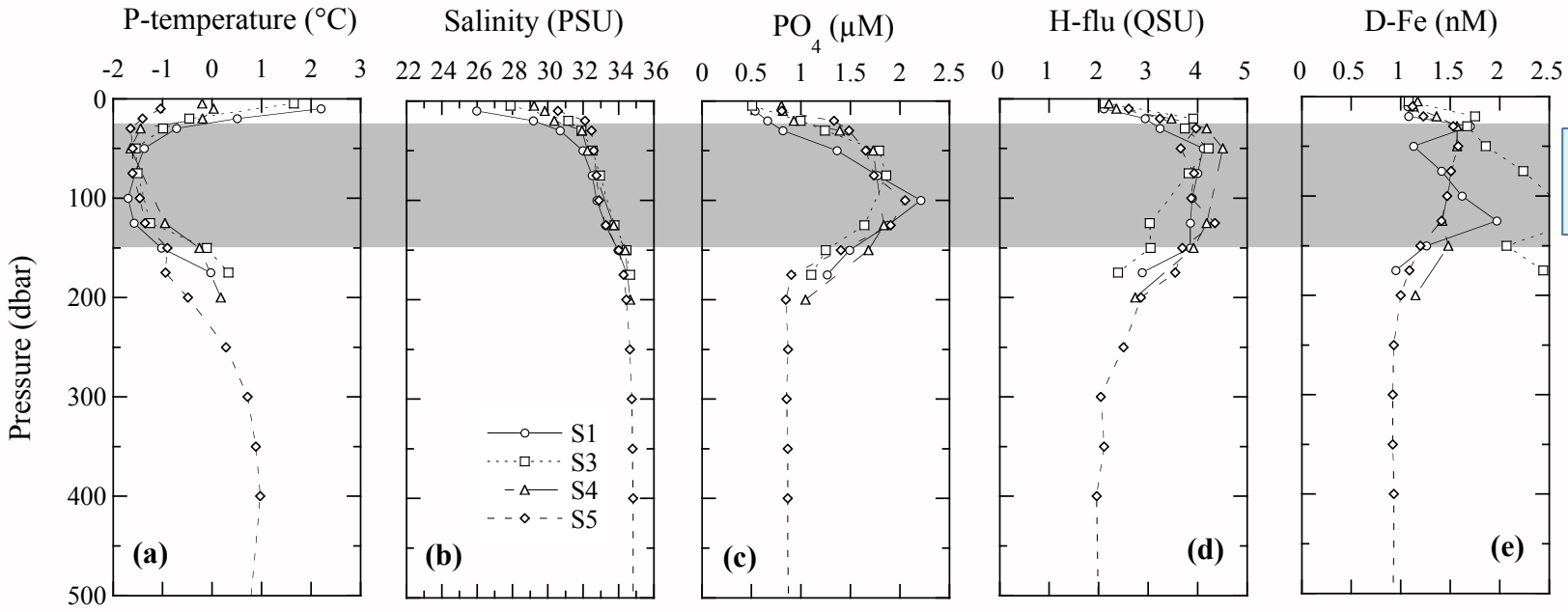
Vertical distributions of T, S, PO_4, humic F-intensity, and [D-Fe] in the surface water (0–500 m) of the slope and shelf regions

Fig. 4



Halocline Layer

25–150 m

****Subsurface maxima of nutrient, humic F-intensity and [D-Fe] in Upper HL**

Three main processes to form the subsurface maxima of chemical components in Upper HL

(1) Brine rejection during sea ice formation

Formation of dense shelf water with low-temperature and high-salinity

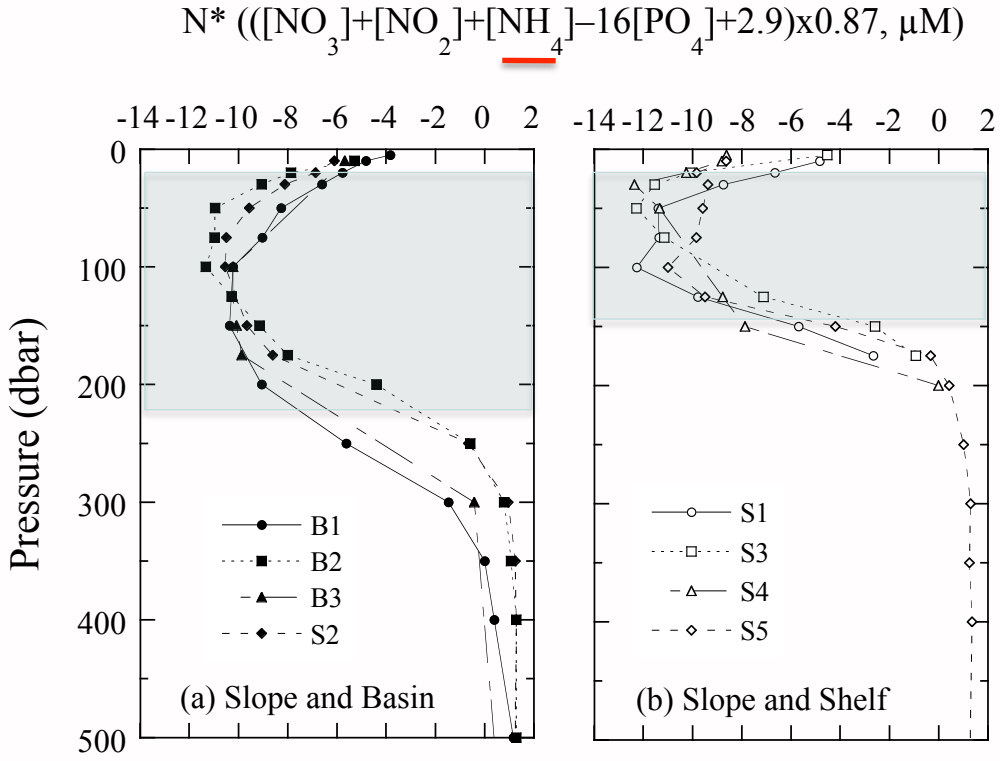
(2) Interactions between brine waters and sediments in the shallower shelves

Supply of nutrient, humic-type FDOM and D-Fe from shelf sediments to the overlying water

(3) Inflow of the Atlantic water with low nutrient, humic-type FDOM and D-Fe into Lower HL

Decrease in nutrient, humic-type FDOM and D-Fe with depth in Lower HL

$N^*=([NO_3^-]-16[PO_4^{3-}]+2.9)\times0.87$ [*Gruber and Sarmiento*, 1997]
$N^*=([NO_3^-]+[NO_2^-]+[NH_4^+]-16[PO_4^{3-}]+2.9)\times0.87$ [*Yoshikawa et al.*, 2006]

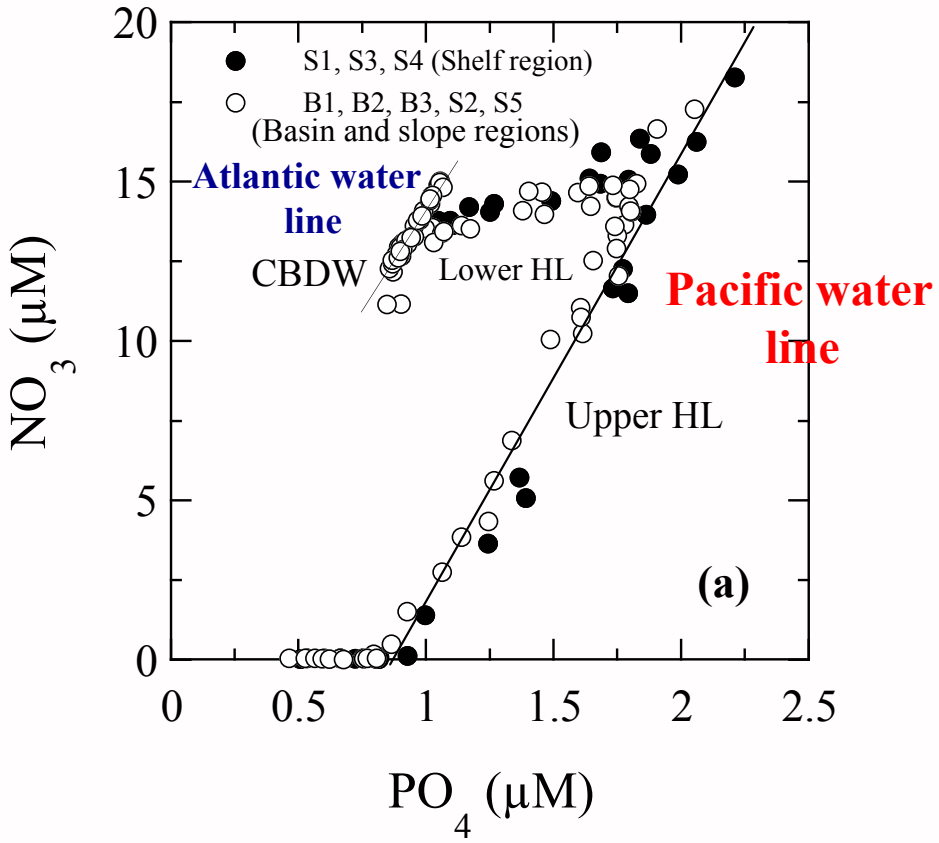


Upper Halocline Layer

$[NH_4]$=0~3 μM [*Gueguen et al.*, 2007; *Wang et al.*, 2006]

Large negative N* value in Upper HL:
Denitrification, consuming nitrate instead of oxygen for bacterial respiration in low-oxygen pore waters in sediments, and supply of nutrient, humic-type FDOM and D-Fe from shelf sediments to the overlying water in the shallower continental shelves

NO_3 versus PO_4 in the Chukchi Sea and Canada Basin in this study (2008)



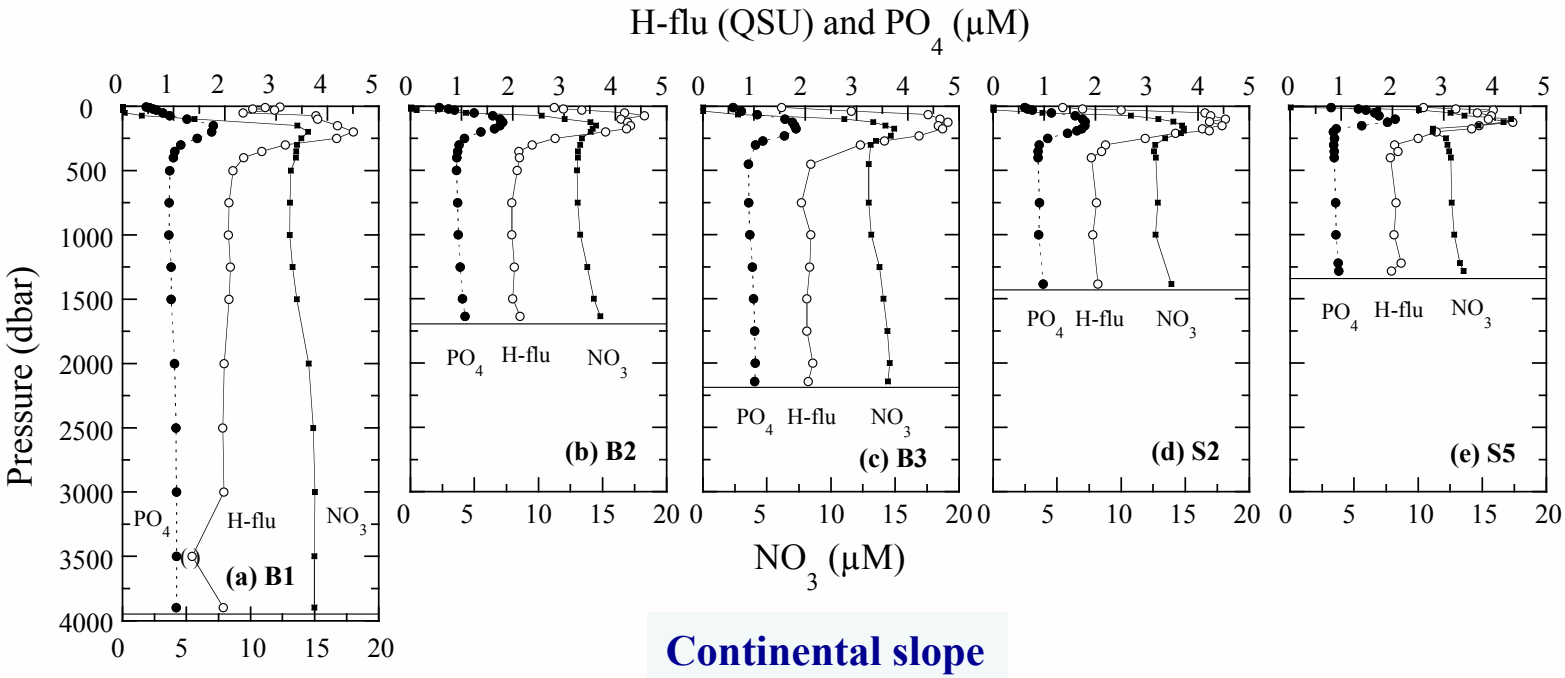
Upper HL: Pacific water via Bering Strait

Lower HL: mixture between Pacific and Atlantic waters due to the inflow of high-salinity Atlantic water into Lower HL

(Jones *et al.*, 1998; Yamamoto-Kawai *et al.*, 2008)

Vertical distributions of PO_4, NO_3 and humic-type F-intensity in the water column of the slope and basin regions

Fig. 5



Upper HL: Subsurface maxima of nutrient (NO_3=15 μM, PO_4=1.8 μM, SiO_2=30 μM)

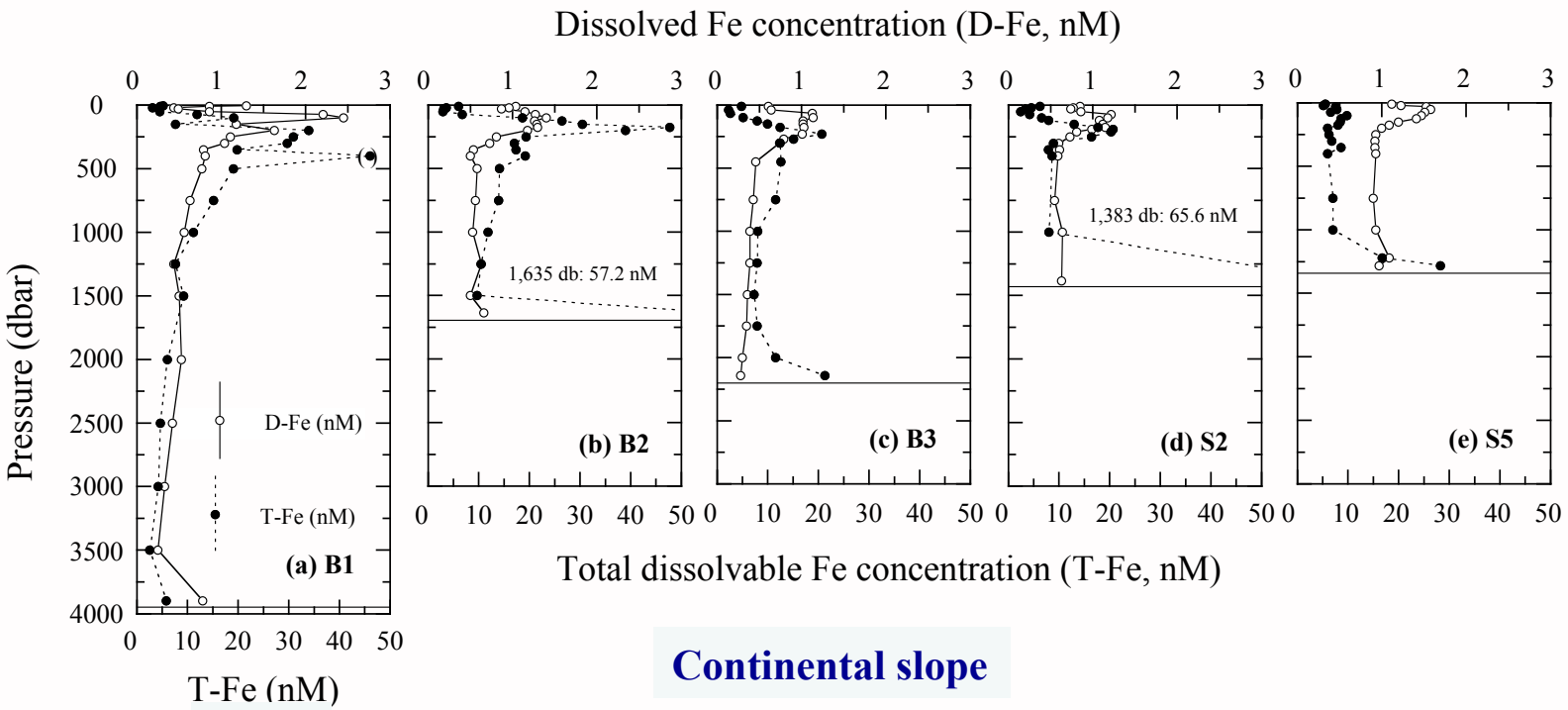
Subsurface maxima of Humic-type F-intensity (4~5 QSU): higher than those (2–2.5 QSU) in the North Pacific Ocean

Deep water (Atlantic layer + CBDW): NO_3=12–15 μM, PO_4=0.8–1.1 μM, SiO_2=5–15 μM

Humic-type F-intensity=2 QSU

Vertical distributions of D-Fe and T-Fe concentrations in the water column of the slope and basin regions

Fig. 8



- **Upper HL: Subsurface maxima of D-Fe (D-Fe=1.2–2.5 nM)**
  - Supply of D-Fe from shelf sediments to the overlying water in the shallower shelves and lateral Fe transport from the shelves to the basin
  - Organic Fe complexation with dissolved humic substances, probably controlling D-Fe concentrations in seawater and laterally transporting Fe to the Arctic Ocean interior
- **Lower HL: Subsurface maxima of T-Fe (T-Fe=10–50 nM)**
  - Sediment resuspension on the shelves by the inflow of the Atlantic water into Lower HL