An online tool for exploring oceanographic connectivity

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Jim Mansbridge (oceanographic analysis)
Phillip England (genetics applications)

http://www.csiro.com/connie2/

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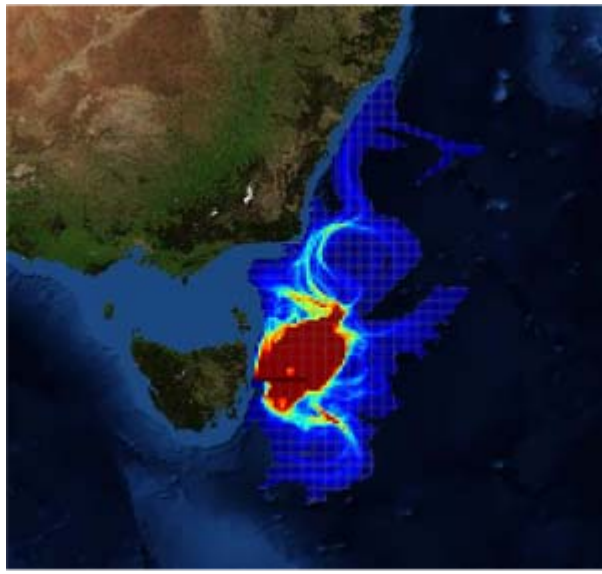
Outline

- Significance of connectivity within the climate context
- Demonstration of CONNIE 2
- Climate related example
- Future developments and collaborations



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Motivation for focusing on connectivity

- Larval transport
  - Recruitment of commercial and conservation species
  - Introductions of exotic species
  - Understanding genetic patterns and biogeography
- Distribution of productivity
  - Phytoplankton
  - Zooplankton
- Dispersal of contaminants
  - Dissolved chemicals
  - Slicks
  - Marine debris

Sensitivities to climate during early life history

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Challenges in characterising connectivity

- Exchange rates vary with time
  - ► need statistical characterization
- Distribution of sources or sinks may be unknown
  - ► need generic characterization
- Role of swimming or settling behaviors
  - ► dependent on species, as well as time and space scales

Data layers are not sufficient and there aren't enough friendly oceanographic modelers to go around!

CONNectivity InterfacE – CONNIE 2

CONNIE 2 integrates:

- oceanographic transport
- biological behaviours
- environmental conditions (soon)

within a user-friendly online tool.

http://www.csiro.com/connie2/

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Ocean Currents: BRAN 2.1

Release Period (dd/mm);

from: 01/01

to: 10/01

Years:

- 2003
- 2004
- 2005
- 2006
- 2007

Source: Sink:

Passive: Behaviours:

Dispersal Time (days): 30

Vertical Level: 105m

Final Stats: Cumulative Stats:

Colour Bar: Jet

Colour Bar Max: 50%

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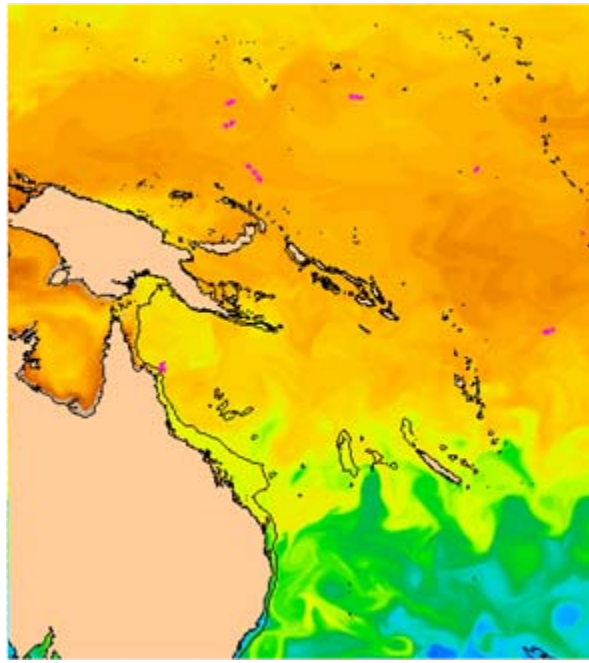
Model currents underlying Connie 2

- Potentially any archived dataset of historical currents
- Initial focus on BLUELink Reanalysis (BRAN)
  - Long time series (1993 – 2008)
  - Large region at high resolution
  - Data assimilation
  - Supported and extended into the future

    (Australia's operational forecasting model)



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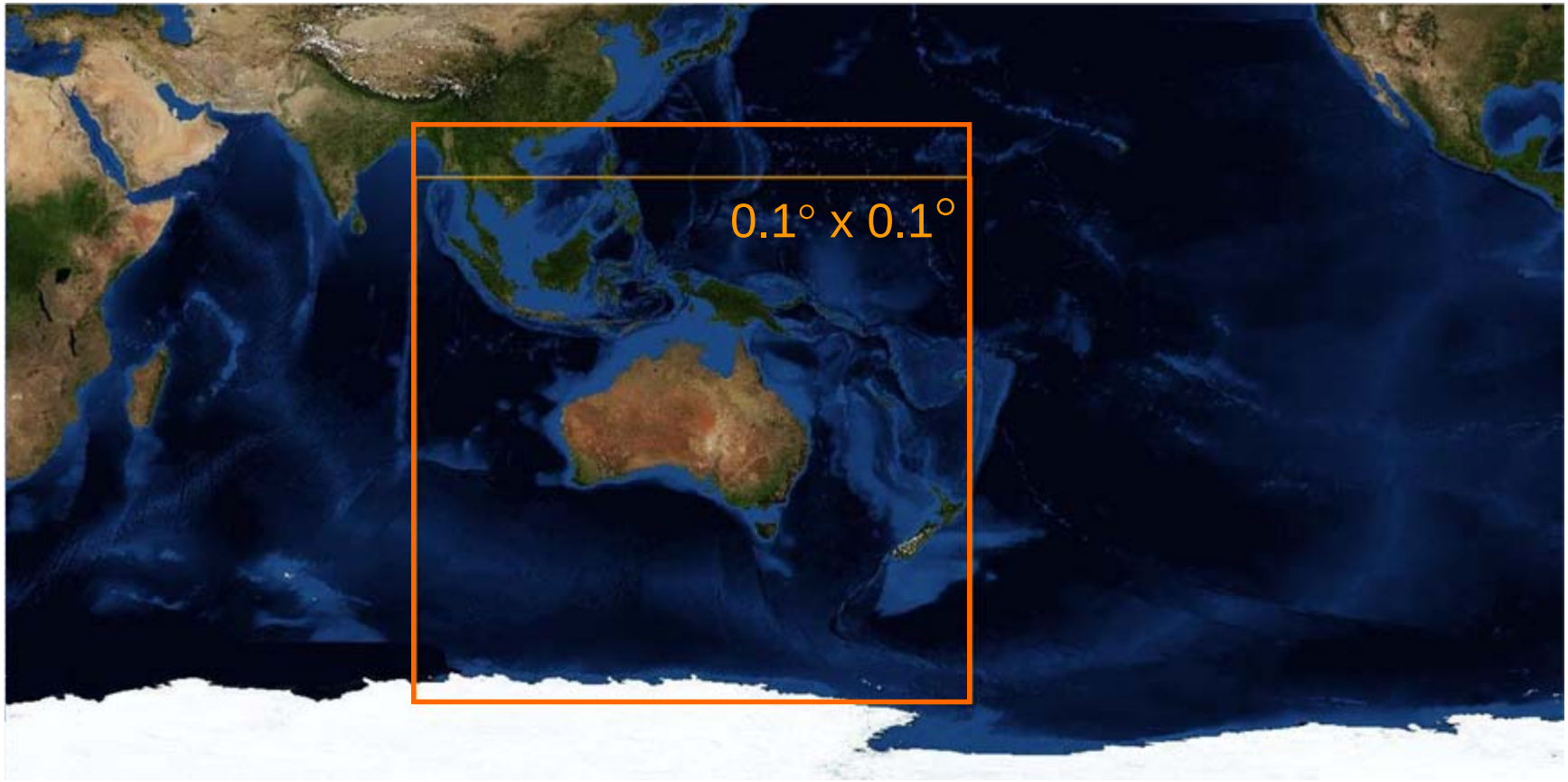
CONNIE 2 Domain



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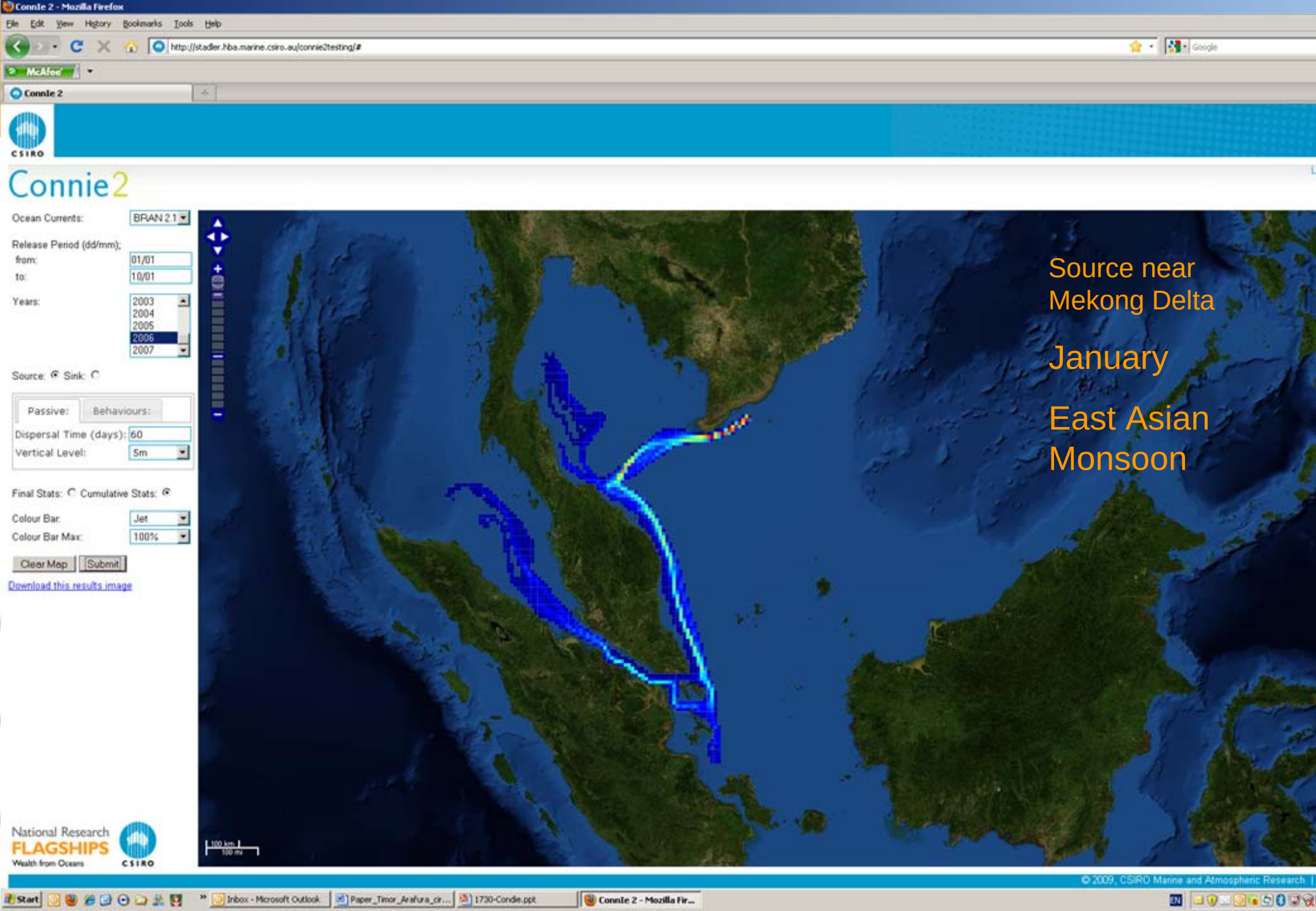
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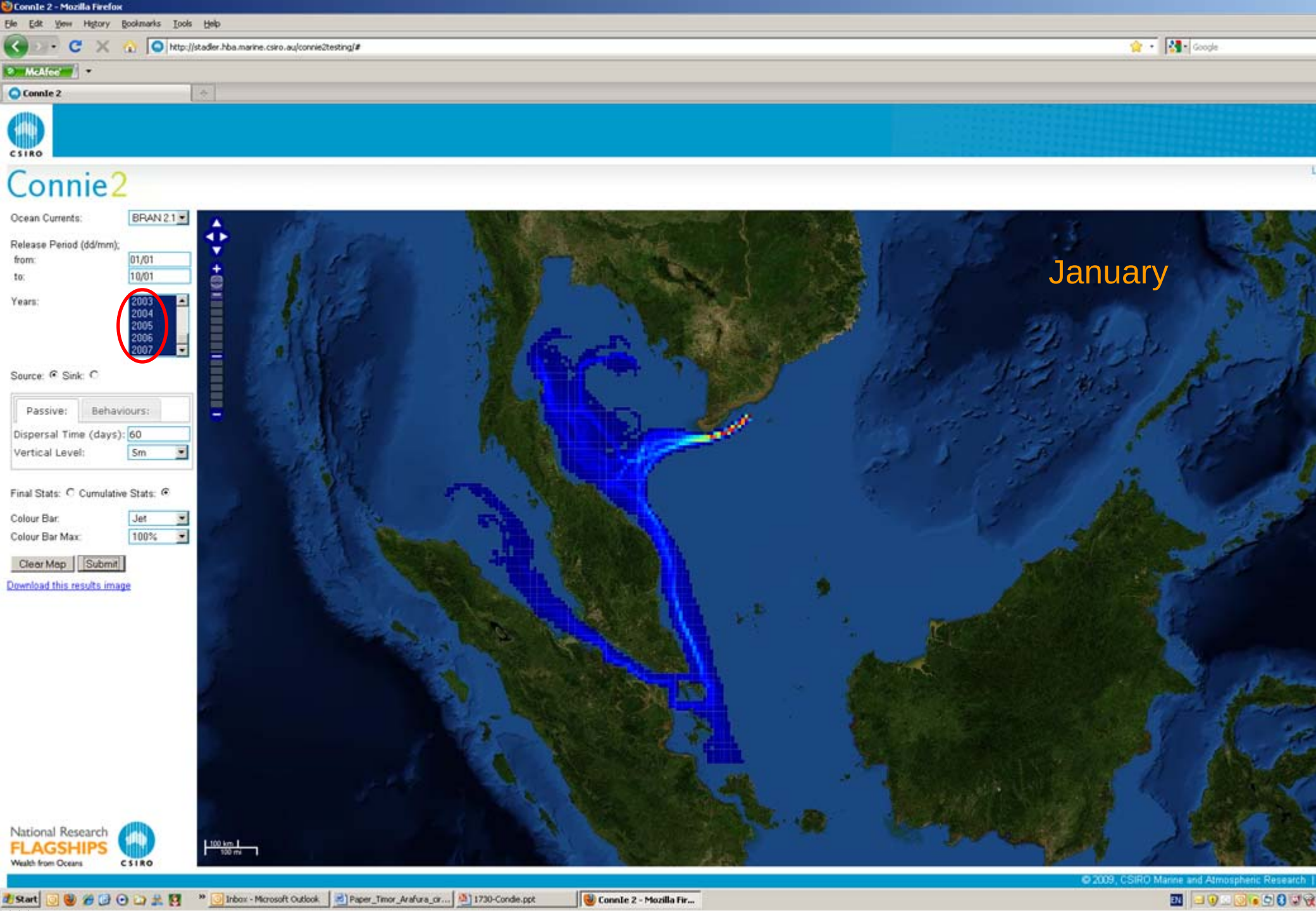
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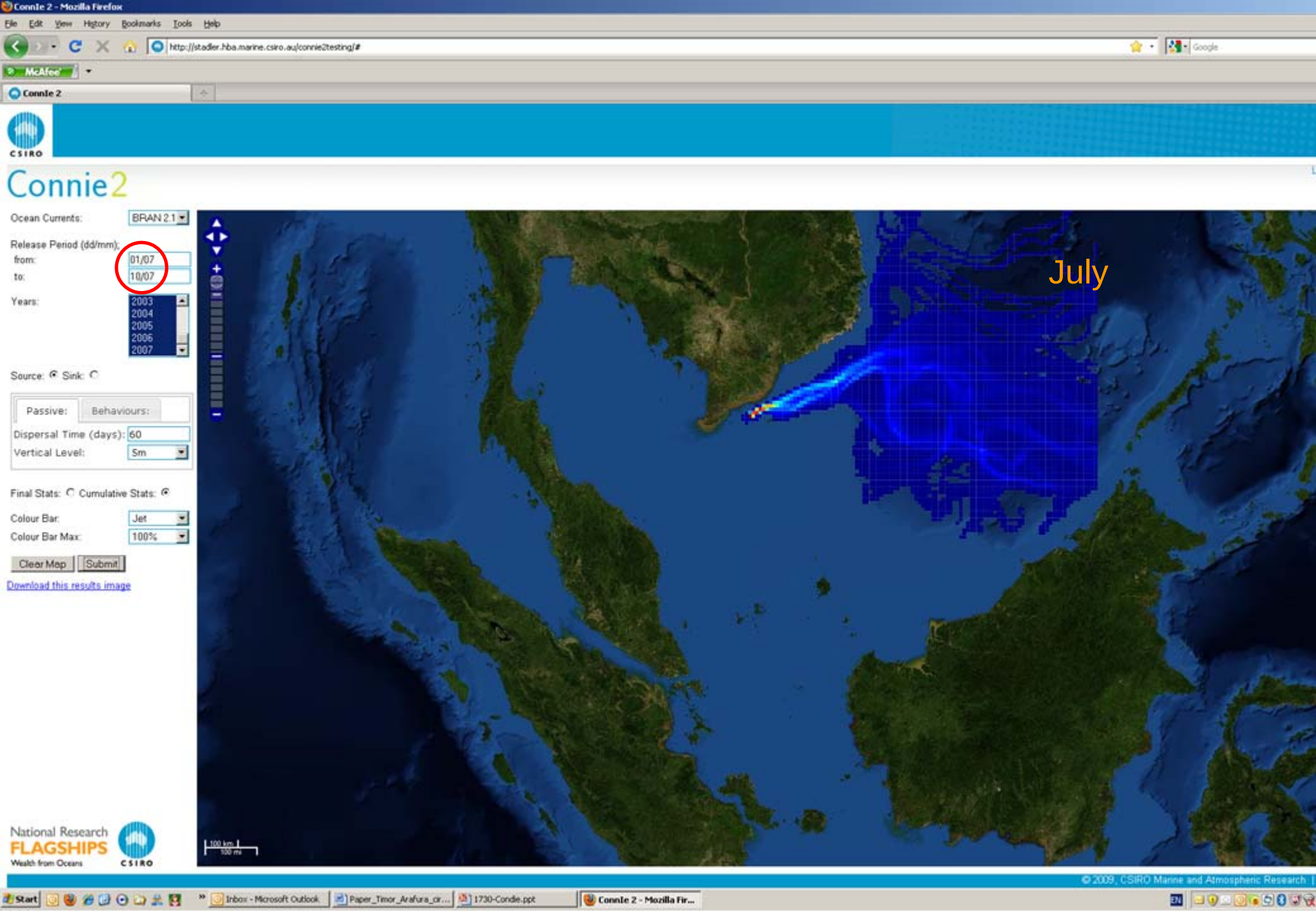
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Connie2

Ocean Currents: BRAN 2.1

Welcome! Thank you for trying out Connie2. We are still rolling out new features, refining the performance and ironing out bugs, so please check back often and report any bugs to the connie team. The site does
message.

Release Period (dd/mm);
from: 01/01
to: 10/01

Years:
1993
1994
1995
1996
1997

Source: Sink:

Passive: Behaviours:

No behaviours configured yet.
Enter Behaviours »

Final Stats: Cumulative Stats:

Colour Bar: Jet
Colour Bar Max: 100%

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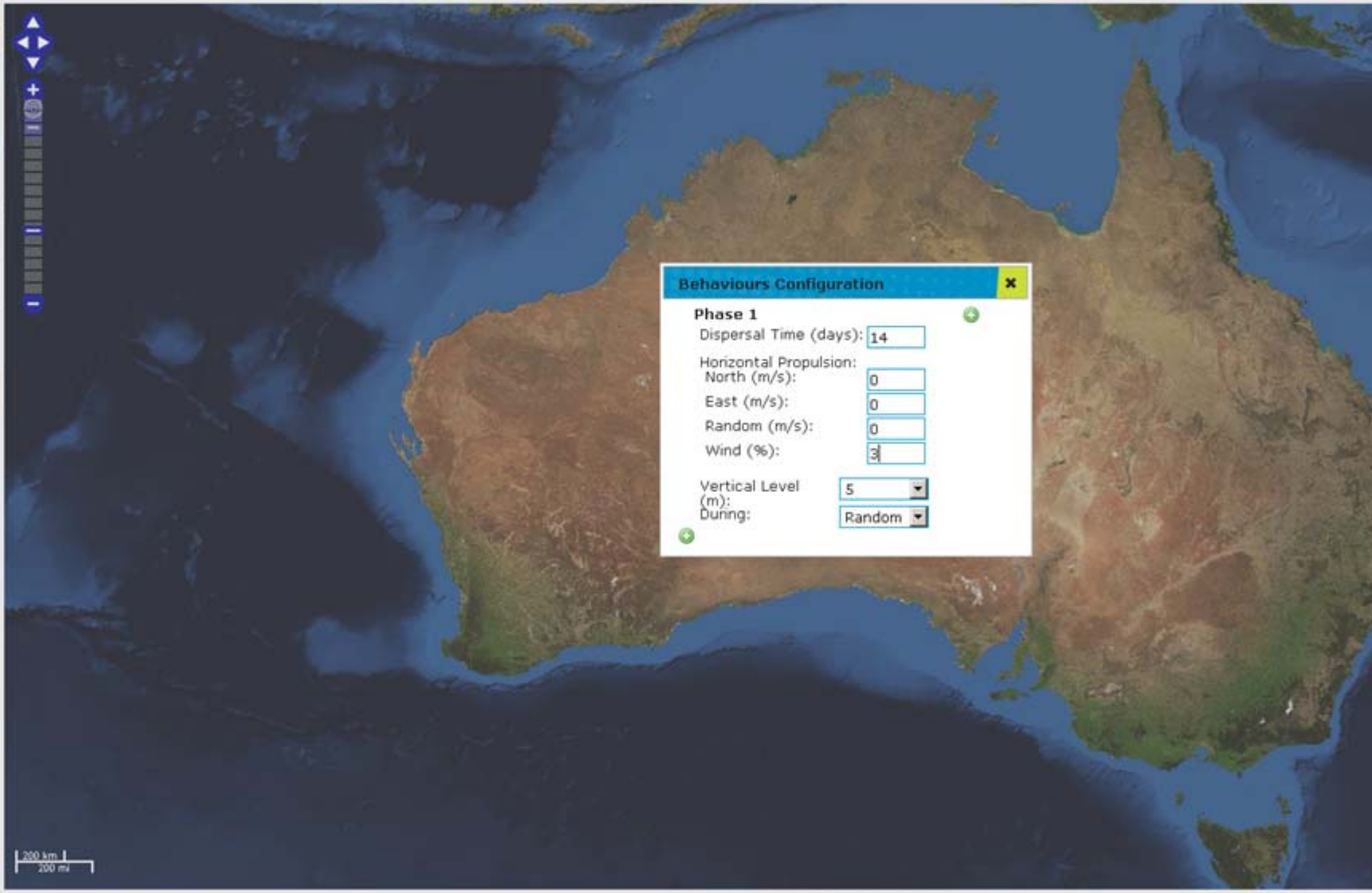
- At least one year must be selected



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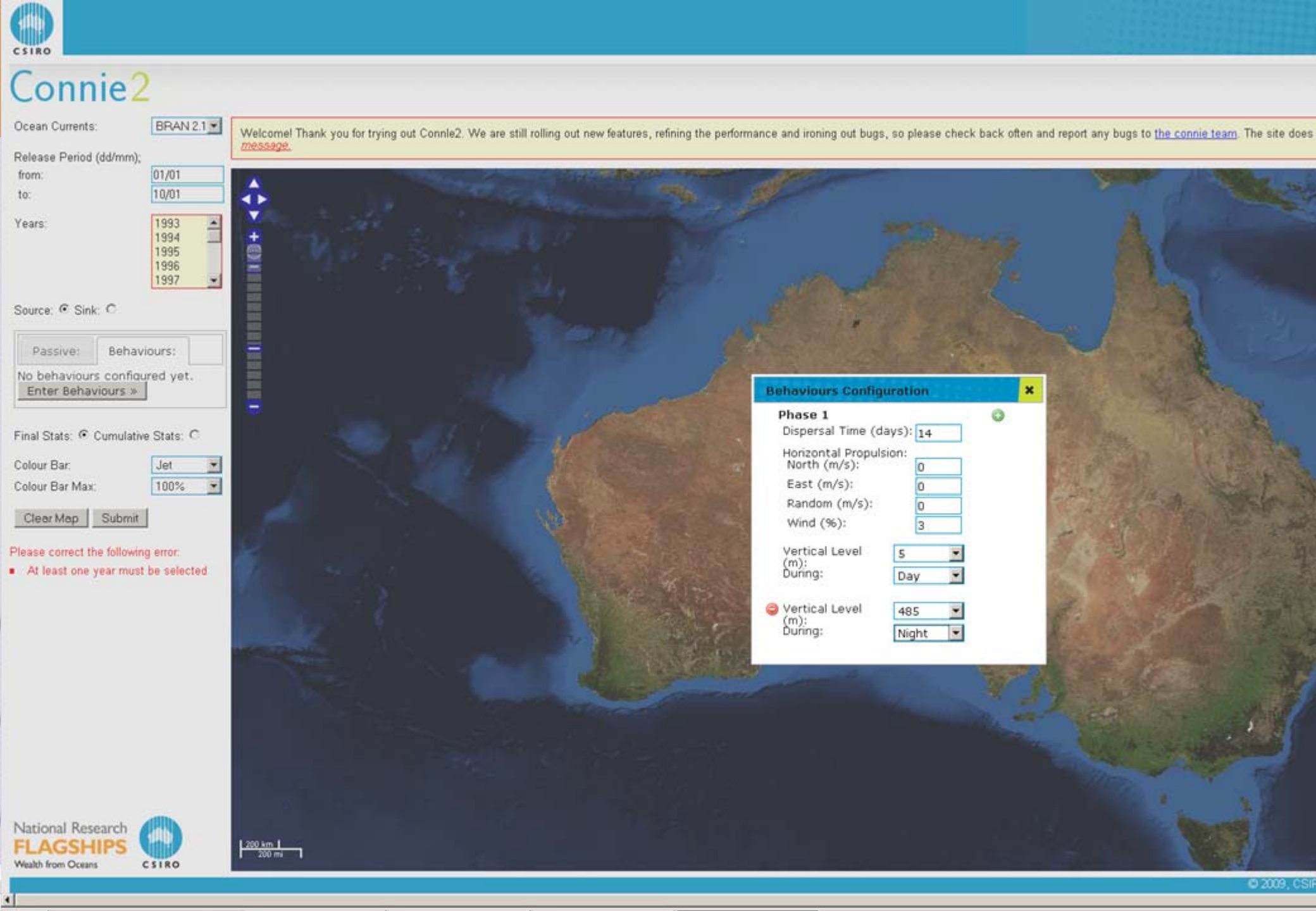
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Years:
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Source:
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Passive:
Behaviours:
No behaviours configured yet.
Enter Behaviours »
Final Stats:
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Colour Bar:
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Colour Bar Max:
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Clear Map
Submit
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At least one year must be selected
Welcome! Thank you for trying out Connie2. We are still rolling out new features, refining the performance and ironing out bugs, so please check back often and report any bugs to the connie team. The site does
message.
Behaviours Configuration
Phase 1
Dispersal Time (days):
14
Horizontal Propulsion:
North (m/s):
0
East (m/s):
0
Random (m/s):
0
Wind (%):
3
Vertical Level (m):
5
During:
Day
Vertical Level (m):
485
During:
Night
200 km
200 mi
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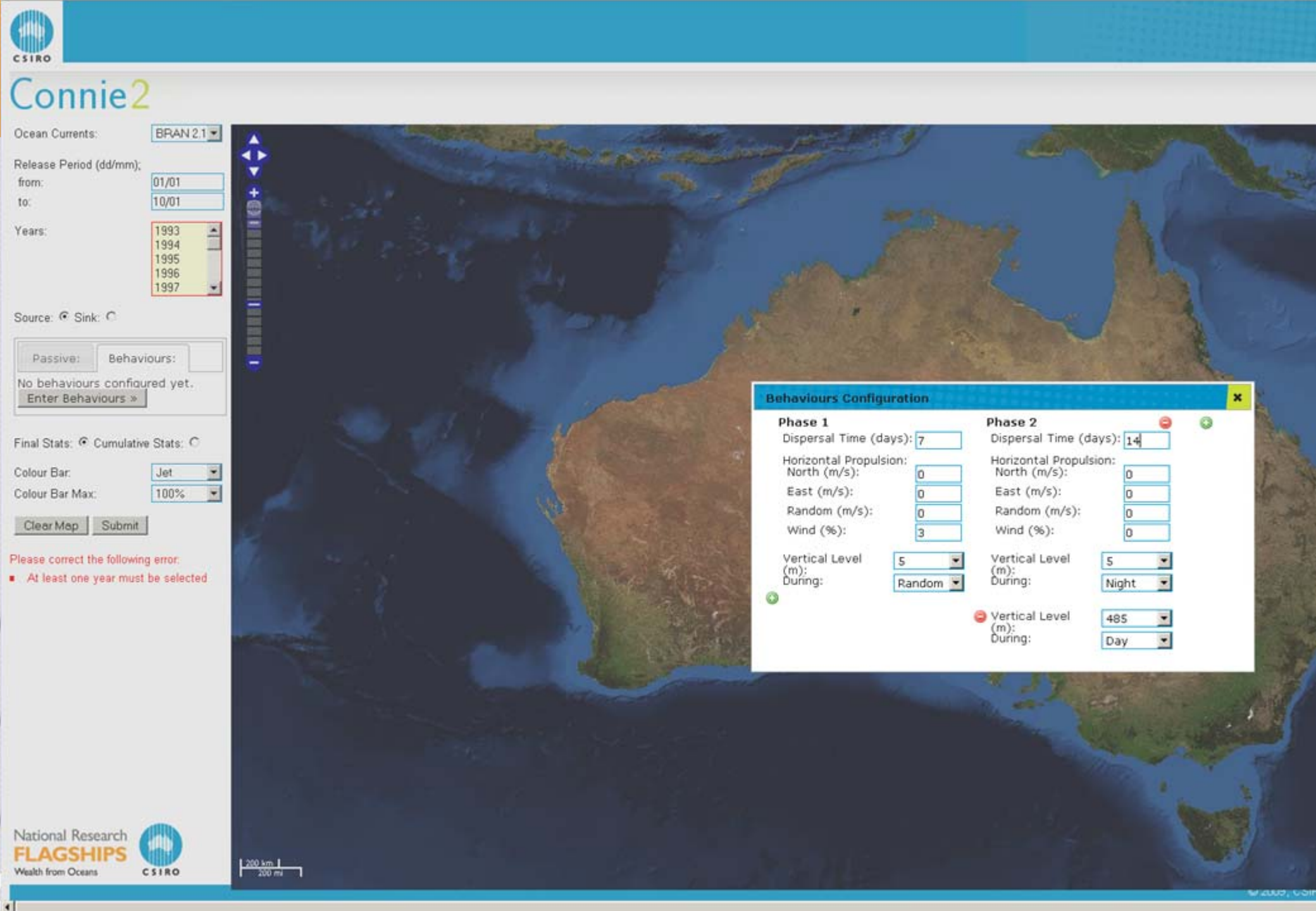
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Release Period (dd/mm):
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Source:
Sink:
Passive:
Behaviours:
No behaviours configured yet.
Enter Behaviours »
Final Stats:
Cumulative Stats:
Colour Bar:
Jet
Colour Bar Max:
100%
Clear Map
Submit
Please correct the following error:
At least one year must be selected
Behaviours Configuration
Phase 1
Dispersal Time (days):
7
Horizontal Propulsion:
North (m/s):
0
East (m/s):
0
Random (m/s):
0
Wind (%):
3
Vertical Level (m):
5
During:
Random
Phase 2
Dispersal Time (days):
14
Horizontal Propulsion:
North (m/s):
0
East (m/s):
0
Random (m/s):
0
Wind (%):
0
Vertical Level (m):
5
During:
Night
Vertical Level (m):
485
During:
Day
200 km
200 mi
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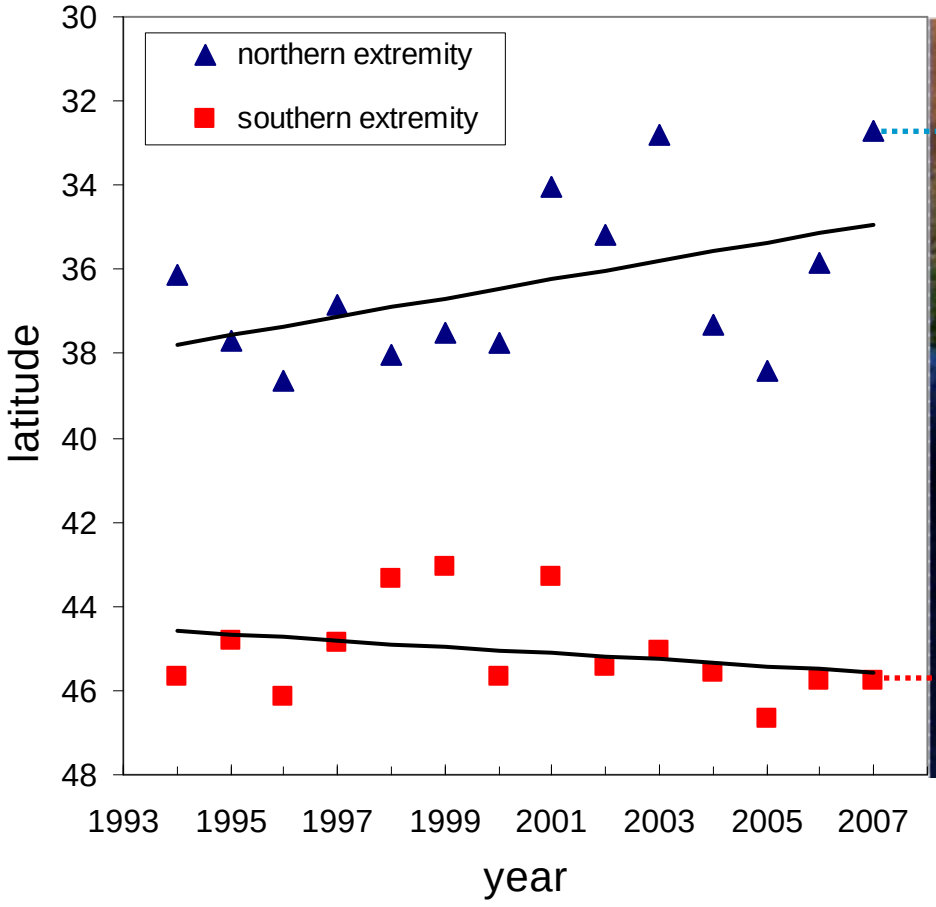
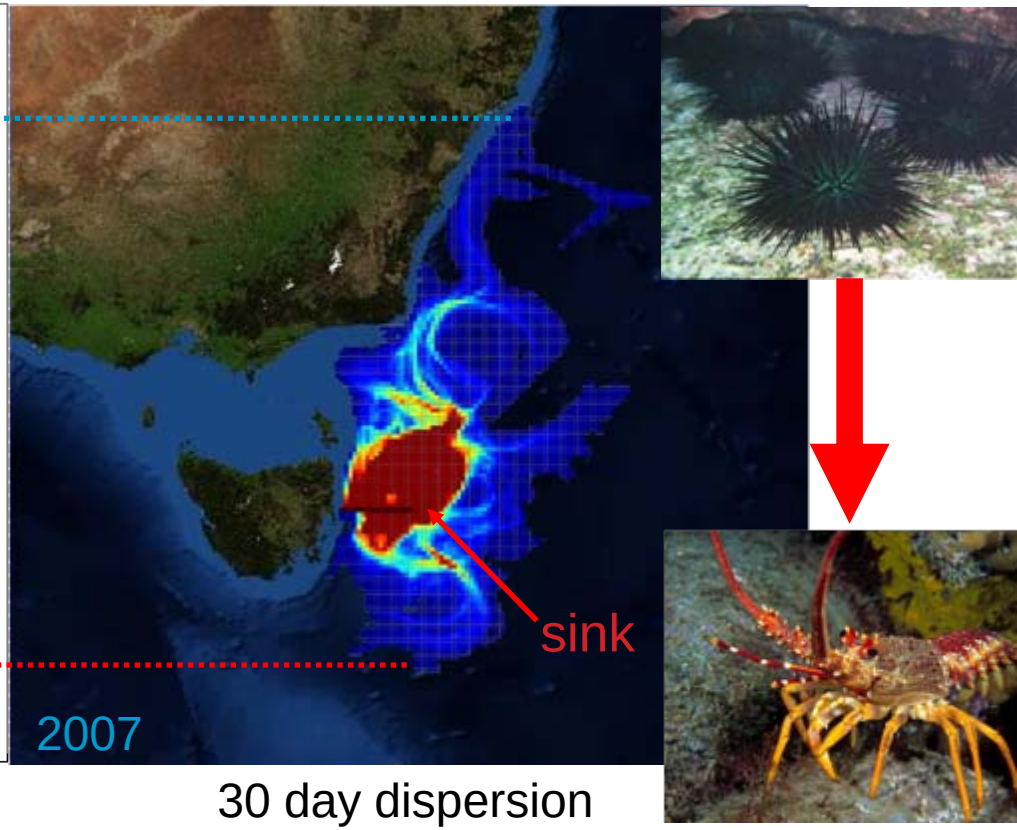
Example from a climate hotspot





30 day dispersion

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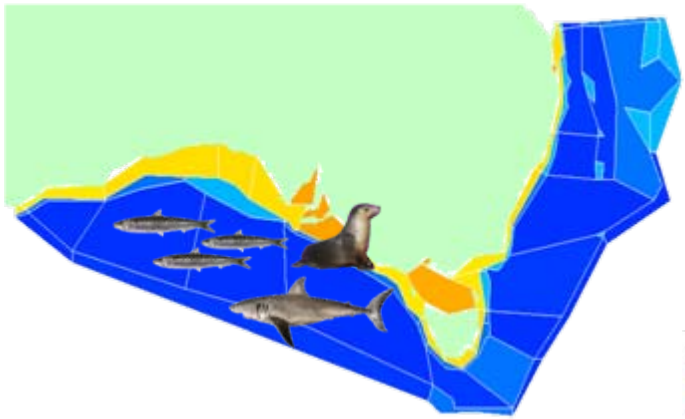
Ongoing development

- Other ocean model data sets
- Alternative specification of sources/sinks (e.g. polygons) and associated output statistics (e.g. connectivity matrices)
- Integration with other spatial datasets (T, S, Chl-a)
  → exposure following trajectories (e.g. degree days)
- Links to other models (e.g. Atlantis, MARXAN)



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Collaboration opportunities

- Areas covered by the existing CONNIE 2
- Linking CONNIE to other model data sets:
  - Great Barrier Reef
  - NW European Seas (POLCOMS)
  - Downscaled climate scenarios?

Thank you

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