect changes



ISO/TC 8/SC 6/WG 17 **N 192**

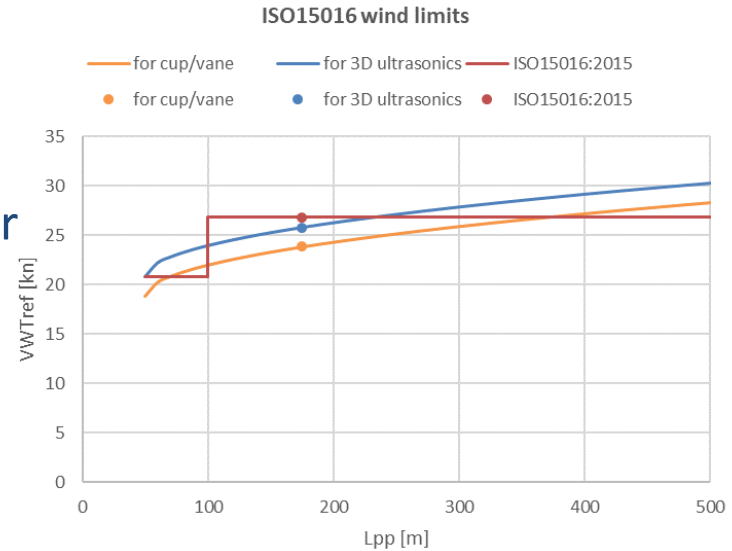
ISO/TC 8/SC 6/WG 17 "Speed trial data analysis"
Convenorship: **JISC**
Convenor: **Takagi Ken Mr.**

Draft ISO15016-2ndDIS 05March2024

Document type	Related content	Document date	Expected action
General / Other		2024-03-07	INFO

ISO WG17: updating ISO15016

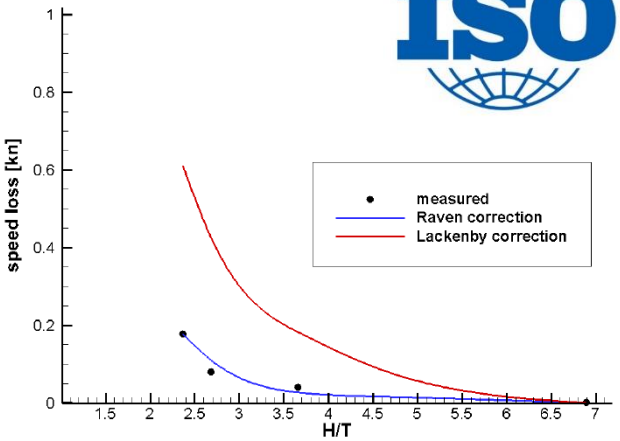
- Waves:
  - STAWAVE-2 replaced by SNNM for trials with ship motions
- Wind:
  - Use of 3D ultrasonic anemometer endorsed
  - Use of wind LiDAR recommended
  - New limits for wind speed (anemo type dependent)
  - Height conversion: using 1/9 power curve for boundary layer (prev. 1/7)
  - 5 new ship types added to wind coefficient database



ISO WG17: updating ISO15016

- Shallow water: Raven method

- Run direction: into waves or wind, whichever has most dominant effect
- When using MoM: may change run direction for new power setting if weather direction changes significantly
- Run order: from low to high power settings mandatory



Questions?

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Scope

Joint Industry Project

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Objective:

The STA-2 JIP aims for more accurate and reliable determination of the actual, full-scale speed/power performance of ships, both from speed trials and in-service measurements.

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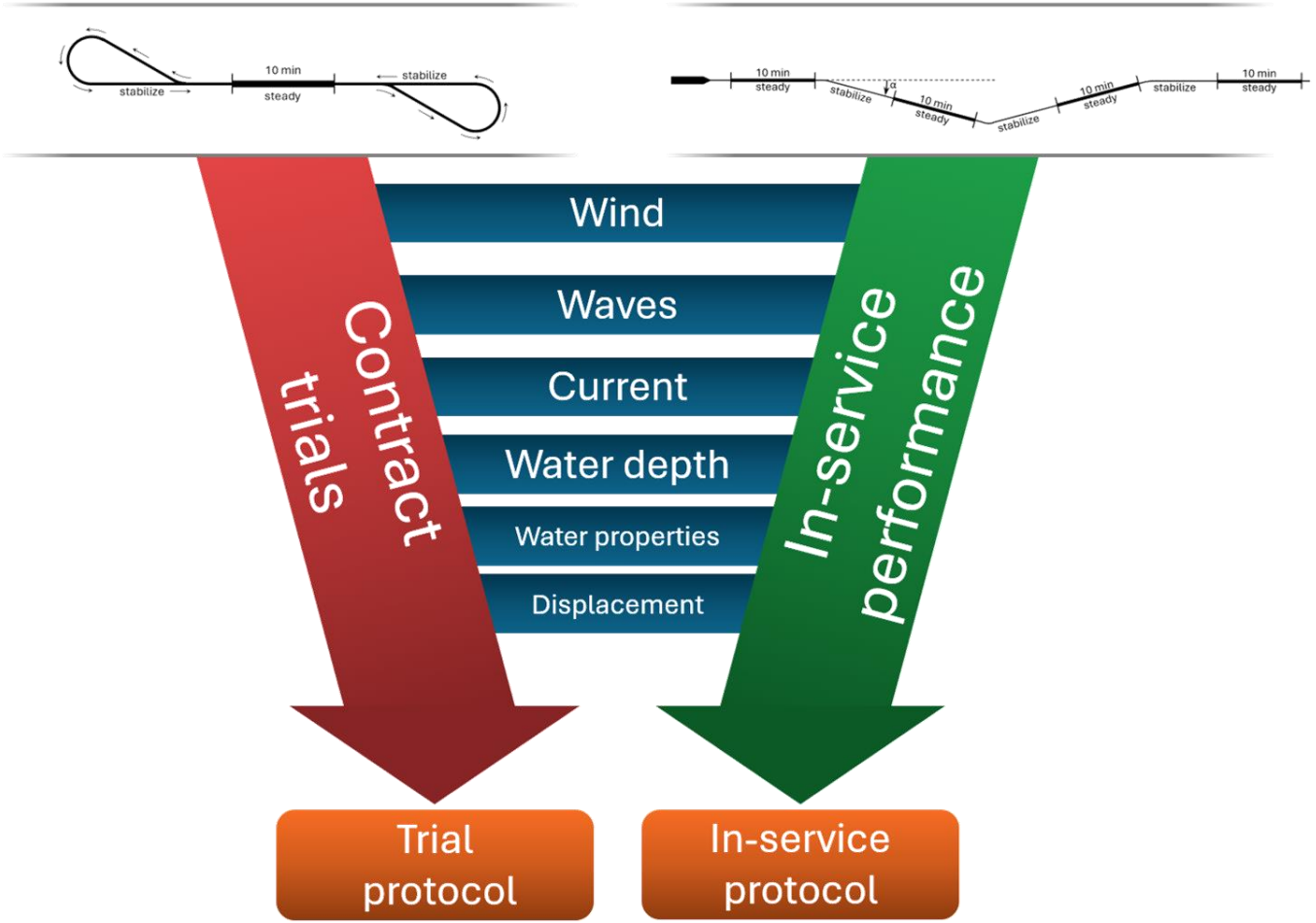
The STA-2 JIP aims for more accurate and reliable determination of the actual, full-scale speed/power performance of ships, both from speed trials and in-service measurements.

Thereto, the project will:

- **Improve the current protocol for speed/power trials**
- **Develop an in-service performance protocol**

Scope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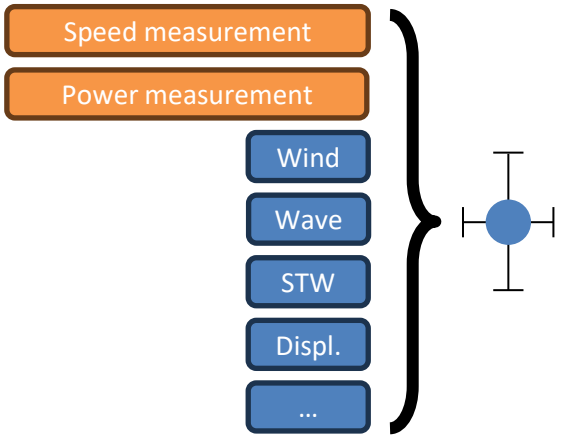
Wind
Waves
Current
Water depth
Water properties
Displacement
Contract trials
In-service performance
Trial protocol
In-service protocol

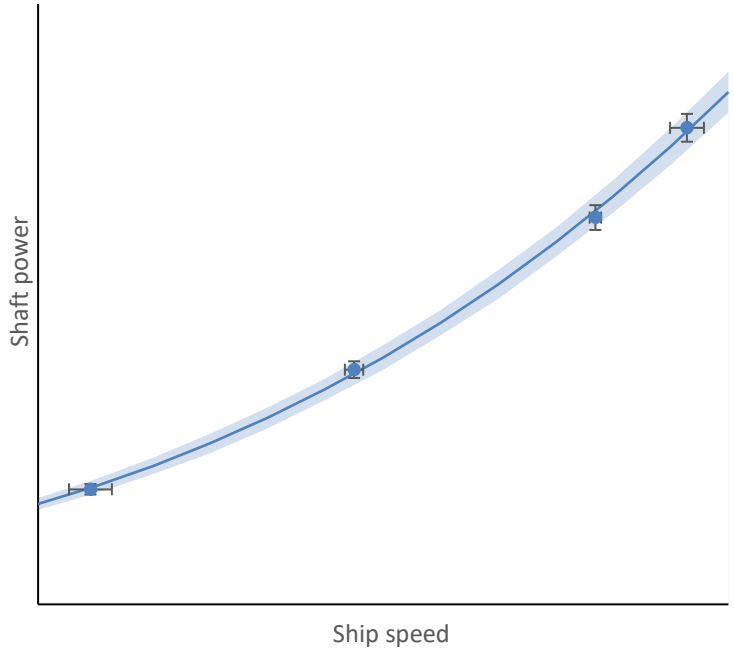
Scope

- WP1 - Aspects of uncertainty
- WP2 - Correction method (wind, waves, current, …)
- WP3 - Test protocols (contract trials, in-service)
- WP4 - Validation trial campaigns
- WP5 - Procedures, implementation, dissemination

WP1 Aspects of uncertainty

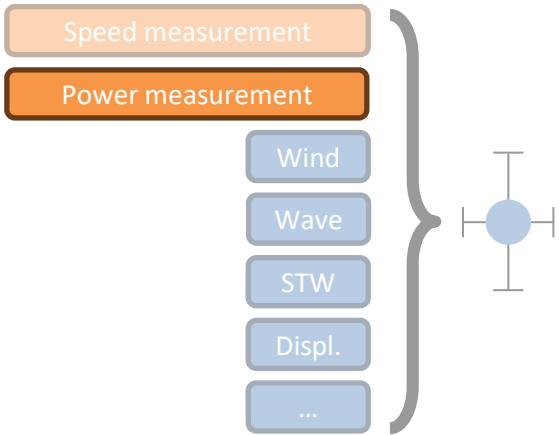
- Study and review all aspects of conduct & analysis, and their contributions to the total uncertainty
- Starting point for defining priorities
- Determine feasibility of standardised uncertainty method





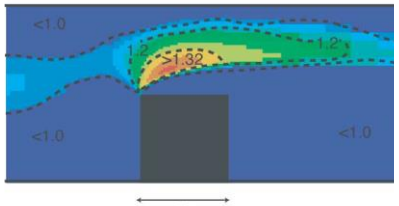
WP1 Aspects of uncertainty - additional

- Power measurements on integrated propulsion systems
- Electrical power measurements, recommended procedure



WP2 Correction methods

- Wind
  - Add ship types to coefficients database
  - Investigate anemometer location & CFD pre-scan techniques
  - Investigate boundary layer profile steepness/exponent
  - (Investigate measurement techniques)



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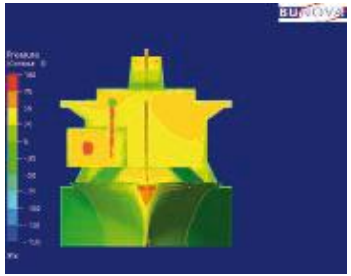
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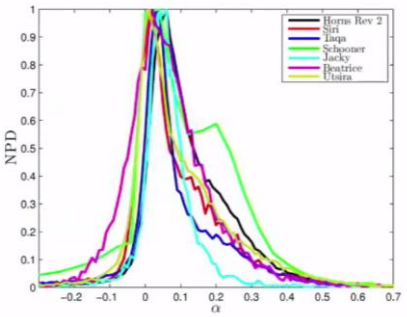
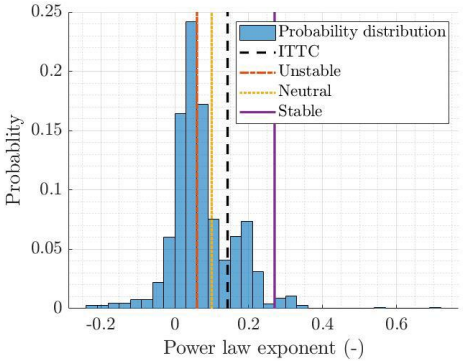
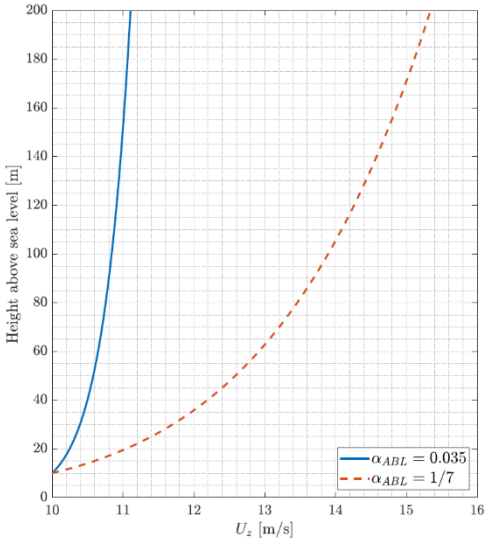
Figure 12. Normalized distribution of α-values from the power law at around 100 m for a number of NORSEWInD wind lidar nodes for all wind speed ranges.



Hasager et al. (2013)



Dhomé (2020)



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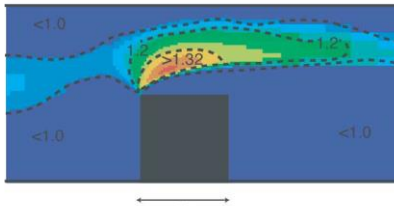

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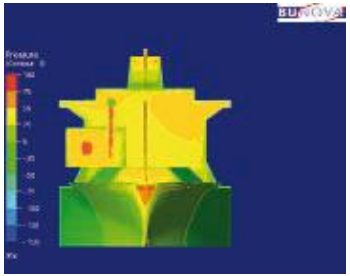
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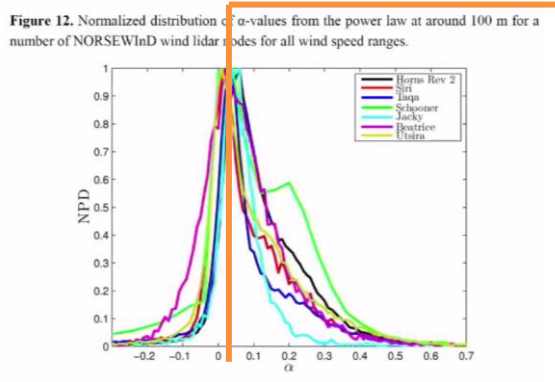

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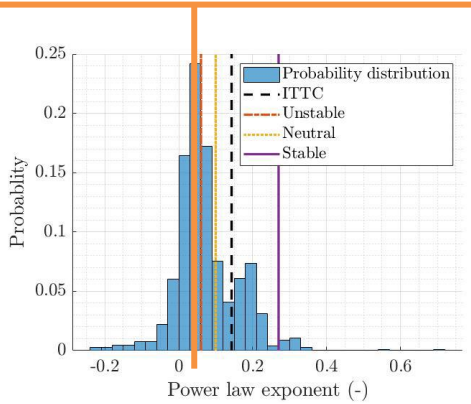

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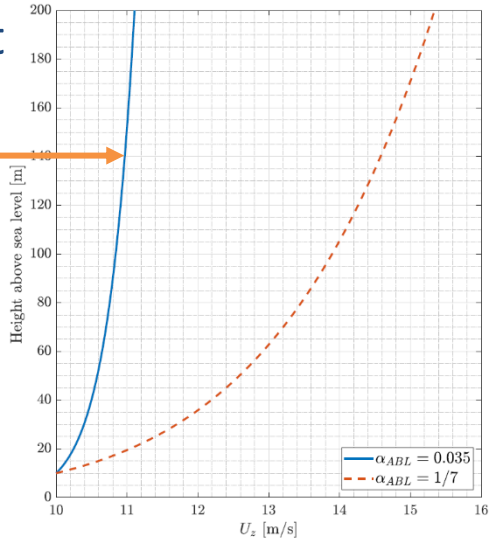
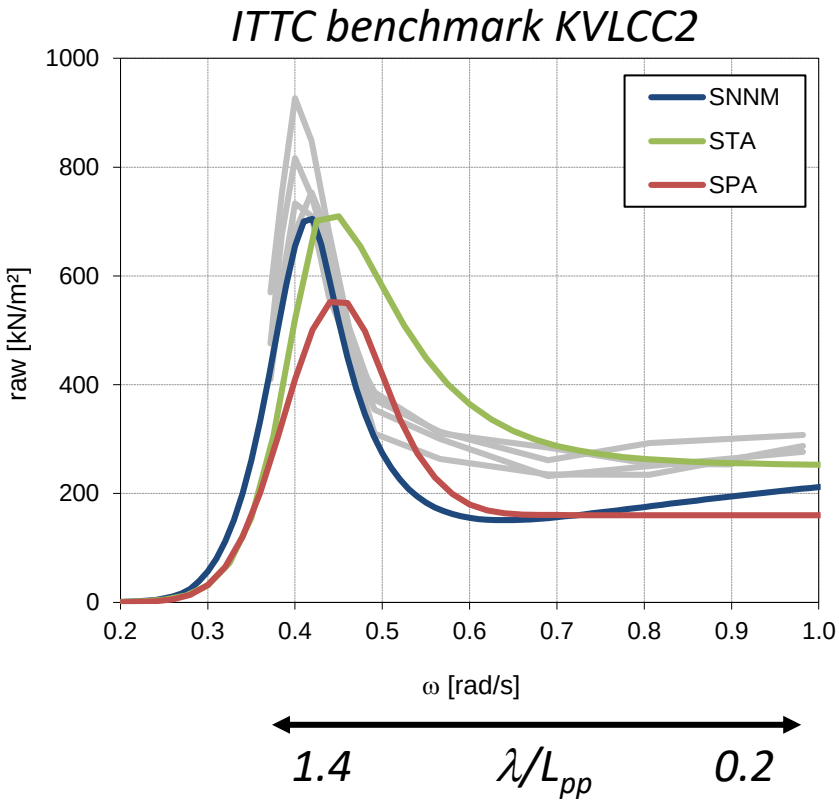


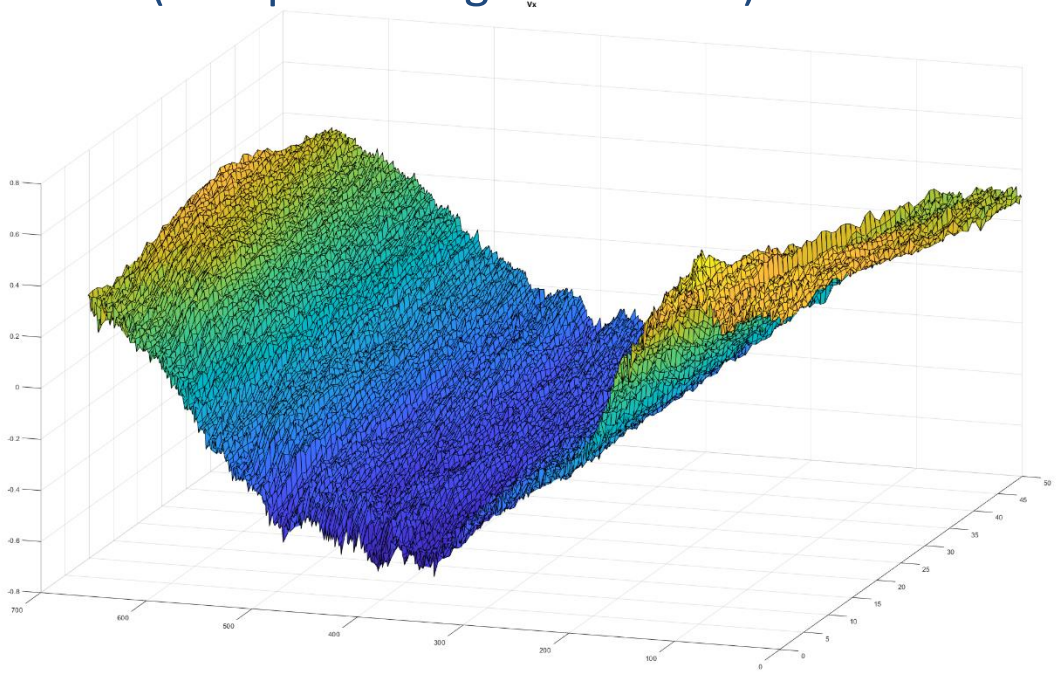
WP2 Correction methods

- Waves
  - Review existing methods
  - Investigate short-wave treatment
  - Joint development of improved method
  - Validation
  - (Investigate measurement techniques)



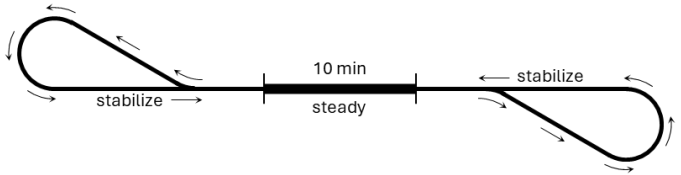
WP2 Correction methods

- Current / speed through water (STW)
  - Revise iterative method for current
  - Validation trials to include ADCP (or equivalent ground truth)



WP3 Test protocols

- **Contract protocol**
  - Based on reciprocal runs
  - Determine if can be made easier: tolerance on the need to return to track
  - Review limits (tied to correction methods & uncertainty)
  - Improve wording & definitions



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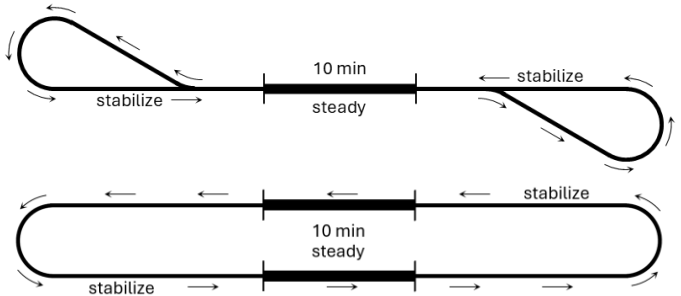

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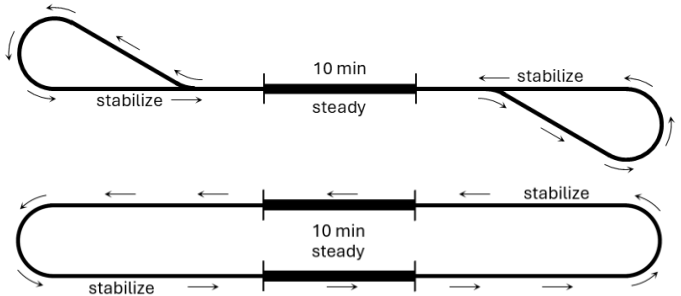
    - Stabilisation period
    - Stabilisation criteria
    - SOG/speed made good
    - Draught reading, displ. calc.
    - …



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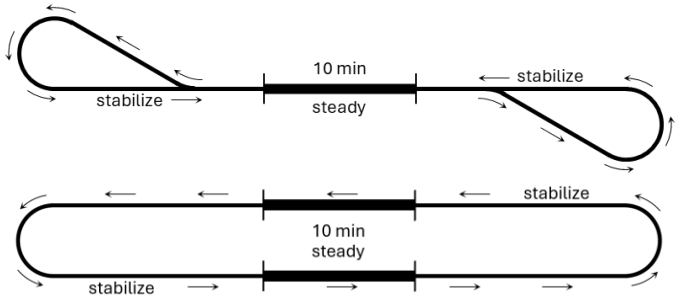
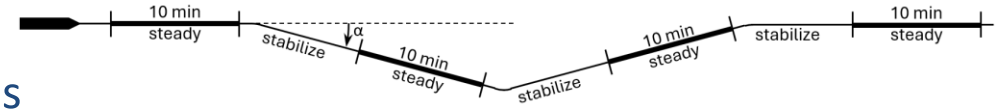


- **In-service protocol**
  - Steady-state zig-zag runs
  - Investigate limits of applicability
  - Draft a workable protocol



WP4 Validation trial campaigns

- Different validation trials foreseen to
  - Verify practicalities
  - Verify applicability limits
  - Validate new approaches
  - Validate new models

WP5 Procedures, implementation, dissemination

- Write new procedures, fit for adaptation in ITTC, ISO, IMO,…
  - Contract speed/power trials
  - In-service performance
- Updated software (STAIMO)
- Best practices documents

- Liaise with ITTC, ISO, IMO
- Publications
- Presentations

Impact

- New software for analysis
- Leading to updated standards, adaptation in
  - ITTC
  - IMO
  - ISO
    - ISO15016 (speed/power trials)
    - ISO19030 (in-service)

Budget

- 20 participants + MARIN
- 3 years, 15 k€/year
- 25% subsidy (NL)

	Description	Costs (k€)	
WP1	Uncertainty study	75	6%
WP2	Correction methods	285	23%
WP3	Test protocols	100	8%
WP4	Validation trials	300	24%
WP5	Procedures, implementation, dissemination	195	15%
	Management	140	11%
	Contingency	164	13%
	Total	**1259**	

	Description	Funding (k€)
	MARIN contribution	45
	Subsidy Dutch government (TKI ~25%)	314
	Participant contribution (20 participants x 3 yr x 15 k€)	900
	Total	**1259**

Planning

		2025				2026				2027			
WP		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
	Start-up phase												
WP1	Uncertainty study												
WP2	Correction methods												
WP3	Test protocols												
WP4	Validation trials												
WP5	Procedures, implementation, dissemination												
	Management												

Organization

The STA-2 JIP is organized by MARIN and hosted within the Vessel Operator Forum.

The project will be managed by MARIN. Participants are expected to actively contribute to the project meetings. Two meetings will be arranged each year.

Project kick-off at next meeting during VOF in April 2025 / part of Blue week 2025 (7-11 April).

The full results of the JIP will remain for exclusive use by the JIP participants for three years after the finishing of this project.

Registration

Participants are encouraged to sign up for this project between
1 December 2024 - 1 March 2025.

The full JIP proposal and JIP agreement will be published on https://www.marin.nl/en/jips/sta-2

After 1 October 2025, new participants will be regarded as ‘late’ participants which involves a 25% addition to the fee.

Acquisition and Promotion

- Website MARIN
  - Project proposal
  - Leaflet
  - *List of participants that have signed*
- Behind login:
  - Reports
  - Presentations
  - Meeting notes
- LinkedIn page:
  - *Announcements of new participants*
  - *General updates on work*
  - *General results and progress*
  - *Etc.*
- MARIN Report

Questions?

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