Comparisons of modeled climate and lower trophic level time series for the North Pacific from 1950 to 2002

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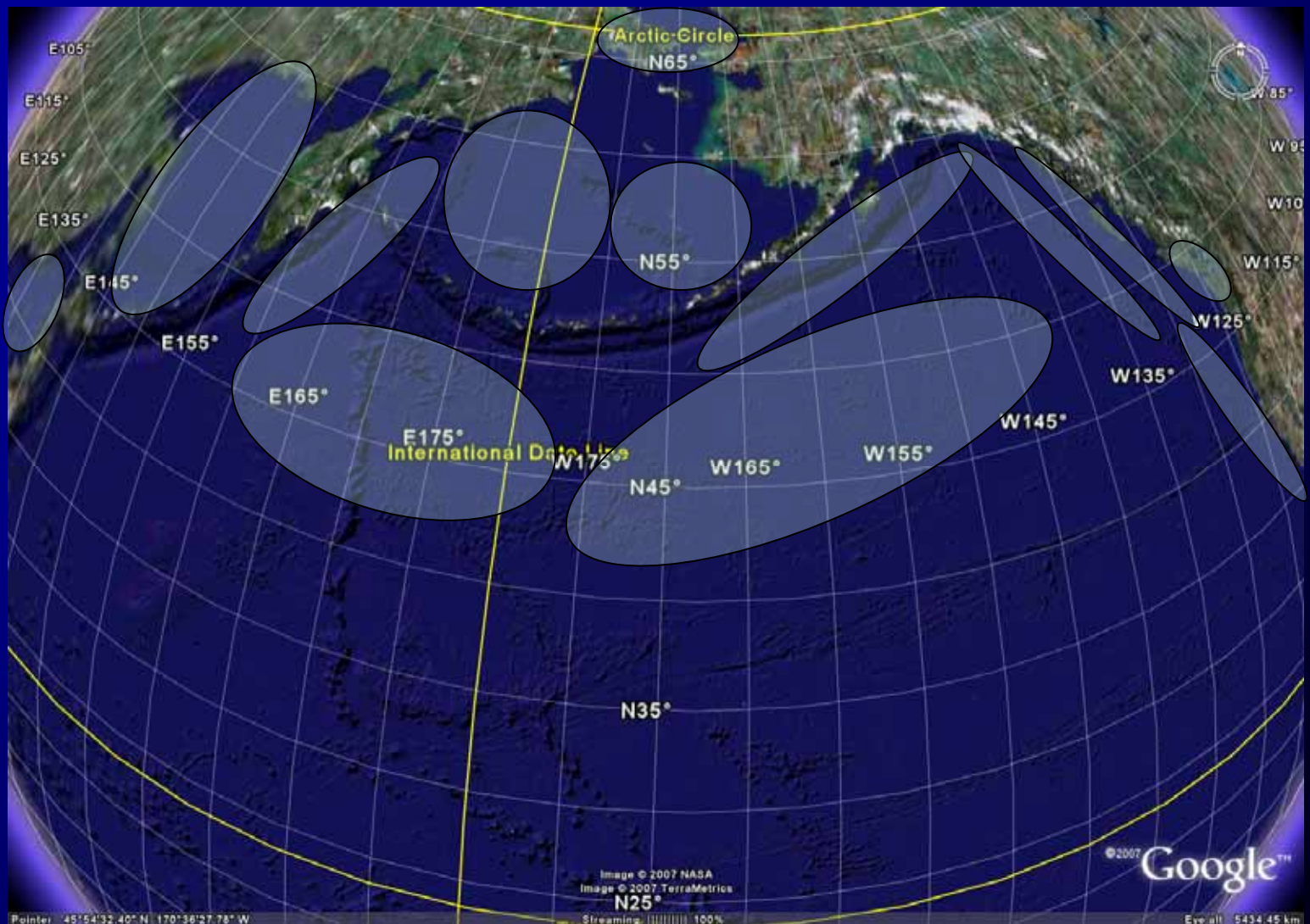
Introduction

- MALBEC (Model for Assessing Links Between Ecosystems) CCCC P-4413 The salmon MALBEC project
- MALBEC Habitats

Introduction: MALBEC Ocean Habitats

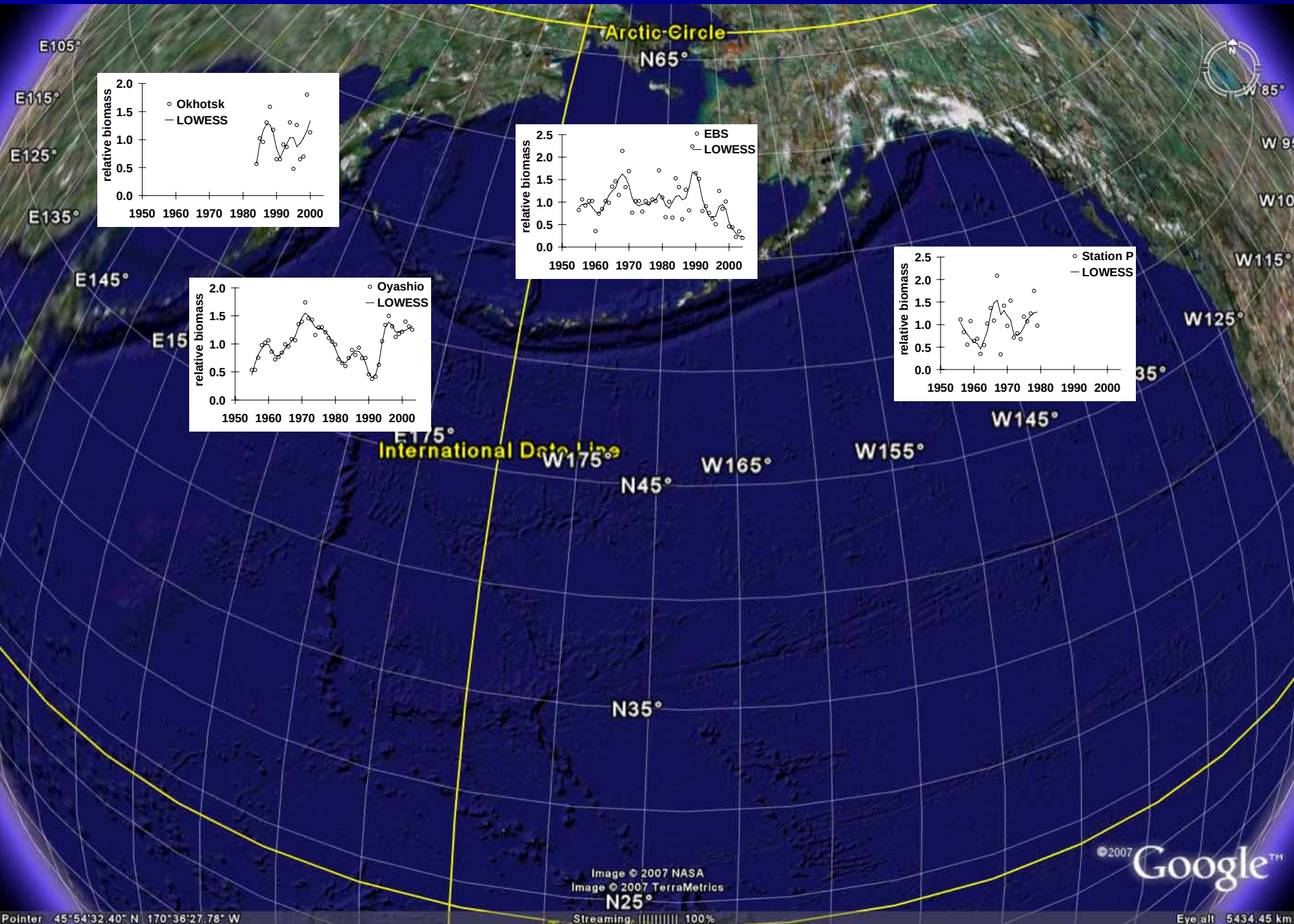


Introduction

- Bottom-up , climate-driven effects and ocean ecosystems
- Time series of North Pacific lower trophic level production used to emulate bottom-up effects
  - Field zooplankton data
  - Fisheries-ecosystem models (Ecosim)
  - Oceanographic based models (NEMURO)

Field Studies

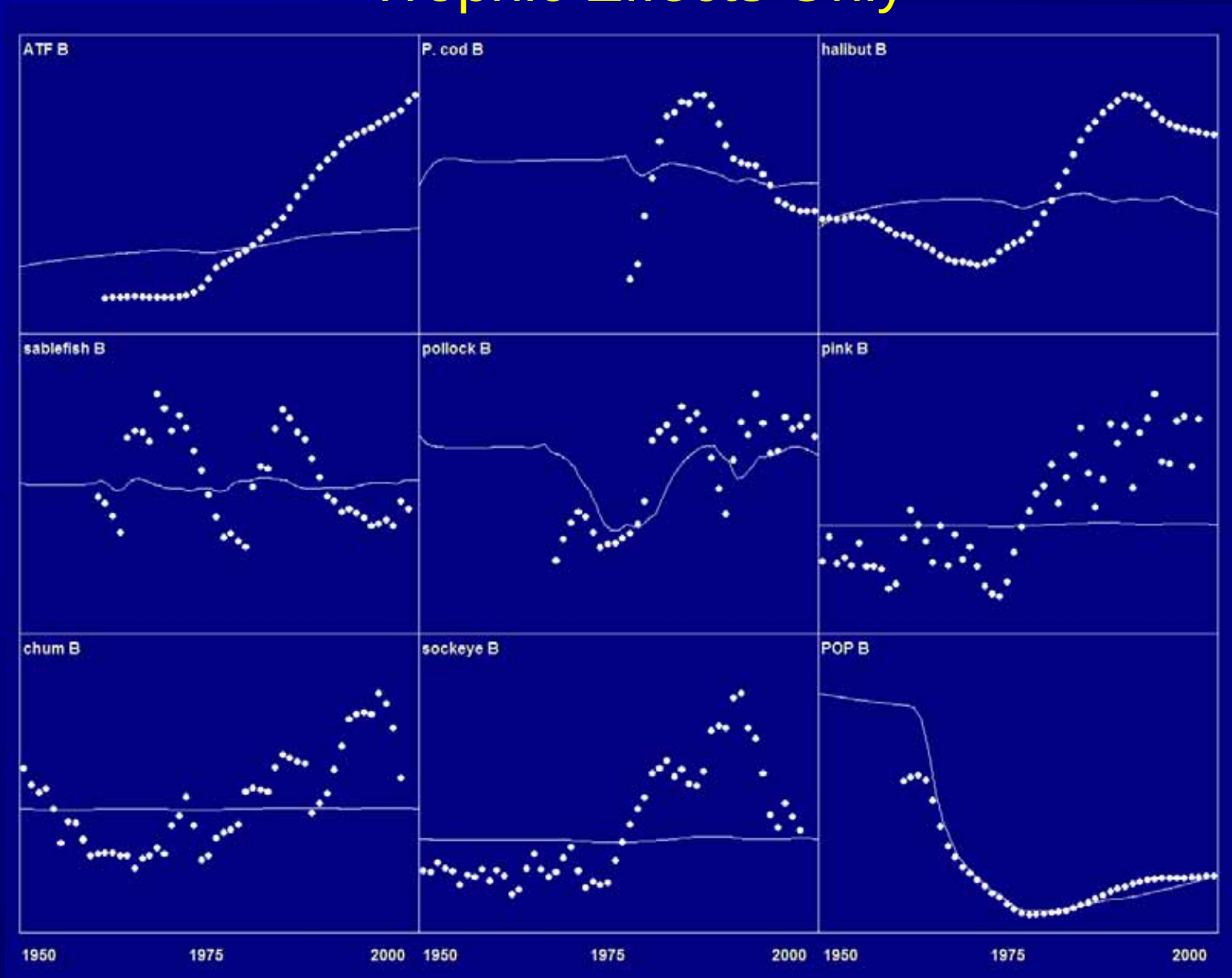
- Time series usually patchy in time and space
- Time series used for MALBEC


Arctic Circle
N65°
E105°
E115°
E125°
E135°
E145°
E15
E175°
International Date Line
W175°
W165°
W155°
W145°
W125°
W115°
W10
W 95
W 85°
N45°
N35°
N25°
relative biomass
Okhotsk
LOWESS
1950 1960 1970 1980 1990 2000
EBS
Oyashio
Station P
Image © 2007 NASA
Image © 2007 TerraMetrics
©2007 Google™
Pointer 45°54'32.40" N 170°36'27.78" W
Streaming 100%
Eye alt 5434.45 km

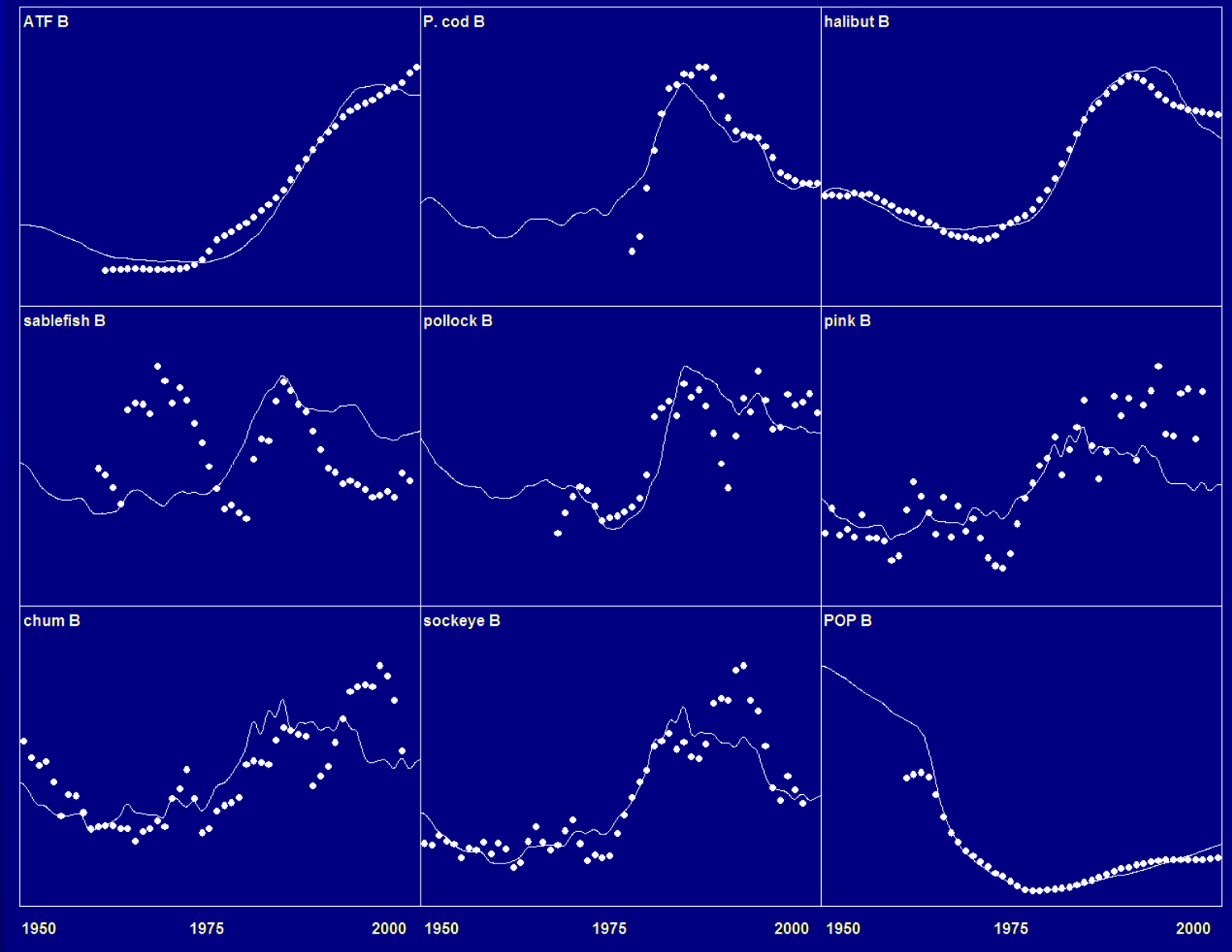
Ecopath / Ecosim Models

- Detail is in commercially fished species
- Models include effects of
  - Fisheries
  - Recruitment
  - Predation and Competition
  - Production Changes

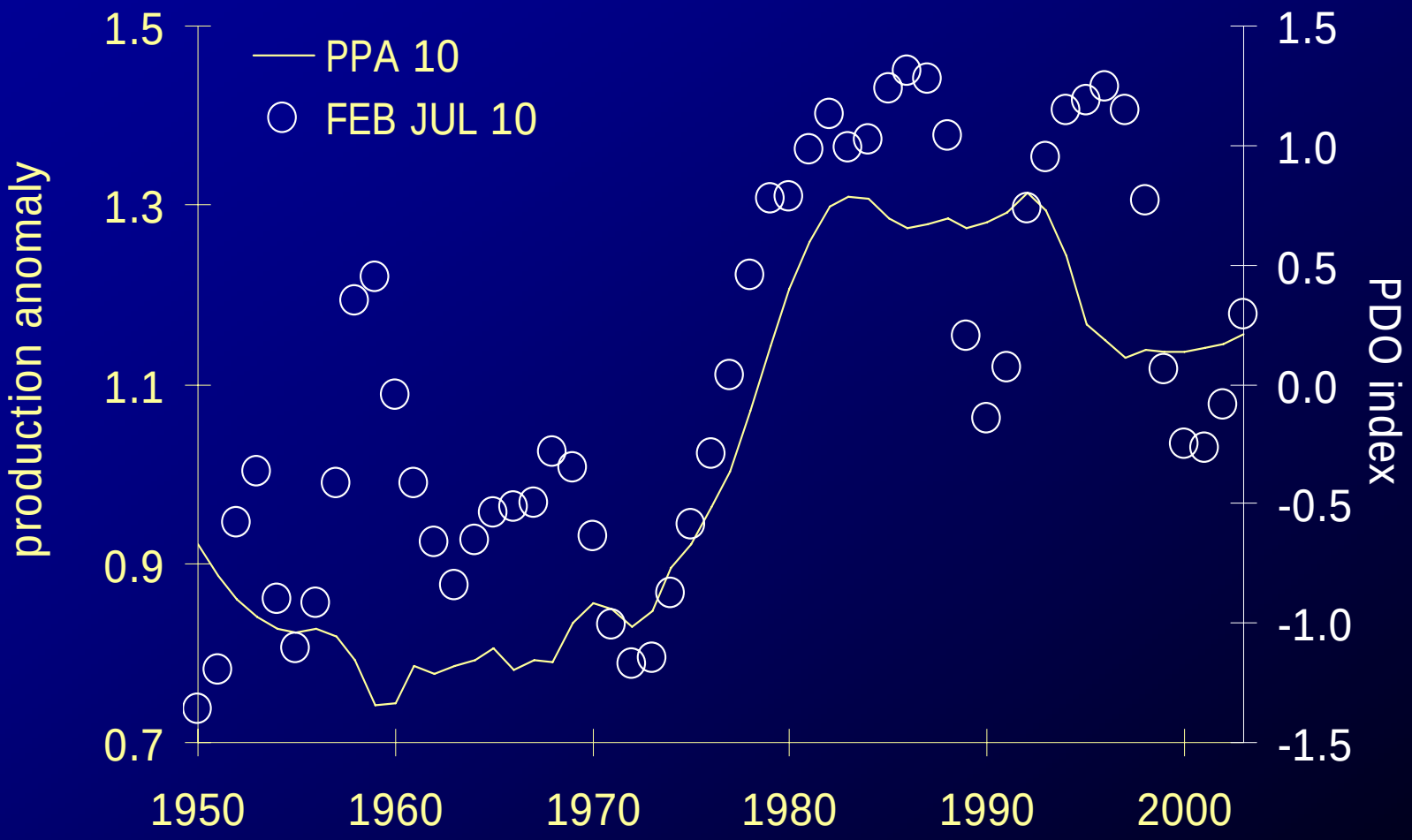
Ecosim: Northeast Pacific – Trophic Effects Only



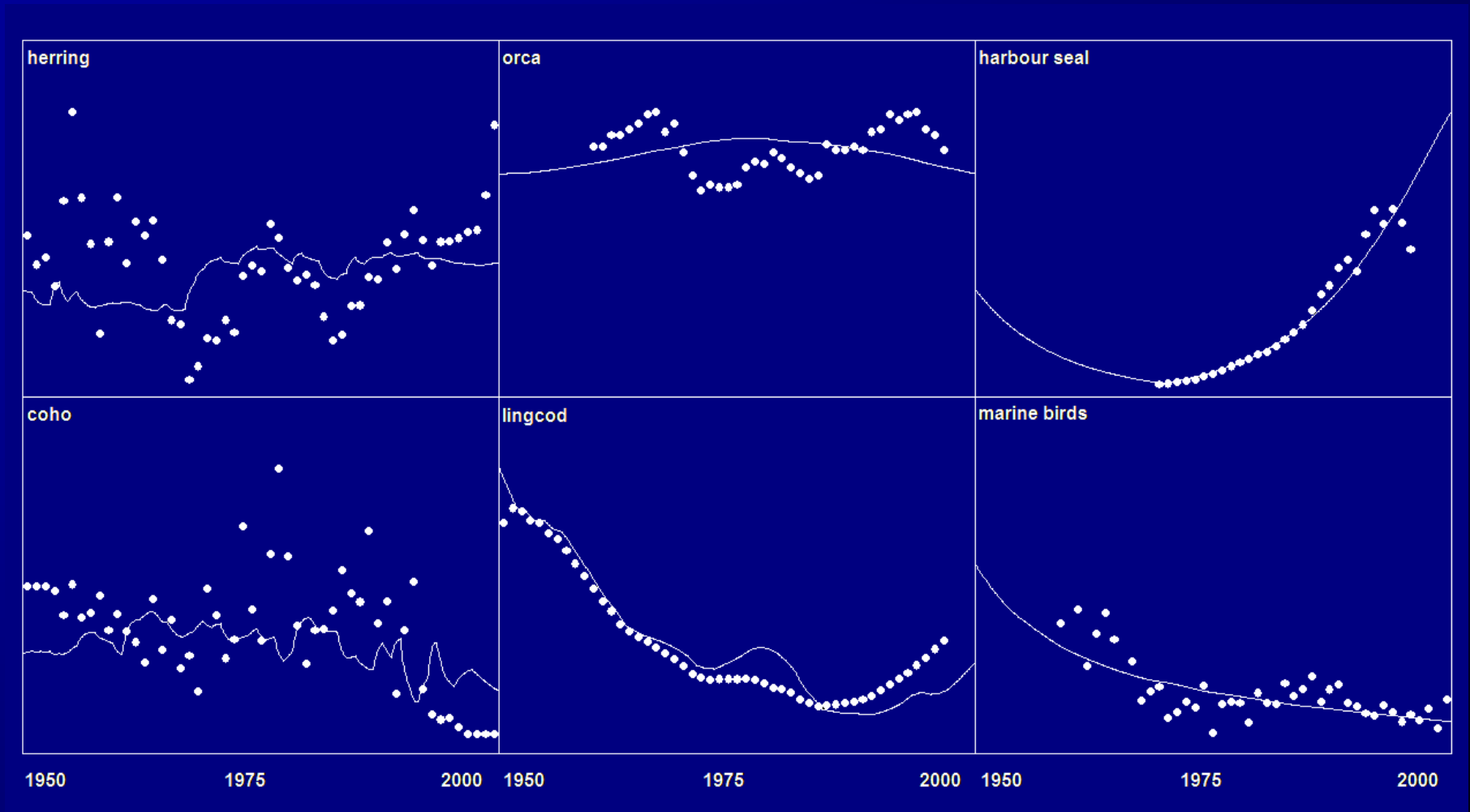
Ecosim: Northeast Pacific – Trophic *and* Climate Effects



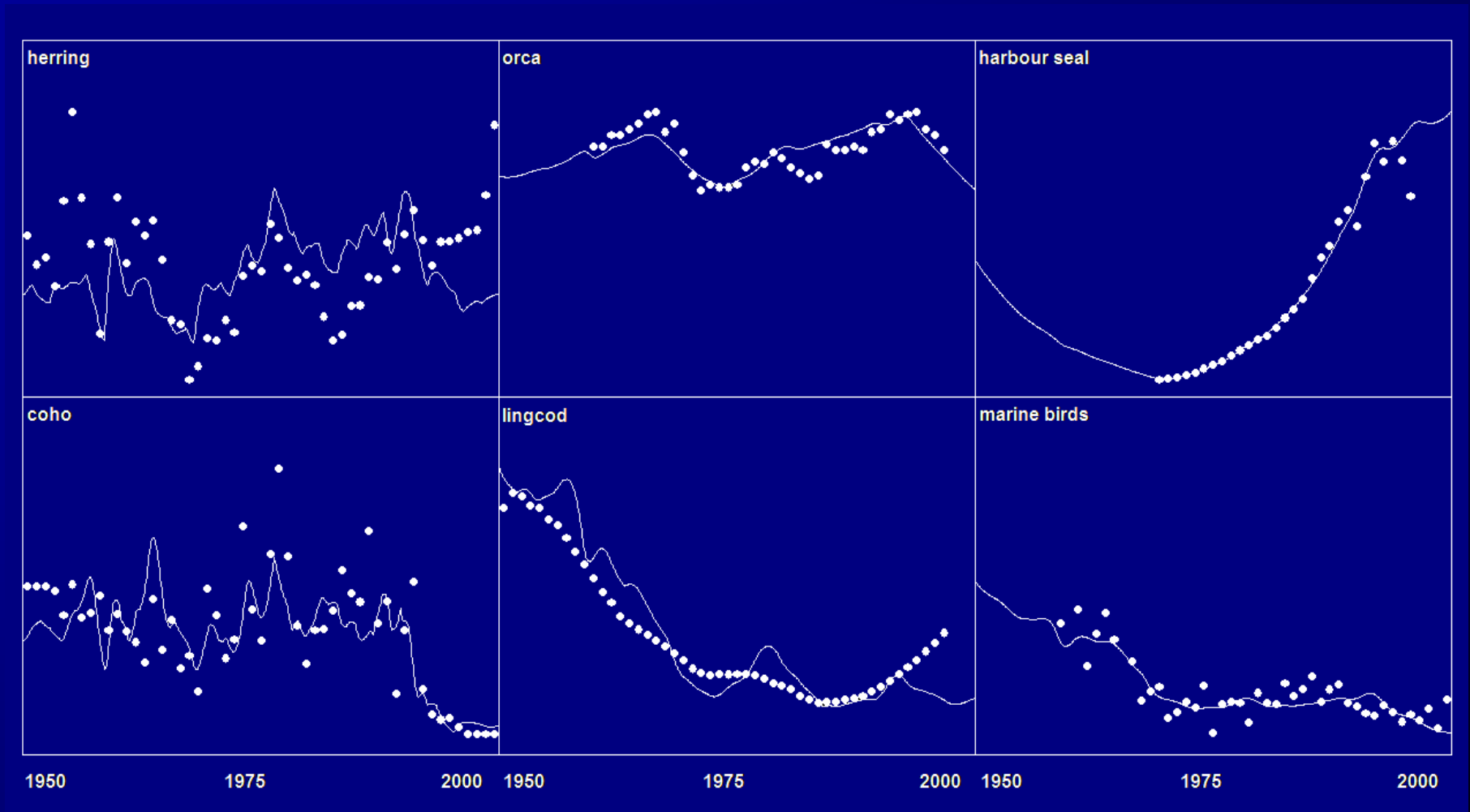
Northeast Pacific Production Anomaly



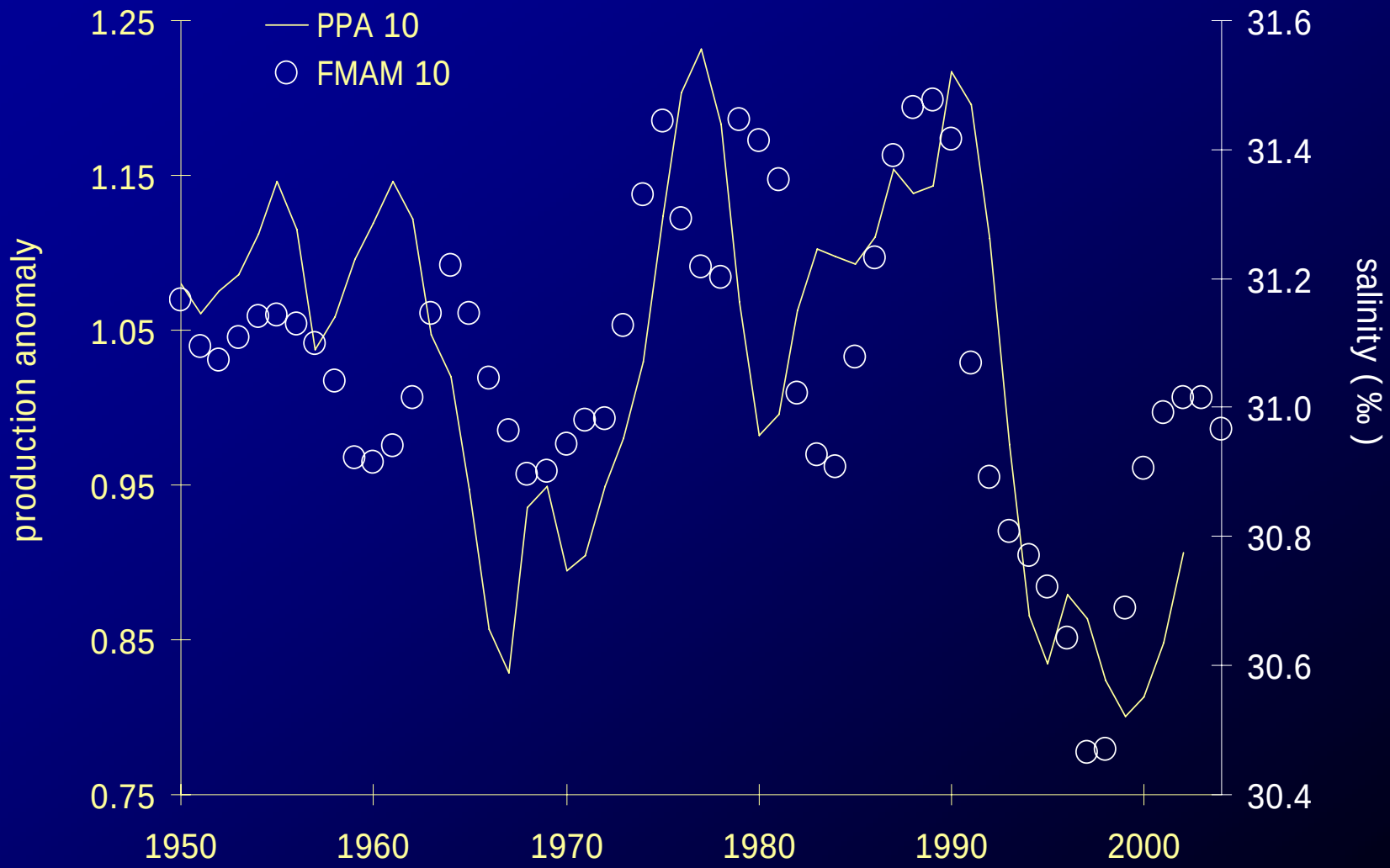
Ecosim: Georgia Strait – Trophic Effects Only

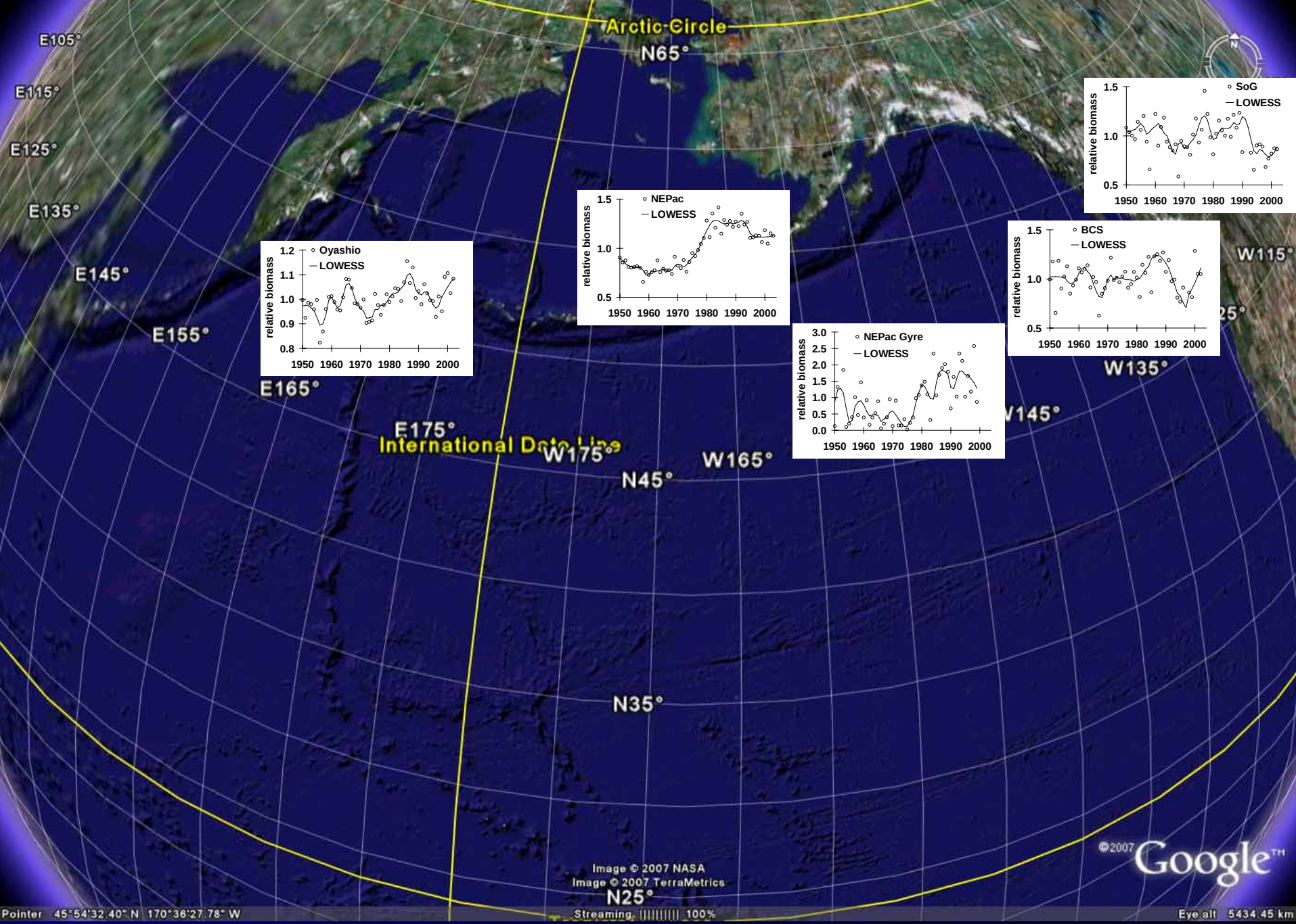


Ecosim: Georgia Strait – Trophic *and* Climate Effects



Georgia Strait Production Anomaly




Arctic Circle
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Oyashio
LOWESS
relative biomass
NEPac
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NEPac Gyre
LOWESS
relative biomass
SoG
LOWESS
relative biomass
BCS
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relative biomass
1950 1960 1970 1980 1990 2000
Image © 2007 NASA
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Pointer 45°54'32.40" N 170°36'27.78" W
Streaming 100%
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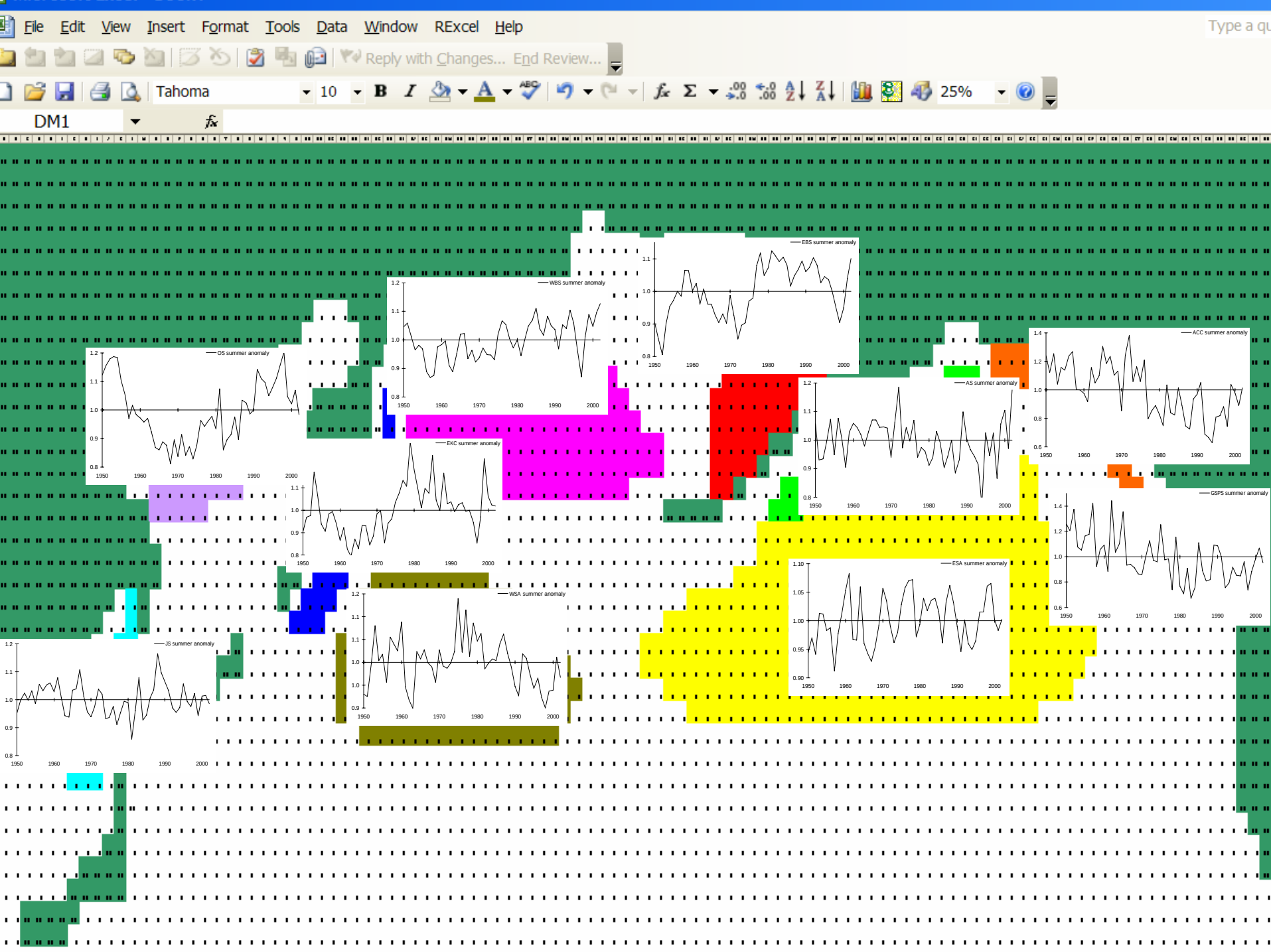
NEMURO Model

- Physical outputs
- Biological outputs
- NEMURO data used in MALBEC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OS summer anomaly
WBS summer anomaly
EBS summer anomaly
ACC summer anomaly
EKC summer anomaly
AS summer anomaly
GSPS summer anomaly
WSA summer anomaly
ESA summer anomaly
JS summer anomaly

Preliminary Results

- Ecosim models show historic changes in fish and upper trophic level biomasses are associated with bottom-up climate processes
- In our bottom-up simulations the best fits were achieved with NEMURO data
- Production time series of bottom-up effects caused only small improvements in fitting of modeled salmon time series to stock assessment time series. Varying productivities by stocks (Ricker α parameter) achieved best fits overall

Future Work

- Examine linkages between lower trophic production and salmon stocks
- Compare physical time series to lower trophic level production time series and develop a protocol for estimating carrying capacities of ocean habitats in the future
- Collaboration with other teams simulating future ocean carrying capacities.

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