Passing-Ship Effects In Confined Waterways

John Flory, Tension Technology International, Morristown, NJ

Scott Fenical, Coast & Harbor Engineering, San Francisco, CA

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Passing-Ship Effects In Confined Waterways

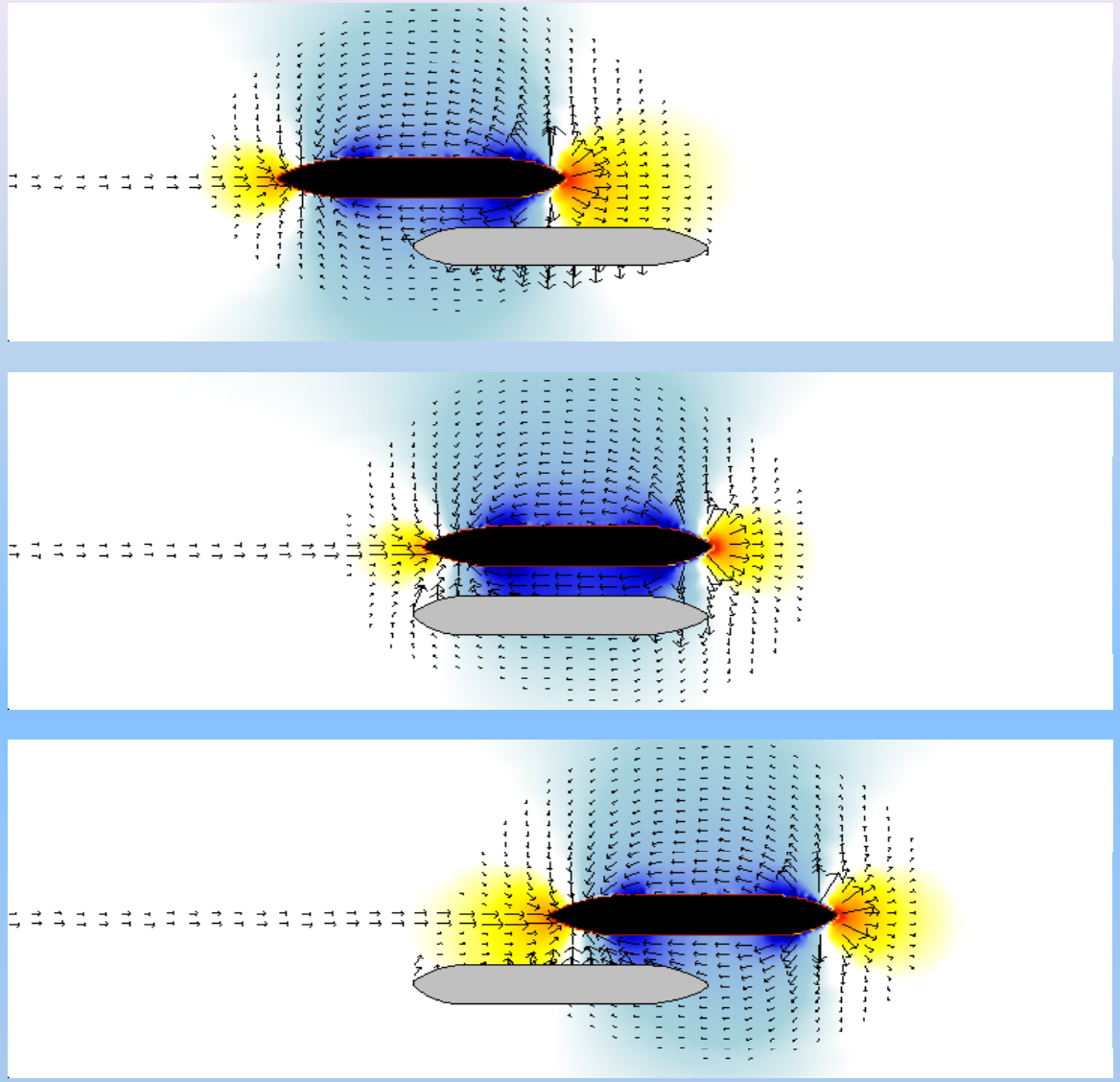
Passing Ship Forces and Moments Have Now Been Analyzed By Computer Program for :

- Vessel Moored Alongside a Solid Quay Wall
- Vessel Moored In a Restricted Waterway

These Cases Produce Peak Forces and Moments Which are Significantly Different From Those for :

- Vessel Moored In Open Water

Passing-Ship Effects In Confined Waterways



Passing Ship in Open Waterway

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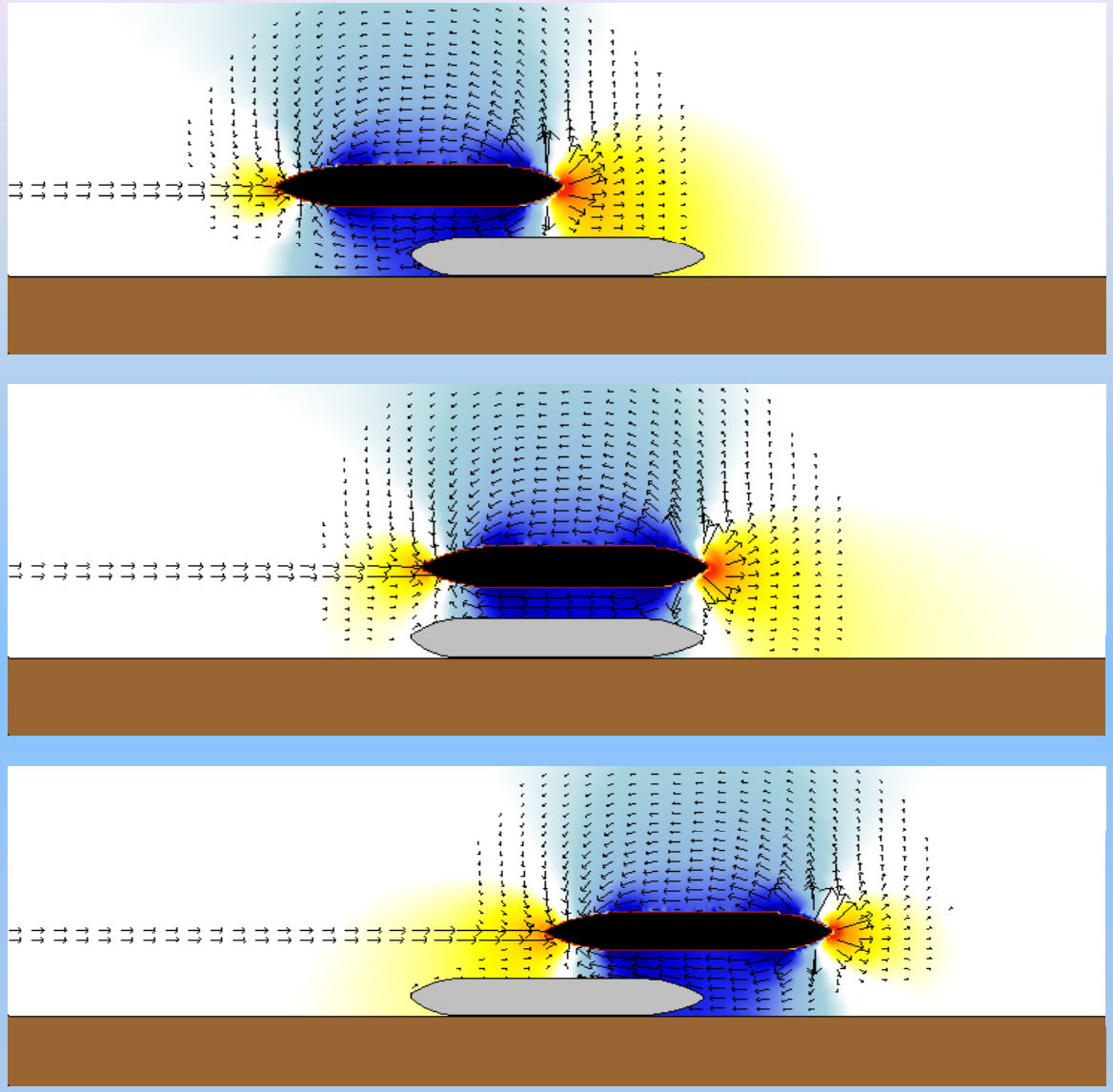
Passing-Ship Effects In Confined Waterways



Passing Ship alongside Quay Wall

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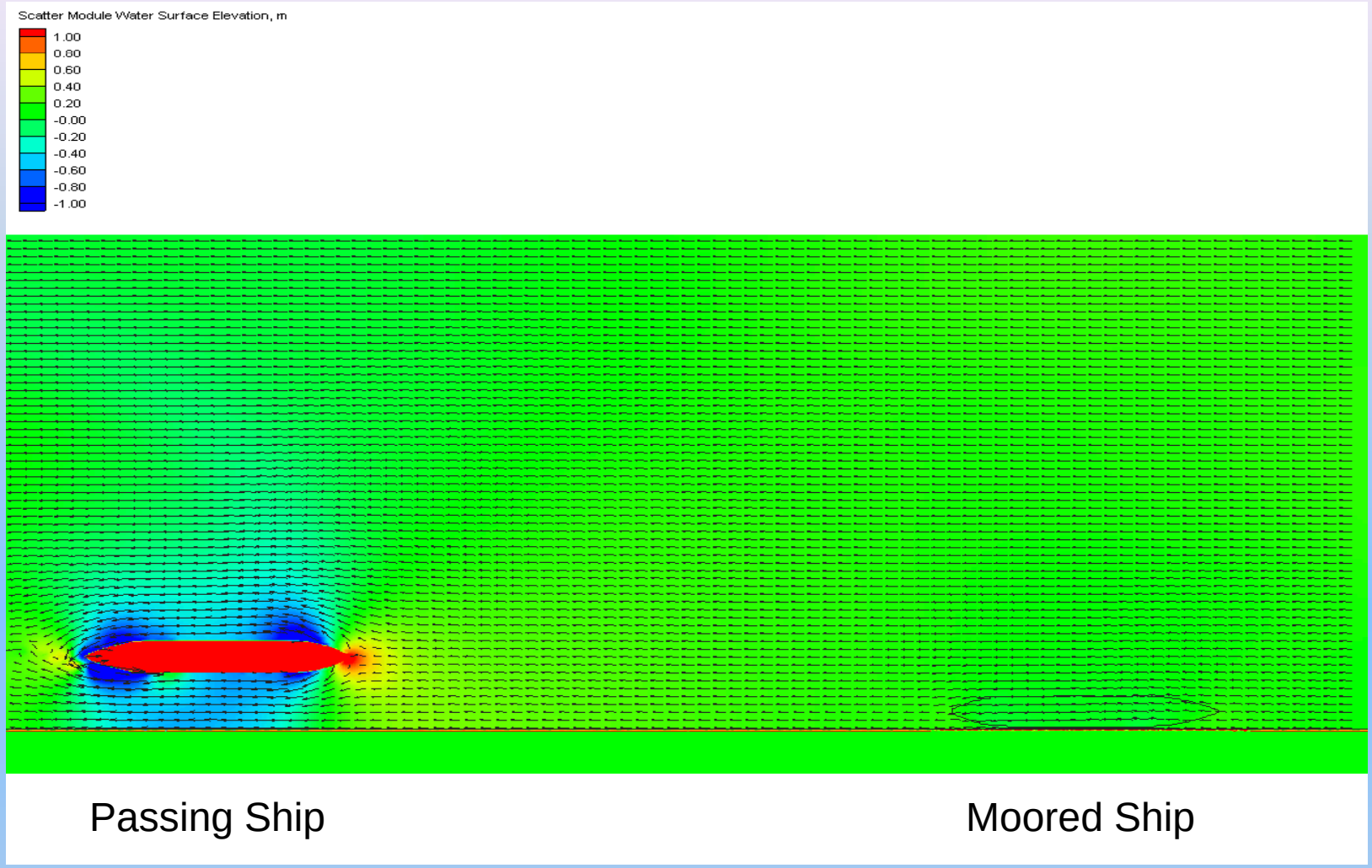

Water Surface Elevation, Blue is negative elevation

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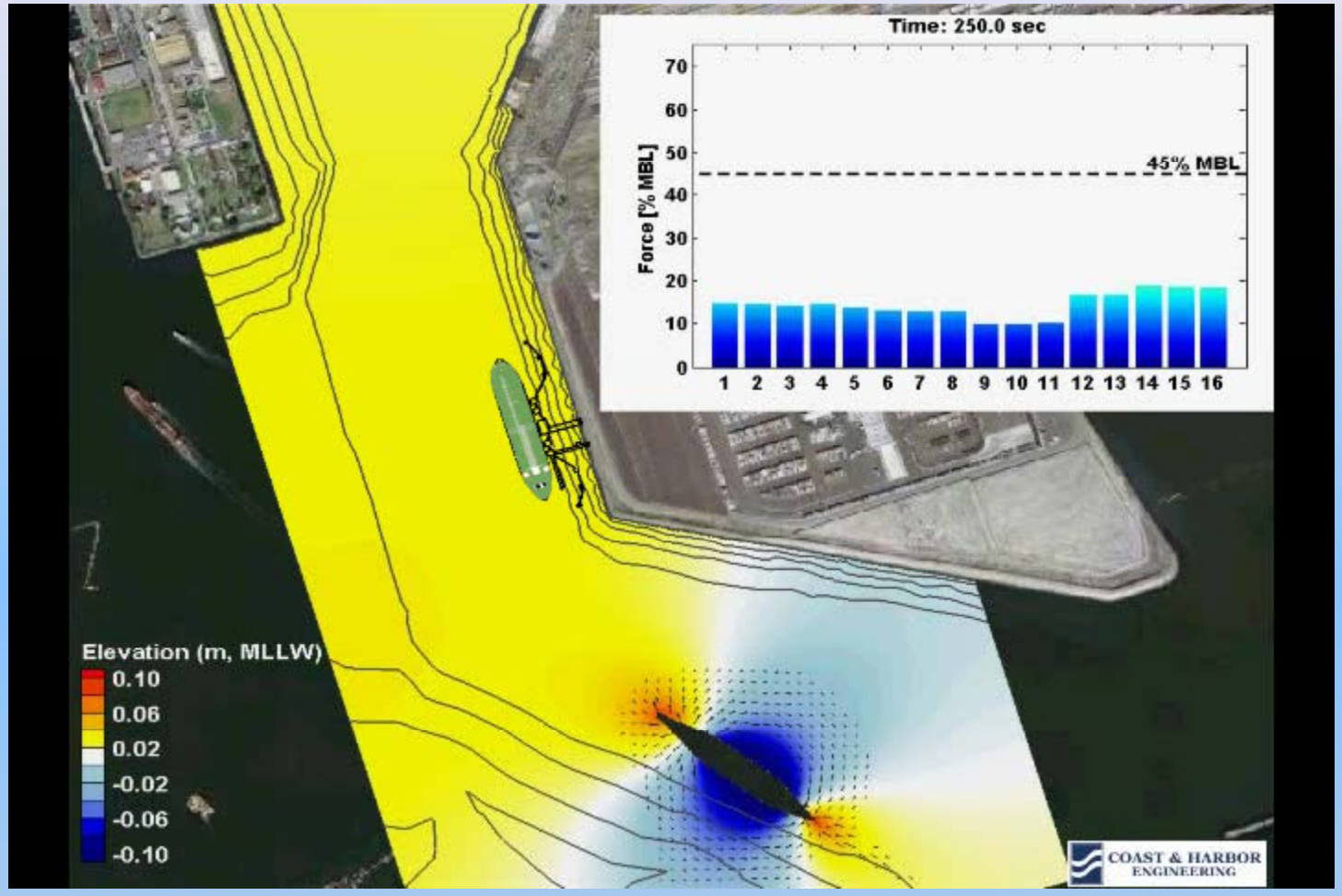

Passing Ship Simulation - Port of Los Angeles Berth 408

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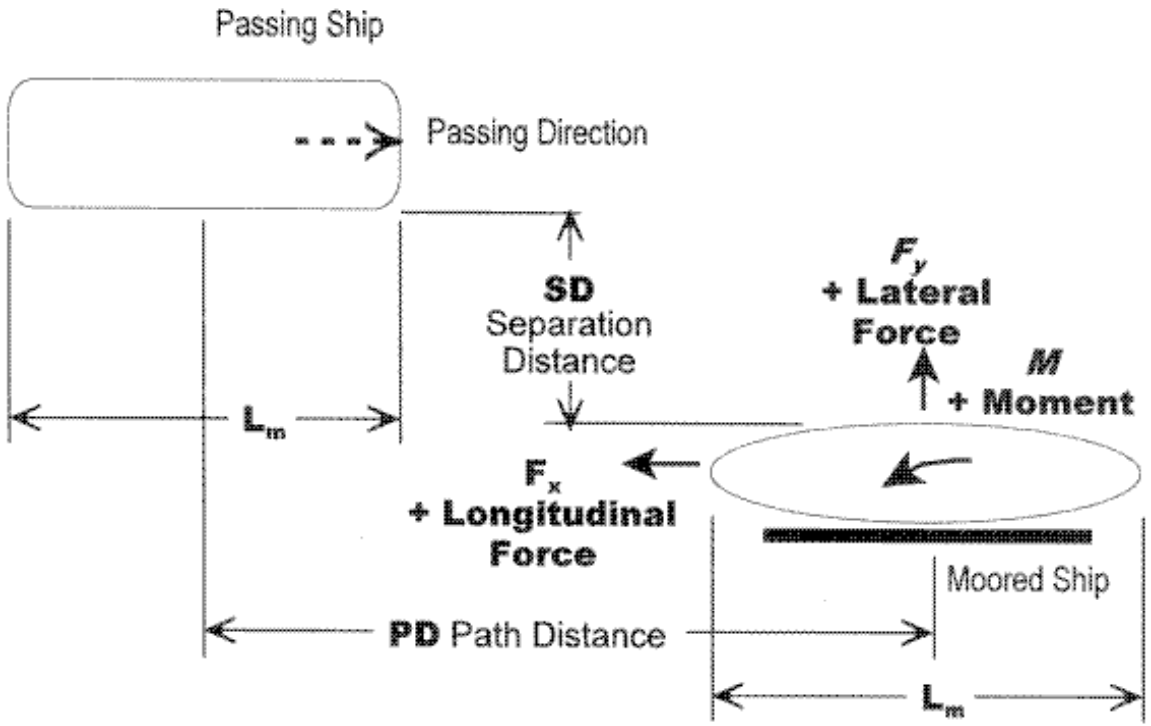
Passing-Ship Effects In Confined Waterways



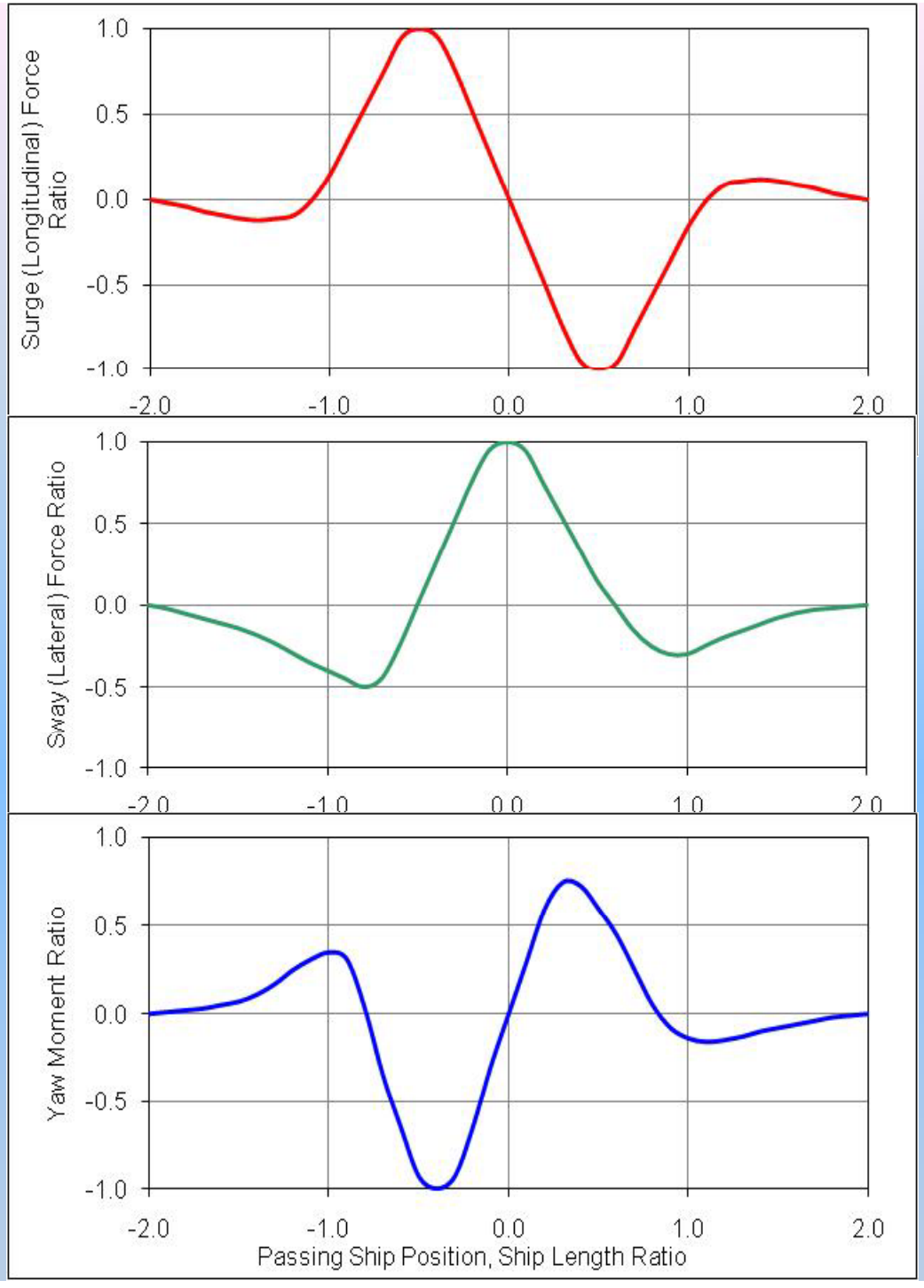
Characteristic Length, $L_c = (L_m + L_p) / 2$

Position $P = PD / L_c$

Length Ratio, $LR = L_p / L_m$

Separation Ratio, $SR = SD / L_c$

Nomenclature and Conventions Used in This Paper



Passing-Ship Effects In Confined Waterways

Nondimensional

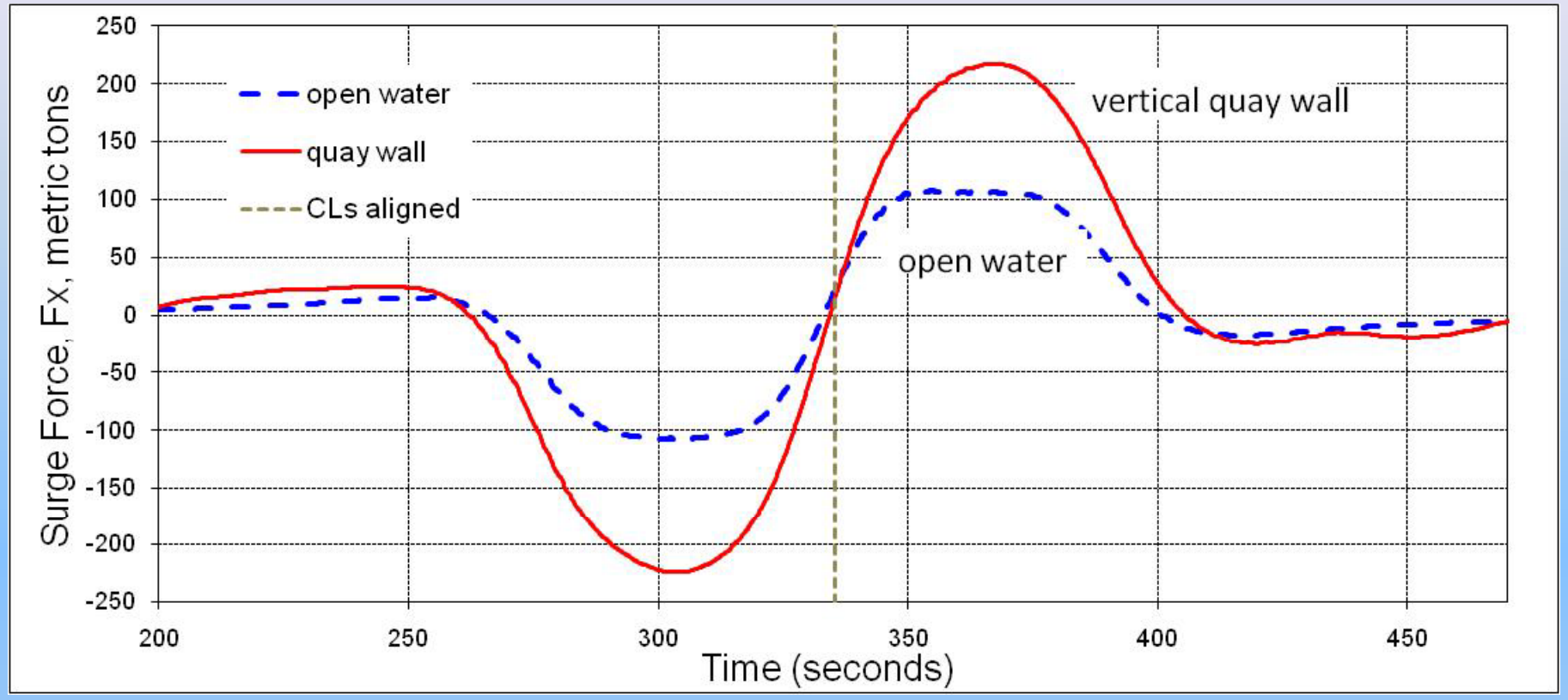
Passing Ship Position

Vs.

Force and

Moment Graphs

Passing-Ship Effects In Confined Waterways



Adjacent Vertical Quay Wall

Doubles the Peak Surge Force

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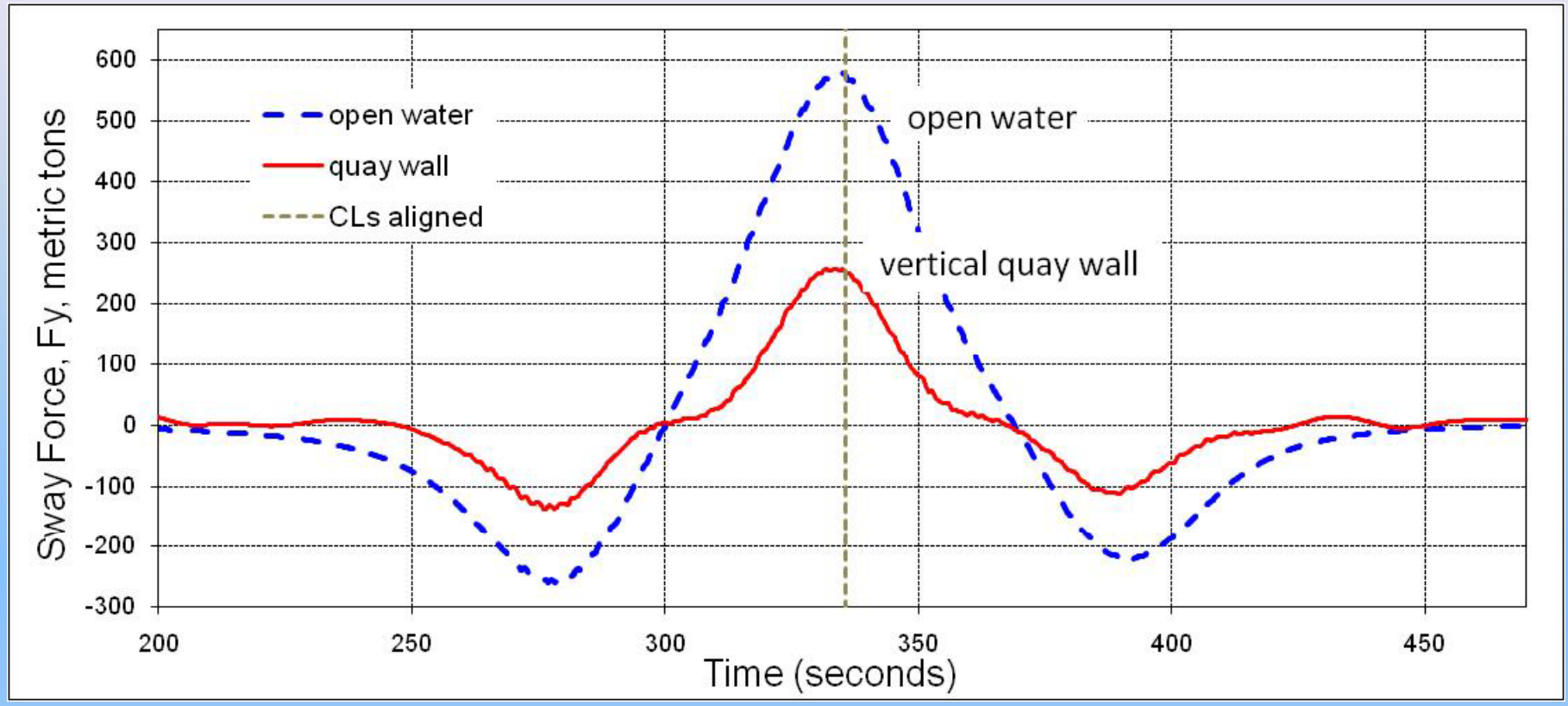
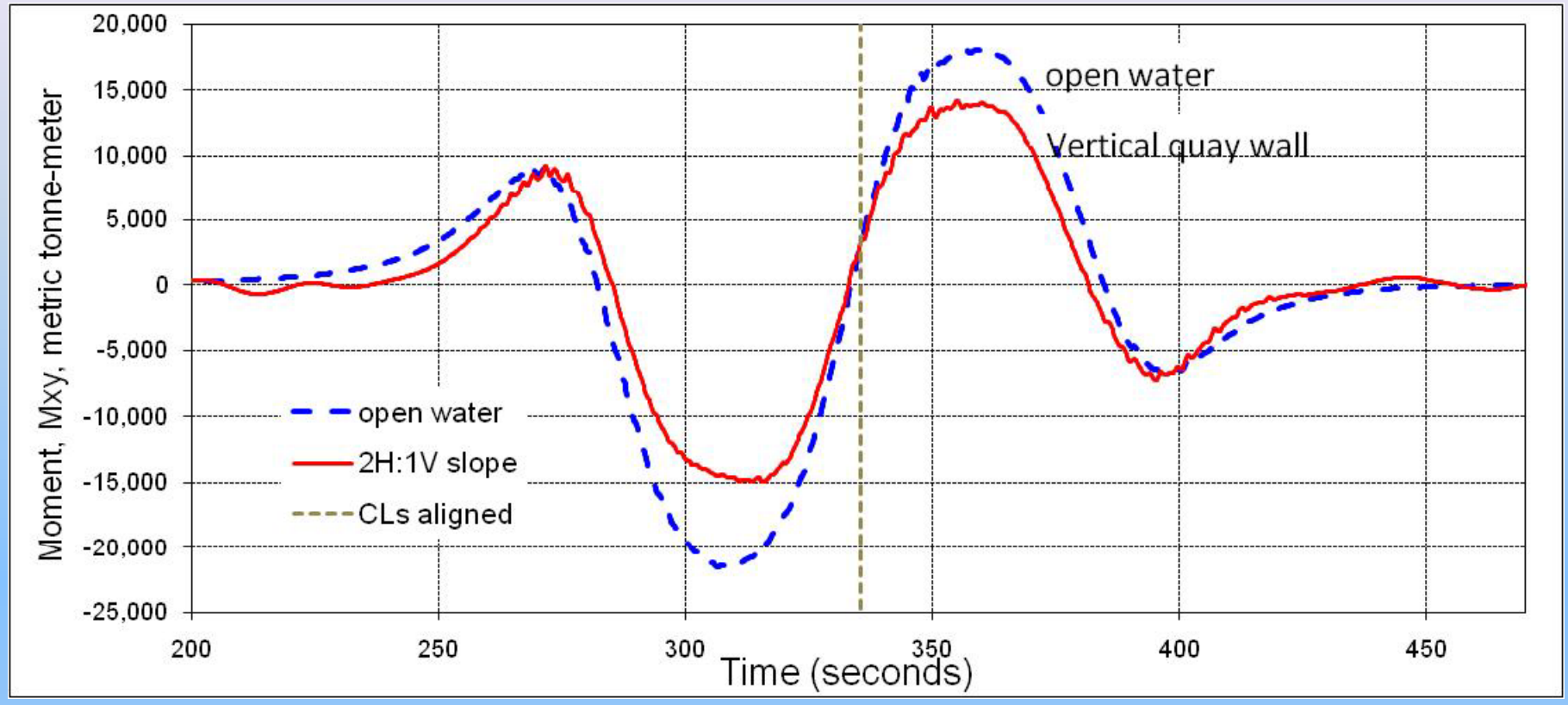
Passing-Ship Effects In Confined Waterways



Adjacent Vertical Quay Wall

Halves the Peak Sway Force

Passing-Ship Effects In Confined Waterways



Adjacent Vertical Quay Wall

Reduces Moment By ~ 25%

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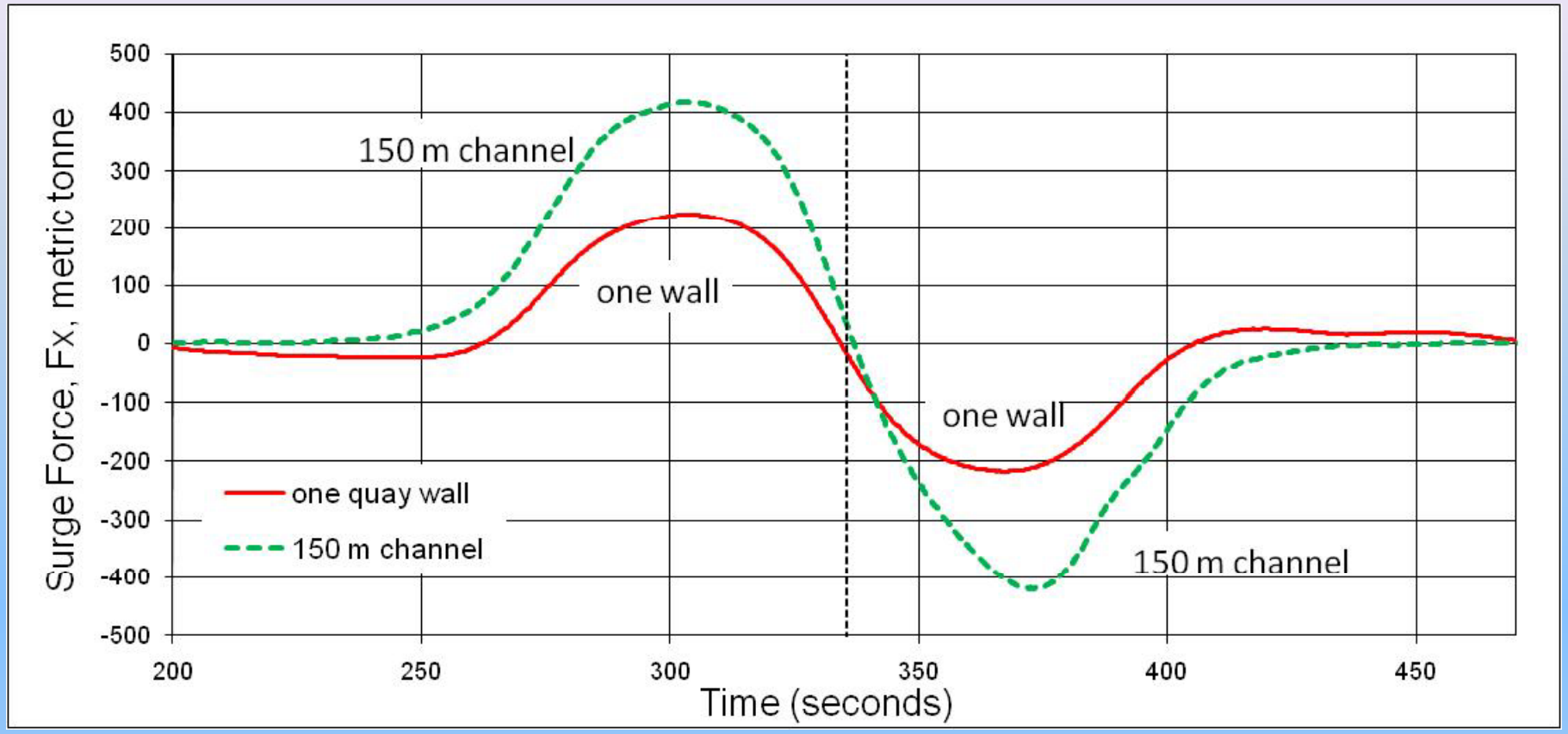
Passing-Ship Effects In Confined Waterways



Restricted Channel Compared

With One Vertical Quay Wall

Almost Doubles Peak Surge Force

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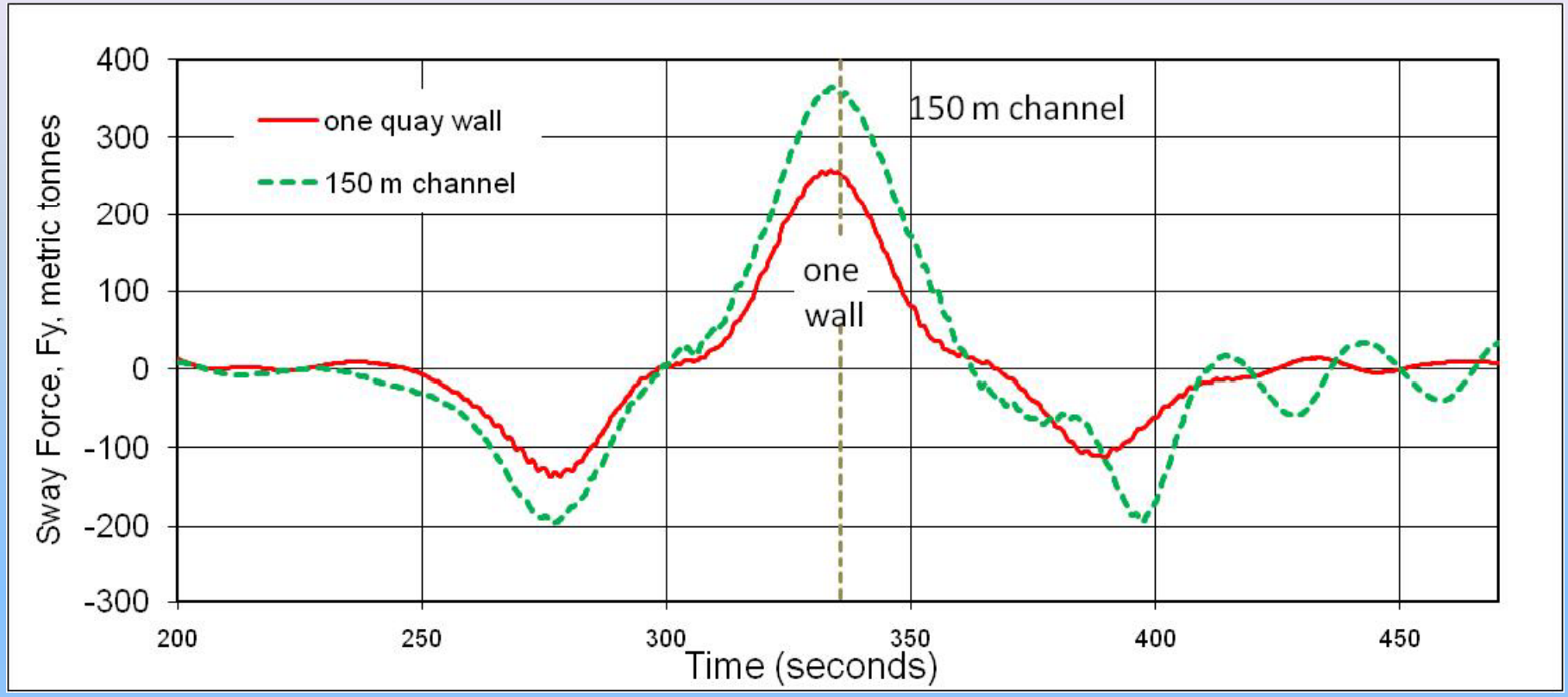
Passing-Ship Effects In Confined Waterways



Restricted Channel Compared

With One Vertical Quay Wall

Increases Peak Sway Force by ~ 50%

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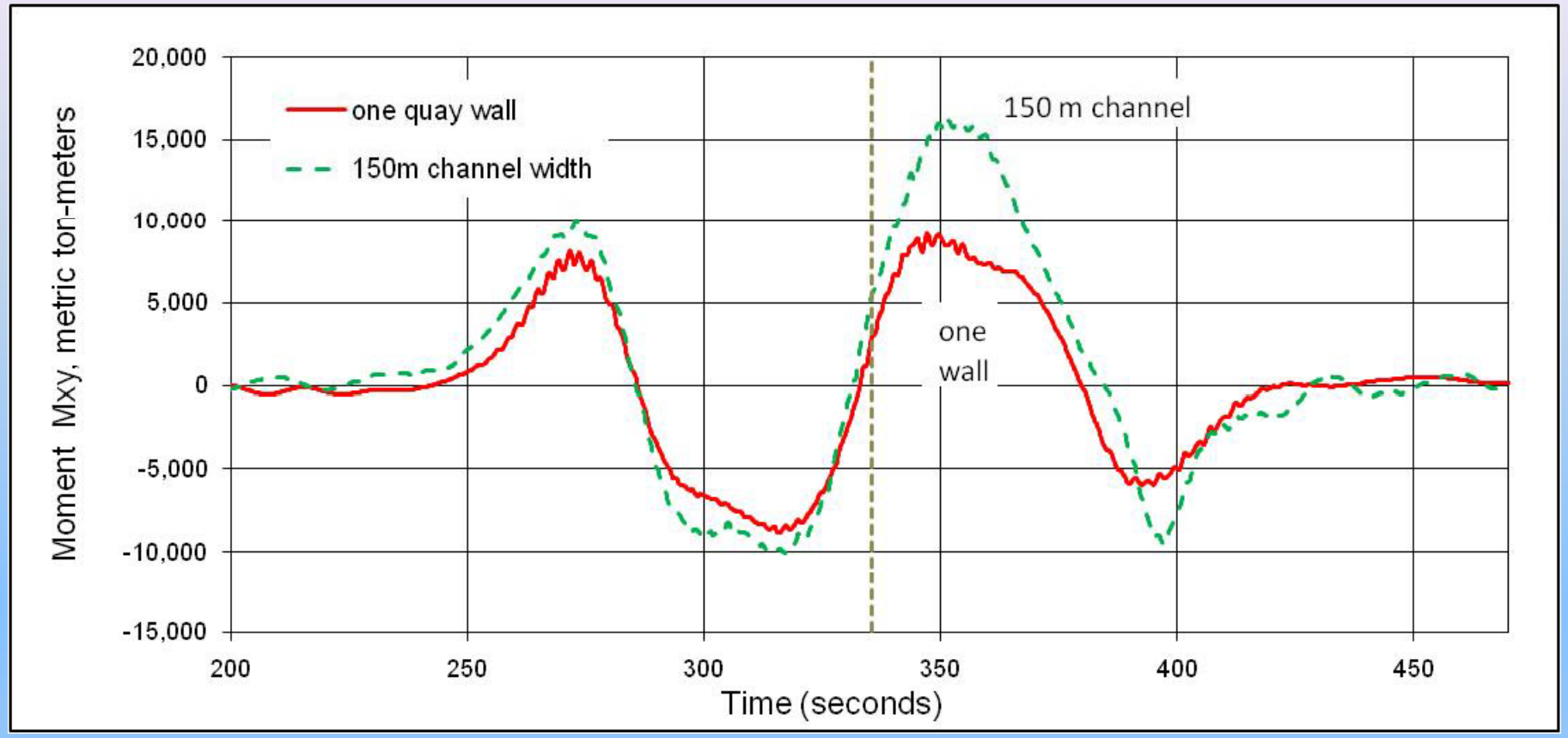

Restricted Channel Compared

With One Vertical Quay Wall

Almost Doubles Peak Moment

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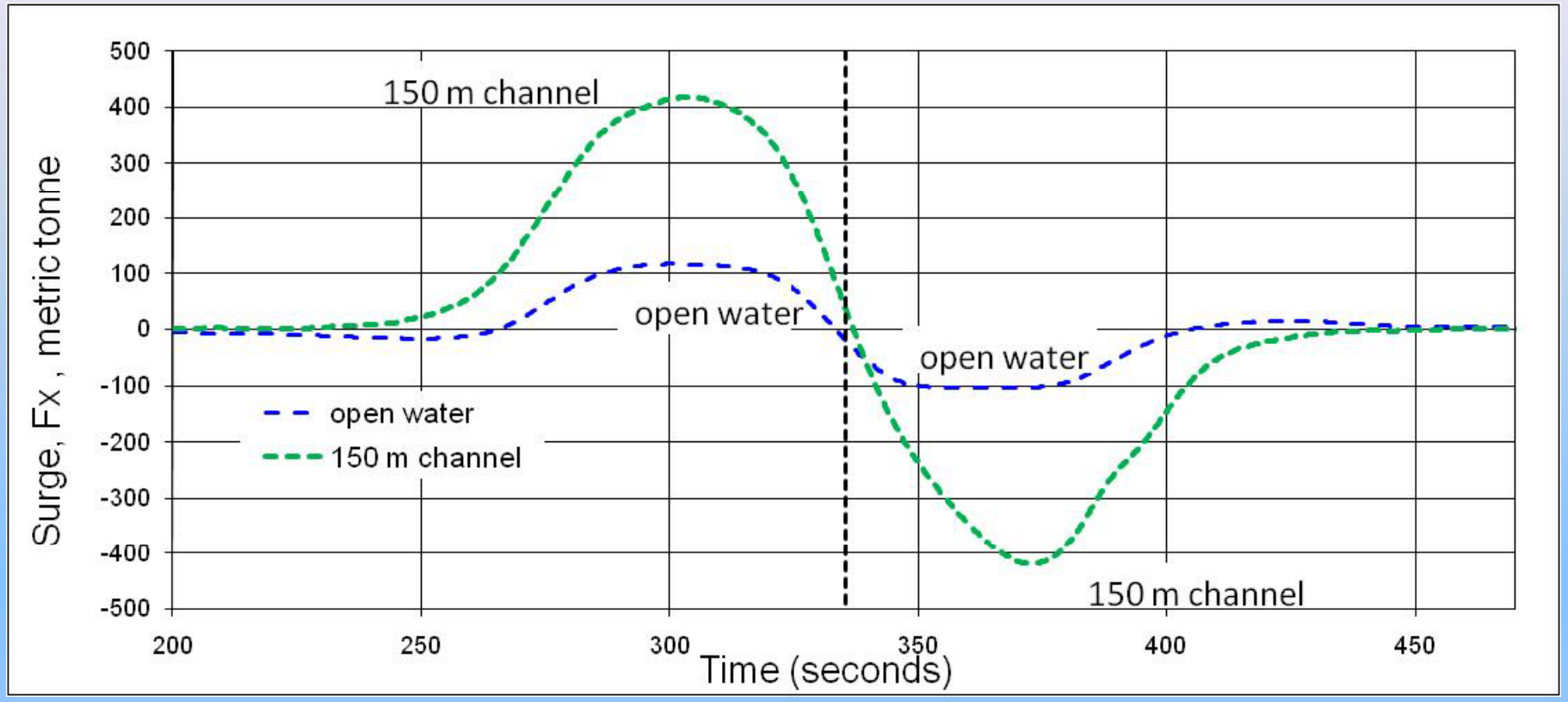

Restricted Channel

Compared with Open Water

Almost Quadruples Peak Surge Force

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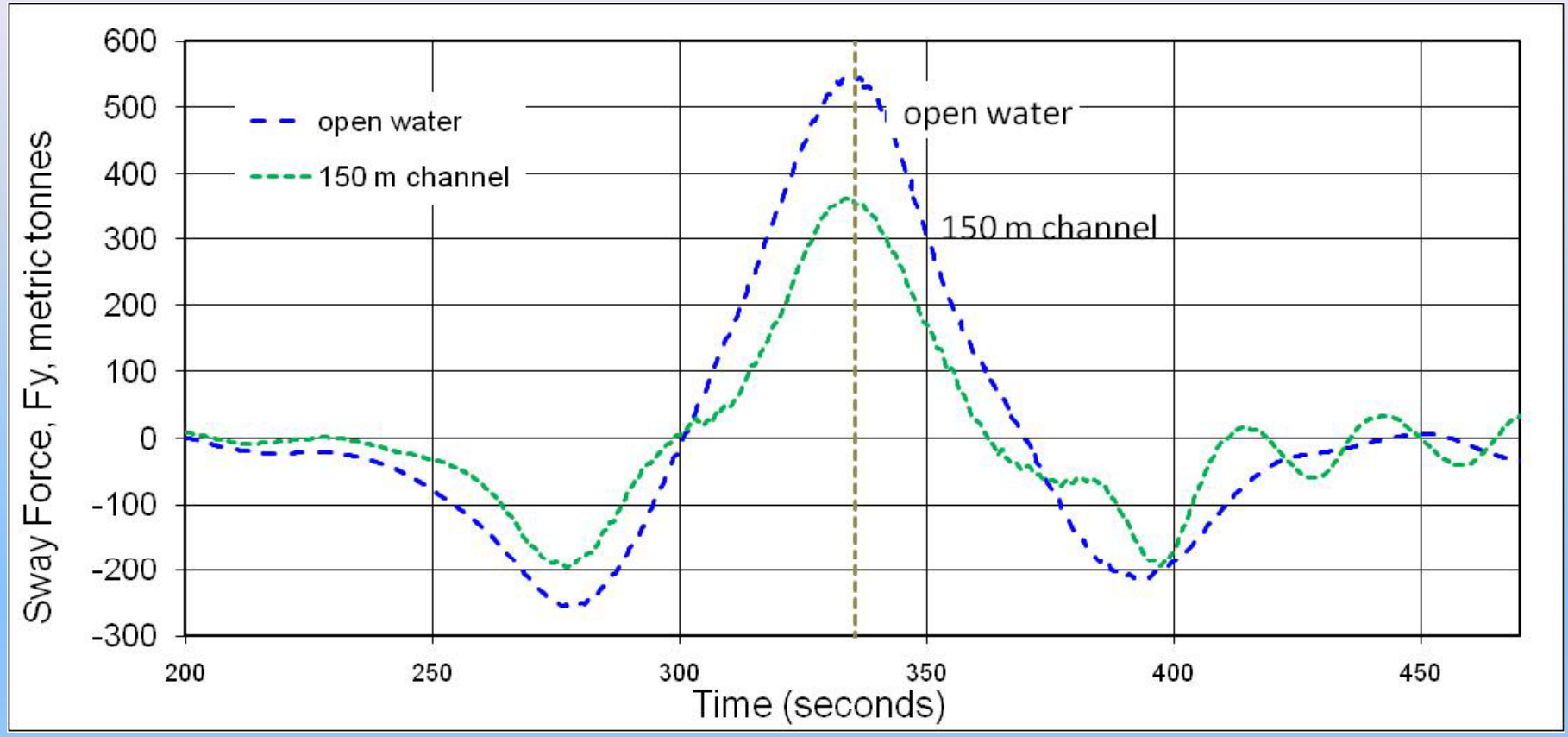
Passing-Ship Effects In Confined Waterways



Restricted Channel

Compared with Open Water

Reduces Peak Sway By ~ 33%

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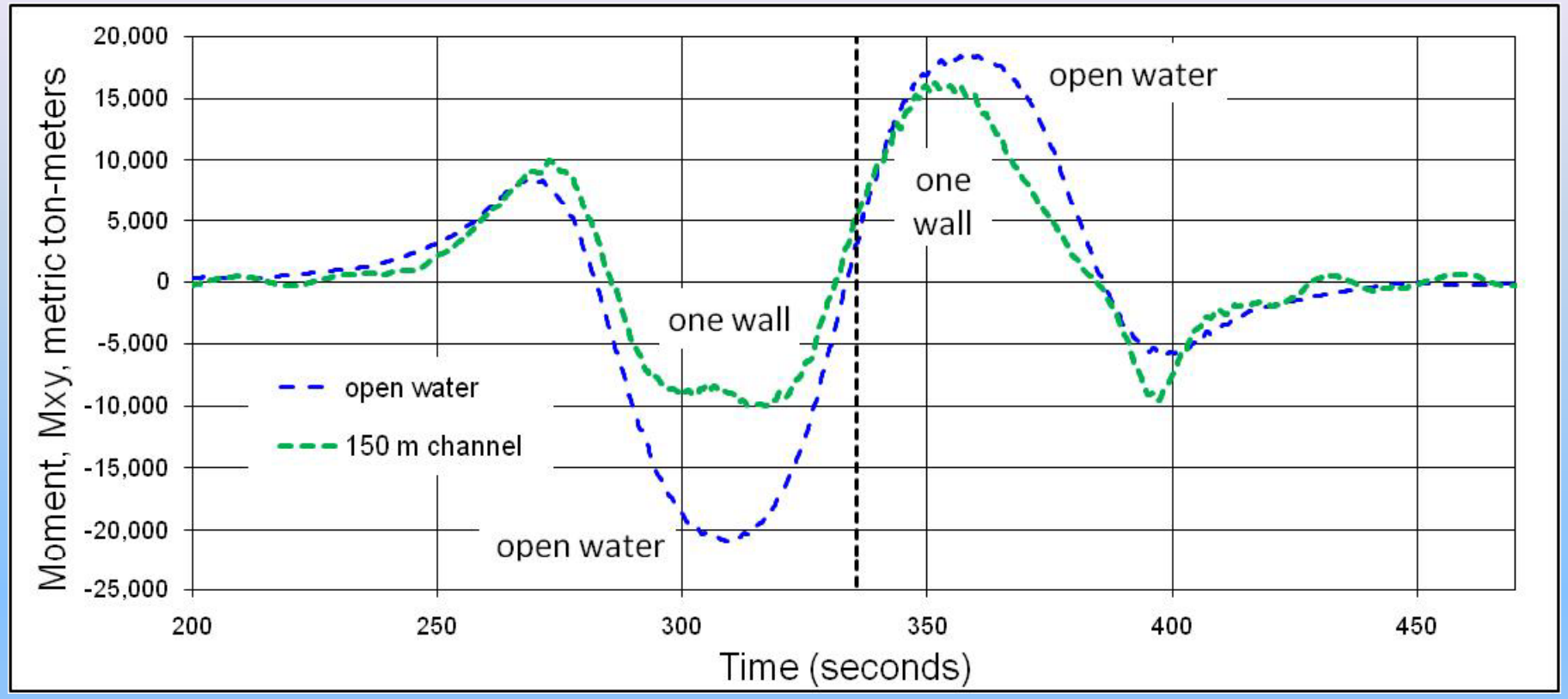
Passing-Ship Effects In Confined Waterways



Restricted Channel

Compared with Open Water

Reduces Peak Moment By ~ 10%

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Passing-Ship Effects In Confined Waterways

Summary and Conclusions (1)

Adjacent Vertical Quay Wall
Compared with Open Water

- Peak Surge Force is **Doubled**
- Peak Sway Force Is **Halved**
- Peak Moment Is **Reduced By ~ 25%**

Passing-Ship Effects In Confined Waterways

Summary and Conclusions (2)

Restricted Channel
Compared with One Vertical Quay Wall,

- Peak Surge Force Is Almost **Doubled**
- Peak Sway Force Is **Increases By ~ 50%**
- Peak Moment Is Almost **Doubled**

Passing-Ship Effects In Confined Waterways

Summary and Conclusions (3)

Restricted Channel
Compared with Open Water,

- Peak Surge Force Almost **Quadruples**
- Peak Sway Force Is Reduced By ~ 33%
- Peak Reduces Sway By ~ 10%

Summary and Conclusions (4)

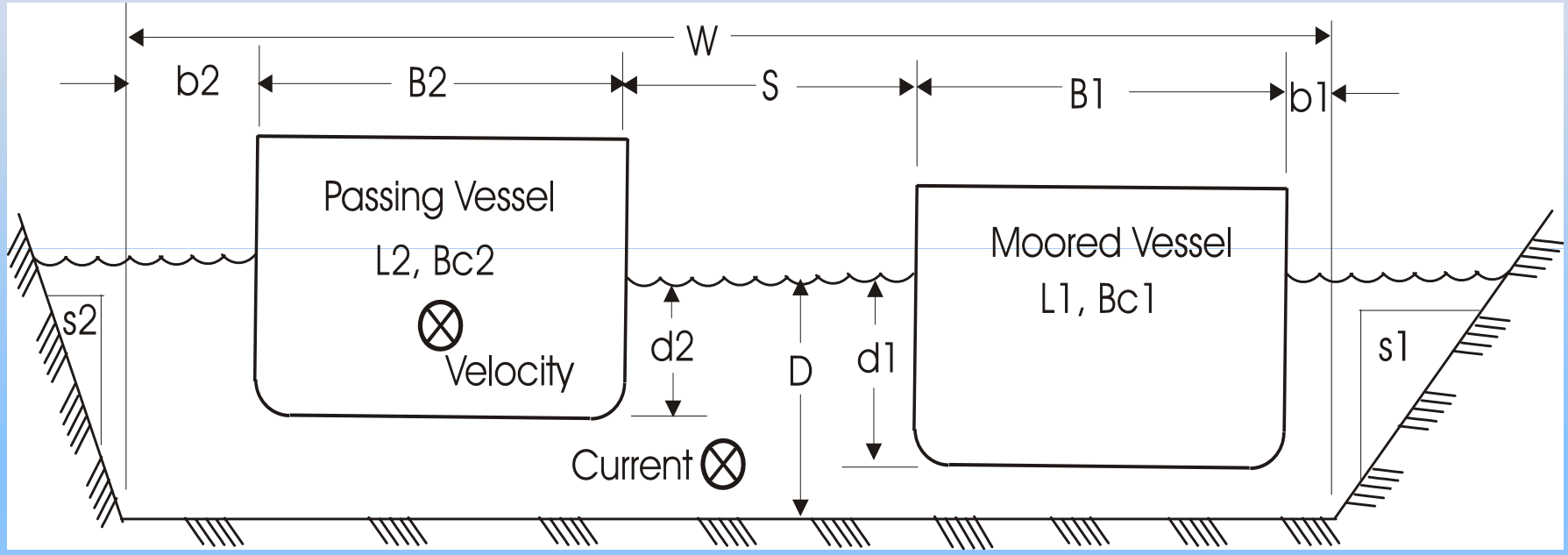
Passing Ship Forces and Moments Which Were Measured or Calculated For Open Water Case Are Not Suitable for :

- **Analyzing Vessel Moored Alongside Quay Wall**
- **Analyzing Vessel Moored In Restricted Waterway**

Continuation of Passing Ship Studies For Inclusion In *Optimoor*

- Ship Moored Alongside Quay Wall
  - Distance from quay wall
  - Slope of adjacent bank
- Confined Channel
  - Width of Channel
  - Slope of opposite bank
- Current
  - Following passing vessel
  - Opposing passing vessel
- Draft and Underkeel Clearance
  - Of moored vessel
  - Of passing vessel

Passing-Ship Effects In Confined Waterways



Parameters Studied in Passing Ship Study

Enhanced *Optimoor* Will Not Be Suitable For:

- Moored Ship At Angle To Passing Ship,
  - especially near perpendicular
- Passing Ship Also Turning
- Passing Ship Also Accelerating or Decelerating
- Complex Channel Shape
  - e.g. contracting width
  - Berth in recess or side channel

Other New Developments for *Optimoor*

- Ship-To-Ship Mooring
  - Double banked at mooring
  - Lightering alongside
- Two-Vessel Wind and Current Coefficients
- Shielded Vessel Wind and Current coefficients
- Wind and Current Coefficients For Modern Vessels:
  - LNG carriers
  - Container ships
- Wave-Induced Vessel Motions Considering Fiber Rope “Cycling Stiffness” Instead of “Broken-In Stiffness”