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Enabling Delta Life

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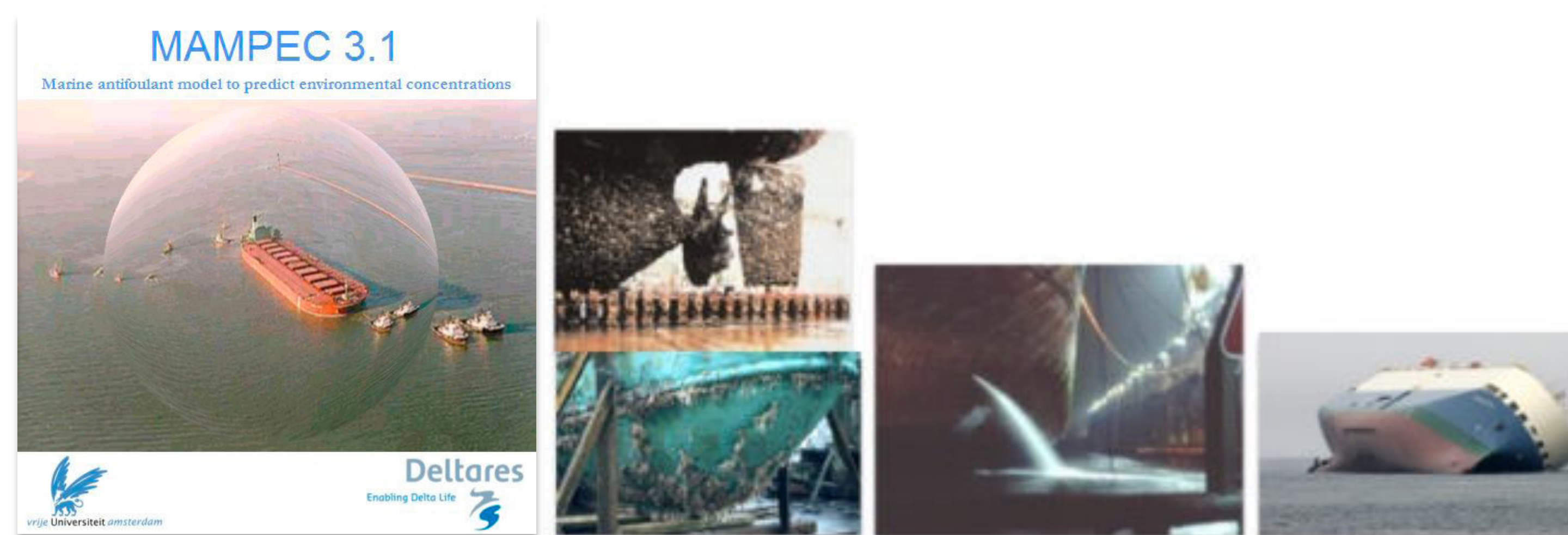
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Exposure assessment of biocides and contaminants from antifouling paints and ballast water treatment installations

Introduction

Antifouling paints and ballast water treatment installations may be sources of direct inputs of contaminants into the marine environment. Against the background of the requirements of the EU Biocidal Products Directive (BPD) and Regulation (BPR), the IMO Antifouling Convention of 2001, and the IMO Ballastwater Convention of 2004 there is a need for reliable modelling tools for risk assessment of new antifoulants and pollutants from ballast water treatment systems. MAMPEC is a 2D steady-state integrated hydrodynamic and chemical fate model with structured input for environmental, chemical, and emission related parameters. In 1999 the first version of MAMPEC was released. The model has since been improved with regular updates of the model.

MAMPEC 3.1
Marine antifoulant model to predict environmental concentrations

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New features

Version 3.0 (2011)
- New emission scenarios: new-build and docking, ESD PT-21, BPD/BPR
- Default BW scenarios recommended by GESAMP-BWWG, and UBA (2011)
- Analysis of fate and most important fluxes, plot of PEC-profile downstream
- Multiple run option to facilitate sensitivity analysis
- Copper speciation options (create input-file for BLM program)
- Multi-lingual support (Japanese, Chinese, Spanish)
- Change from Visual Basic 6.0 to the .NET platform and C#

Version 3.1 (2016)
- Compatibility with Windows Vista / 7 / 8.1 / 10
- Update of hydrodynamic exchange module (version 3.1)
- EU BPR TM - Consolidated list of PT-21 agreements (2013) included
- New regional marina scenarios (agreed EU BPR 2013)
- Improved open harbour scenario
- Improved scenario management (folders, labels to group scenarios)
- Improved import and export options for settings and results
- Batch import of multiple scenarios created in CSV file
- Improved photolysis handling and information panel
- New options for handling background concentrations
- New updated manuals and tech. documentation (MAMPEC 3.1 Handbook)

Prototype environments:
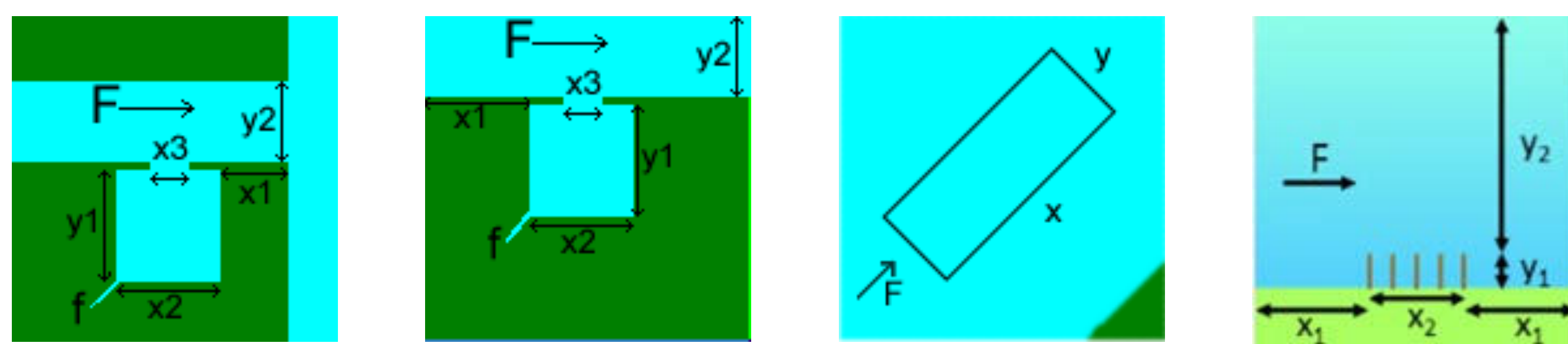
Commercial harbour
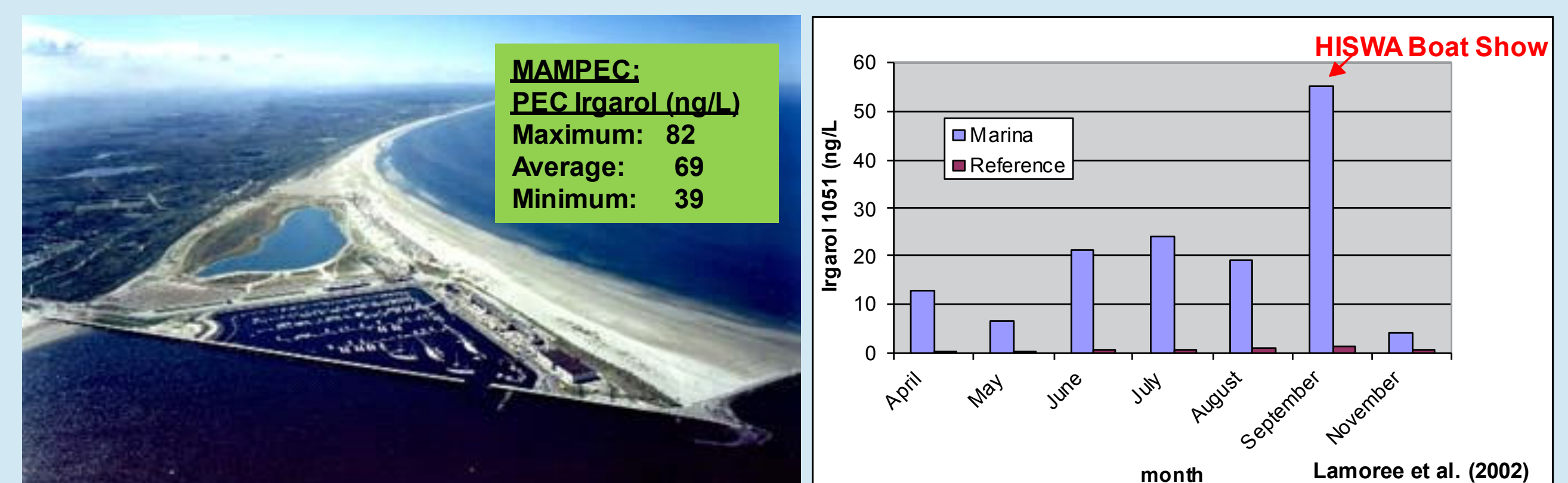Estuarine harbour

Marina

Shipping lane
Open sea

Open harbour

Support site: www.deltares.nl/en/software/mampec/
Software and documentation are freely available

Example: Irgarol in Seaport Marina IJmuiden (NL)

MAMPEC:
PEC Irgarol (ng/L)
Maximum: 82
Average: 69
Minimum: 39

HISWA Boat Show
Irgarol 1051 ng/L
Marina
Reference
April May June July August September November
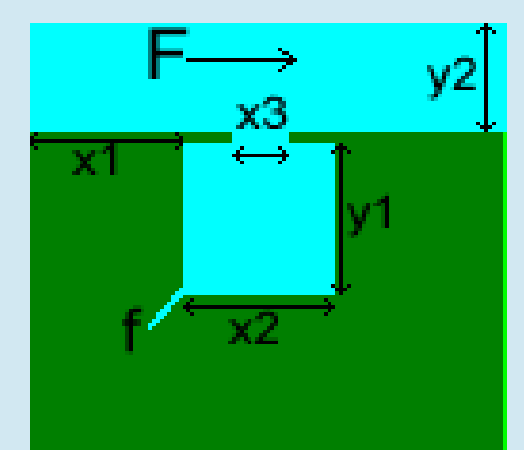month
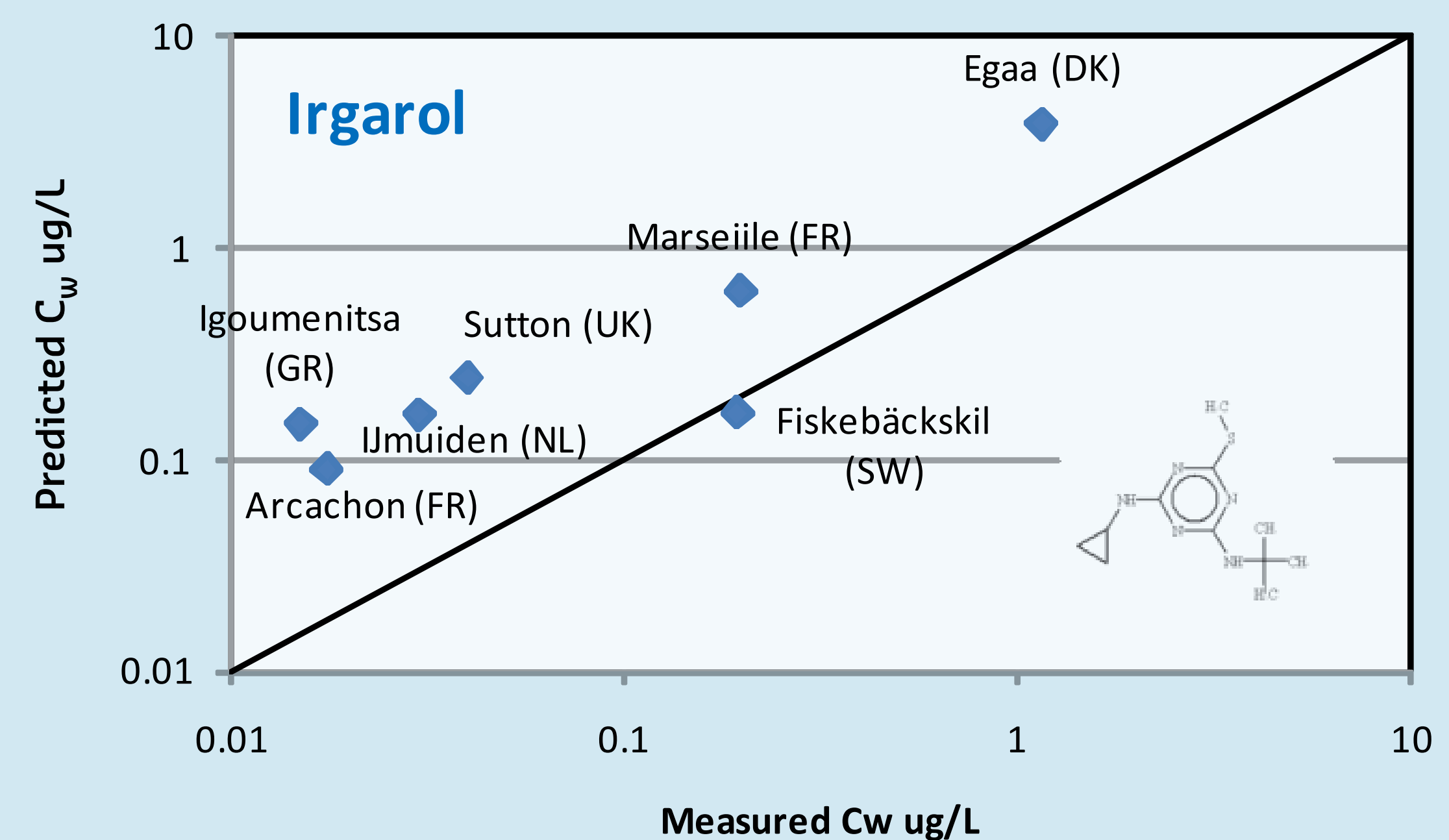Lamoree et al. (2002)

Emissions
- Nr of berths: 650
- Nr of boat slips in use: 150 (5-10 m); 150 (10-20 m)
- 10% coated with irgarol
- Load = 13 g day^{-1}

Dimensions for model:
- X2 and y1 as 240 x 240 m
- X3 = 30 m
- X1 and y2 as 10% = 24 m
- F=0
- Depth: 4-6 m; Entrance: 30 m
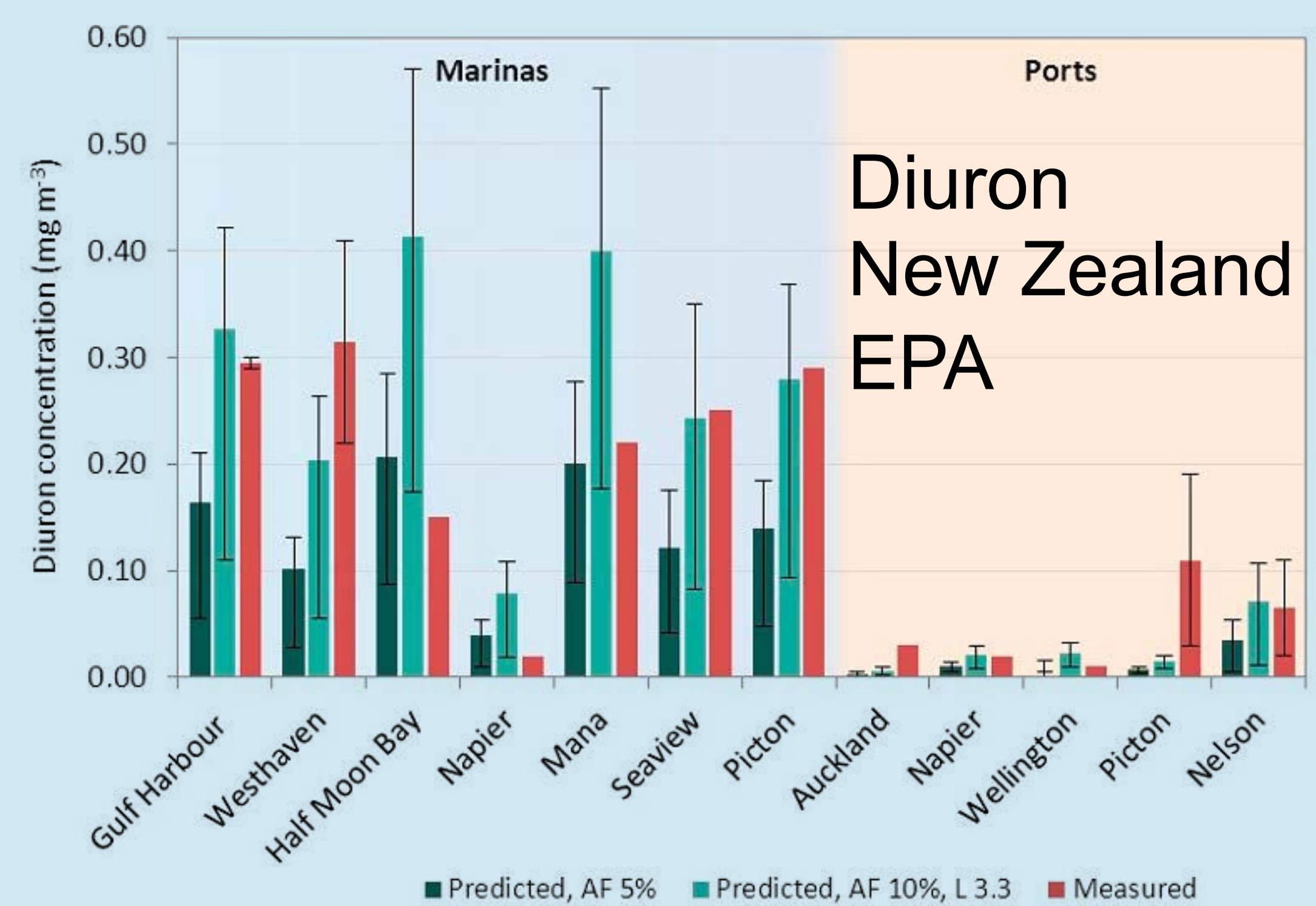- Tidal range: 1.5 m
- Exchange: 25% per tide

Validation and application examples

Irgarol

Egaa (DK)
Marseiile (FR)
Igoumenitsa (GR)
Sutton (UK)
IJmuiden (NL)
Fiskebäckskil (SW)
Arcachon (FR)

Predicted C_w ug/L
Measured Cw ug/L

Irgarol (µg/L; averages) in European marinas and predictions (averages) derived with MAMPEC v 3.0. Source: Readman (2002). MAMPEC scenarios: van Hattum et al. (2002).

DCOIT (Sea-NineTM) in Korsør harbour. Study with two freshly painted naval ships. Observed concentrations: Steen et al. (2004); simulations with MAMPEC 2.0

Marinas
Ports

Diuron
New Zealand
EPA

Diuron concentration (mg m^{-3})

Gulf Harbour, Westhaven, Half Moon Bay, Napier, Mana, Seaview, Picton, Auckland, Napier, Wellington, Picton, Nelson

Predicted, AF 5%   Predicted, AF 10%, L 3.3   Measured

Predicted (MAMPEC v2.5) and measured concentrations of diuron in New Zealand marinas and ports. AF = application factor of the paint. Source: Gadd et al. (2011), reproduced with permission of New Zealand EPA.

References: as cited in MAMPEC-Handbook.
Van Hattum, B. , J. Van Gils, H. Elzinga, A. Baart 2014, MAMPEC 3.0 Handbook - Technical Documentation. Report nr. R-14/33. Institute for Environmental Studies, Vrije Universiteit, Amsterdam.

www.deltares.nl

for more information

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