

Influence of the North Atlantic swell on the wave fields in the Barents and White seas.

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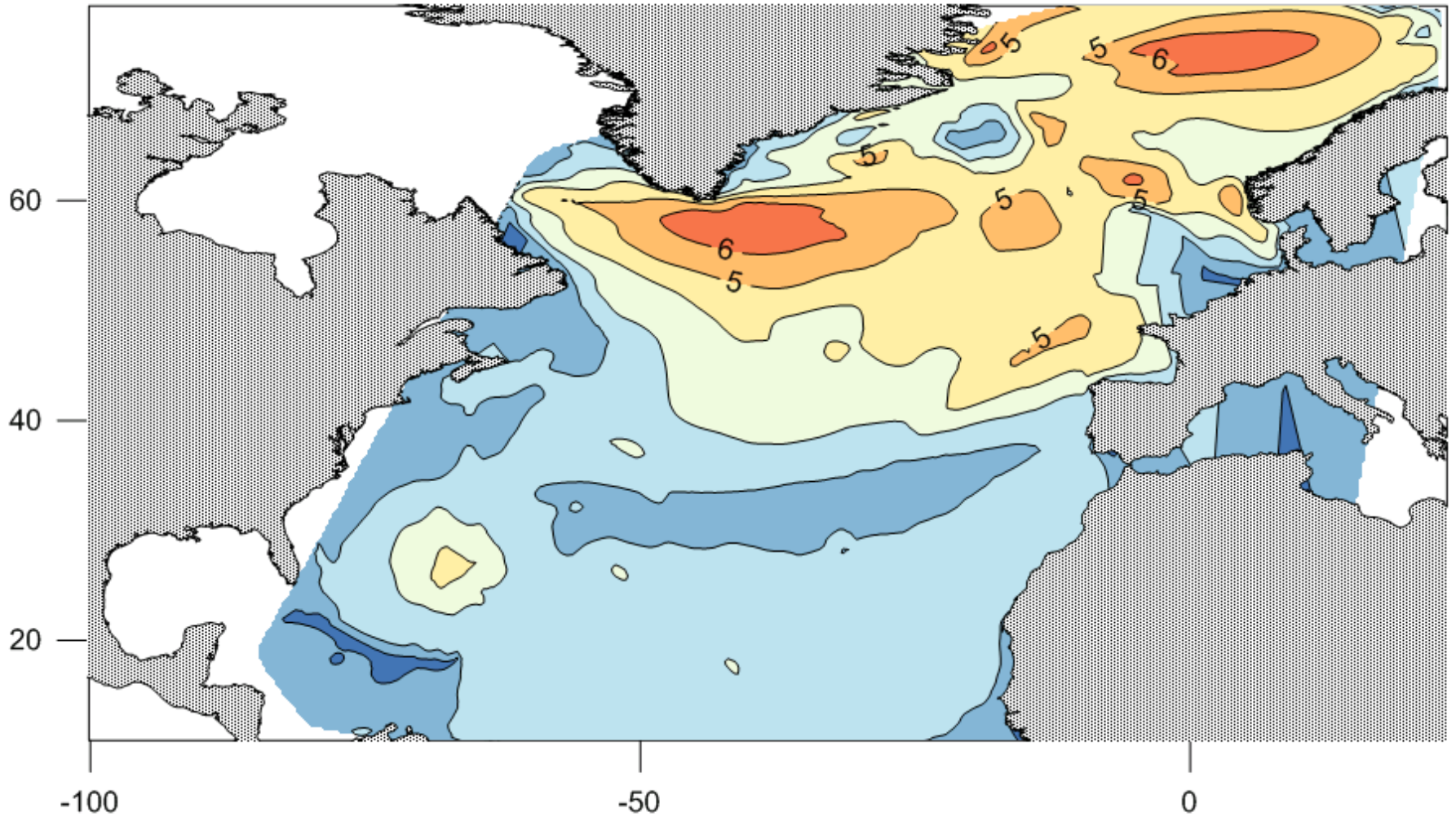
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Main tasks

- To simulate swell distribution from the North Atlantic to the Barents and White seas.
- To estimate swell height in the Barents and White seas coming from the North Atlantic.

The main idea of model experiment - limited wind forcing above the Barents and White seas to show swell effect without local wind waves.

Typical field of significant wave height (m).



Study motivation – to improve wave hindcast and forecast



(Photo by Ministry of Defence of the Russian Federation)

Modeling tools

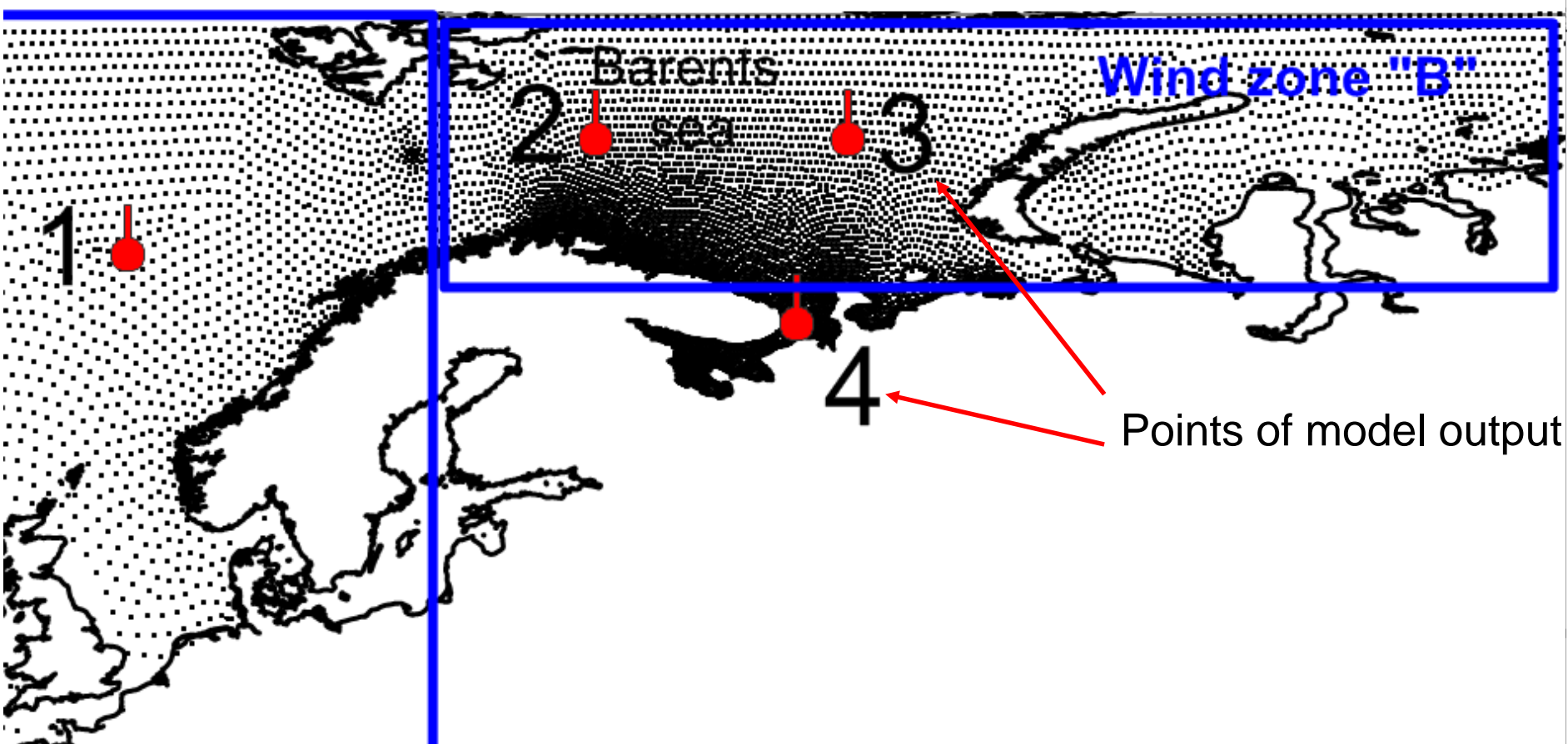
SWAN (Simulating waves nearshore) – spectral wave model for simulating significant wave height and swell height

Input data:

- Wind NCEP CFSR ($\sim 0,3 \times 0,3^\circ$; 1 hour)
- Topography – Etopo5
- Ice cover NCEP CFSR – ice edge (monthly averaged) as a fixed solid boundary

SWAN mesh, wind forcing zones

80



Barents sea

Wind zone "B"

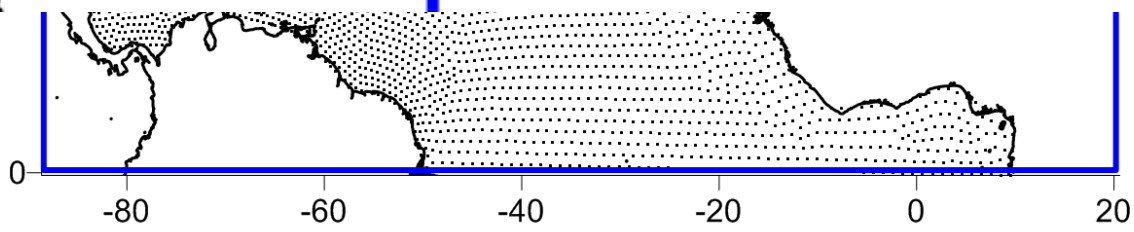
1

2

3

4

Points of model output



0

-80

-60

-40

-20

0

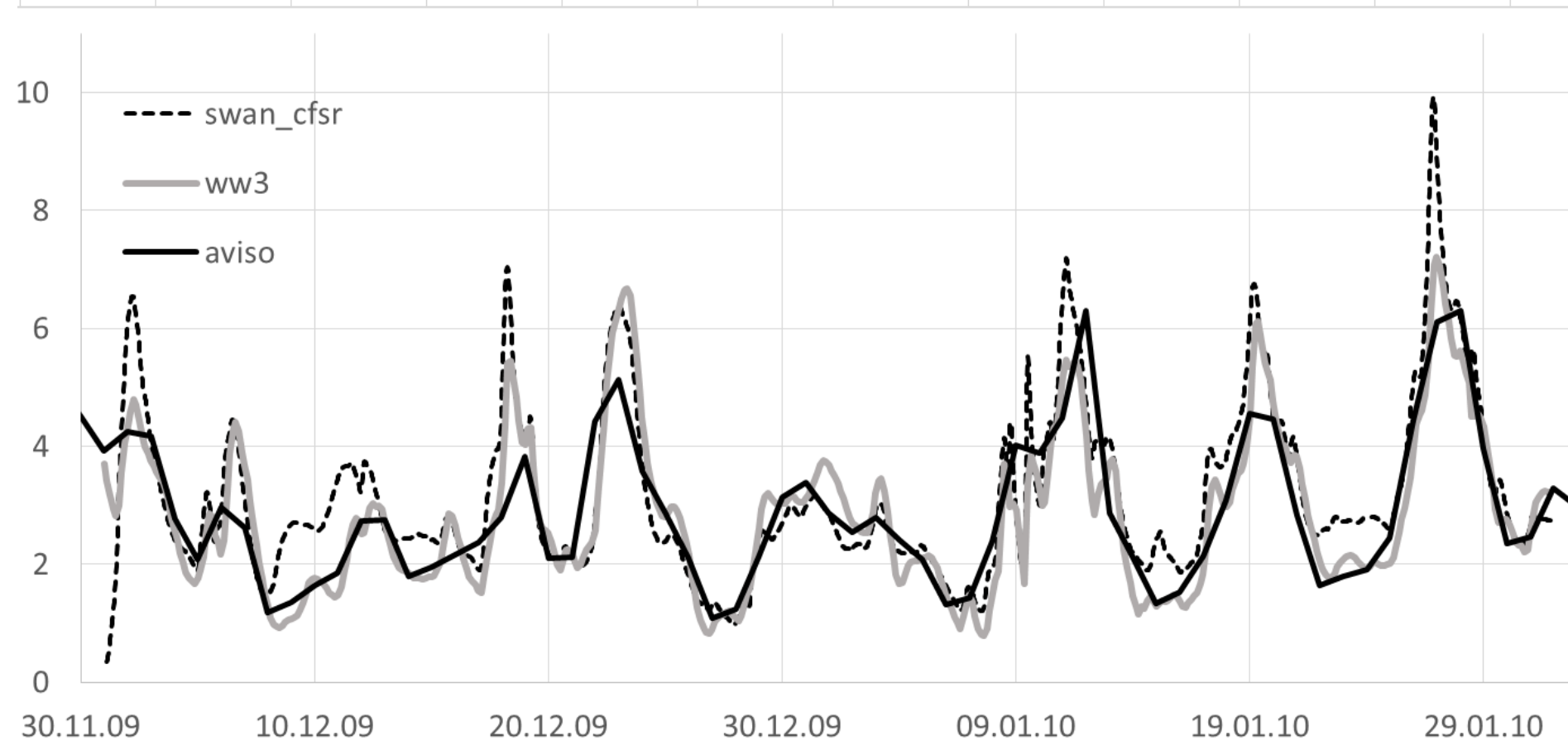
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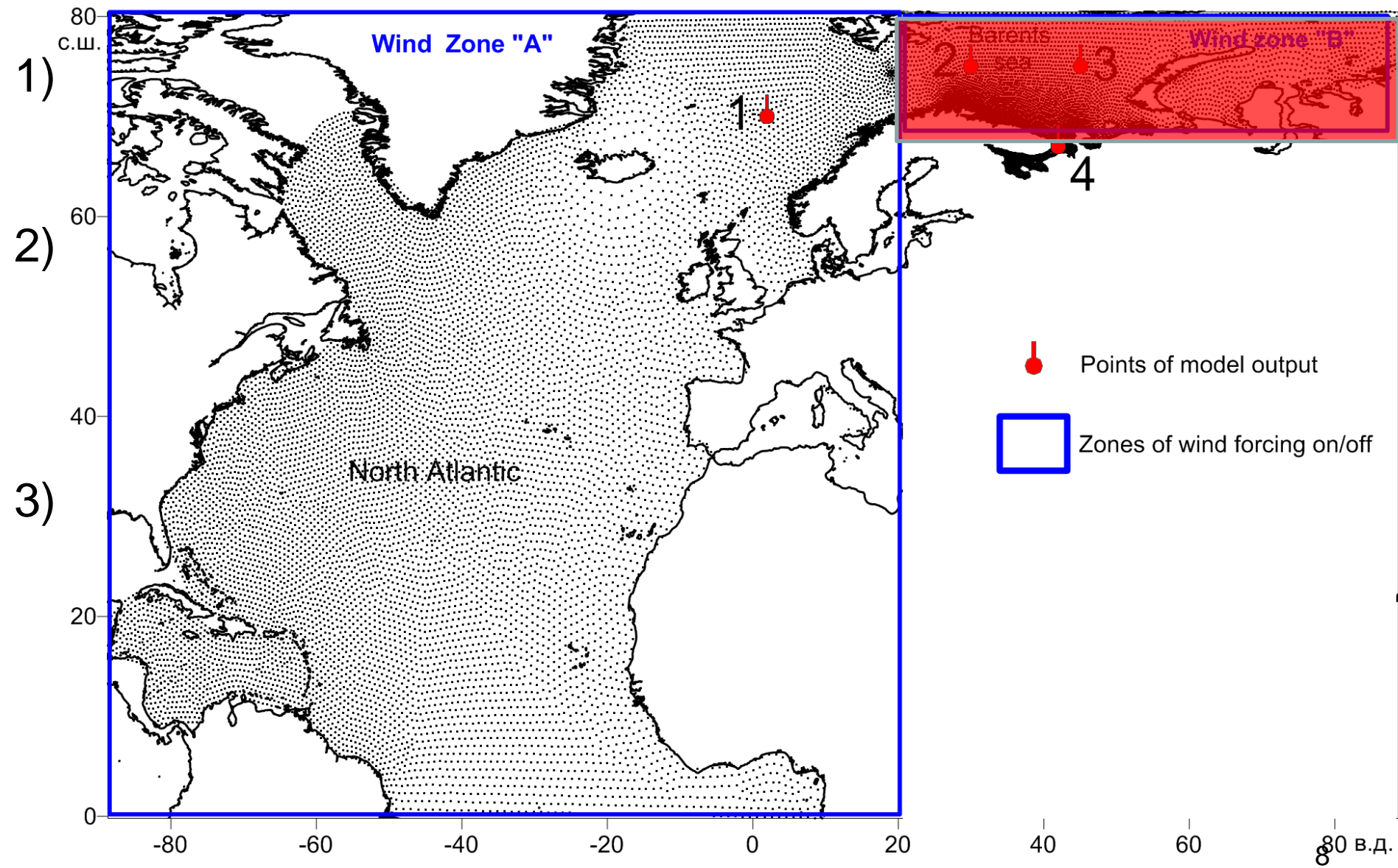
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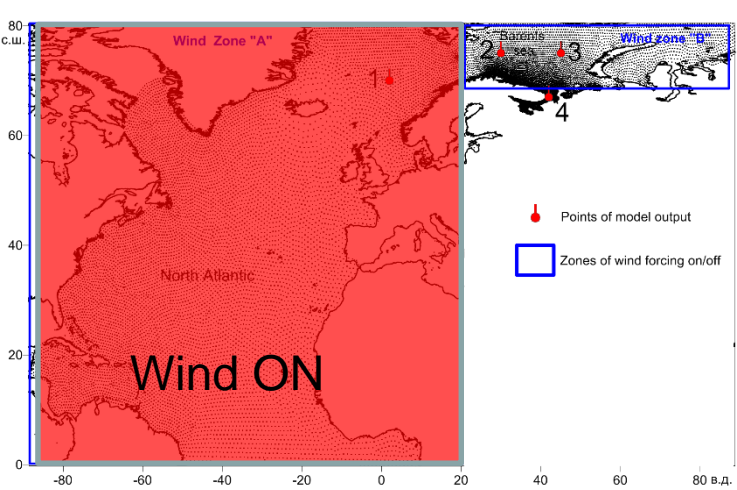
60

80 в.д.

Comparison of significant wave height (m) from SWAN, WaveWatch3 and Aviso altimetry



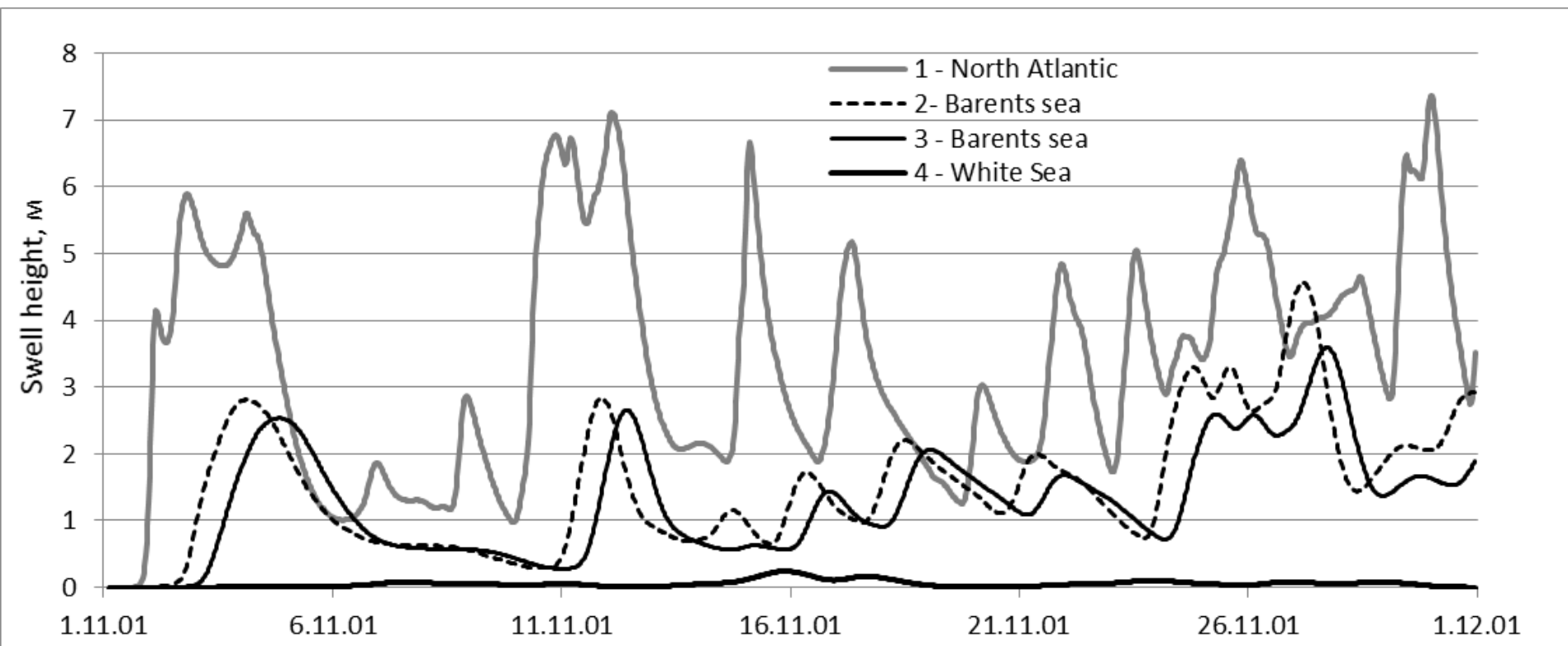


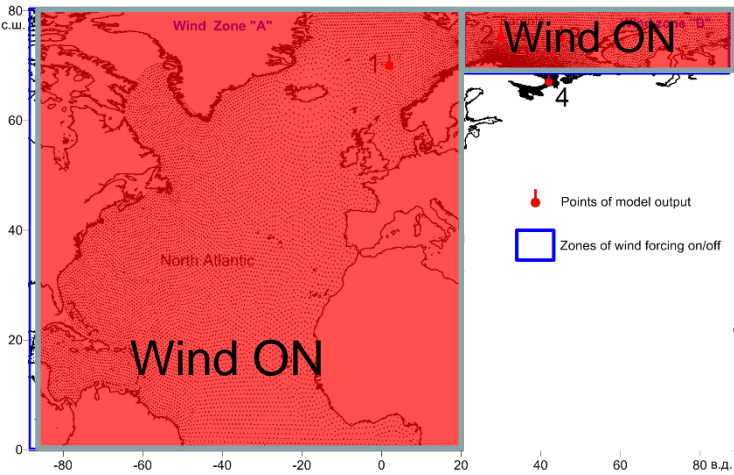


Wind forcing ON in Zone A

Wind forcing OFF in zone B

In the Barents sea no local wind.
Wave coming only from North Atlantic.

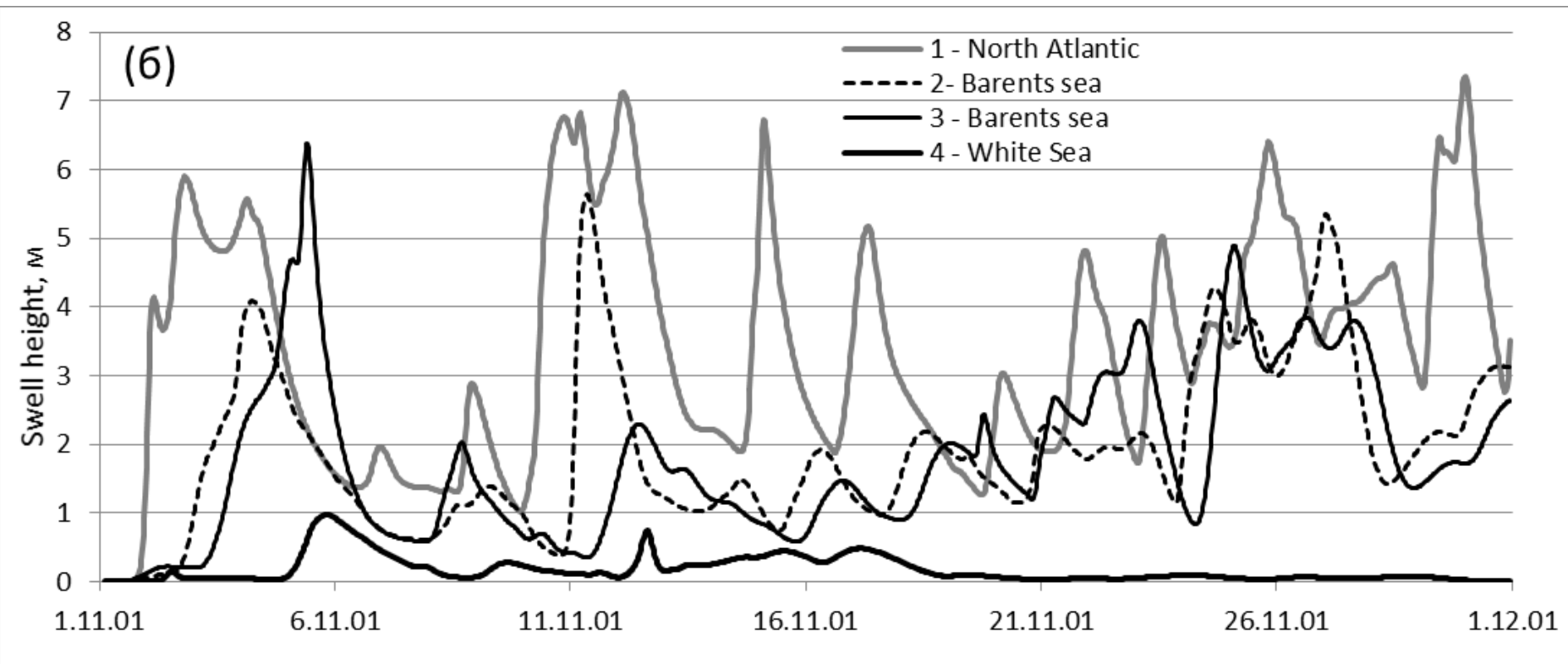


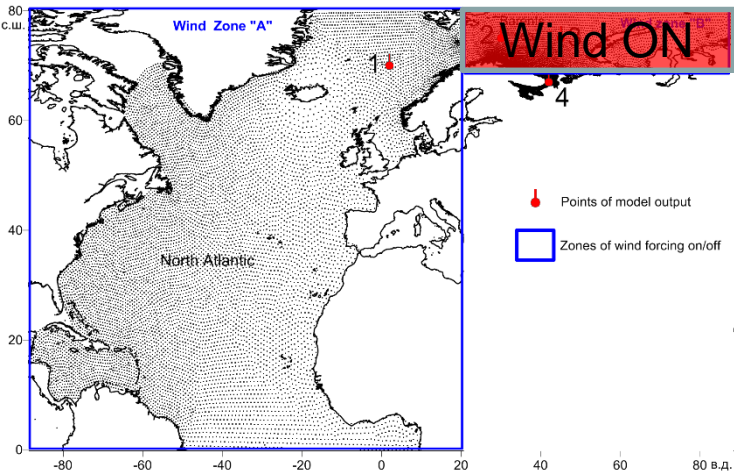


Wind forcing ON in Zone A

Wind forcing ON in Zone B

No local wind in the White Sea. We can see sum effect from the Barents sea and North Atlantic

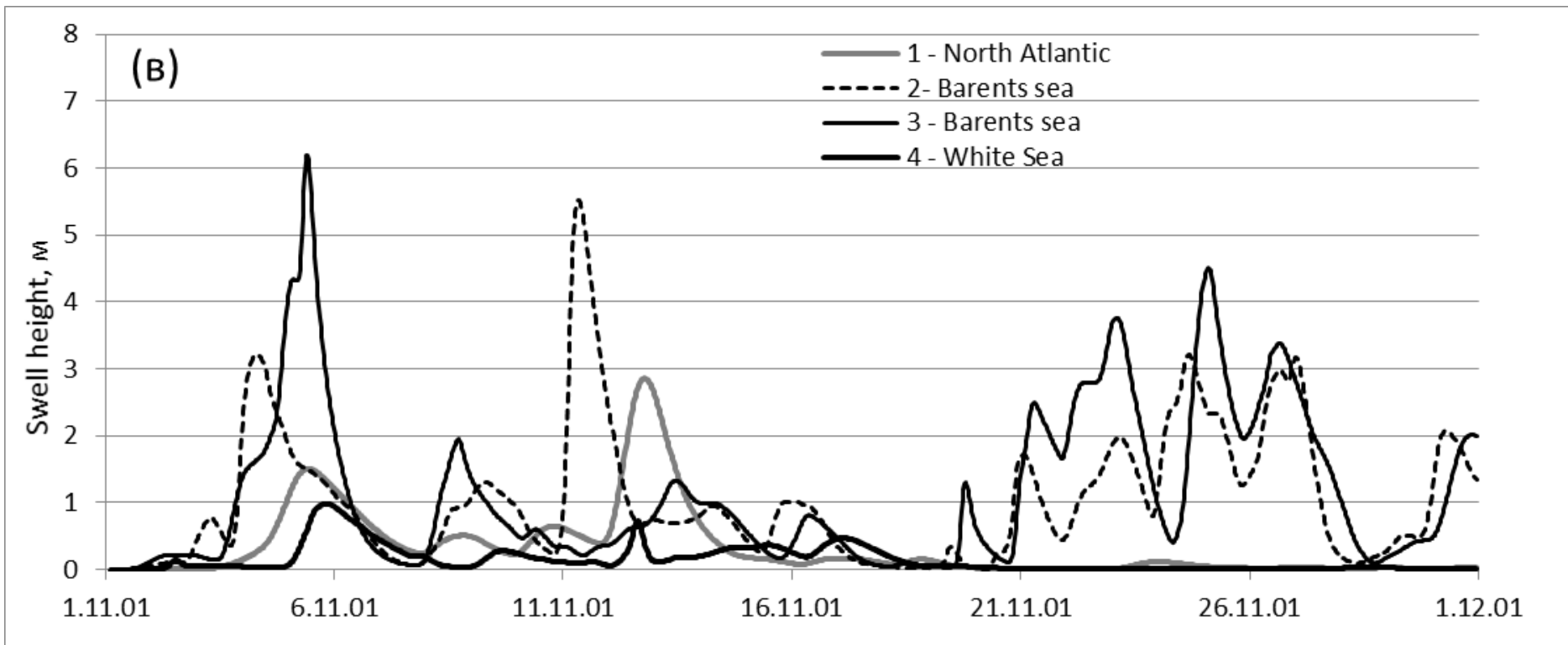




Wind forcing OFF in Zone A,

Wind forcing ON in Zone B

In the White Sea we can see only swell from the Barents sea without North Atlantic influence



Results

The SWAN wave model was implemented for the North Atlantic and the Barents and White seas with unstructured mesh

1 experiment - swell from the North Atlantic in the Barents sea 2-4 m is usual effect, but for the White Sea - no swell effect from the NA

2 experiment - the sum effect of wind forcing in the NA and the Barents generates swell with heights 4 - 5 m, for the White Sea height is 0.5 -1 m (effect from the Barents sea)

3 experiment – local wind in the Barents sea generates swell with heights 4 - 5 m which enters to the North Atlantic (1 - 3 m)

This method could be used for another areas. So, scientists could choose location of open boundaries for wave modeling

THANK YOU FOR YOUR ATTENTION!

For collaboration:
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