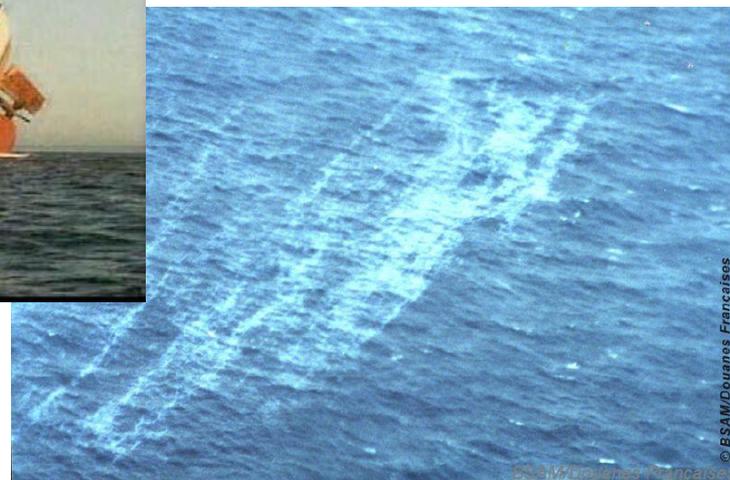
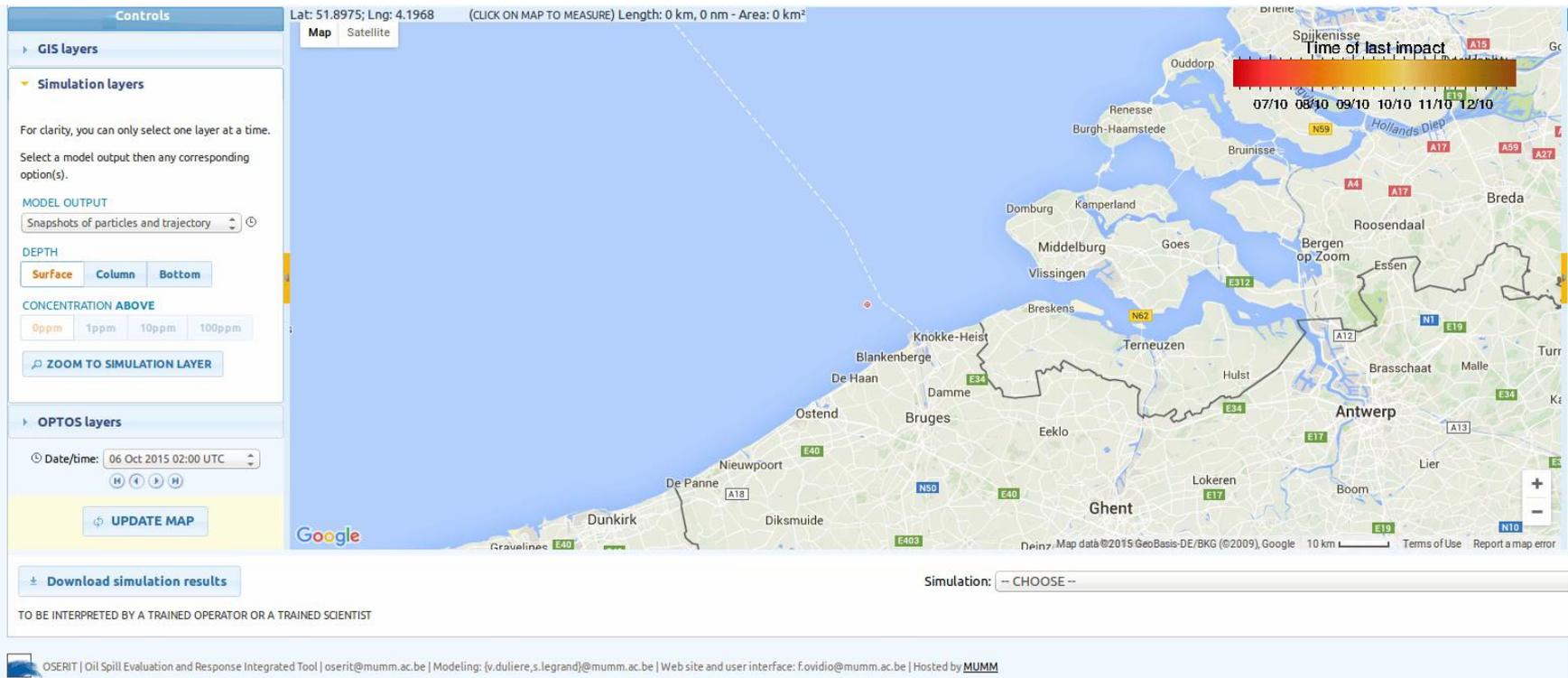
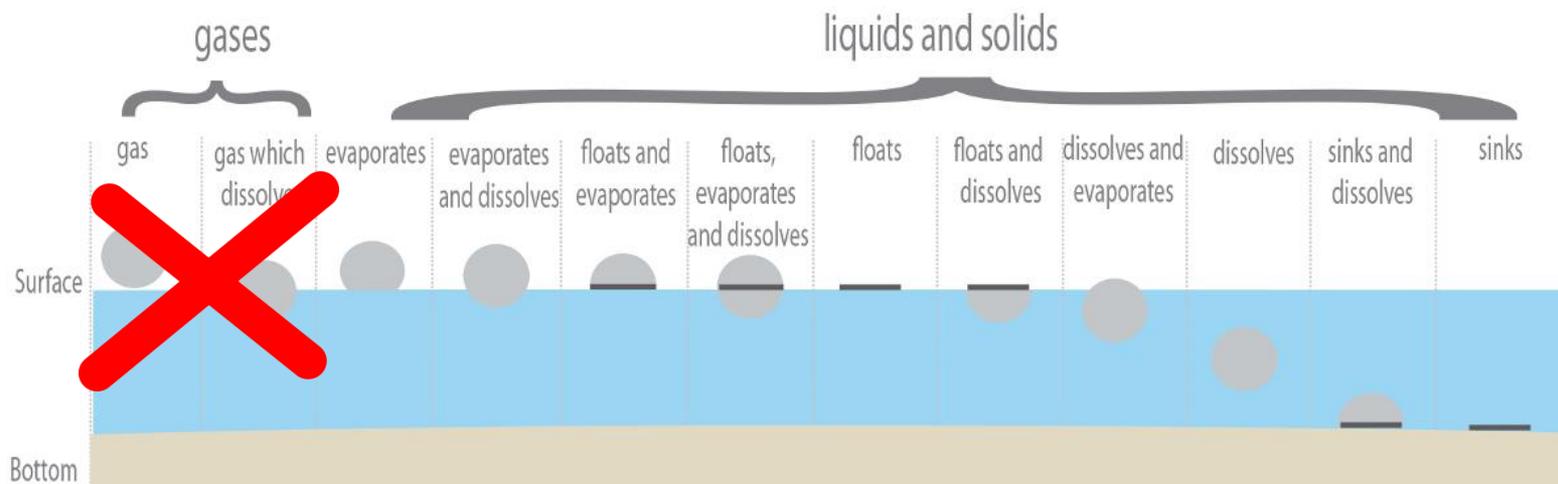


HNS-MS far field model Focus on timescales from 1 to 5 days & transport





What the model has to do?



GAS (Vapour pressure > 101.3 kPa at 20 °C)

	<i>G</i>	<i>GD</i>
Solubility	10%	

SINKING LIQUIDS (density > seawater)

	<i>S</i>	<i>SD</i>	<i>D or DE</i> <small>if VP > 10kPa</small>
Solubility	0.1%	5%	

FLOATING LIQUIDS (density < seawater)

Vapour pressure			<i>DE</i>
10 kPa	<i>E</i>		<i>ED</i>
3 kPa	<i>FE</i>	<i>FED</i>	
0.3 kPa	<i>F</i>	<i>FD</i>	<i>D</i>
Solubility	0.1%	1%	

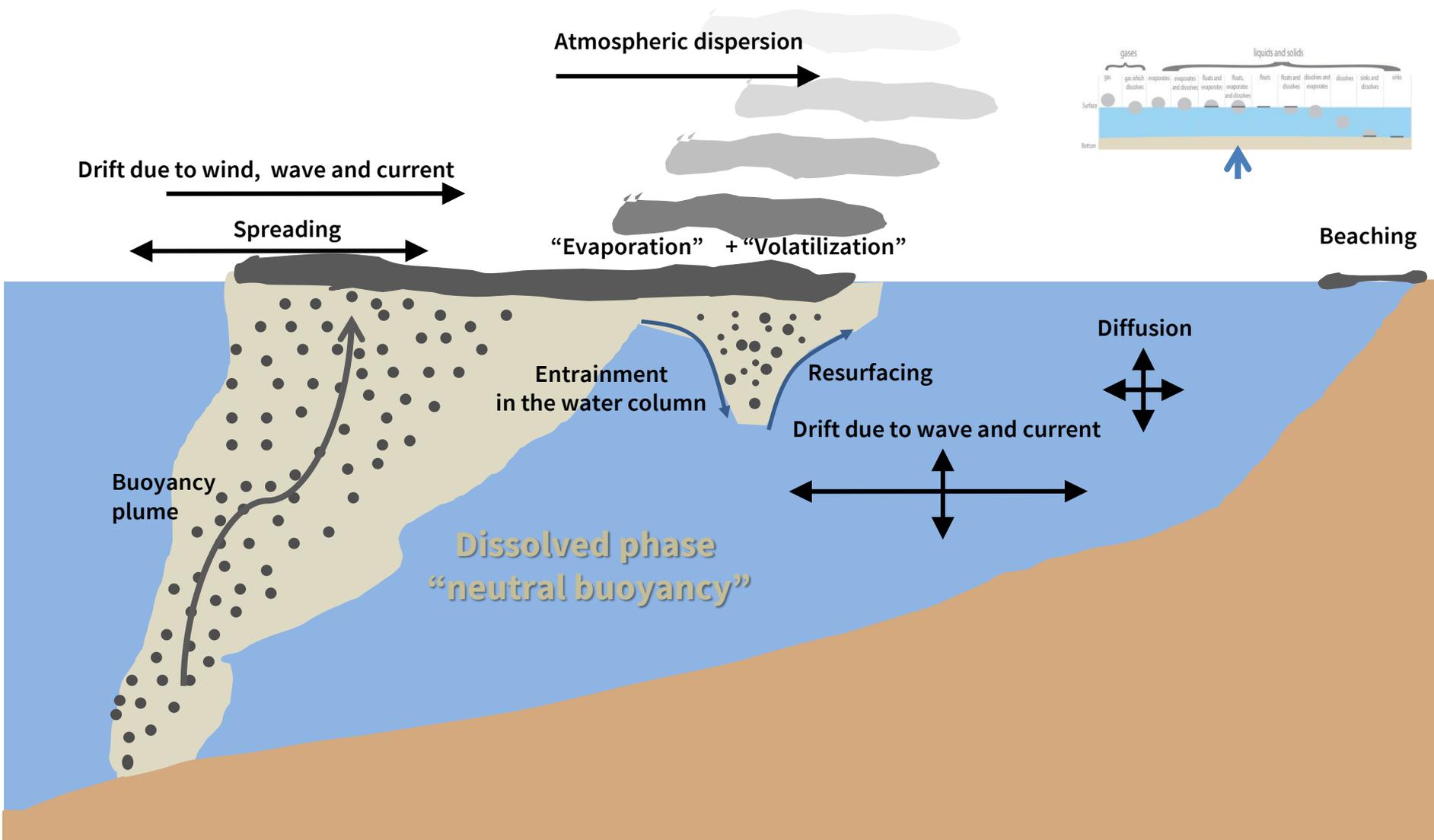
FLOATING SOLIDS (density < seawater)

	<i>F</i>	<i>FD</i>	<i>D</i>
Solubility	10%	100%	

SINKING SOLIDS (density > seawater)

	<i>S</i>	<i>SD</i>	<i>D</i>
Solubility	10%	100%	

Evaporator-Floater-Dissolver from a subsurface source

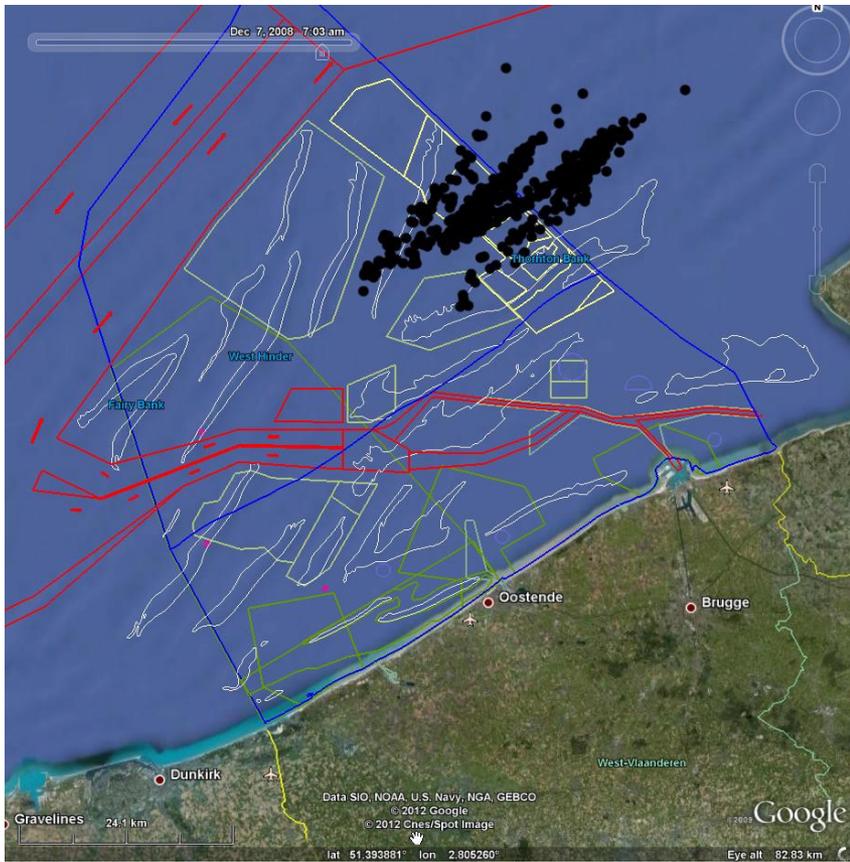


Far-field model still based on the Lagrangian particles tracking method

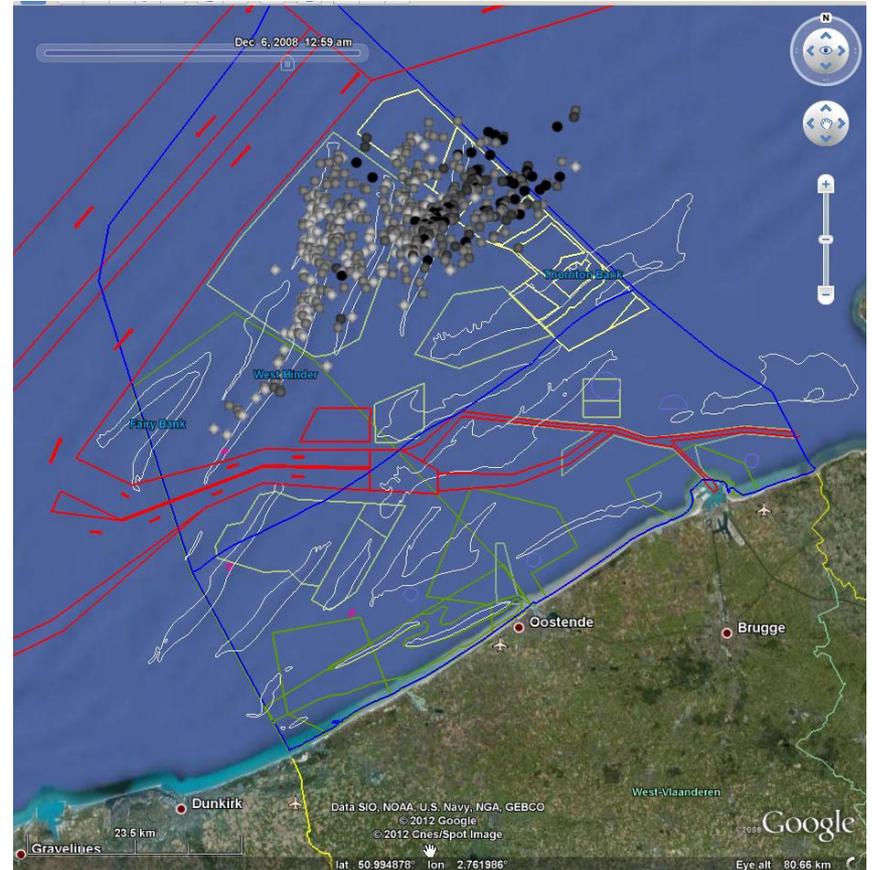
- Pollution is represented by a cloud of Lagrangian particles that moves independently from each other due to wind, waves & currents
- Random walk approach to model turbulence diffusion and surface slick spreading
- Position of the particle in the water column
 - At sea surface
 - In the water column
 - At the sea bed
 - Entrainment (function of waves, HNS viscosity)
 - resuspension (function of bottom current speed and HNS viscosity)



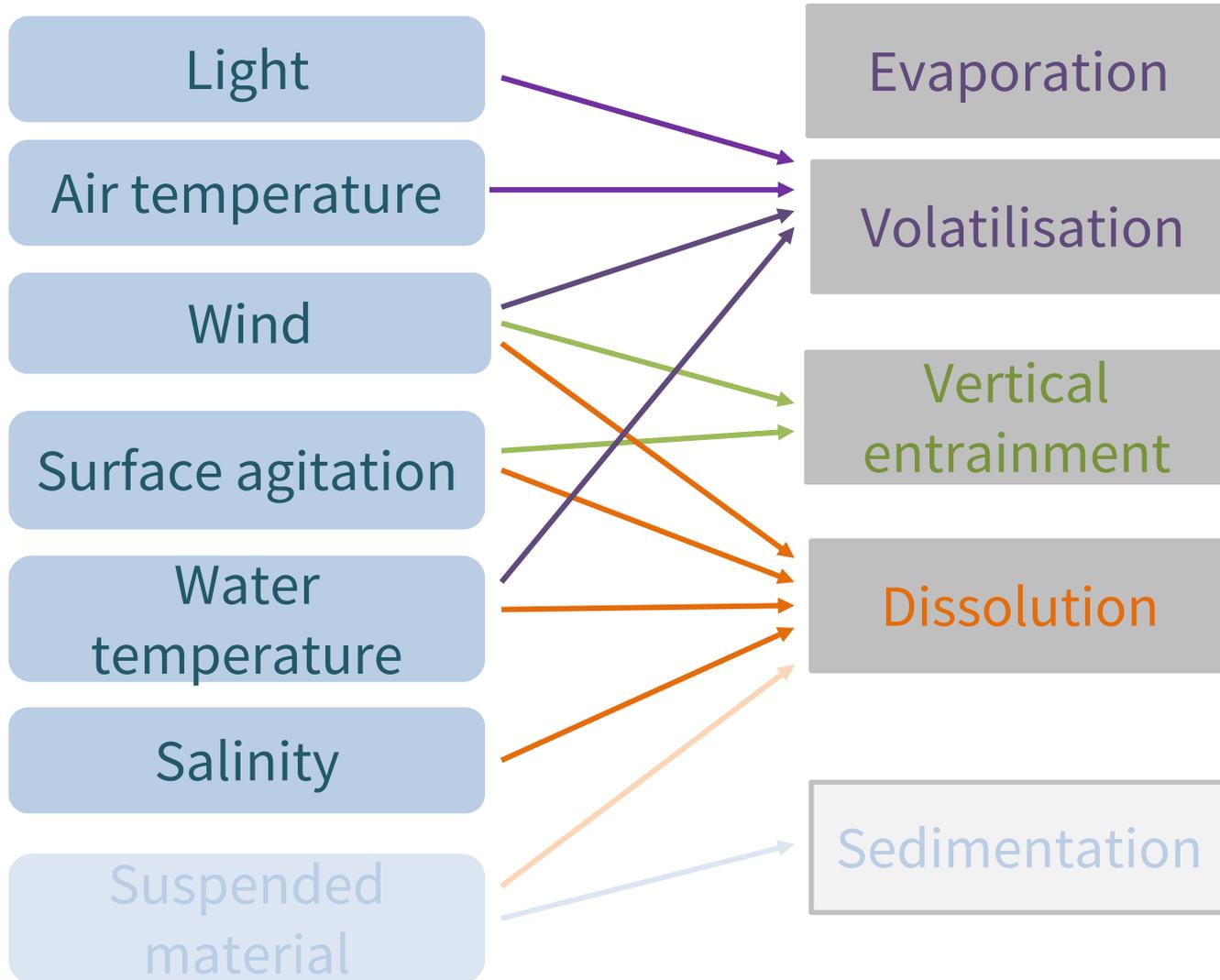
Persistent floater



Floater-dissolver

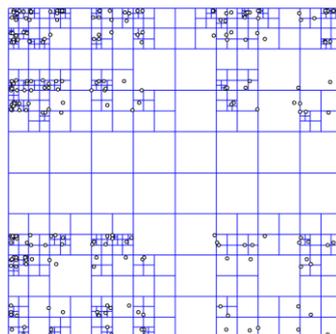


HNS behaviour – Environmental conditions



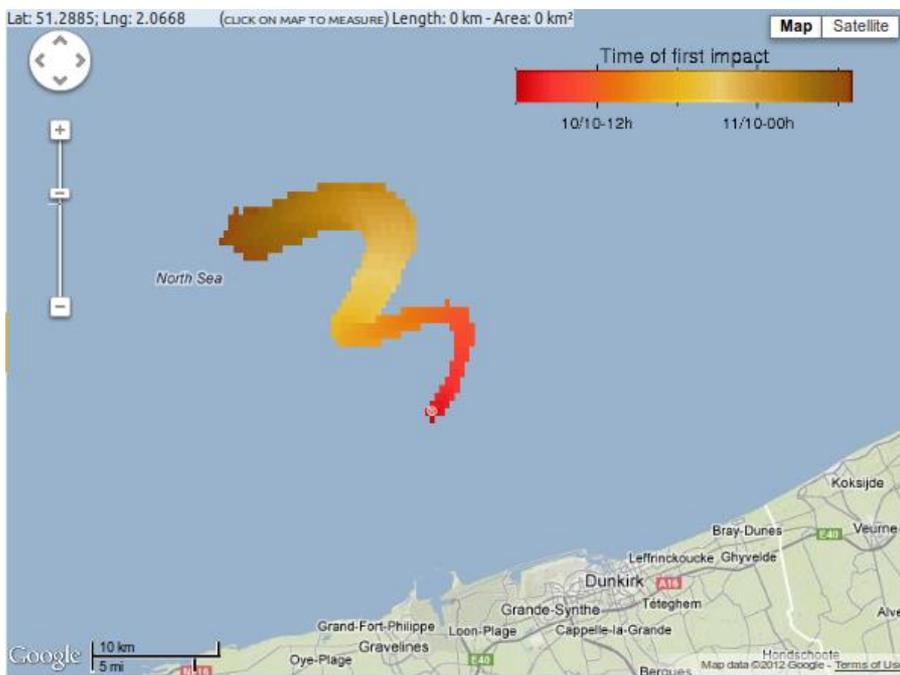
Fate & behaviour

- Each particle represents a fraction of the total HNS volume;
- Each HNS mass fraction may be in several phase as a function of the particle history
 - Need to keep track of the mass fraction history in
 - Liquid phase
 - Solid phase,
 - Evaporated phase,
 - Dissolved phase
 - Need to know the dominant phase
 - Need to keep track of the droplets size distribution
- Every hour, redistribution of the different mass fraction between the neighbouring particles

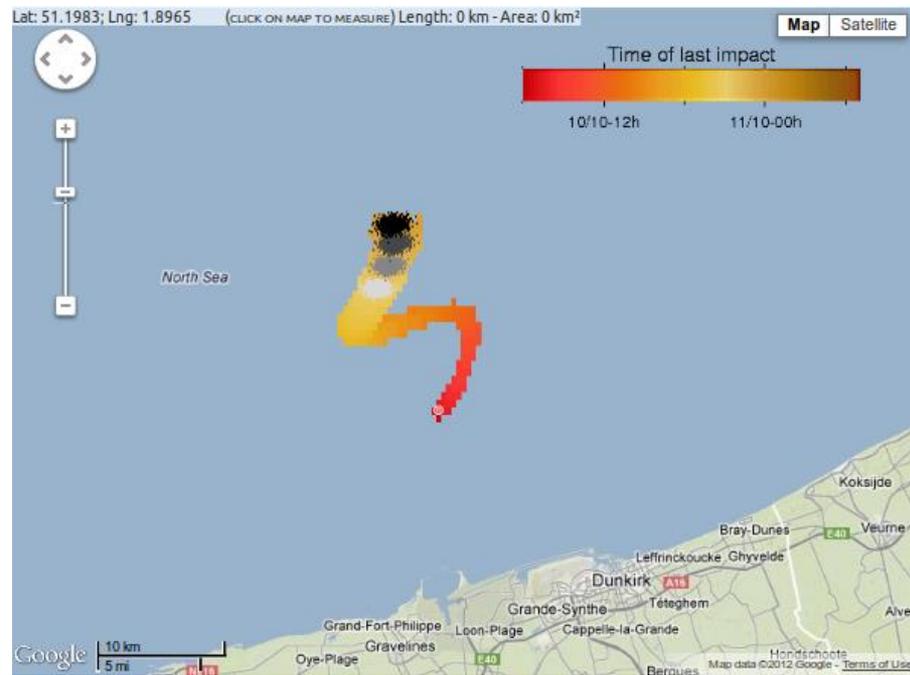


Impacted area (forecast)

Full trajectory (forecast)

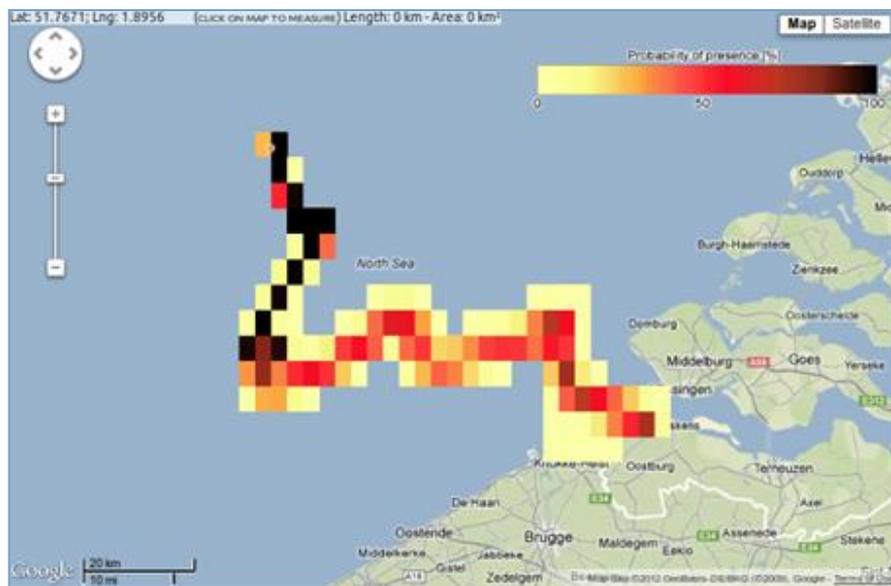


Snapshot of particles & trajectory

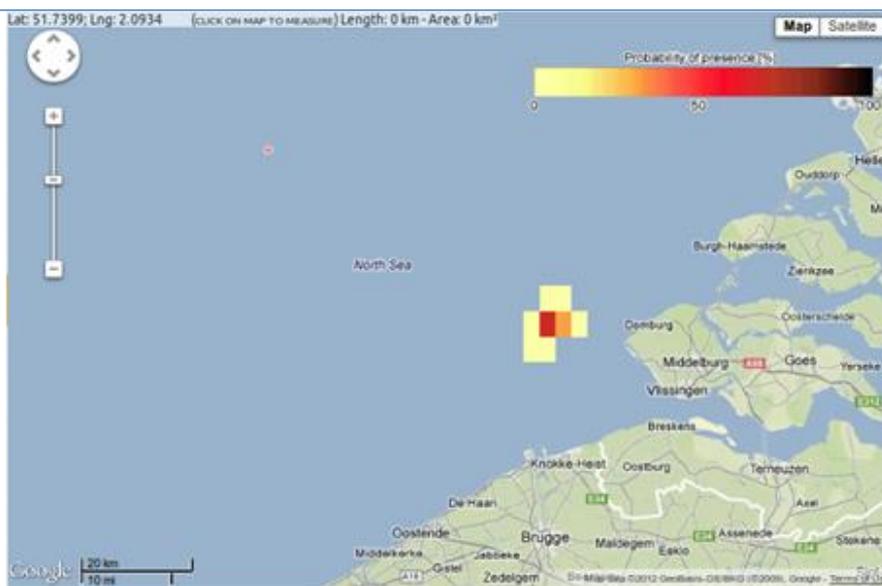


Impacted area

Maximum probability of presence

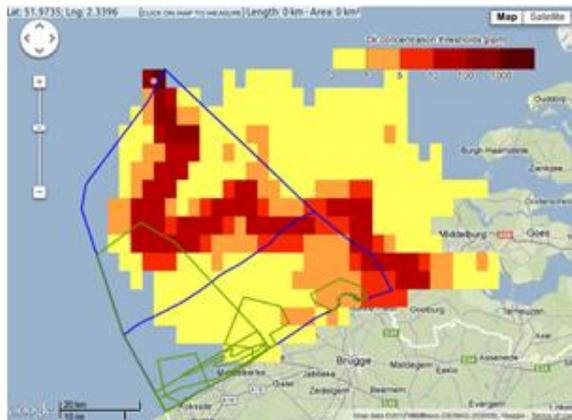


Snapshot of probability of presence



Concentration

Surface



Water column



Bottom



Exposure time

Global exposure time to 10 ppm

10 ppm

Surface



Water column

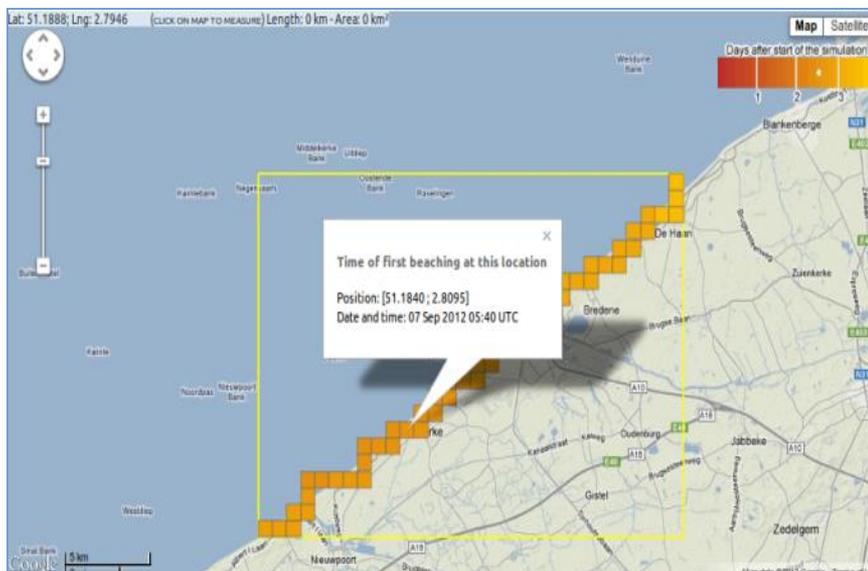


Bottom

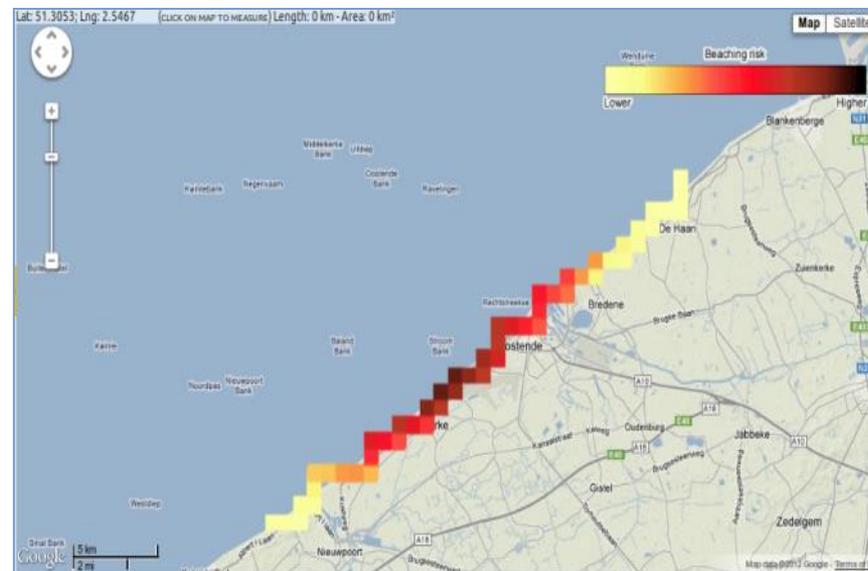


Beaching risk

First beaching time

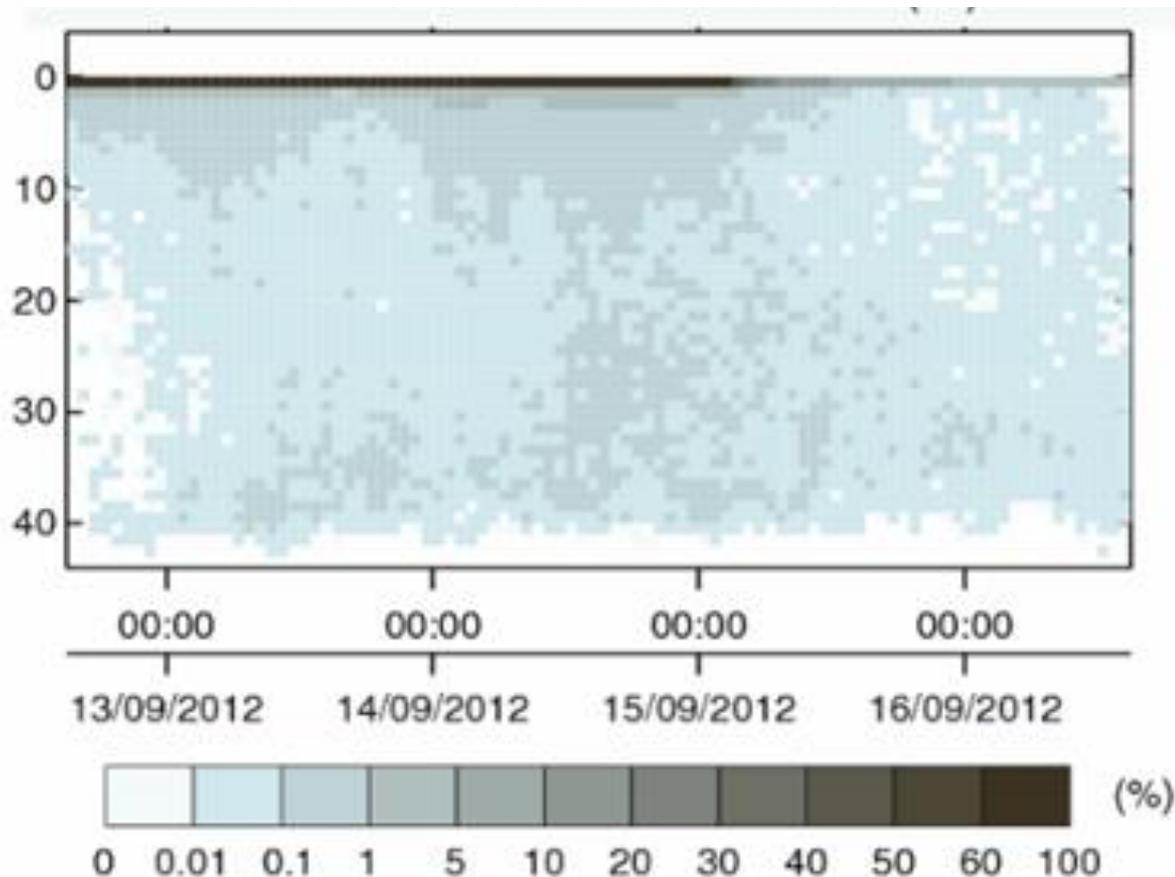


Beaching risk



Vertical distribution

Vertical distribution of HNS dispersed volume (%)



Mass balance

