



R&D tools to validate technical response strategies

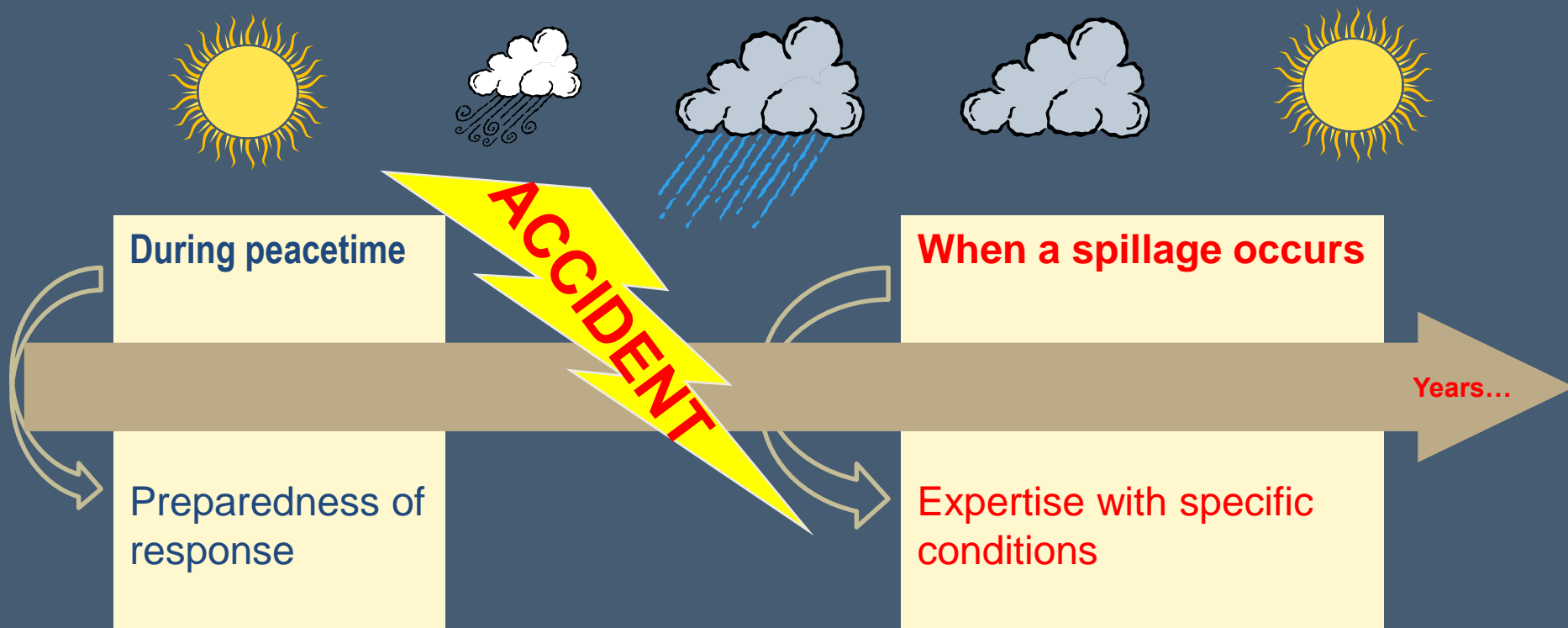
MARINER project
CIIMAR, Matosinhos, 28th April 2017

Using technology towards a better preparedness to HNS spills



R&D tools at Cedre

What framework for Cedre to help stakeholders of emergency response ?



EU funding

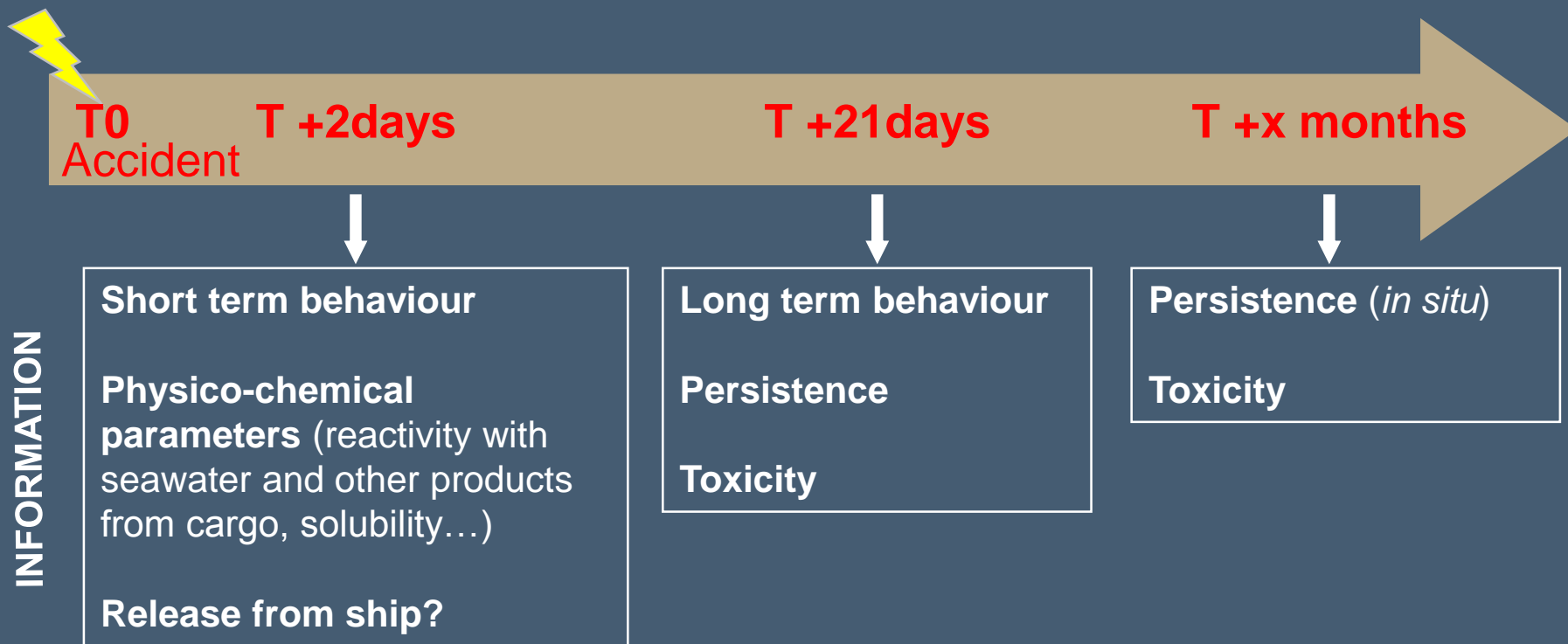


French Research
National Agency



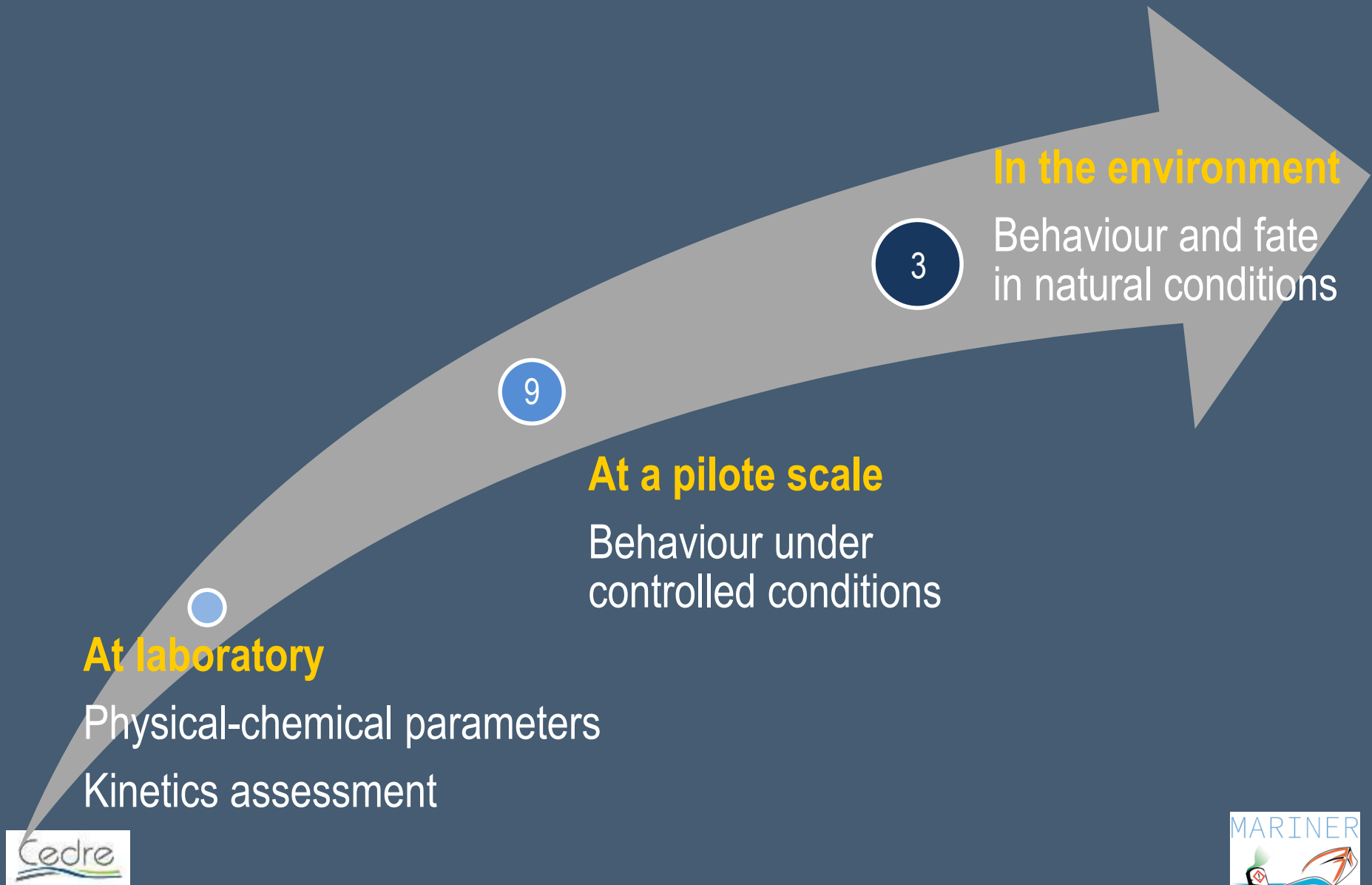
Accident

Challenges of emergency response

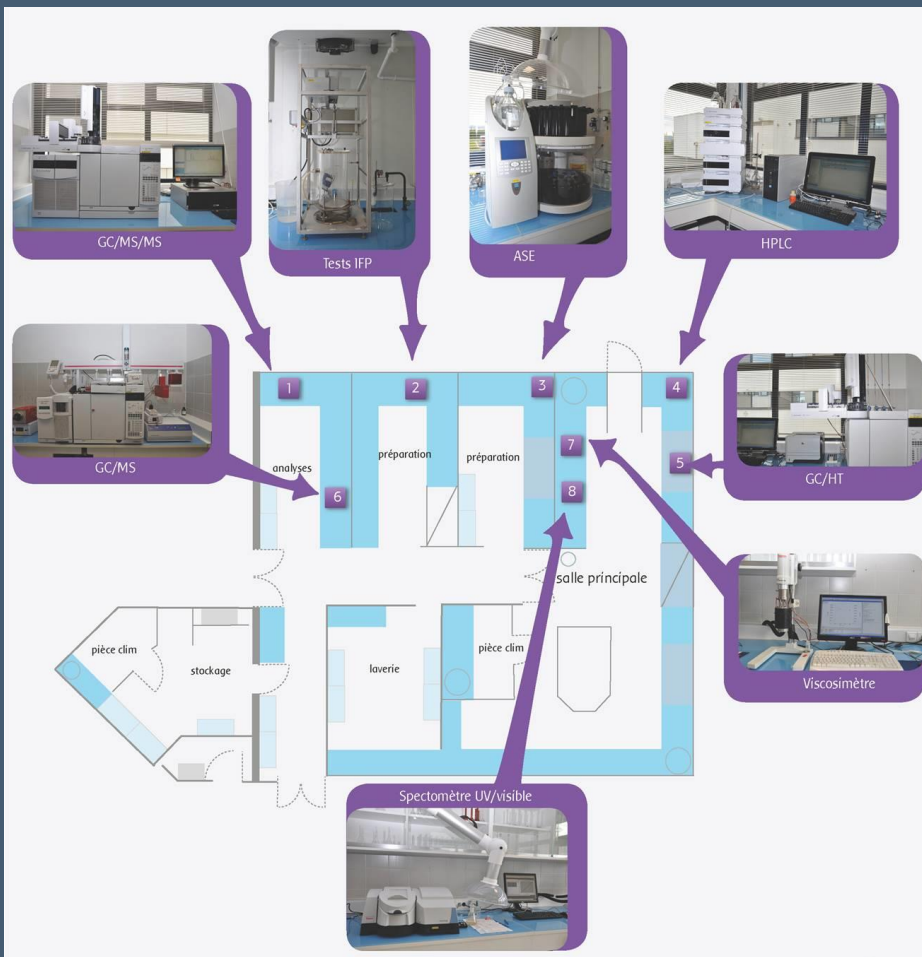


EROCIPS, HASREP, ARCOPOL, ARCOPOLplus

Approach at different scales



Short term behaviour - Laboratory



Determination of key parameters:

- **Viscosity** versus temperature
AND seawater content
- **Flash point**
- **Solubility**

Standard European Behaviour Classification

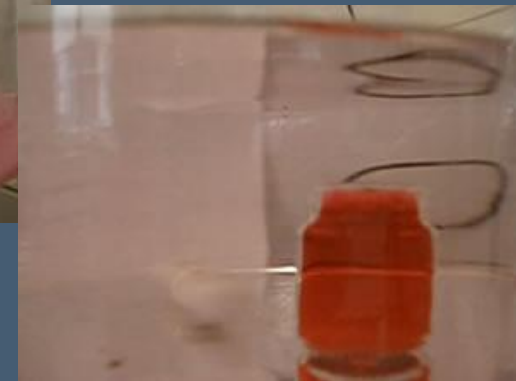
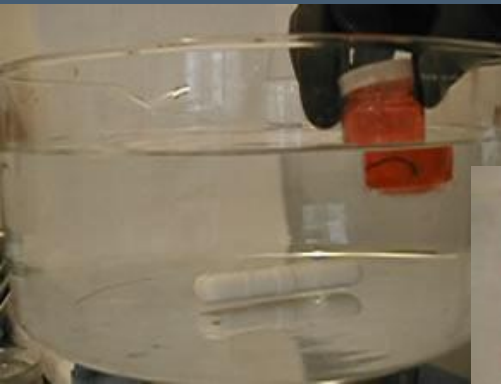
Short term behaviour - Laboratory



ECE chemical tanker (Channel, 2006)
Phosphoric acid, D (SEBC), 10 000 t



Source : Marine Nationale



Density $> 1.03 \Rightarrow$ clouds on seabed.
Complete dissociation with mixing energy.

Short term behaviour - Laboratory



FENES tanker (Corsica, 1996)

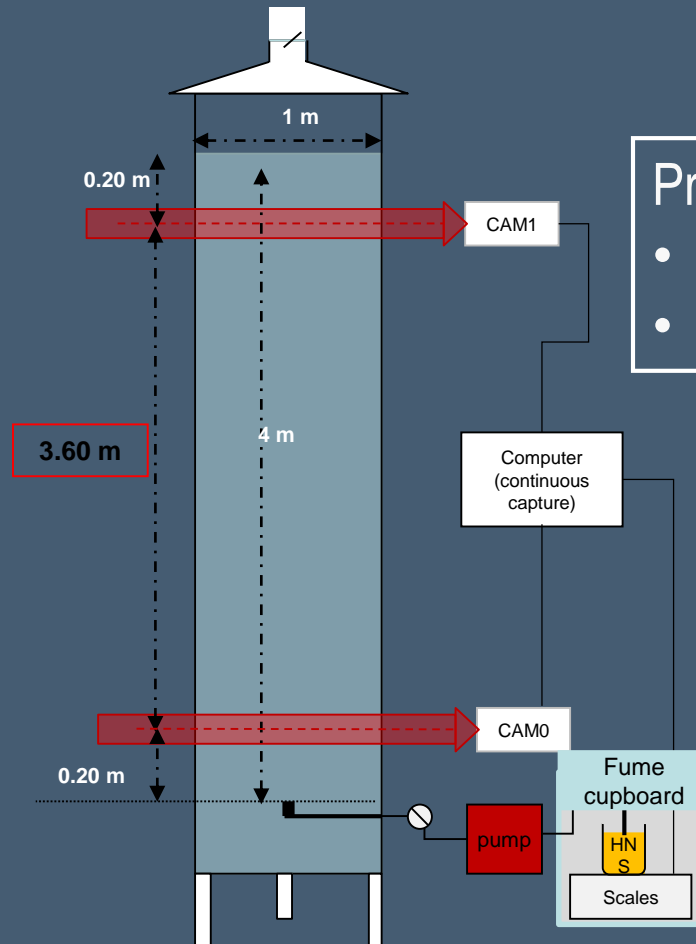
Wheat S (SEBC), 2600 t



Experiments to monitor **H₂S** production

Short term behaviour – pilot scale : Experimental Column

Study of the behaviour of floating (wreck), gas (blow out), sinker chemicals, etc.



Processes monitored

- Rise or descent speed
- Dissolution monitoring



**BLOW OUT
METANE**

Product released from the bottom ($d < 1.03$) or from the top ($d > 1.03$)

Short term behaviour – pilot scale : Experimental Column

 **IEVOLI SUN chemical tanker (British Channel, 2000)**

Styrene (10 000 t)

Isopropyl alcohol (996 t),

Methyl Ethyl Ceton (1027 t)

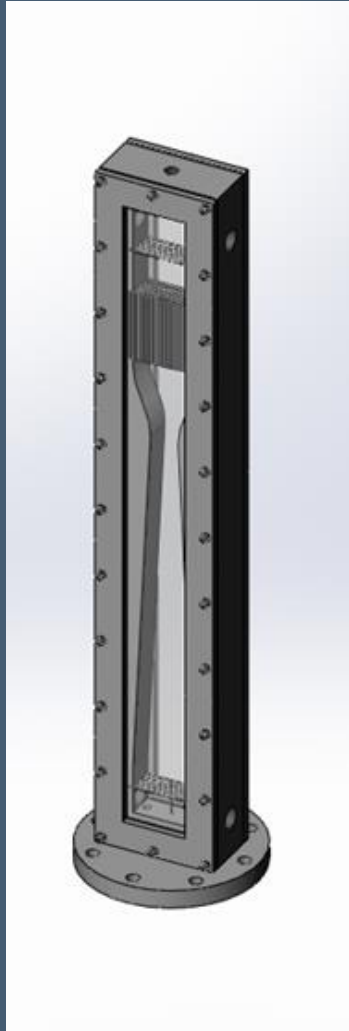


Questions addressed :

- Risk of polymerisation?
- Risk/impact for marine life?
- Technical response?

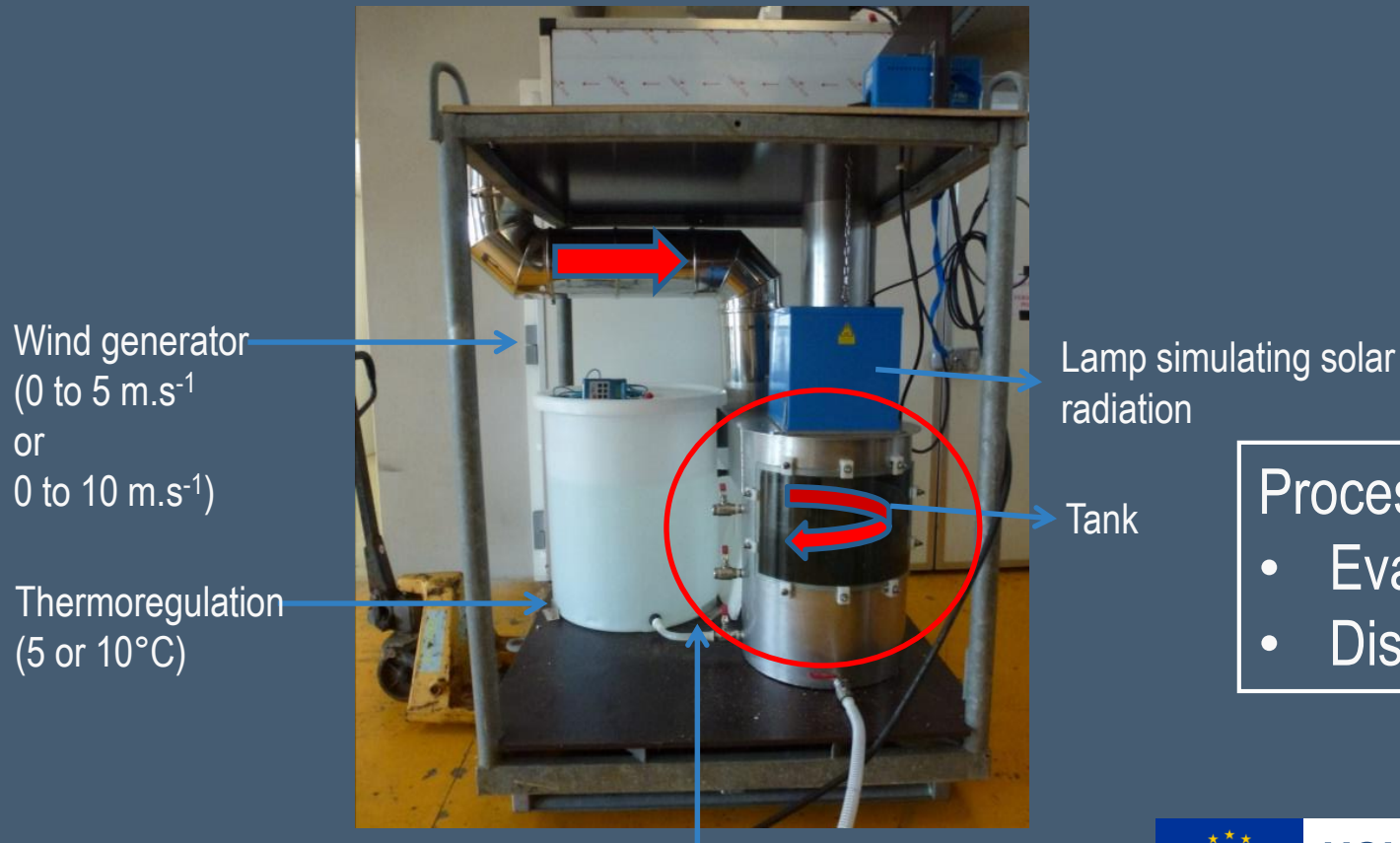
Short term behaviour – pilot scale : *polludrome*

Infinite water column : persistence of a drop of a product



Short term behaviour – pilot scale : chemical reactor

Study of the behaviour of floating chemicals (SEBC F)



Processes monitored:

- Evaporation
- Dissolution



HSN-MS, MARPOCS

Short term behaviour – pilot scale : chemical reactor

⚡ BOW EAGLE chemical tanker (Atlantic, 2002)

Collision with fishing boat: 4 dead people

Ethyl acetate (2100 t),

Cyclohexane (4750 t)



Source : *Marine Nationale*

© Photo marine nationale



Short term behaviour – pilot scale : *polludrome*

Current generator

Solar radiation
simulation system

Wave generator

Wind generator



Processes monitored:

- Buoyancy
- Emulsification
- Viscosity
- Dispersibility

Simulations of accidental coal immersion

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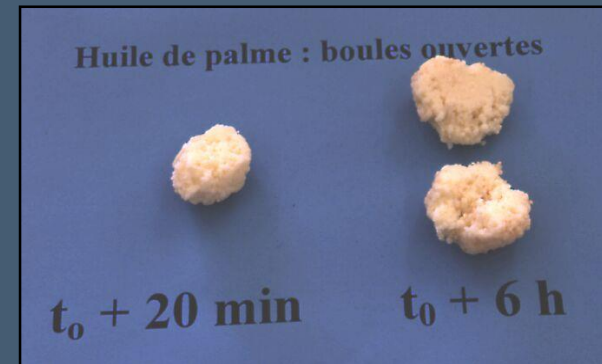
Short term behaviour – pilot scale : *polludrome*

 ALEGRA tanker (Channel, 1997)

Palm oil (15 000 t)



Slick 20 x 4 km



900 T of oil were released, only 30 T were collected on beaches...

Short term behaviour – natural conditions: floating cells

Study of the behaviour of floating chemicals (SEBC F)



Processes monitored:

- Evaporation
- Dissolution
- Remaining slick



Realistic exposures of sentinel
marine species to chemicals

Long term behaviour – natural conditions: experimental greenhouse



Interest: study of the impact of a pollutant on marine organisms

Long term behaviour – natural conditions: experimental greenhouse

⚡ IEVOLI SUN chemical tanker (British Channel, 2000)

Styrene (10 000 t)

Isopropyl alcohol (996 t),

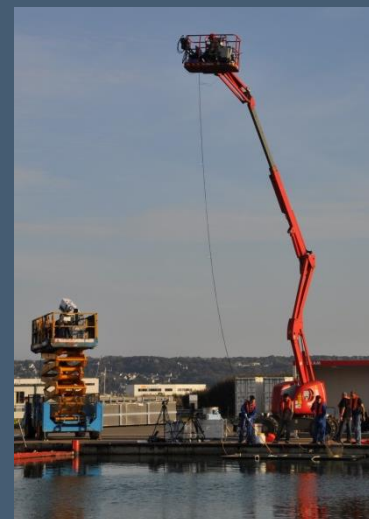
Methyl Ethyl Ceton (1027 t)



Experimentations on crabs and mussels

Short term behaviour – natural conditions: at sea

Consolidation of proofes of chemical marine spill with the help of radar and optical airborne sensors



Conclusion

- Bibliography has not answers to every situation
- Importance of being able to perform experiments in emergency conditions
- Provide response authorities with the right information at the right time

Thanks for your attention