Two sources of primary production of sand bank ecosystems in the Seto Inland Sea, Japan

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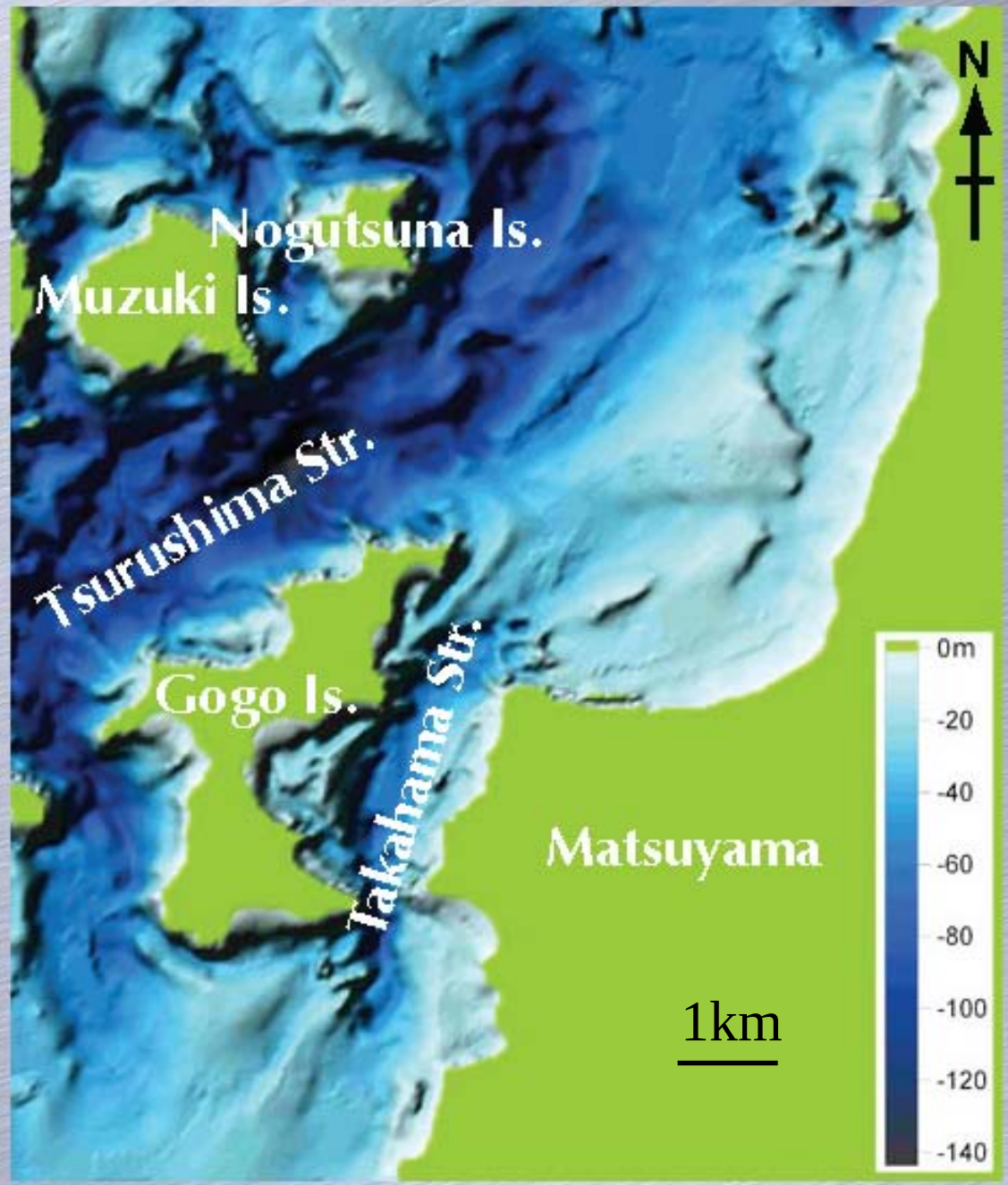
Sand banks in study area

(Sekiguchi et al. 2005)



Sand banks in study area

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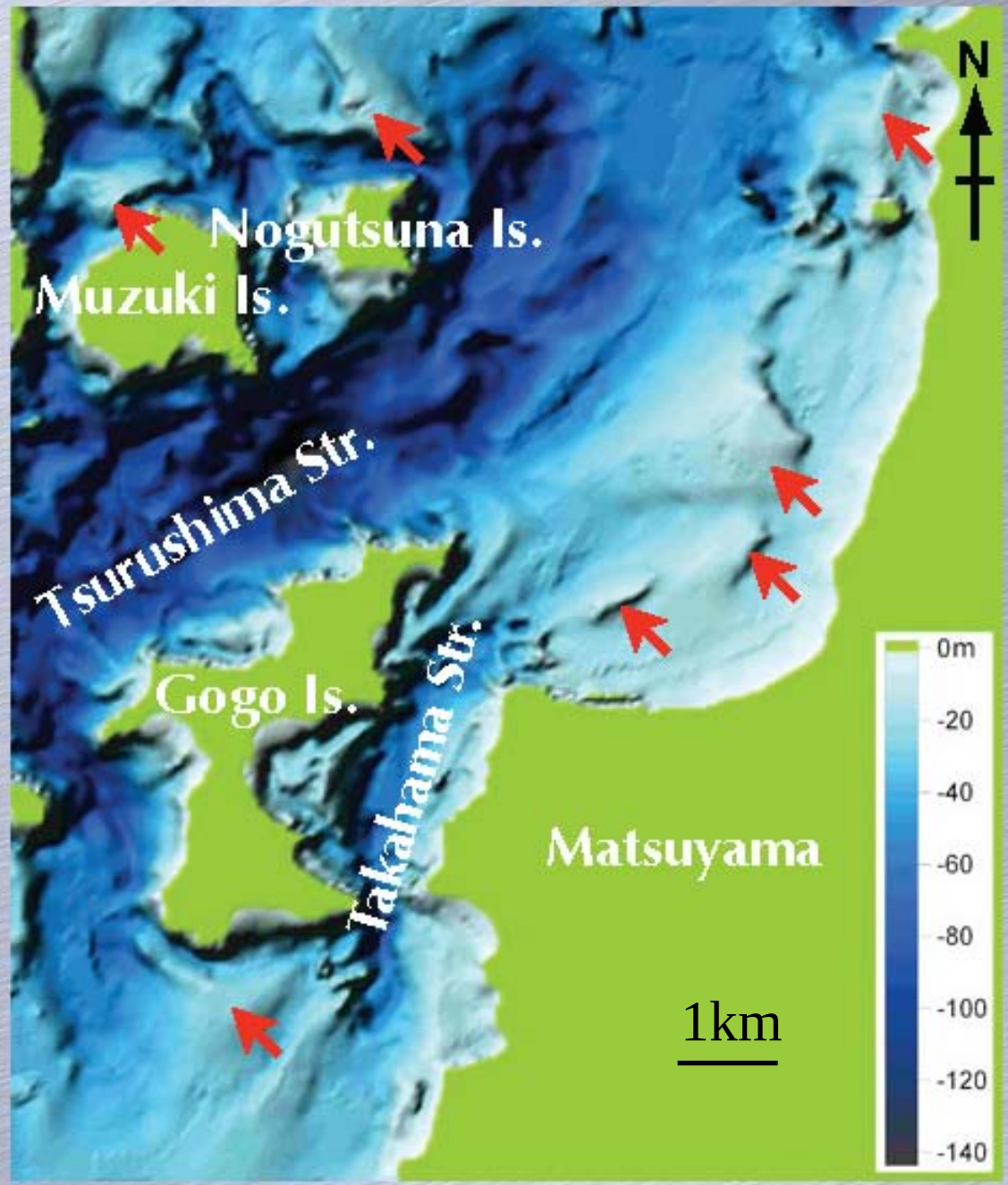

Sand banks in study area

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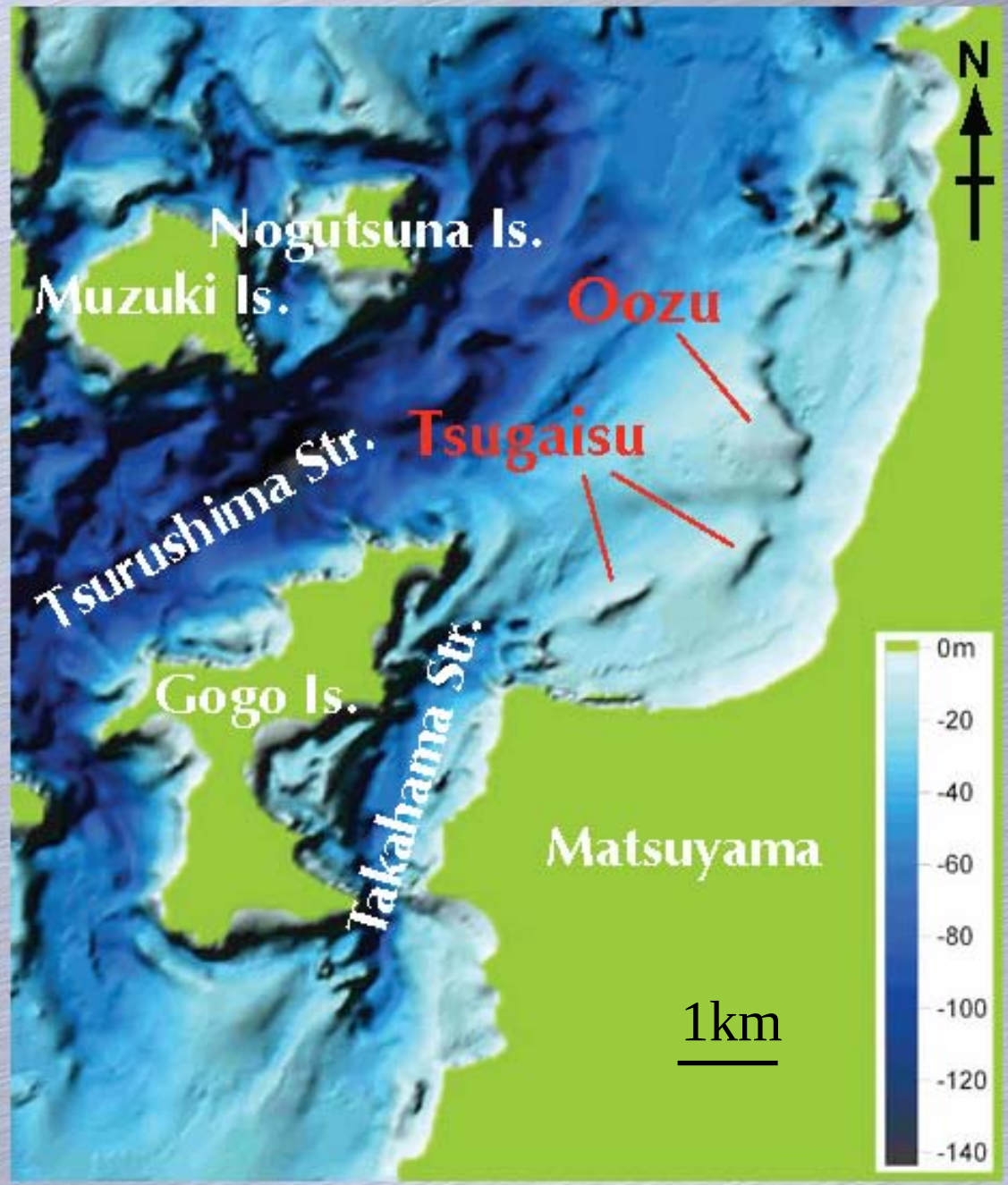
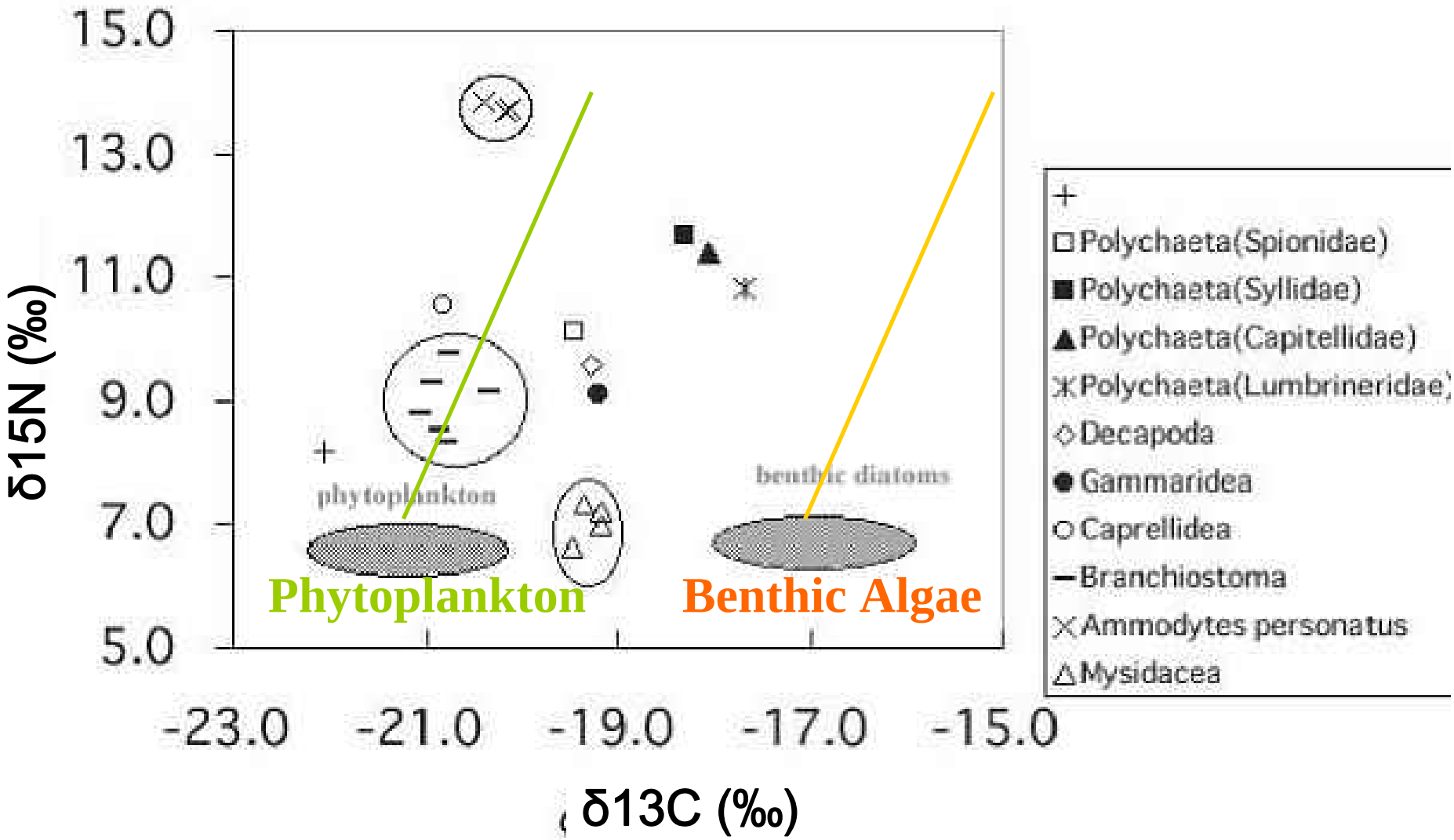
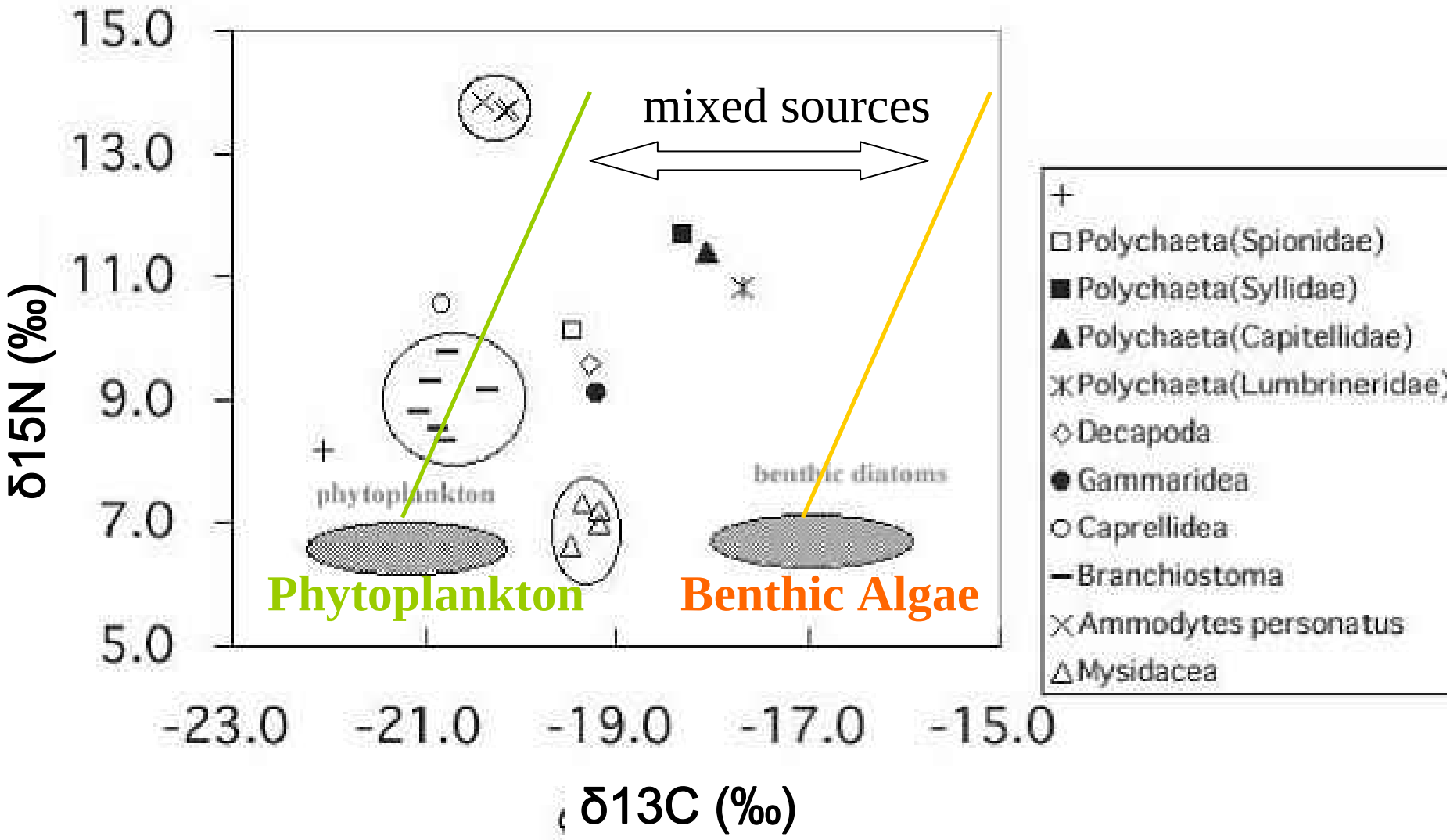


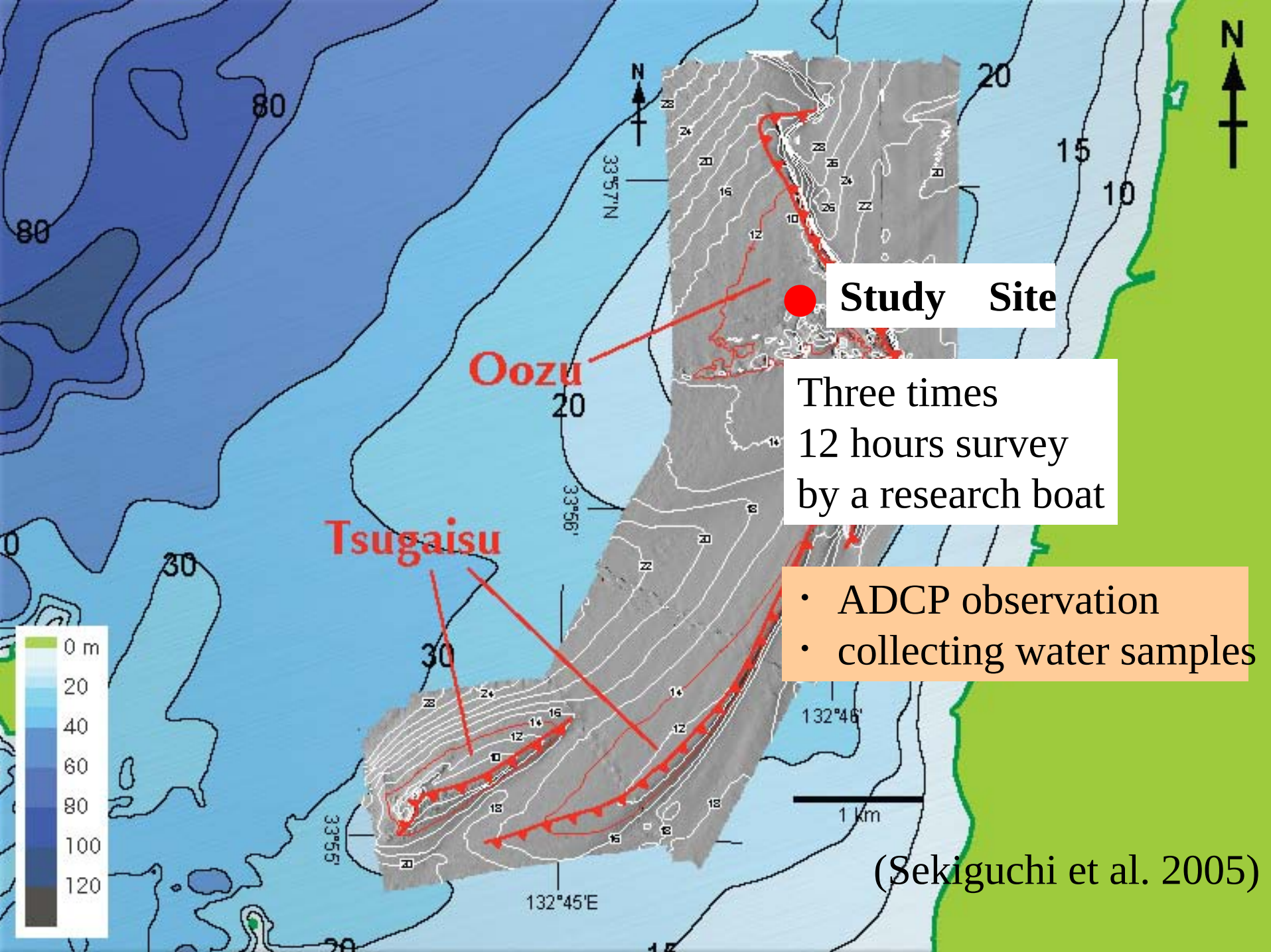


Food Web around the sand bank

Higher trophic groups depend on both phytoplankton and benthic algae productions



Food Web around the sand bank


Study Site
Oozu
Tsugaisu
Three times
12 hours survey
by a research boat
・ ADCP observation
・ collecting water samples
(Sekiguchi et al. 2005)
N
1 km
33°57'N
33°56'
33°55'
132°45'E
132°46'
0 m
20
40
60
80
100
120

Two sources of primary production in sand bank ecosystems

A) Primary production of phytoplankton in the water column

a) relationship between concentrations of nutrients and chl a

B) Primary production of benthic algae on the bottom sediment

a) relationship between current speed and reflection intensity of ADCP signal

b) relationship between current speed and concentration of chl a

c) suspension of benthic algae

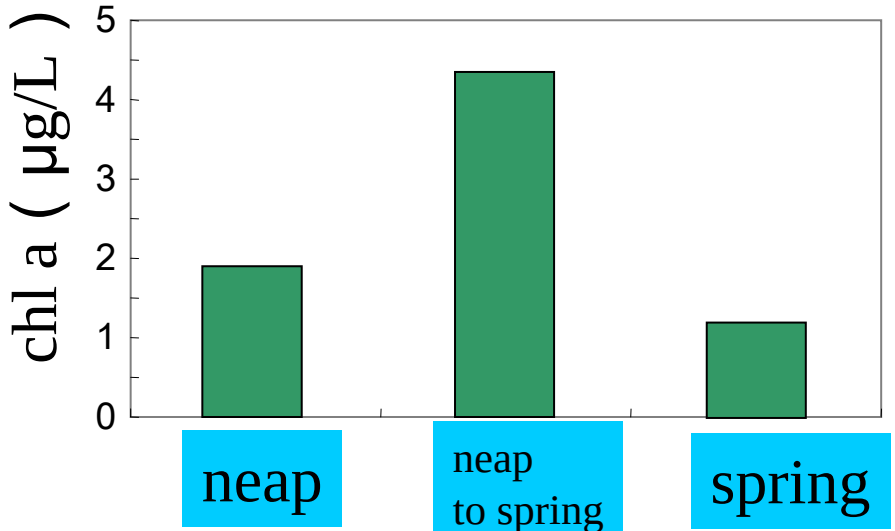
A) primary production of phytoplankton in the water column

a) relationship between concentrations of nutrients and chl a

	NO_3-N (µg/L)	PO_4-P (µg/L)
neap	37.73	13.38
neap to spring	33.08	10.39
spring	102.95	13.62

NO_3-N, PO_4-P
lower concentration at neap to spring tide than at spring tide

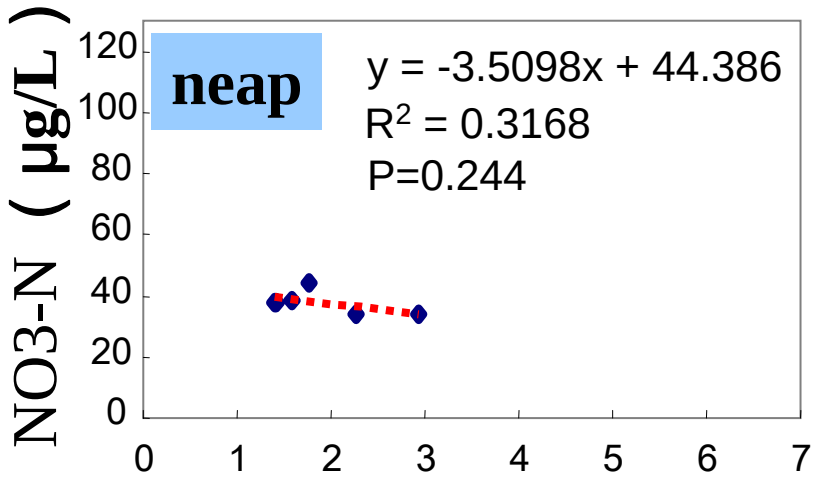
consumption of nutrients by primary producer ?

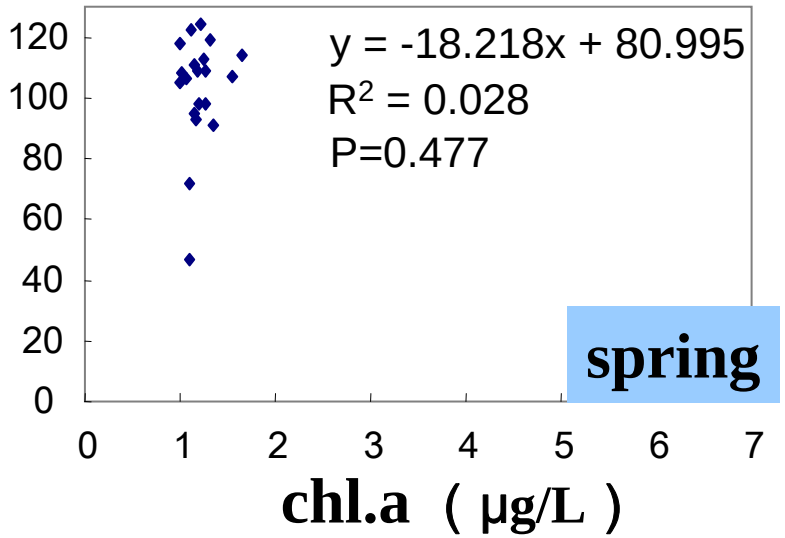


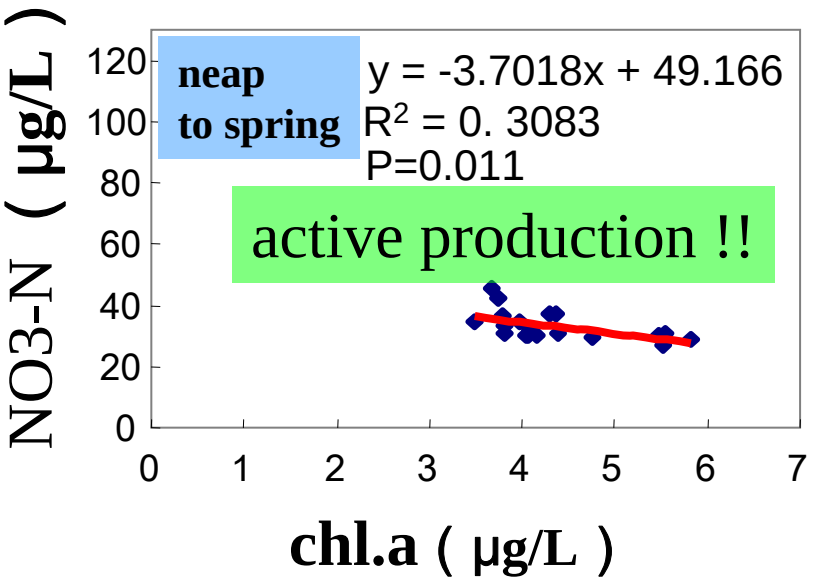
negative correlation between concentrations of chl a and nutrients

A) primary production of phytoplankton in the water column

a) relationship between concentrations of nutrients and chl a







neap no correlation

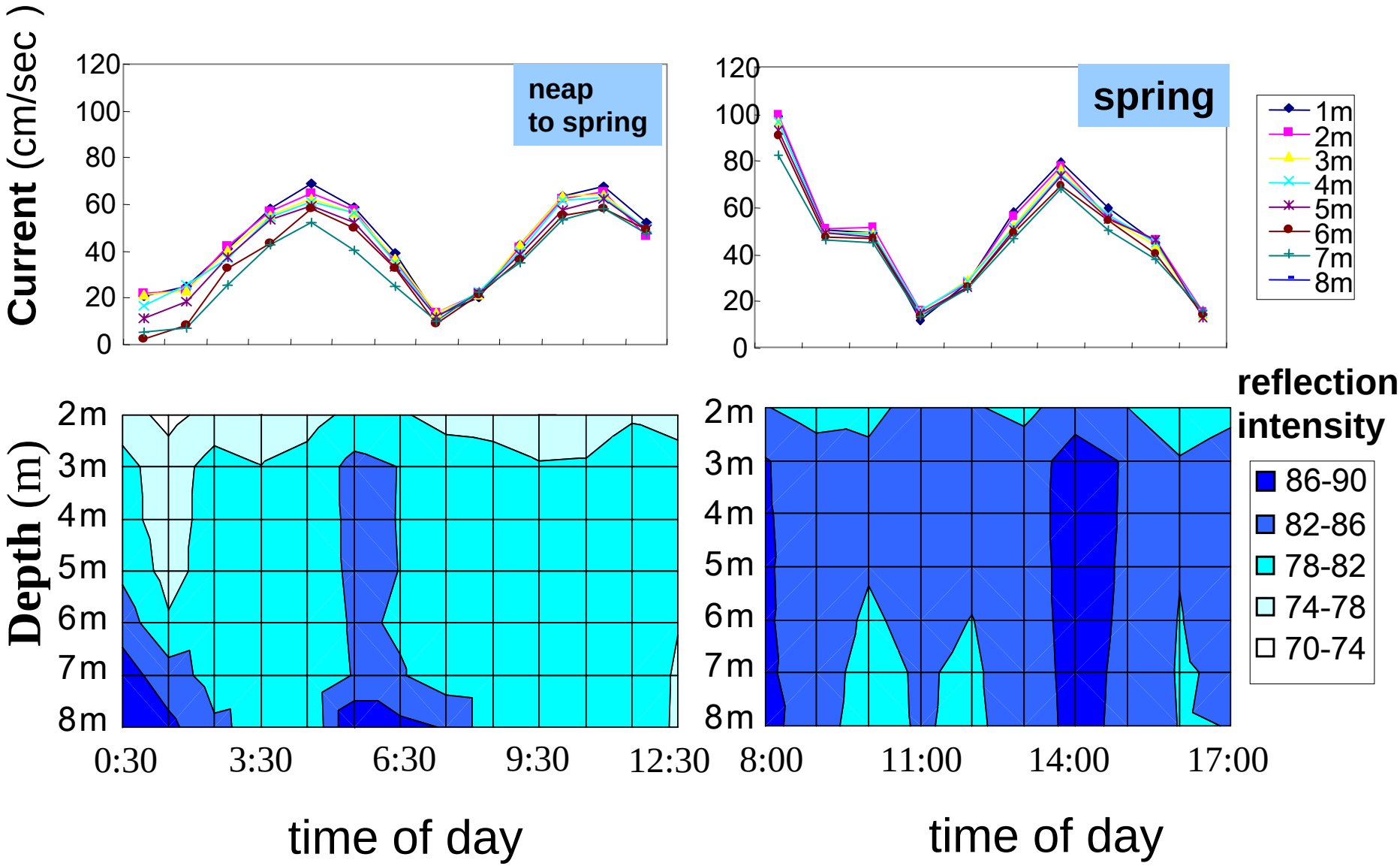
neap to spring negative correlation

spring no correlation

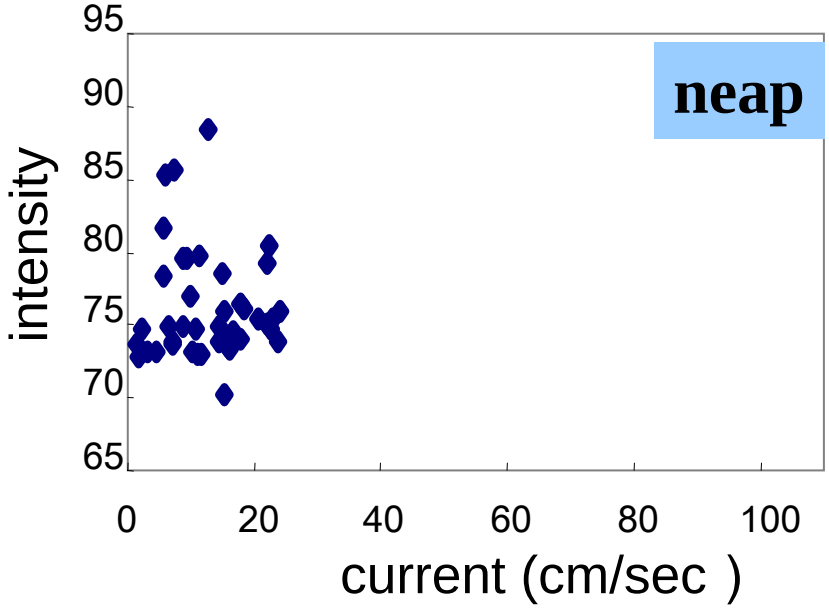
B) primary production of benthic algae on the bottom sediment

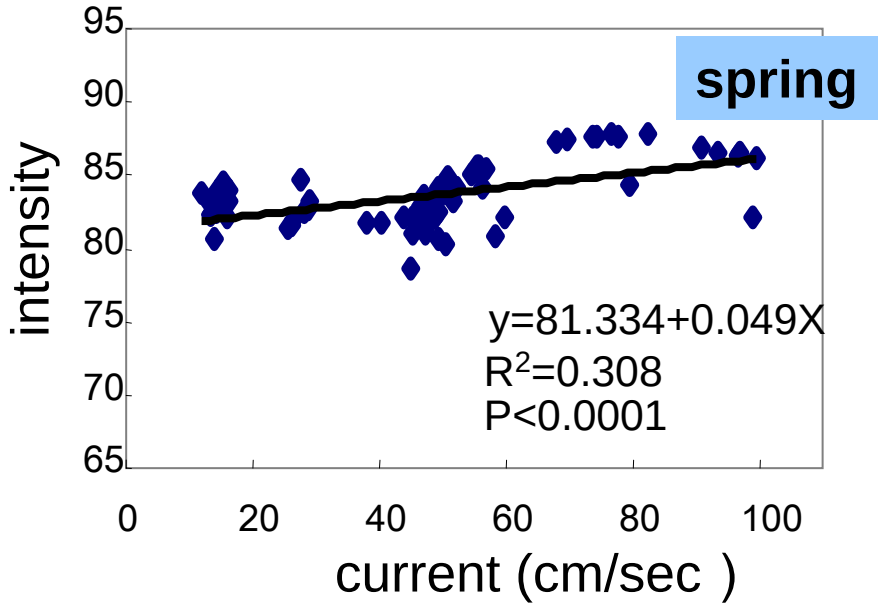
- **suspension of sands and benthic algae**

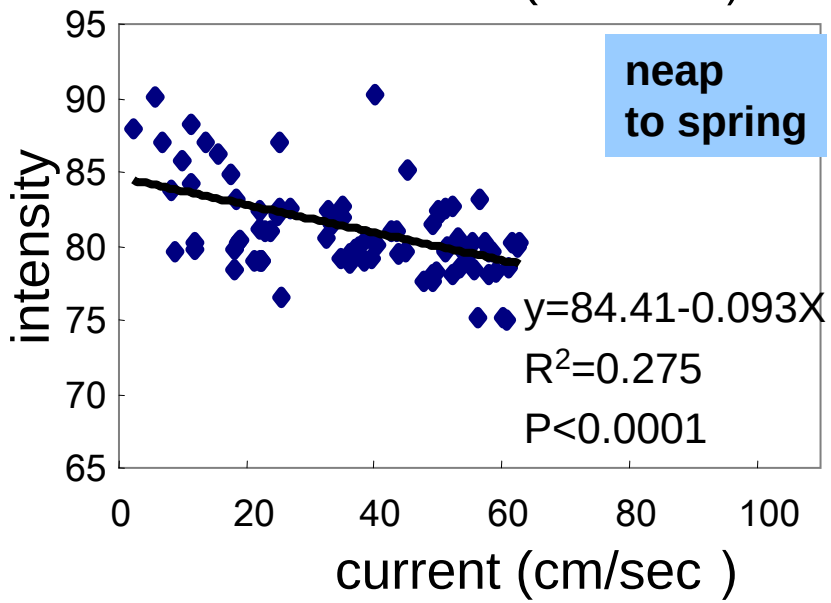
a) relationship between current speed and reflection intensity of ADCP signal



a) relationship between current speed and reflection intensity of ADCP signal



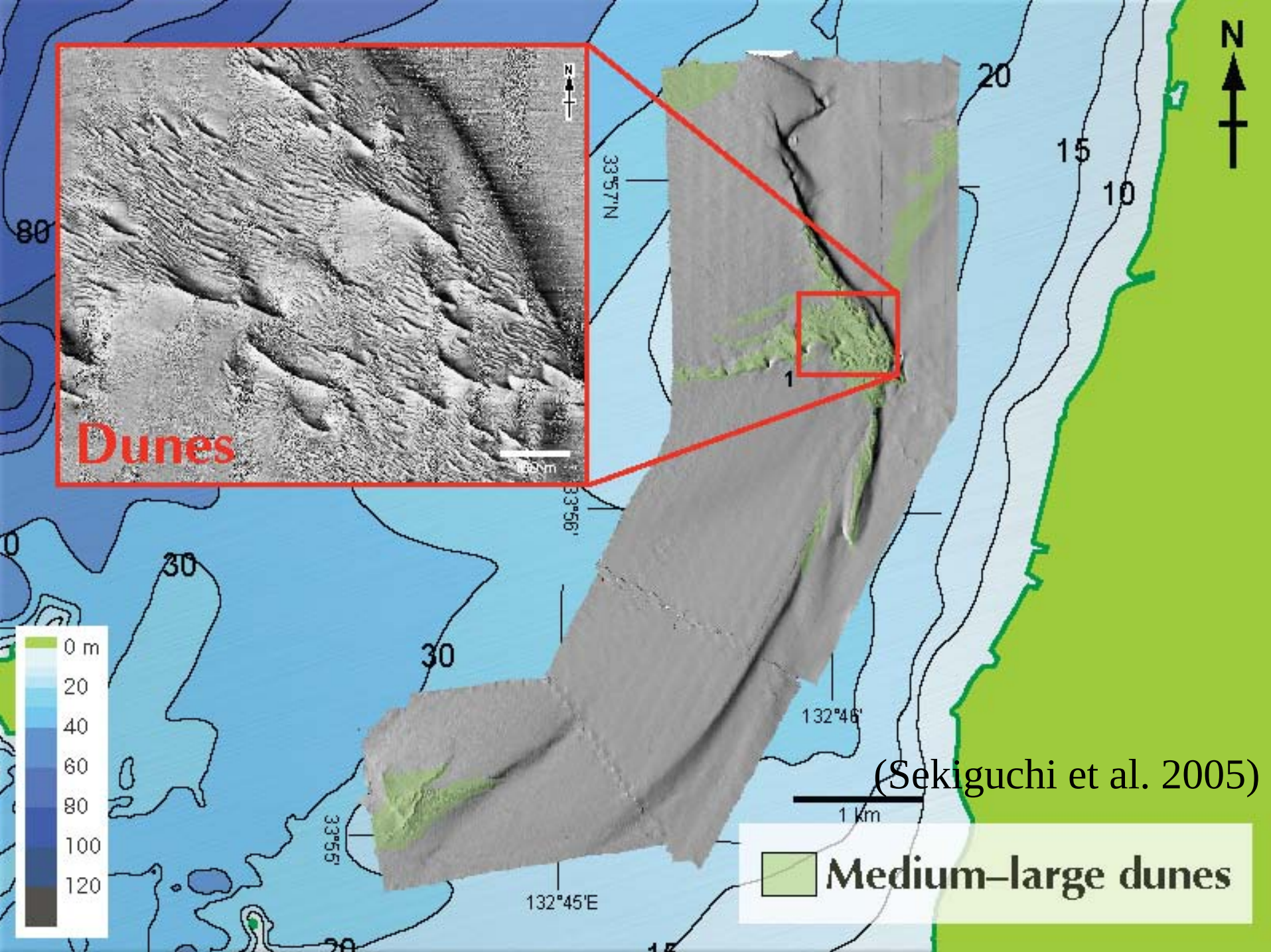




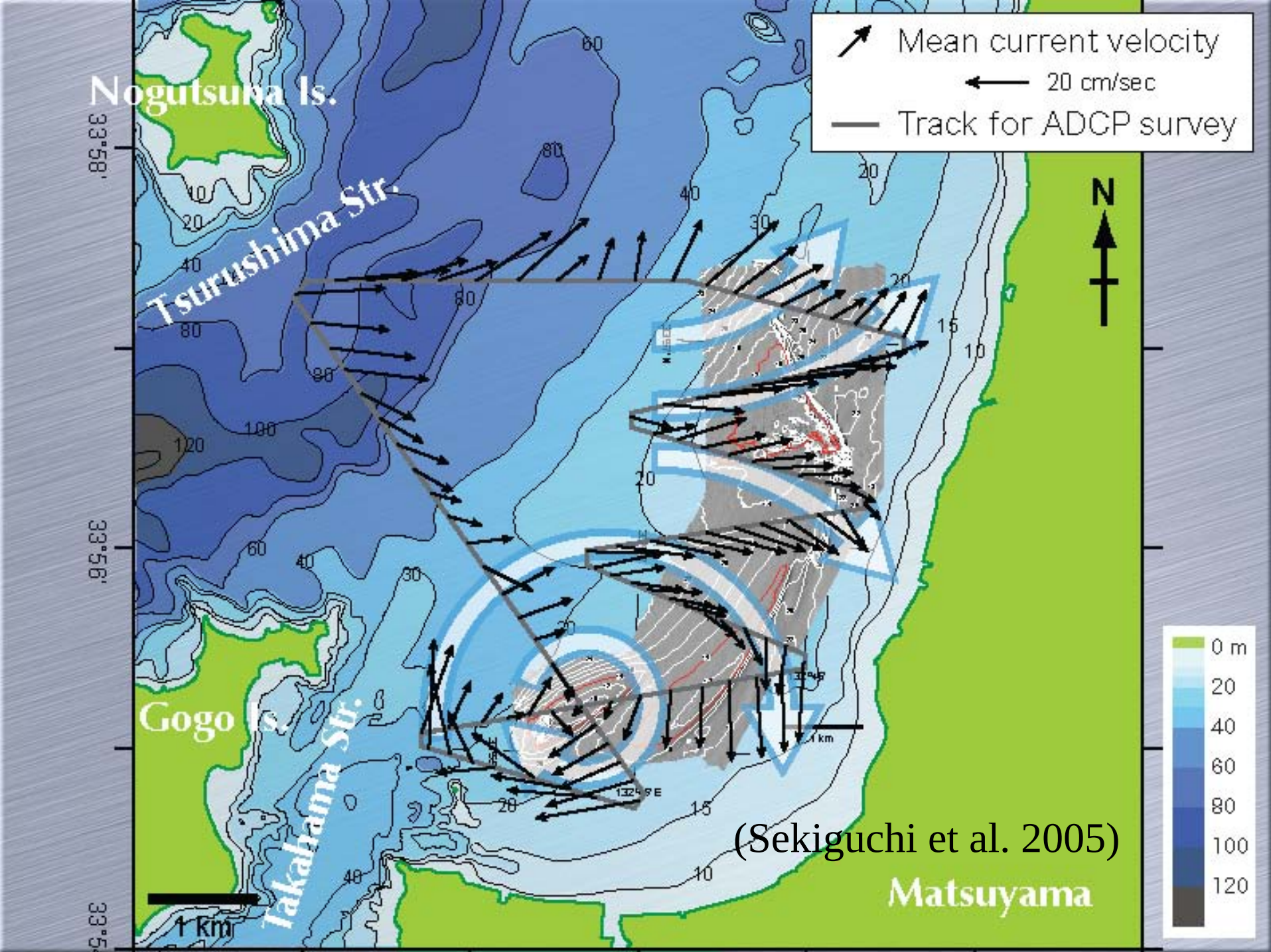
neap **no correlation**

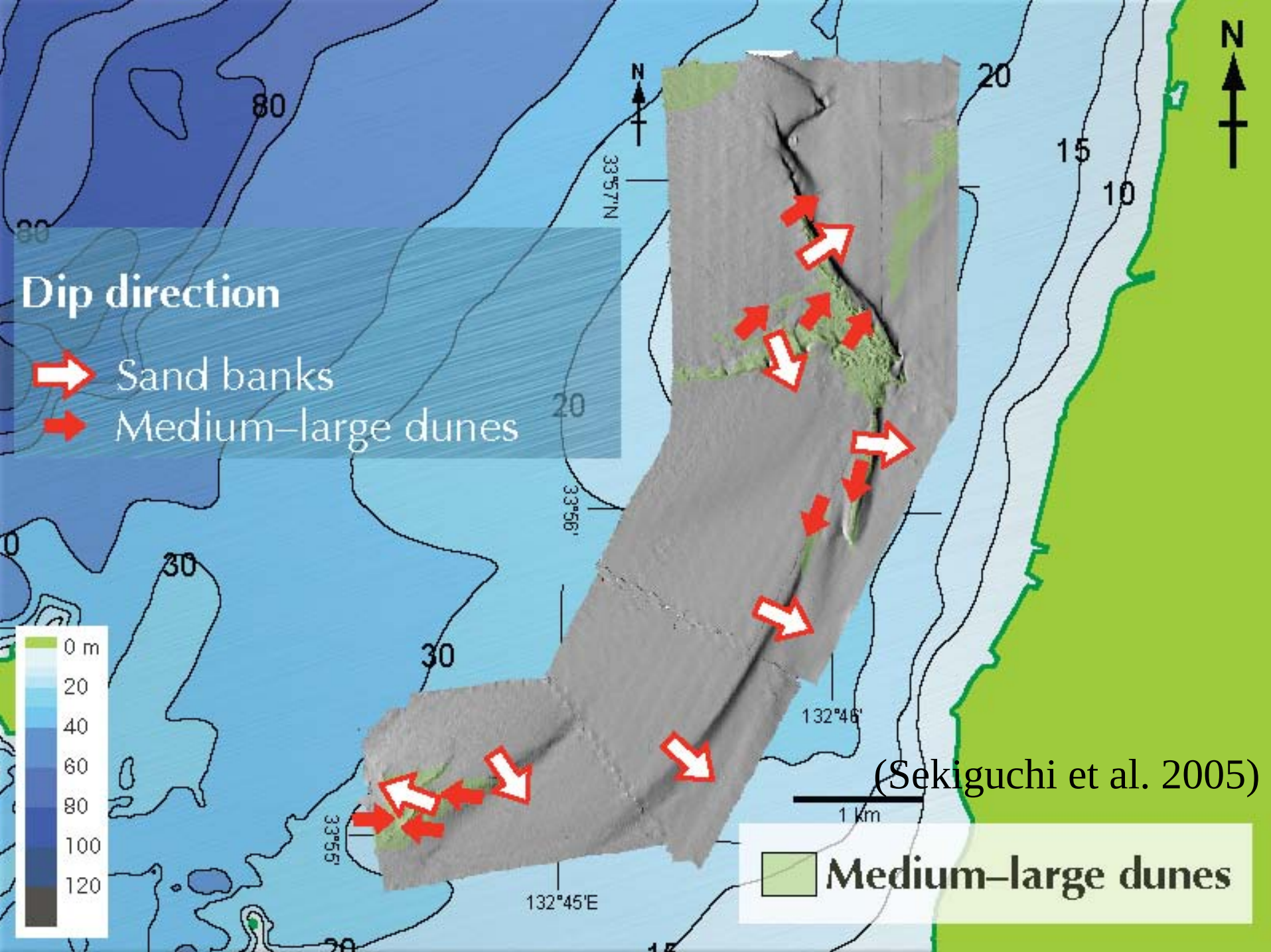
neap to spring **negative correlation**

spring **positive correlation**



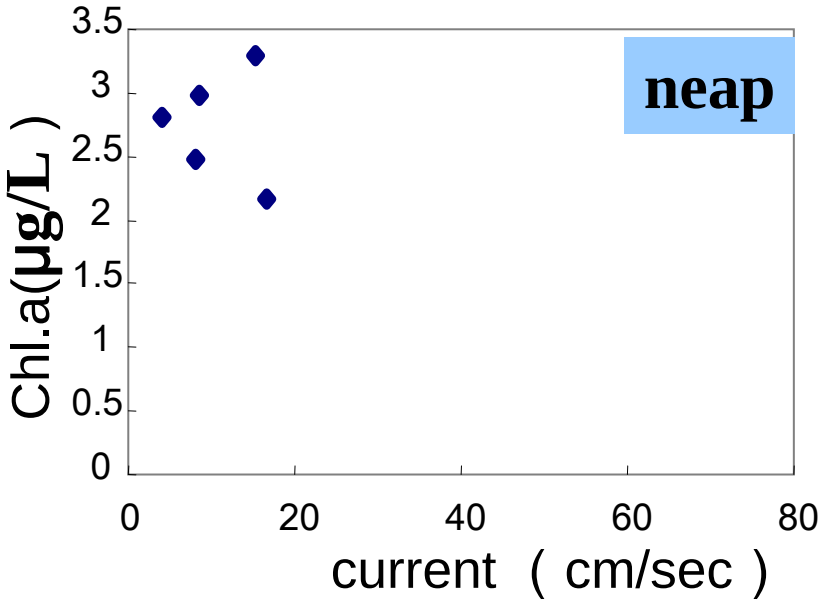
(Sekiguchi et al. 2005)

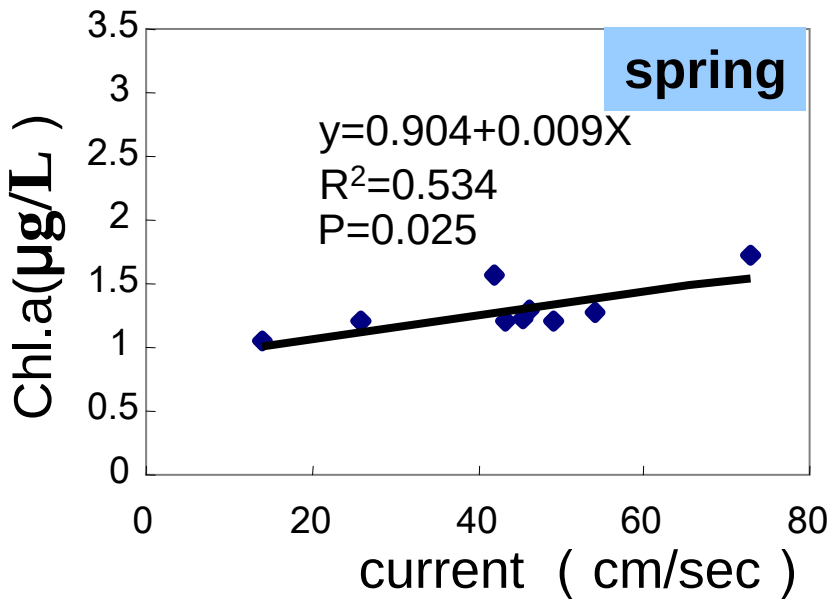

Mean current velocity
20 cm/sec
Track for ADCP survey
N
Nogutsuna Is.
Tsurushima Str.
Gogo Is.
Takahama Str.
Matsuyama
1 km
0 m
20
40
60
80
100
120
(Sekiguchi et al. 2005)

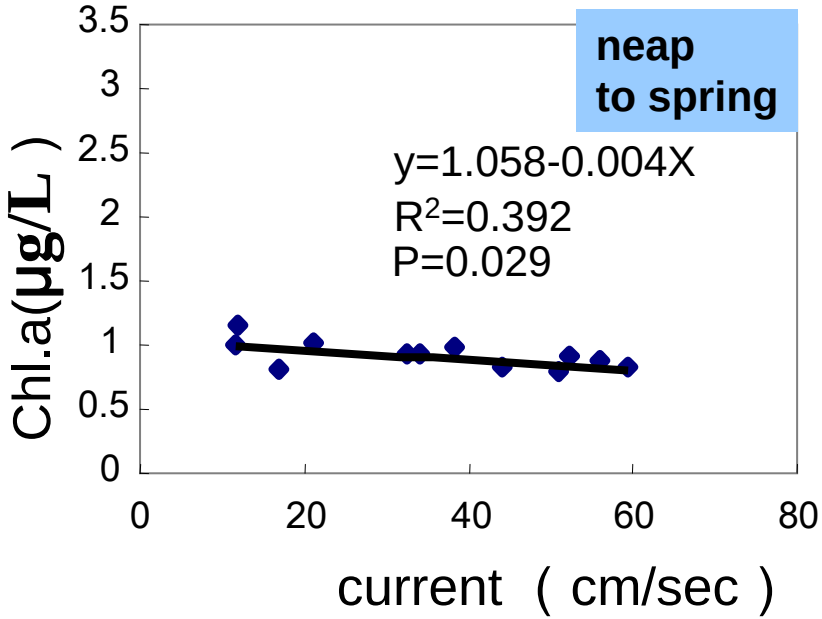


(Sekiguchi et al. 2005)

b) relationship between current speed and concentration of chl a







neap	**no correlation**
neap to spring	**negative correlation**
spring	**positive correlation**

c) suspension of benthic algae

2005

Jul. 25 **neap to spring** 296.4cm

Skeletonema spp.	47.94 %
Chaetoceros spp.	31.44 %
Nitzschia spp.	20.62 %

Sep. 27 neap 260.7cm

Chaetoceros spp.	53.39 %
Skeletonema spp.	23.76%
Melosira spp.	11.41%
Asterionella spp.	11.41%

Sep. 8 **neap to spring** 314.5cm

Skeletonema spp.	35.65%
Chaetoceros spp.	32.17%
Nitzschia spp.	32.17%

Nov. 4 **neap to spring** 337.5cm

Navicula spp.	35.82 %
Thalassiothrix sp.	34.32 %
Nitzschia spp.	29.85 %

tidal level

benthic algae

Two sources of primary production in sand bank ecosystems

Summary of Results

A) primary production of phytoplankton in the water column

a) **negative** relationship between concentrations of nutrients and chl a

B) primary production of benthic algae on the bottom sediment

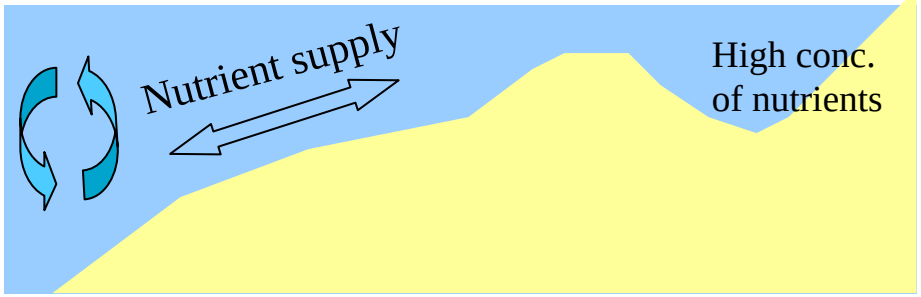
a) **positive** relationship between current speed and reflection intensity of ADCP signal

b) **positive** relationship between current speed and concentration of chl a

c) **occurrence** of suspension of benthic algae

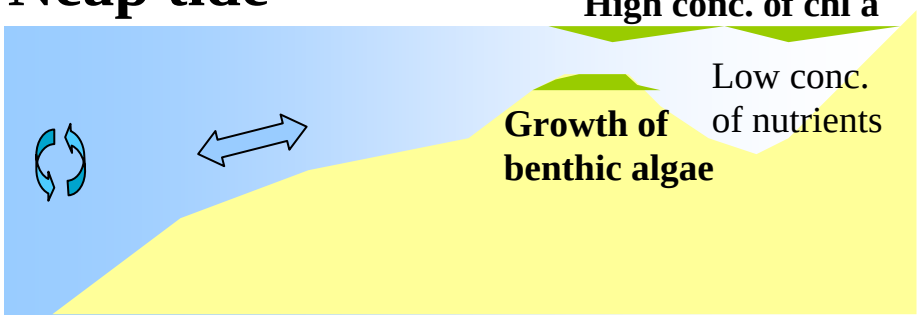
In conclusion: Estimated production process around sand banks

Spring tide



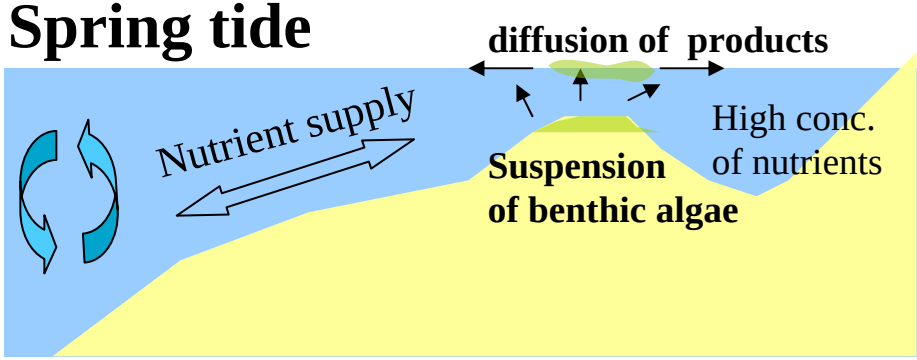
At spring tide, large water movement supplies nutrients around sand banks. Also, it reduces primary production of phytoplankton through water mixing.

Neap tide



At neap tide, small water movement promotes primary production of phytoplankton. Sometimes, a bloom of phytoplankton can be found at thin surface layer. In addition, production of benthic micro- and macroalgae will be promoted.

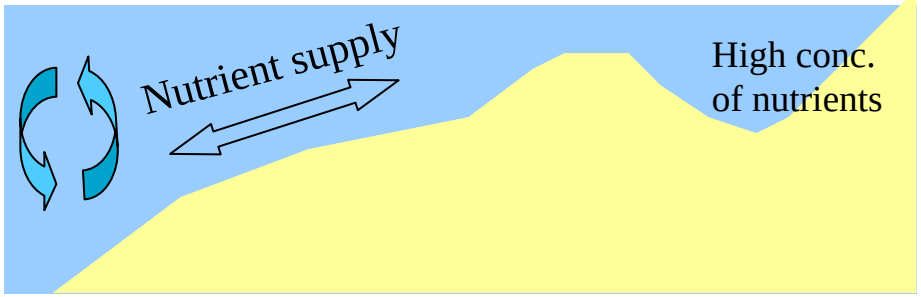
Spring tide



Production of phytoplankton during neap tide will be scattered over coastal areas. Also, benthic production will be suspended and dispersed by large water movement.

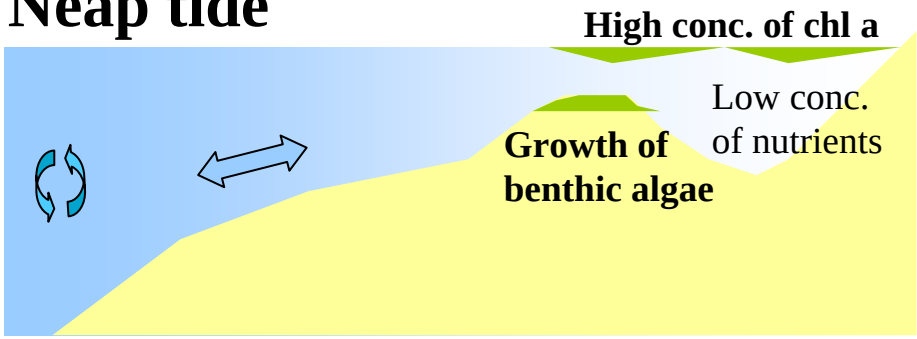
In conclusion: Estimated production process around sand banks

Spring tide



At spring tide, large water movement supplies nutrients around sand banks. Also **setting of nutrients** ction of phytoplankton through water mixing.

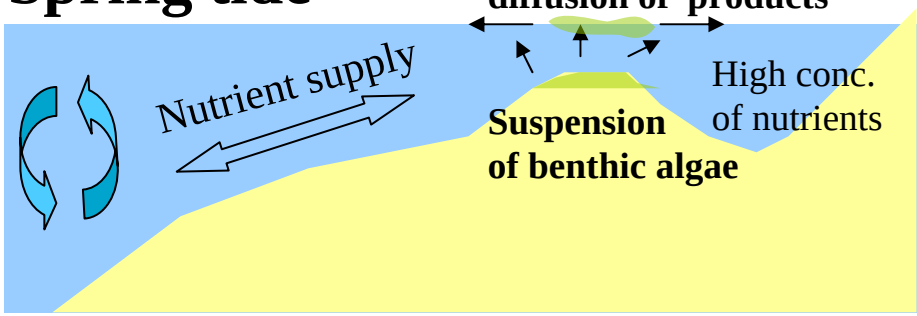
Neap tide



At neap tide, small water movement promotes primary production of p n o in s n of benthic micro- and macroalgae will be promoted.

occurrence of production in surface and bottom

Spring tide



Production of phytoplankton d c p dispersed by large water movement.

delivery of products and resetting of nutrients