The SAIL project and other work at MARIN

Rogier Eggers (R.Eggers@marin.nl)

2nd Natural Propulsion Seminar

January 17th, 2013

OUTLINE

Part 1:

The SAIL project

Part 2:

Voyage simulations with route optimisation for wind assisted ships

Part 1: SAIL

Sustainable Approaches and Innovative Liaisons

SAIL BACKGROUND

- Rising fuel prices
- Increasing pressure to reduce emissions
- A group of organizations and people with innovative ideas
- The potential of wind (assisted) propulsion -> hybrid sailing

Leading vision and aim:

Alternative propulsion systems for (freight) sailing - defined as 'hybrid sailing concepts' - have high potential due to environment (global warming and pollution) and rising oil prices. To develop and test hybrid sailing concepts, that will lead to more sustainability and new business opportunities.

European Union
The European Regional Development Fund
The Interreg IVB North Sea Region Programme
provinsje fryslân
provincie fryslân
www.nsrsail.eu
MARIN

SAIL OBJECTIVES

- Capacity building in hybrid sailing concepts
- Development of tools, living labs
- Develop public-private alliances to stimulate implementation of hybrid sailing
- Embed hybrid sailing in policy and legislation
- Develop a long-term strategic sustainable sea transport plan, keeping zero emission sailing in mind
- Promotion of hybrid sailing

European Union
The European Regional Development Fund
The Interreg IVB North Sea Region Programme
provinsje fryslân
provincie fryslân
www.nsrsail.eu
MARIN

SAIL PROJECT

- EU Interreg IVB North Sea Region
- Budget: € 3.4 million (50% EU funding, 50% by partners).
- Project duration: till June 2015
- Very diverse participants:
  - Public bodies (province, ports)
  - (Future) ship operators
  - Research institutes
  - Universities and schools
  - NGO/Interest group
  - Design/engineering
  - Engineering consultancy

European Union
The European Regional Development Fund
The Interreg IVB North Sea Region Programme
provinsje fryslân
provincie fryslân
www.nsrsail.eu
MARIN

SAIL PROJECT PARTICIPANTS

provinsje fryslân
provincie fryslân

MARINVEST

INNOVATE WITH PLYMOUTH UNIVERSITY

JADE HOCHSCHULE
Wilhelmshaven Oldenburg Elsfleth

Helmholtz-Zentrum Geesthacht
Zentrum für Material- und Küstenforschung

AALBORG UNIVERSITY

Stichting De Noordzee

FAIR TRANSPORT

GEMEENTE HARLINGEN

C-JOB

AMELAND & SKYLGE SHIPPING

NHL HOGESCHOOL

MARIN 80

E&E CONSULTANT
ENVIRONNEMENT
ÉNERGIE

VIEL TECHNOLOGIE

Port Oostende

The Interreg IVB North Sea Region Programme

provinsje fryslân
provincie fryslân

European Union
The European Regional Development Fund

www.nsrsail.eu

MARIN

SAIL WORK PLAN

To match the objectives, the work plan covers diverse topics:

- Publicity and dissemination
- Engineering
- Economy
- Policy and legislation
- Public-private-civil alliances

MARIN CONTRIBUTION TO SAIL

- Verification of energy saving and operability in a realistic scenario, including:
  - A profile of realistic (optimized) routes, speeds and loading conditions
  - Hindcast data for wind, waves and current
  - Model of hydrodynamic performance (speed-power and seakeeping)
  - Large amount of statistics (reliable answers)

European Union
The European Regional Development Fund
The Interreg IVB North Sea Region Programme
provinsje fryslân
provincie fryslân
www.nsrsail.eu
MARIN

TO CONCLUDE

- We hope to update you later on progress

- For questions with regard to the entire SAIL project, refer to Robbert van Hasselt r.v.hasselt@idmm.nl. He is here today.

European Union
The European Regional Development Fund
The Interreg IVB North Sea Region Programme
provinsje fryslân
provincie fryslân
www.nsrsail.eu
MARIN

Part 2: Voyage simulations with route optimisation for wind assisted ships

WHY (OPTIMISED) VOYAGE SIMULATIONS?

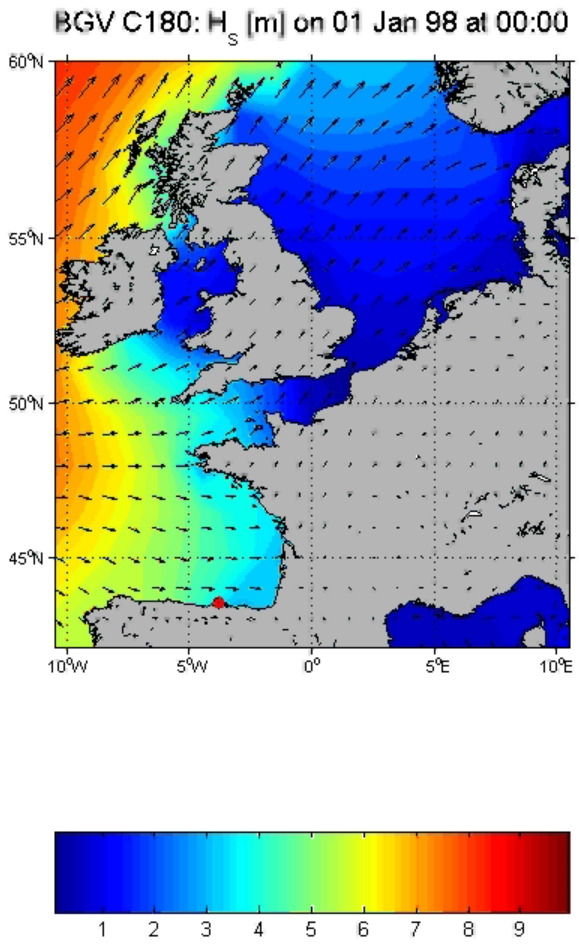
- The environment, operational profile and routes are crucial in the performance of wind assisted vessels
- Ships with wind assistance are expected to follow different routes and have a different speed profile compared to conventional ships
- They should therefore be compared on basis of their optimal speed/route in optimised voyage simulation with large statistics

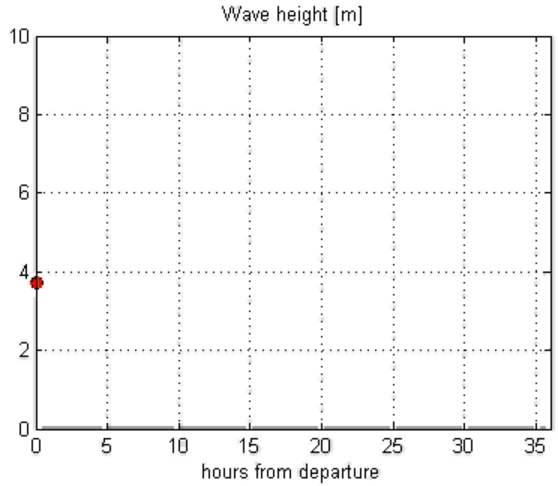
- Note:
  - This is not intended for operations
  - The merits of route optimisation is also of interest to “conventional” vessels

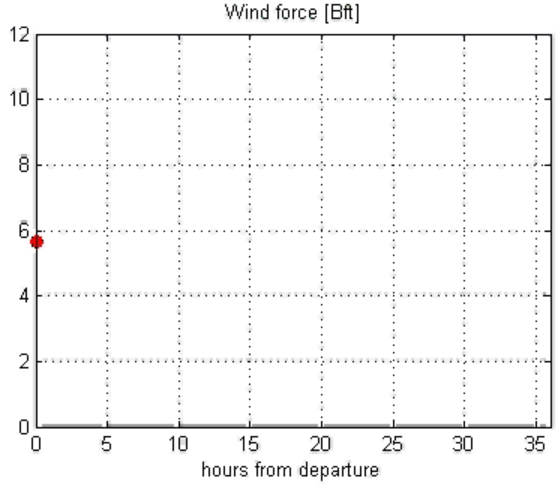
VOYAGE SIMULATIONS

- MARIN's in-house voyage simulation tools are Gulliver and Safetrans
- Gulliver includes:
  - Large databases for wind, waves, tidal stream and ocean current
  - Calculation of sustained speed including wind, waves and current
  - Calculation of ship motions using RAO database and wave spectra
  - Calculation of fuel consumption
  - Operational criteria -> impact on speed (voluntary speed loss)

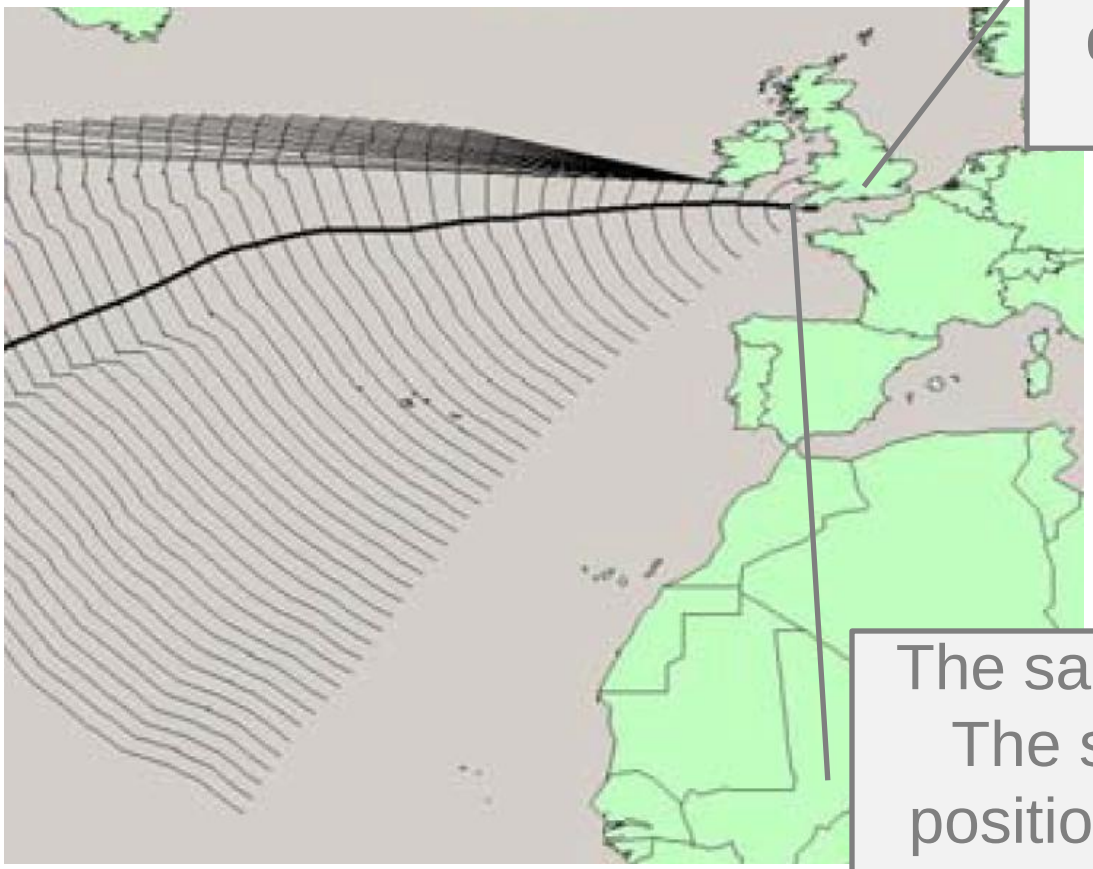
VOYAGE SIMULATION ON A FIXED ROUTE







ROUTING WITH ISOCHRONES



From start point a series of course with different headings is calculated.

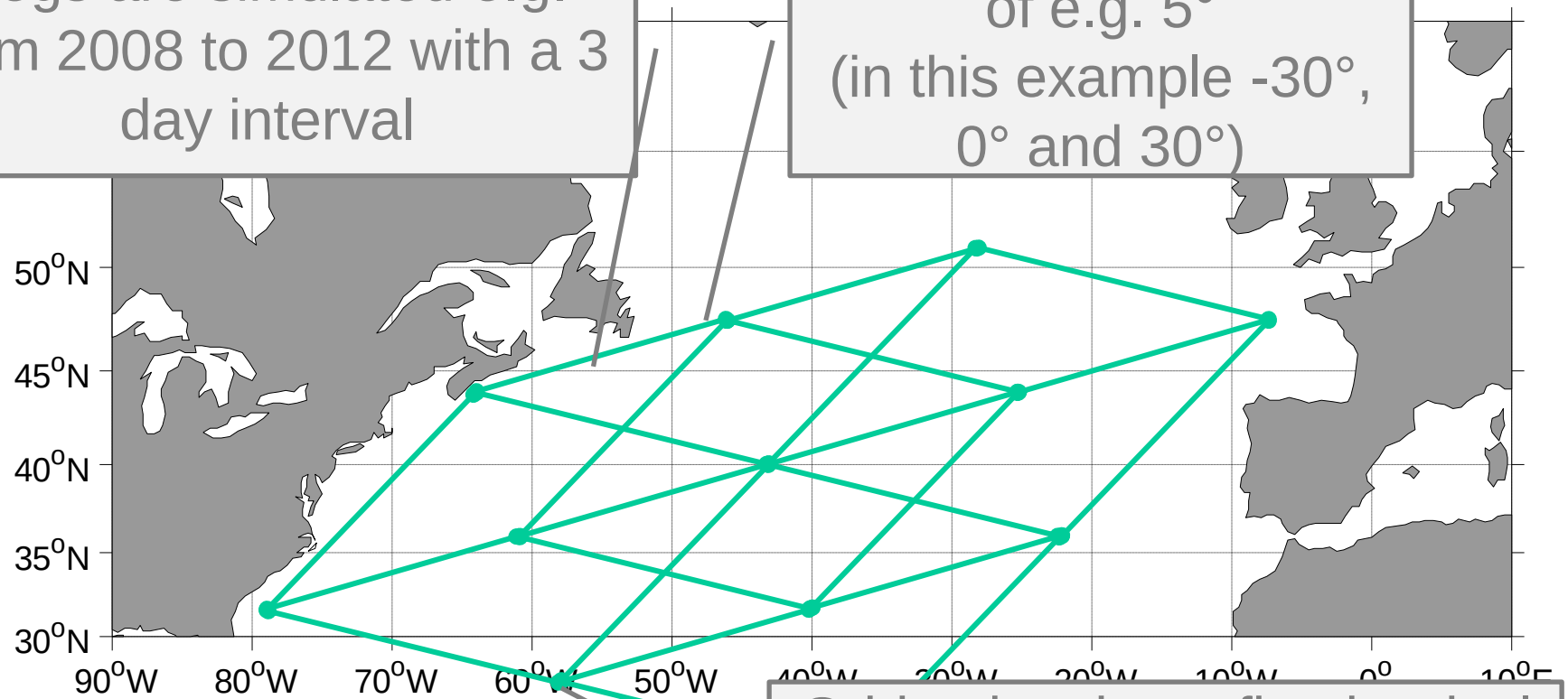
The sailing time is constant. The speed and possible positions after the first time step follow from the VPP.

MARIN

ROUTING WITH FIXED GRID

Legs are simulated e.g. from 2008 to 2012 with a 3 day interval

Fixed course changes of e.g. 5° (in this example -30°, 0° and 30°)



Grid points have fixed arrival times as function of speed (e.g. 8, 10, 12, 14 kn)

VOYAGE SIMULATIONS WITH OPTIMISED ROUTES

- Gulliver will be equipped with a minimization algorithm in combination with a fixed grid
  - Increased flexibility, especially on the cost function:
    - Allows optimisation on other variables than arrival time
    - Allows to run different optimisations after the actual route simulations
  - Parallel computing is possible as arrival times and positions are known on each grid point beforehand
  - Work in progress - first results Q2 2013

THANKS FOR YOUR ATTENTION