

# Lagrangian or not Lagrangian?

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## ① Introduction

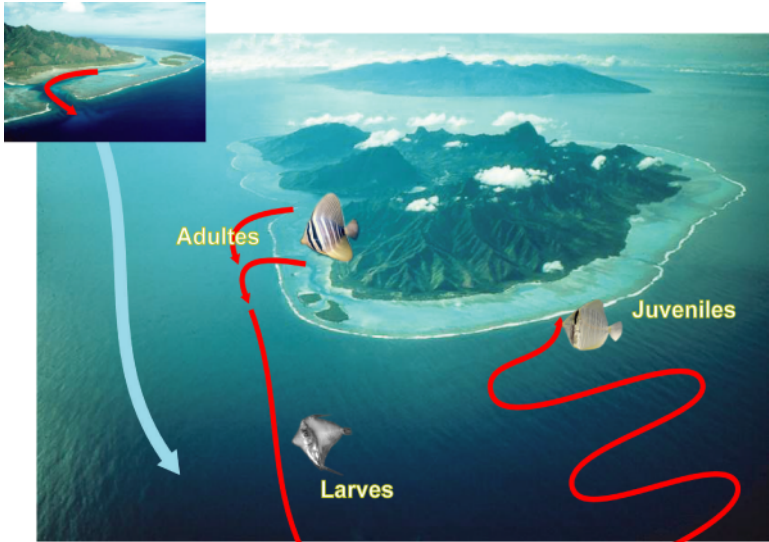
The problem  
The solutions

## ② Two models

A passive lagrangian model  
An active optimisation model

## ③ Advantages and drawbacks

Comparison  
Models developpement



**Dispersion**

# Ecological questions raised

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- Population genetics
- Conservation biology
- Fisheries (professional and artisanal)

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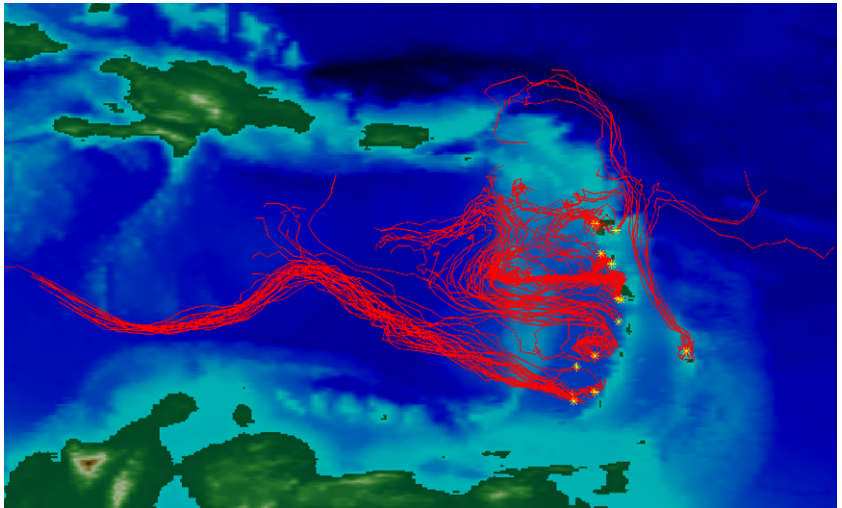
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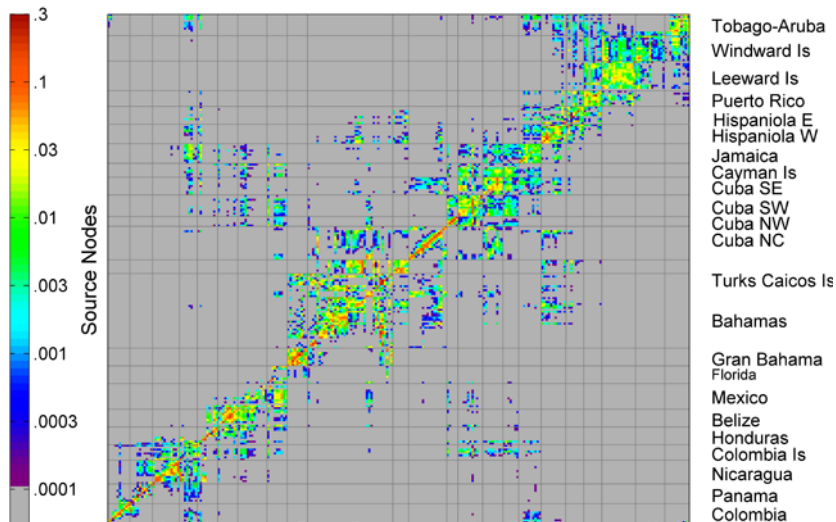
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  - ② continues passive trajectory if not

# Precise trajectories

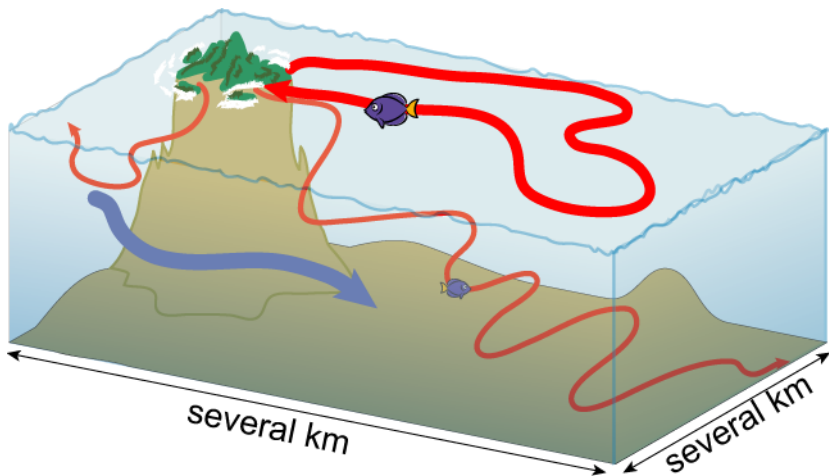


# Connectivity at the scale of the Carabbean

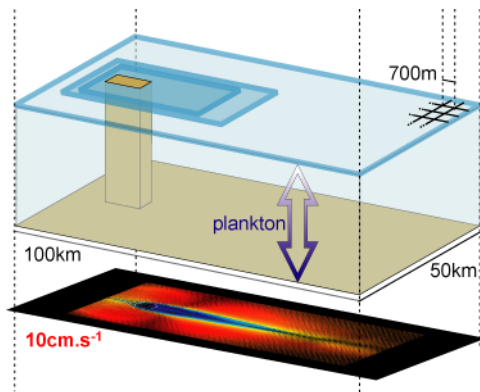
Receiving Nodes



# Our system

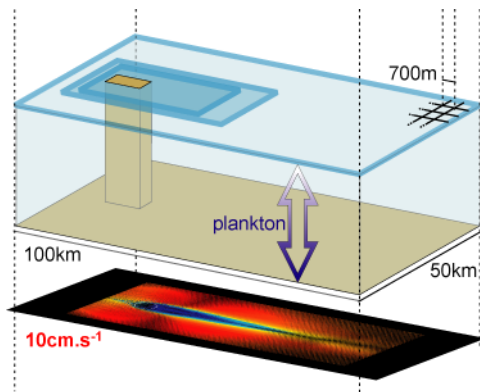


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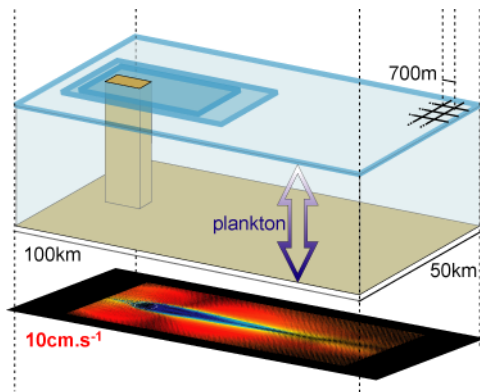
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- Plankton and predators distribution (accounting for the *island mass effect*)
- Daily vertical migration of the plankton



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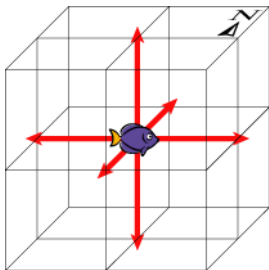
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- Energy budget  $\Rightarrow$  more than one day without eating means death.

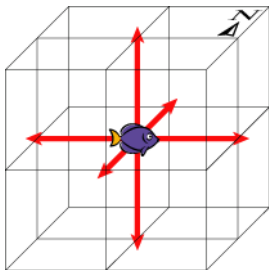
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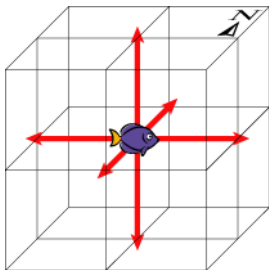
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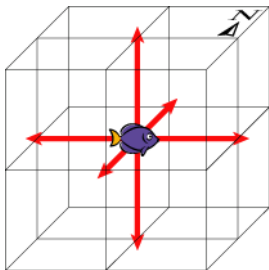
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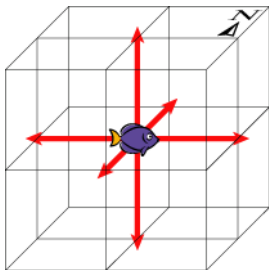
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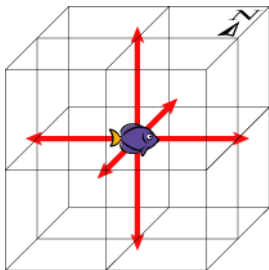


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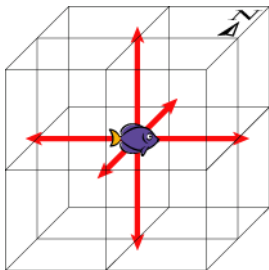


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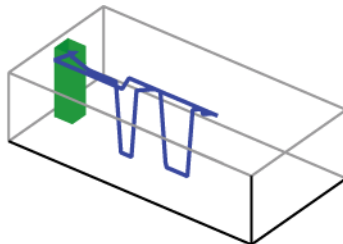
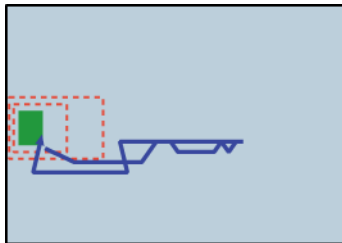
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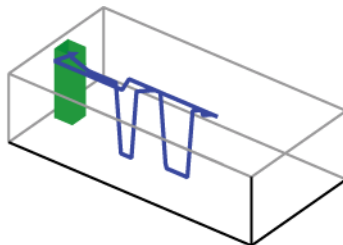
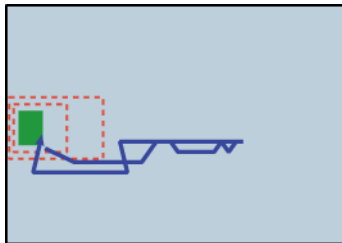
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- Choice criteria: “**optimal**” choice

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captures **fine scale** properties of the trajectory, related to the **behavioural** abilities of the larvae and far from Lagrangian trajectories

# Some differences

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### Lagrangian

- Large scale (space vectorized)
- Focus on the oceanography rather than on the biology
- Precision of the prediction  
⇒ direct validation and application is possible (tracking of larvae schools, genetic connectivity. . . )
- Predicts the influence of some oceanographic regimes

### Optimisation

- Small scale (space discretized and dimension is costly in the optimization process)
- Focus on the biology rather than on the oceanography
- Model aimed at understanding the processes (extensive sensitivity analysis)



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- The optimization process requires a discretized state  $\Rightarrow$  prevents large scale
- Transitions described by transition probabilities stored in huge matrices which have to be loaded in memory  $\Rightarrow$  there cannot be too many
- To choose the right decision, all have to be computed  $\Rightarrow$  prevents a precise Lagrangian advection scheme

# Future developments

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- Better oceanographic model with vertical resolution and random vertical migration

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## Optimisation

- Re-writing of the code and parallelisation to gain dimension
- New optimization method using genetic algorithm

Thank you for your attention