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Stuttgart Wind Energy (SWE)
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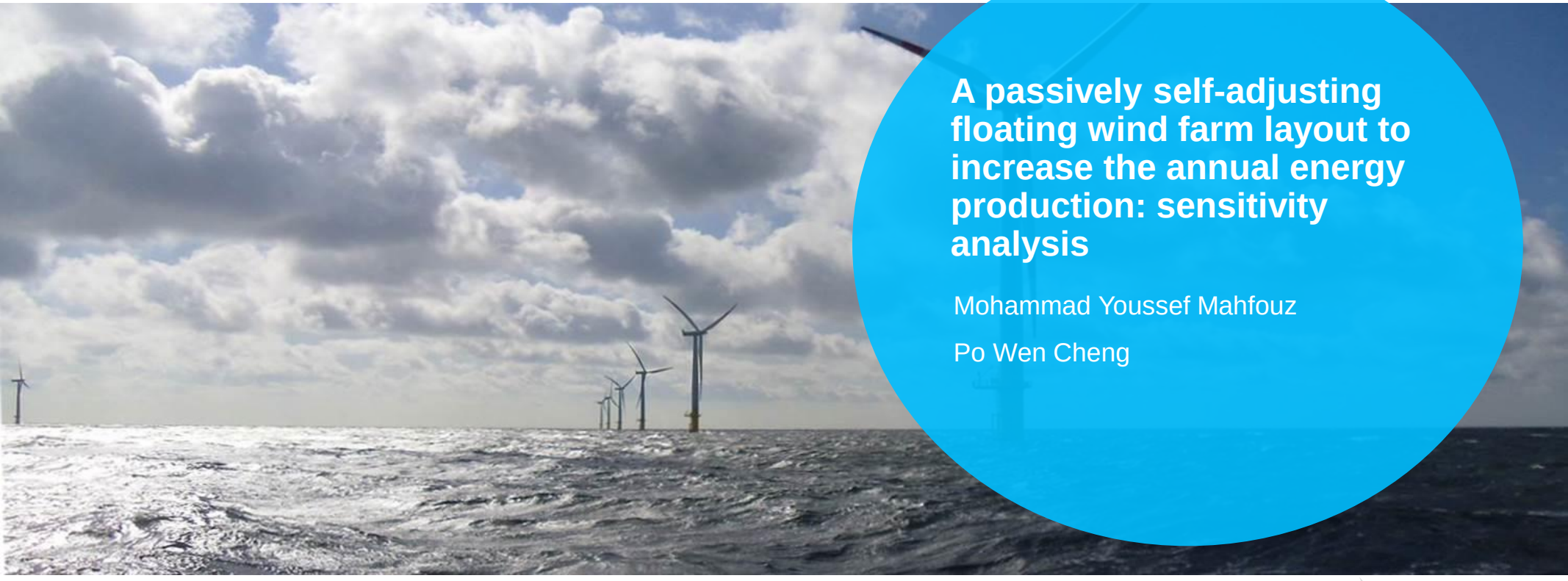

A passively self-adjusting floating wind farm layout to increase the annual energy production: sensitivity analysis

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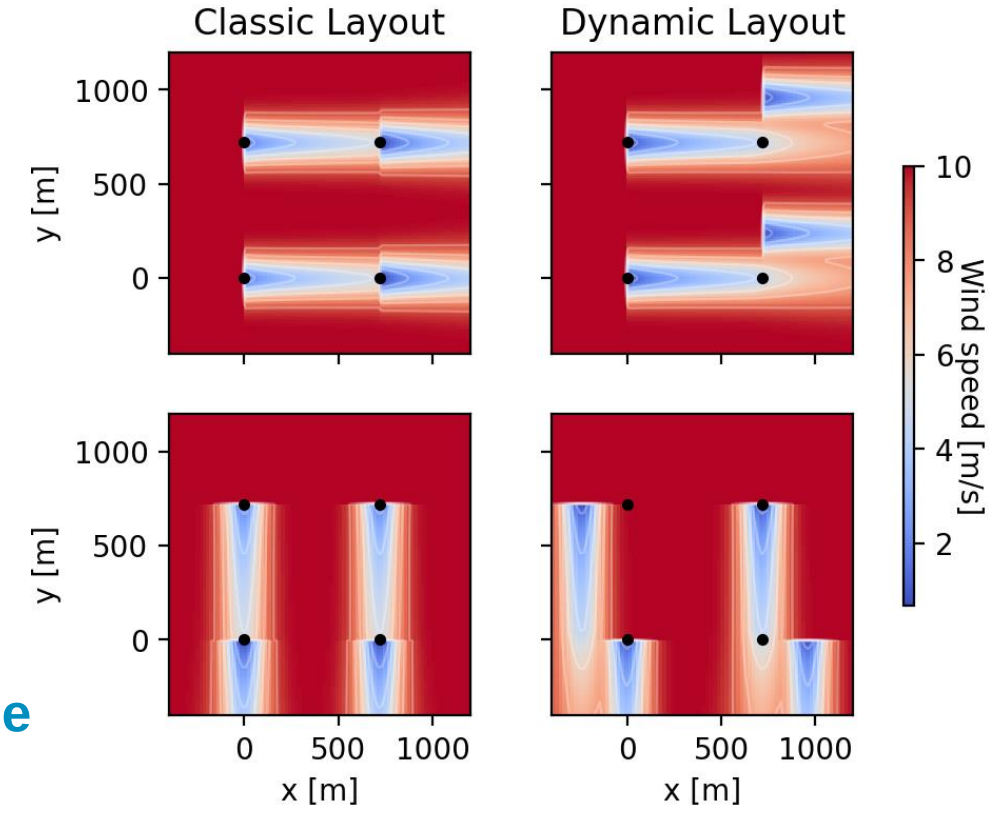
SWE

WindForS
Windenergie
Forschungscluster

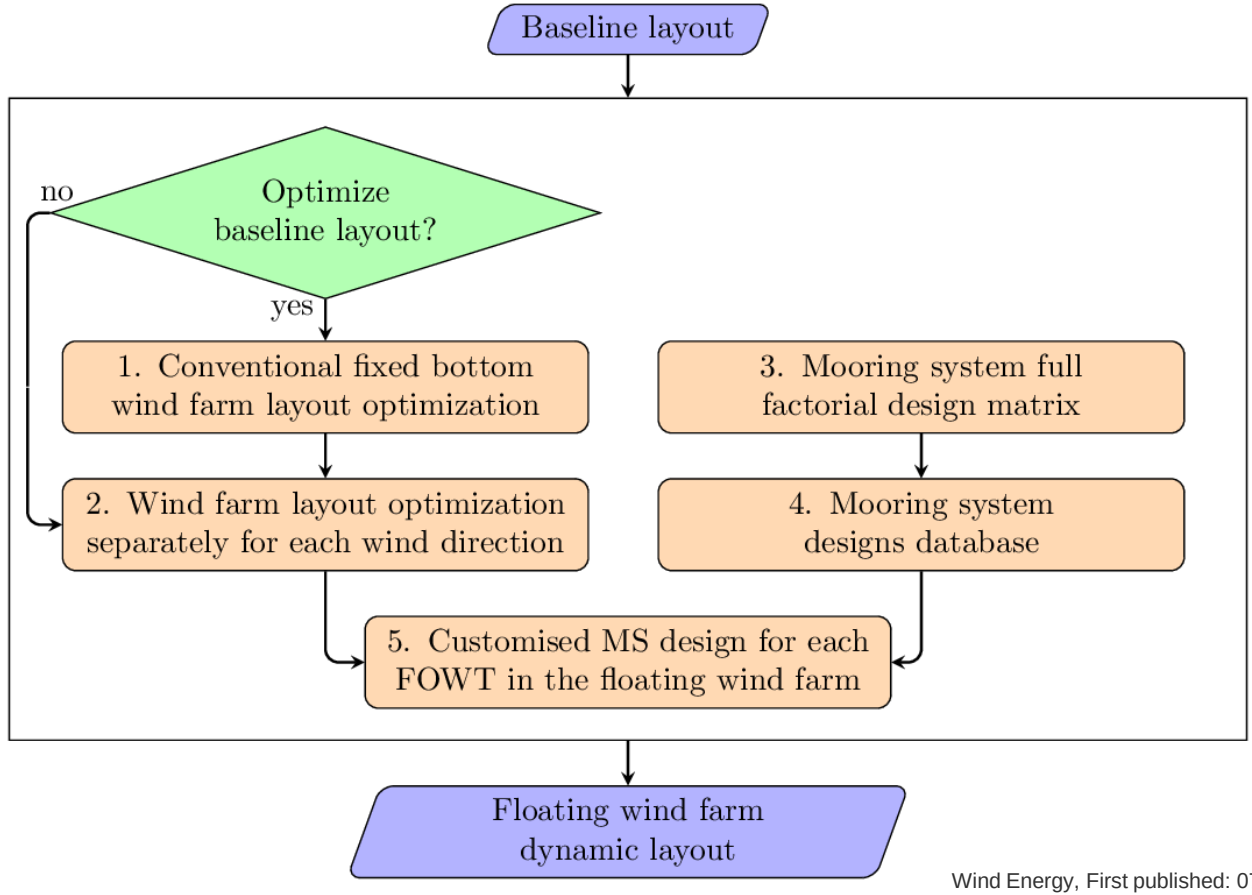
FOWT are able to relocate their position

- Ability of a FOWT to move in the crosswind direction
- New DoF that can be used in floating wind farm layouts optimization



Can we benefit from this DoF to decrease wake losses?

Yes we can benefit from relocating FOWT



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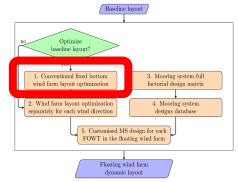
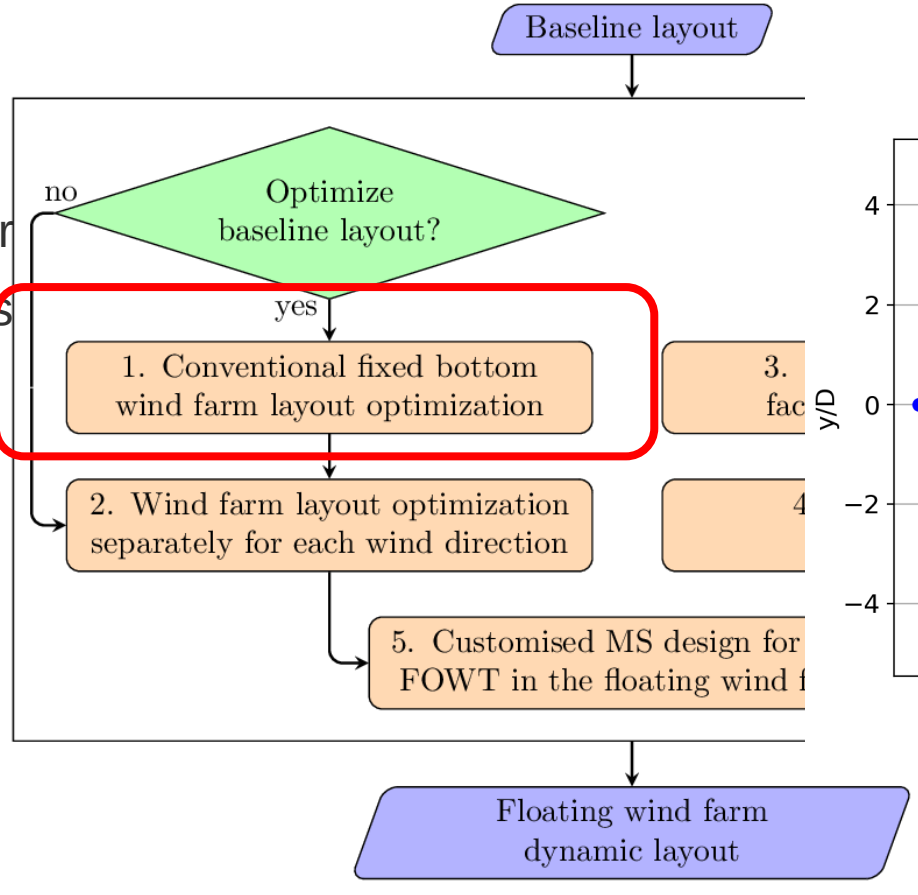
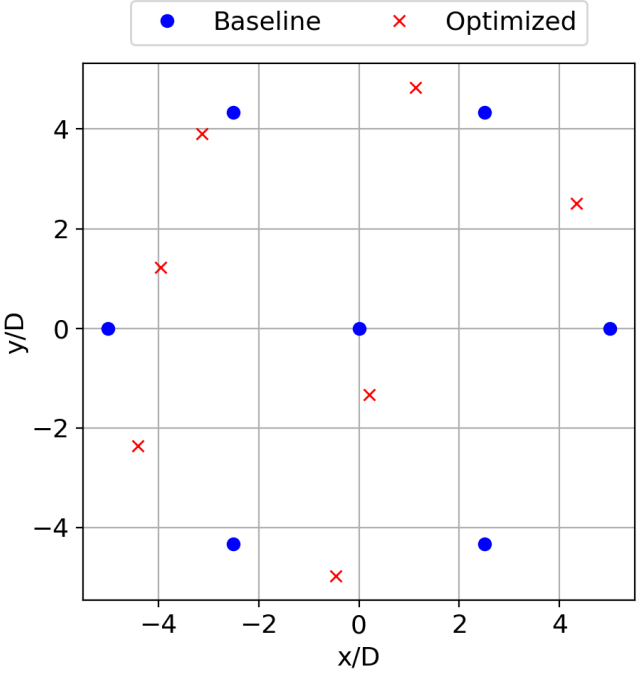
1. Conventional fixed bottom wind farm layout optimization



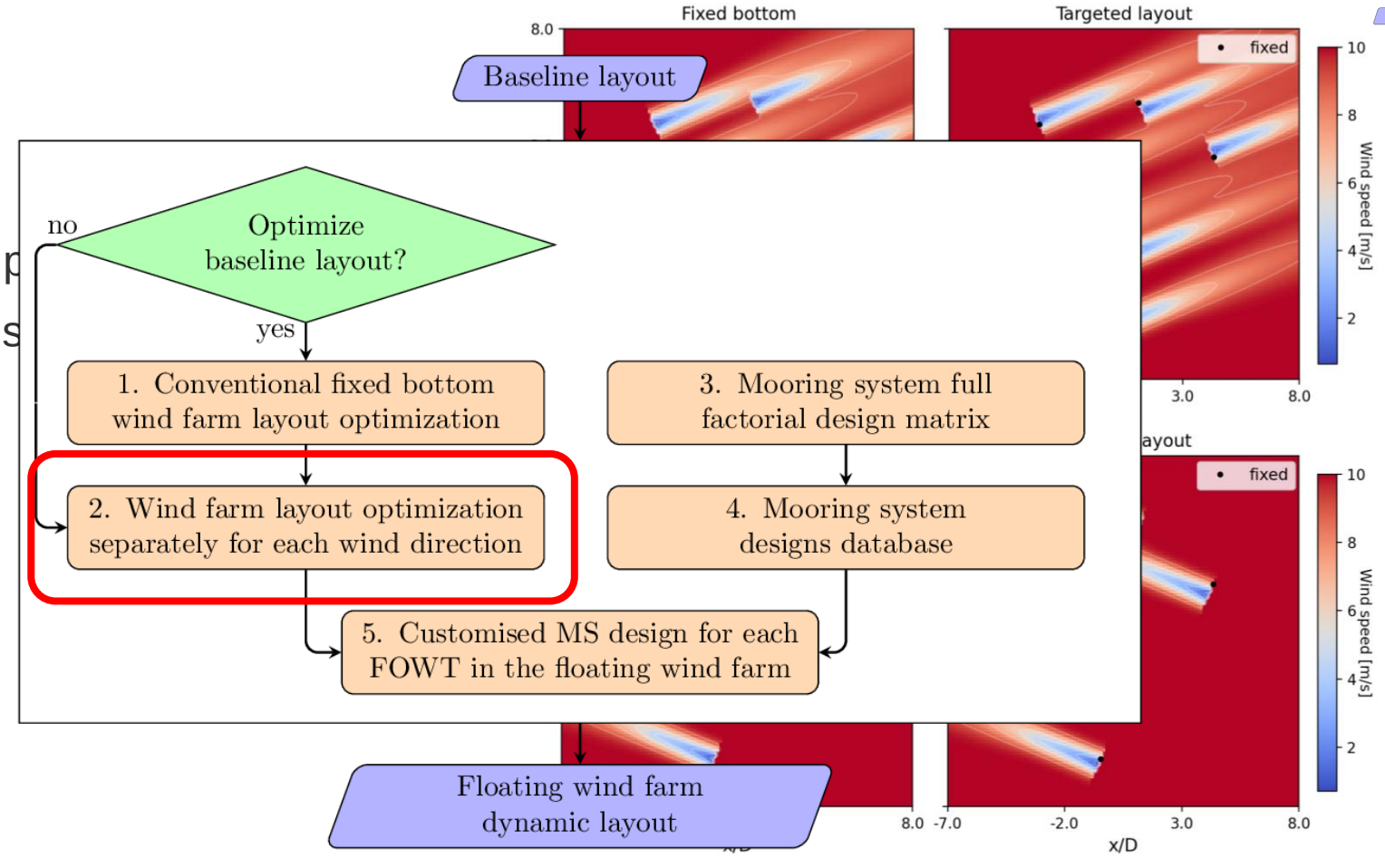
- Constraints:
  - Inside the far
  - Minimum Dis



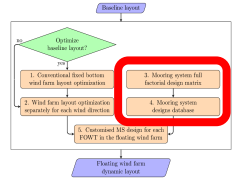


2. Wind farm layout optimization separately for each wind direction

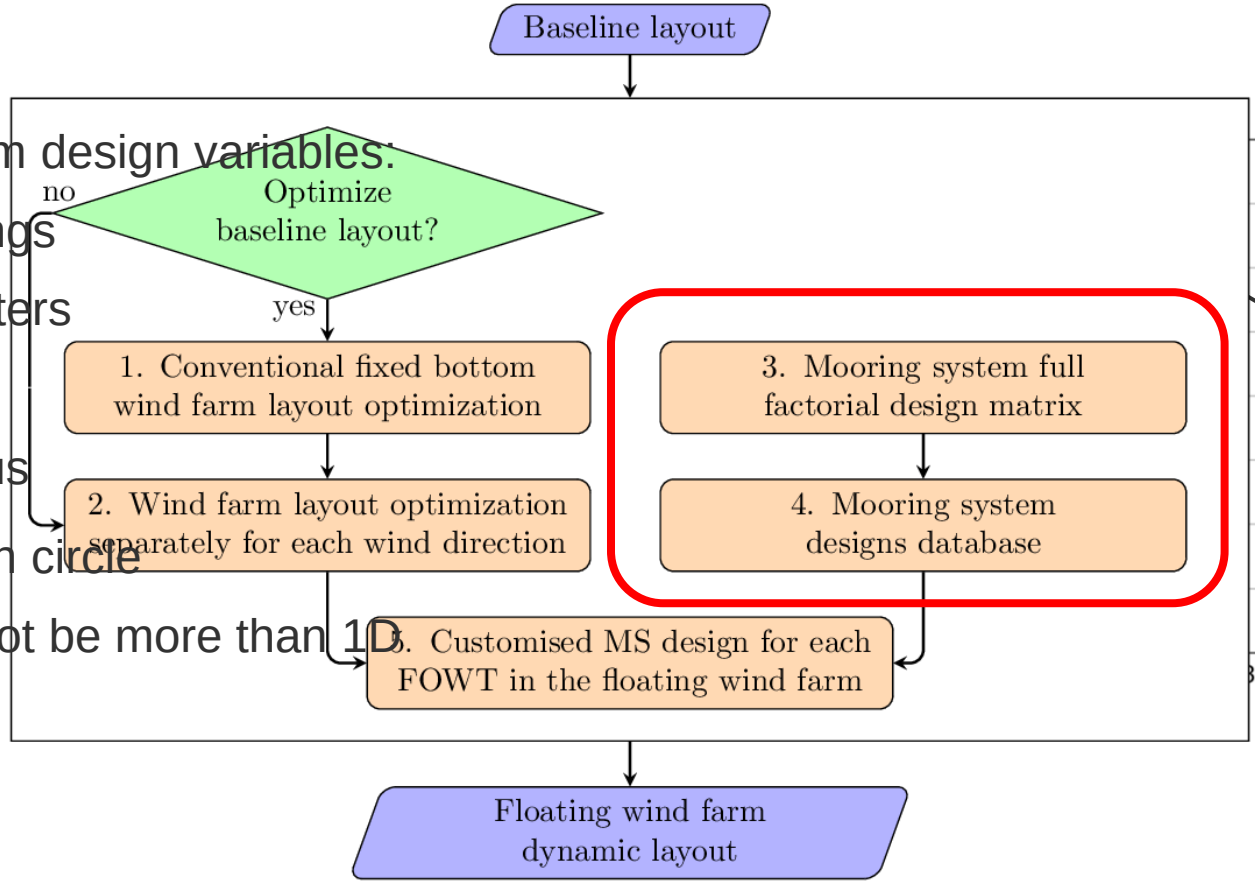
- Constraints:
  - Motion only p
  - Maximum dis

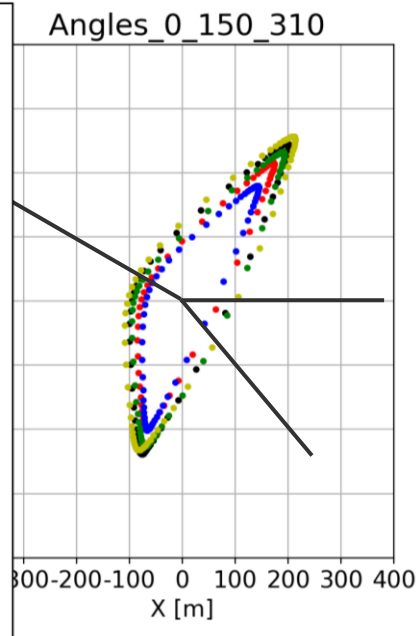


3. & 4. Mooring system database



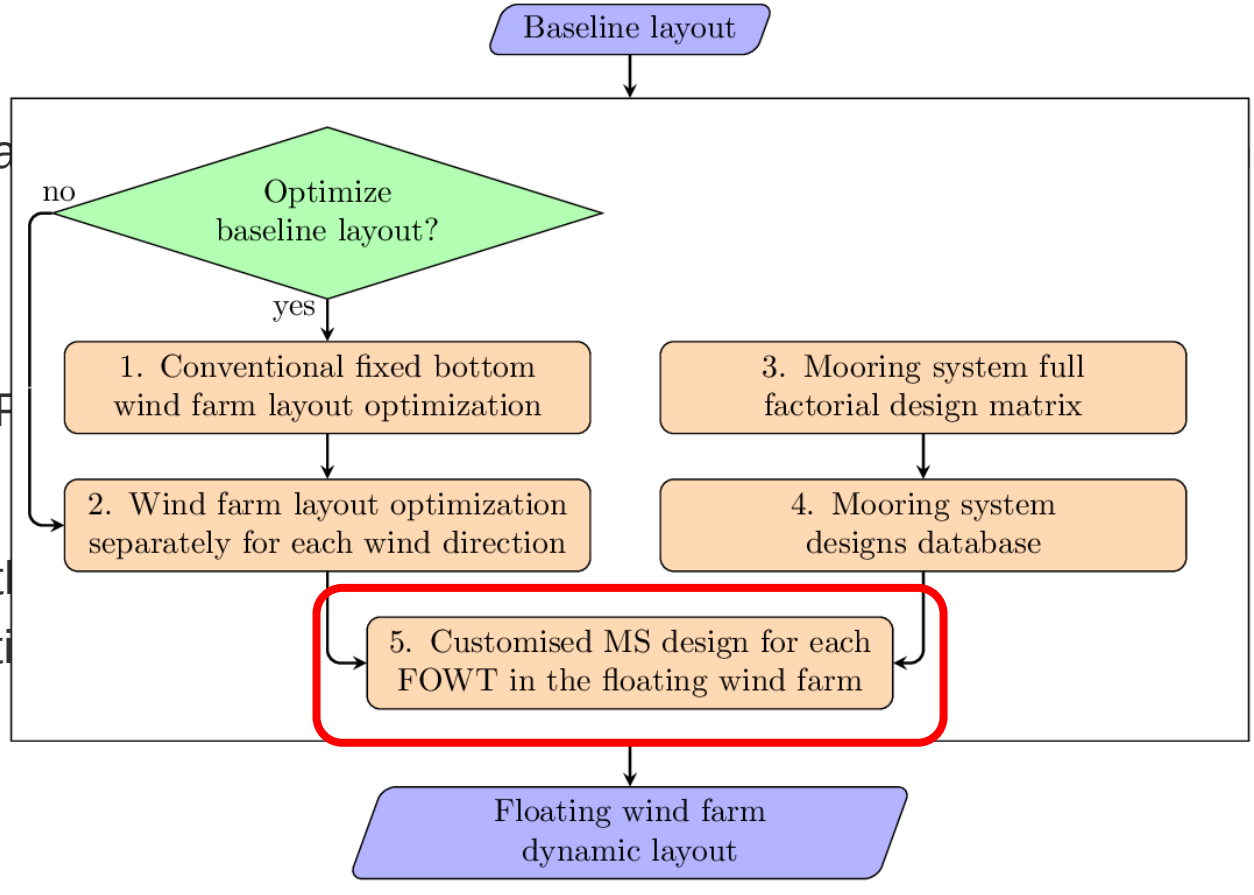
- Mooring system design variables:
  - Lines headings
  - Lines diameters
  - Lines length
  - Anchor radius
- Save the watch circle
  - Motion cannot be more than 1D





5. Customized MS design for each FOWT in the floating wind farm

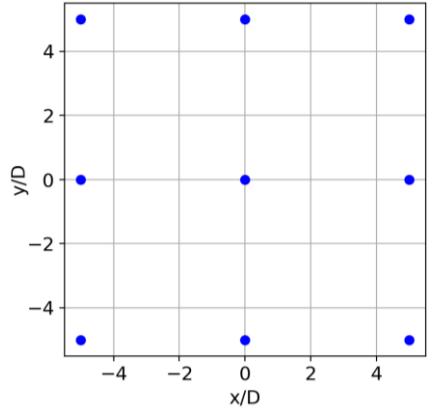
- Matching the ta ooring system.
- Objective:
  - Increase AEP
- Method:
  - Iterate over t to the targeted moti



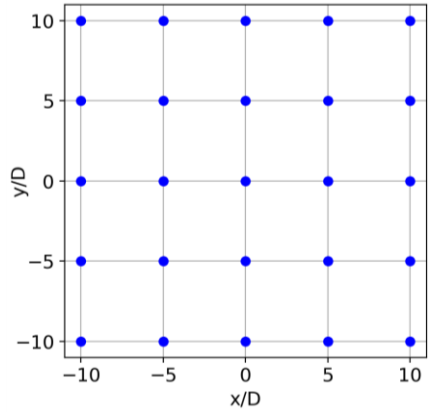
Sensitivity analysis of the method

Is it better to relocate the turbines in smaller or larger farms?

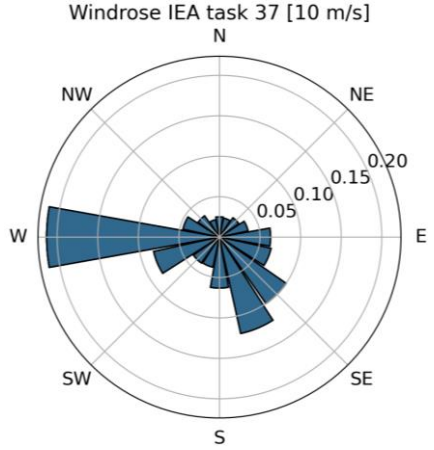
9 turbines

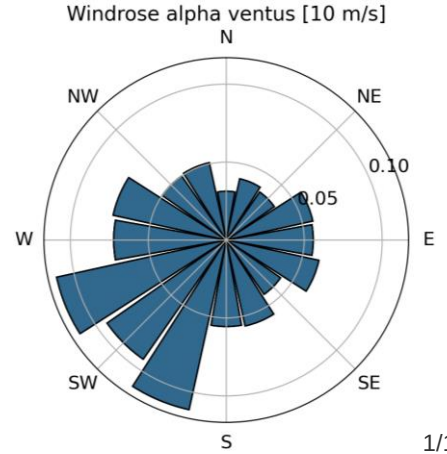


25 turbines



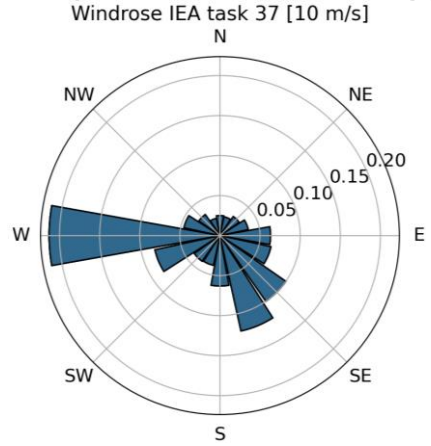
Does the windrose need to be multi-directional?

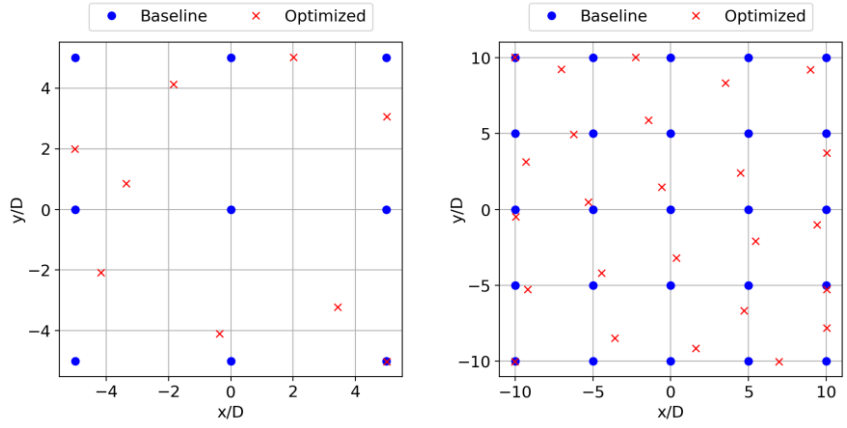


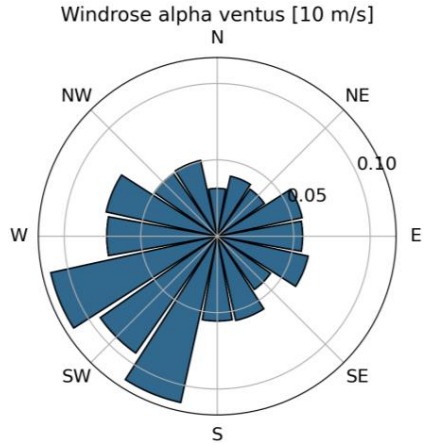


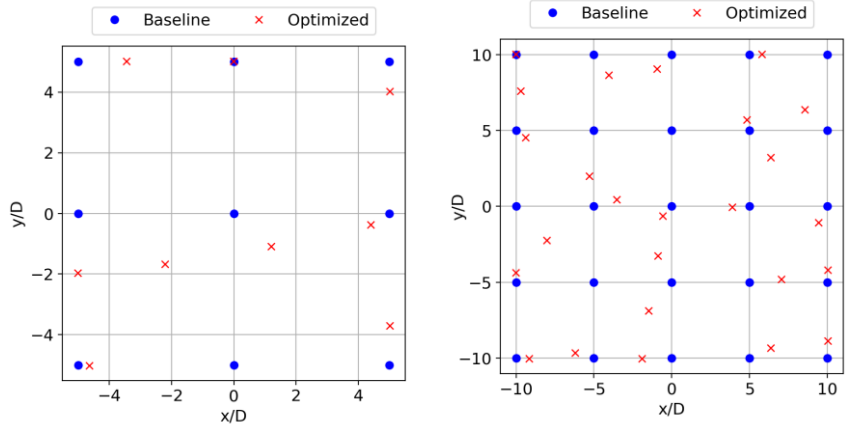
Baseline optimization

Reference layouts for energy comparison

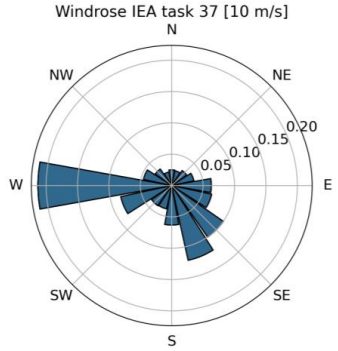
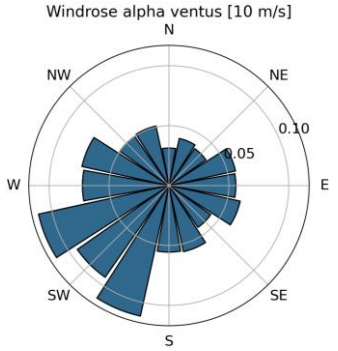








Results

No. of turbines \ Windrose		
9 turbines	5.47% gain	3.94% gain
25 turbines	2.16% gain	2.57% gain

Conclusions

- The percentage gain of energy production from relocating the FOWT is higher in smaller wind farms
- Relocating the turbines will lead to energy gain even for wind roses with the wind coming from one section
- The gain for more layouts will be shown in the paper.

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Thank you!

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