Phytoplankton

NO_3

Zooplankton

PO_4

Fe

MOBI 2.0

Model of Ocean Biogeochemistry and Isotopes

DIC

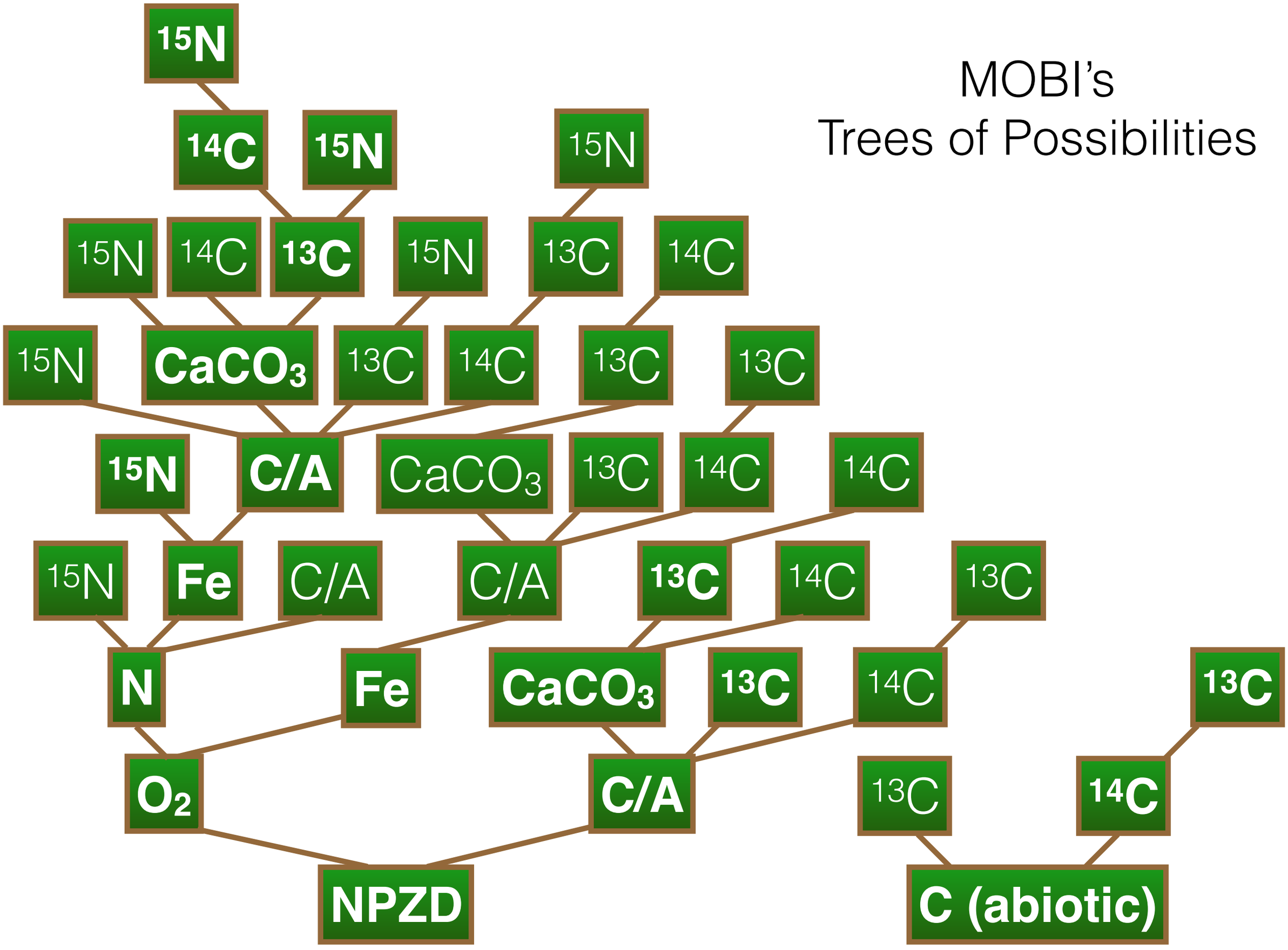
^{15}N

$CaCO_3$

^{13}C

Detritus

MOBI's Trees of Possibilities

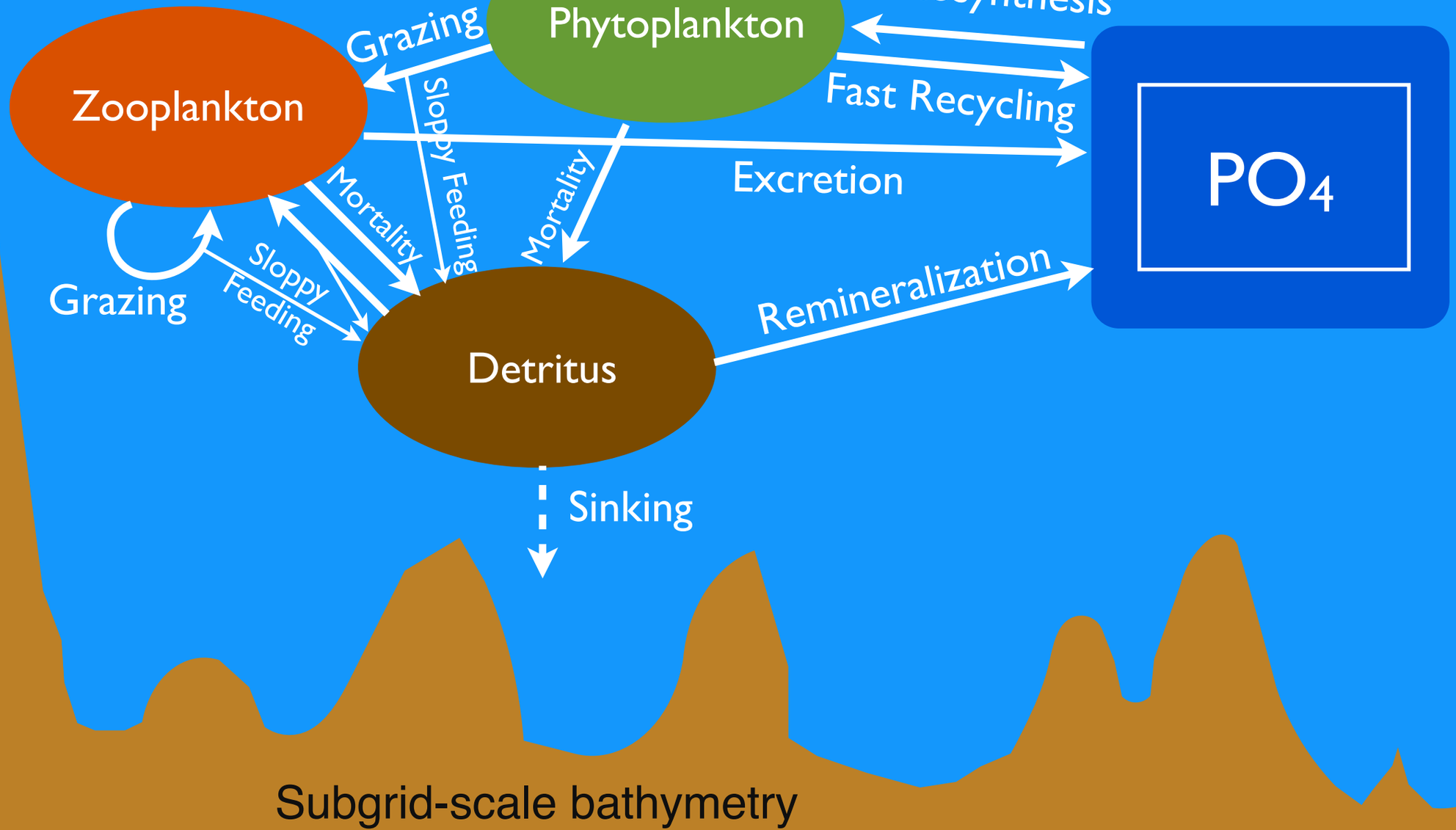


MOBI 2.0

1.6 model years/CPU min
or
900 model years / day

N=4

O_npzd



Subgrid-scale bathymetry

MOBI 2.0

1.8 model years/CPU min
or
800 model years / day

N=5

O_npzd
O_npzd_o2

O_2

Air-Sea Gas Exchange

Phytoplankton

Zooplankton

Detritus

PO_4

O_2

$r_{P:O}$

Subgrid-scale bathymetry

MOBI 2.0

1.9 model years/CPU min
or
760 model years / day

N=6

O_npzd
O_carbon
O_npzd_alk

CO_2

Air-Sea Gas Exchange

Phytoplankton

Zooplankton

Detritus

DIC

$r_{C:P}$

PO_4

ALK

$CaCO_3$

Production

Dissolution (instantaneous)

Sinking

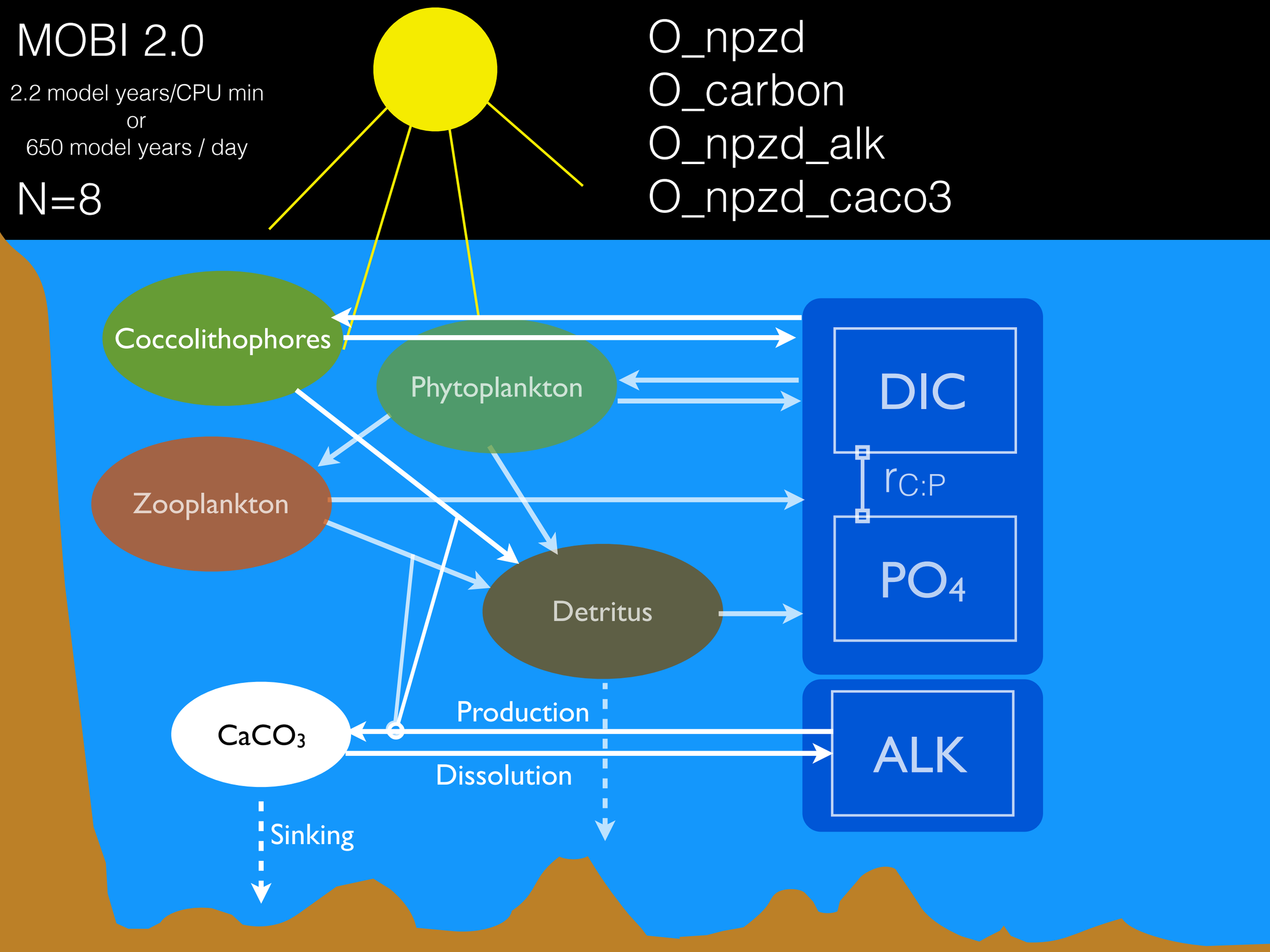
pH
$CO_{2,aq}$
CO_3^{2-}
HCO_3^-

MOBI 2.0

2.2 model years/CPU min
or
650 model years / day

N=8

O_npzd
O_carbon
O_npzd_alk
O_npzd_caco3



MOBI 2.0

N=7

O_npzd
O_npzd_o2
O_npzd_iron

Dust

Phytoplankton

dFe

Sediment Source

$r_{Fe:P}$

Zooplankton

PO_4

O_2

Scavenging

Remineralization

Geothermal

Detritus

pFe

Sinking

Burial

Subgrid-scale bathymetry

MOBI 2.0

2.3 model years/CPU min
or
600 model years / day

N=9

O_npzd
O_npzd_o2
O_npzd_nitrogen

O_2

Air-Sea Gas Exchange

N_2 Nitrogen Fixation

Phytoplankton

Diazotrophs

PO_4

O_2

$r_{P:N}$

$r_{O:N}$

O_2<5µM

NO_3

Zooplankton

Dissolved
DOP
DON
Organic

Detritus

Water Column Denitrification

Benthic Denitrification

Subgrid-scale bathymetry

MOBI 2.0

2.5 model years/CPU min
or
580 model years / day

N=11

O_npzd
O_npzd_o2
O_npzd_nitrogen
O_npzd_iron

Dust

N_2

Phytoplankton

Sediment Source

dFe

Diazotrophs

PO_4

O_2

Zooplankton

Scavenging

Remineralization

DOP

Geothermal

DON

NO_3

WCD

Detritus

pFe

Sinking

BD

Burial

Subgrid-scale bathymetry

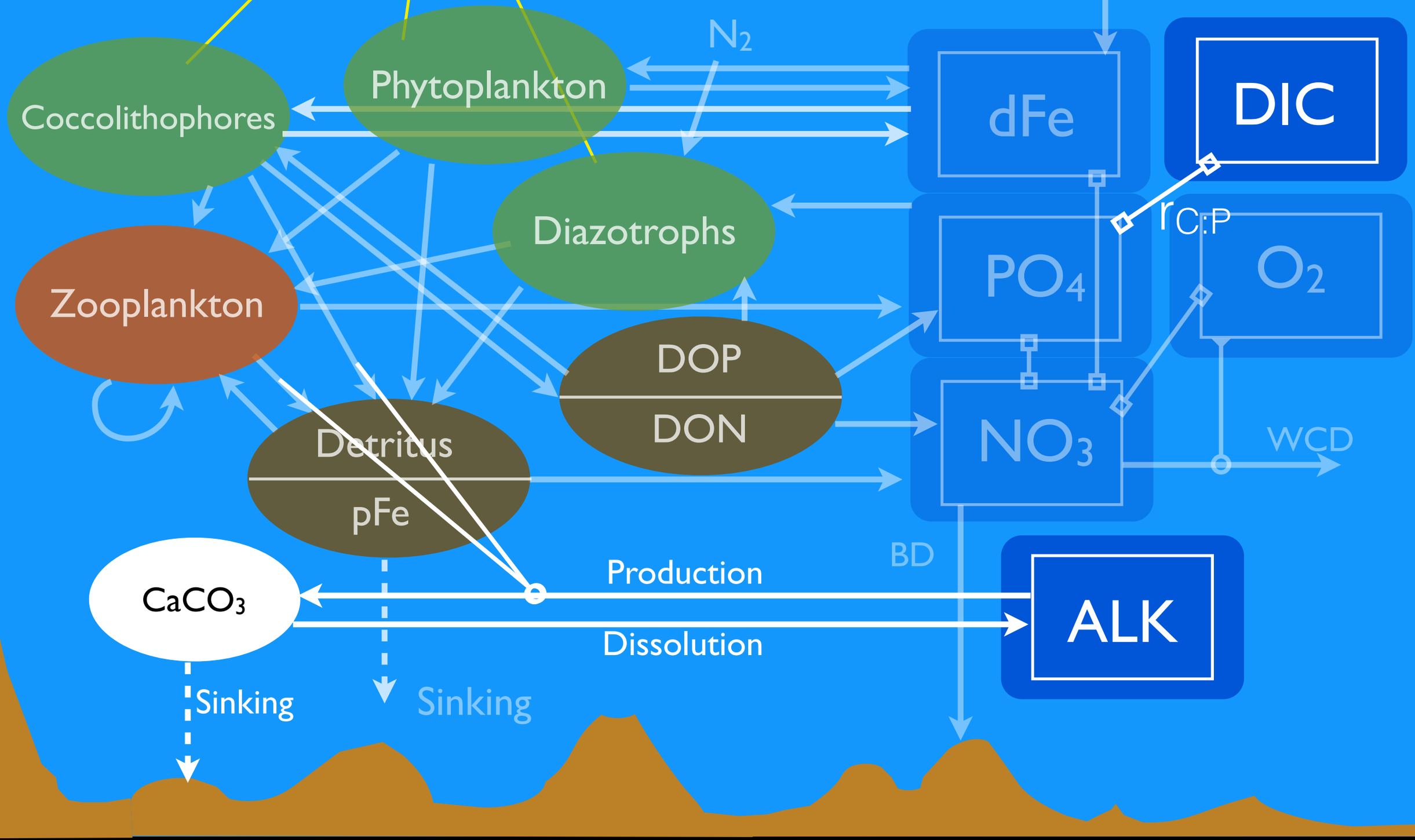
MOBI 2.0

3.3 model years/CPU min
or
440 model years / day

N=15

O_npzd
O_npzd_o2
O_npzd_nitrogen
O_npzd_iron

O_carbon
O_npzd_alk
O_npzd_caco3



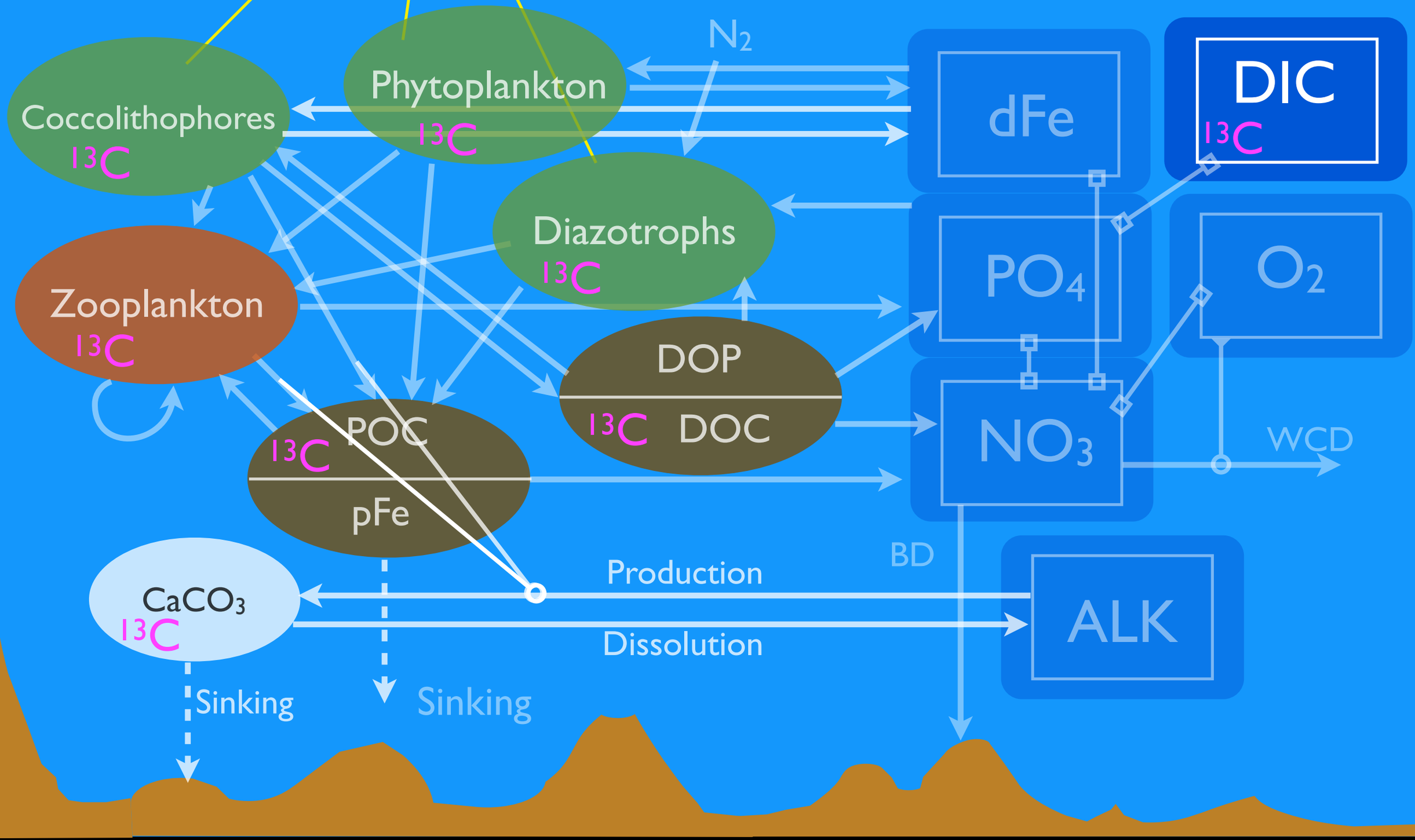
MOBI 2.0

4.1 model years/CPU min
or
350 model years / day

N=23

O_npzd
O_npzd_o2
O_npzd_nitrogen
O_npzd_iron

O_carbon
O_npzd_alk
O_npzd_caco3
O_carbon_13



MOBI 2.0

N=15

O_npzd
O_npzd_o2
O_npzd_nitrogen
O_npzd_nitrogen_15

O_2

Air-Sea Gas Exchange

N_2 $\delta^{15}N_{N2}=0$

$\varepsilon_P \simeq -5‰$

Phytoplankton
^{15}N

$\varepsilon_{NF} \simeq -1‰$

Diazotrophs
^{15}N

ε_G

ε_G

Zooplankton
^{15}N

$\varepsilon_E = -6‰$

Dissolved
DOP
DON^{15}N
Organic

Detritus
^{15}N

PO_4

$r_{P:N}$

$r_{O:N}$

O_2

O_2<5μM

NO_3
^{15}N

$\varepsilon_{WCD} \simeq -25‰$

$\varepsilon_{BD} \simeq -4‰$

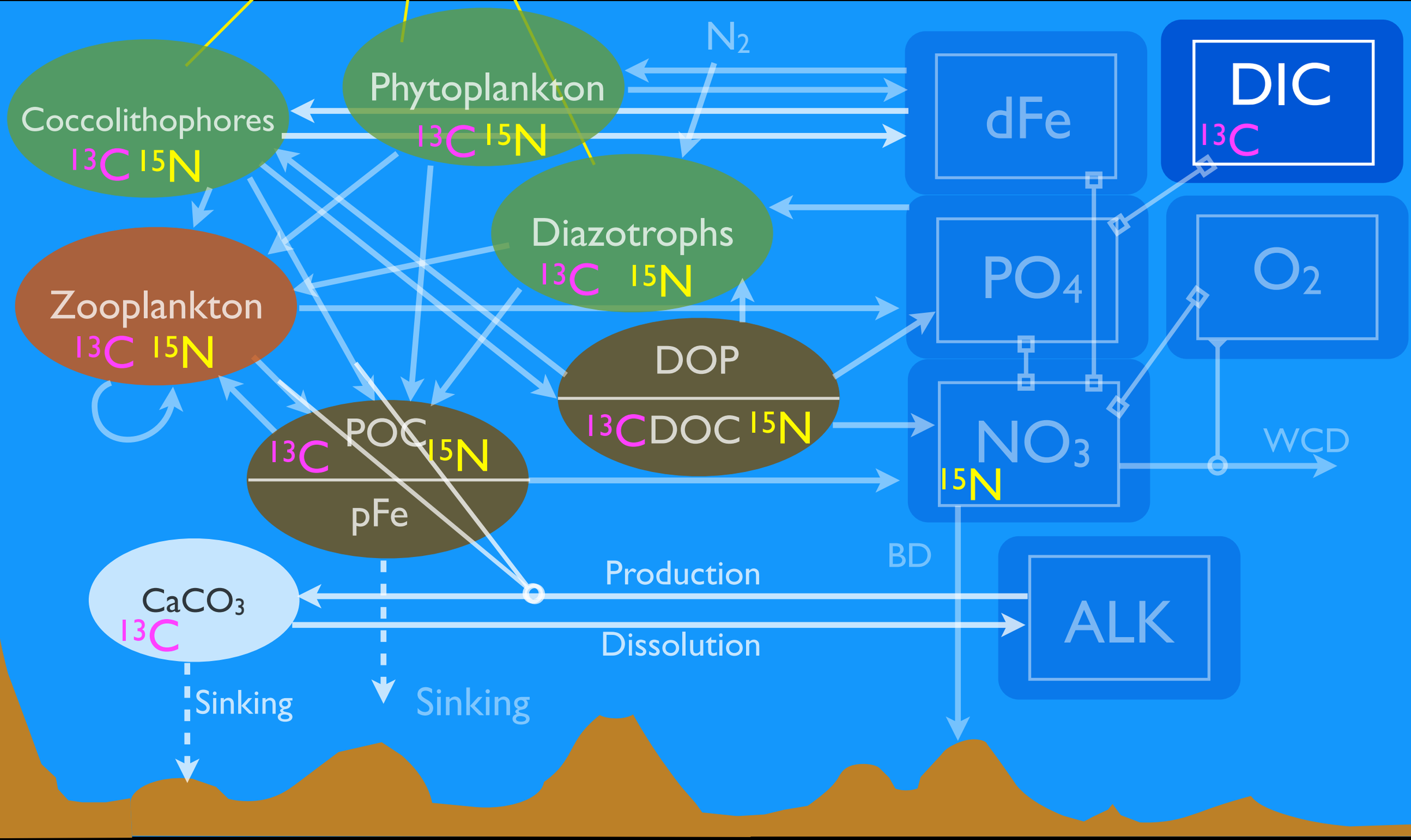
Subgrid-scale bathymetry

MOBI 2.0

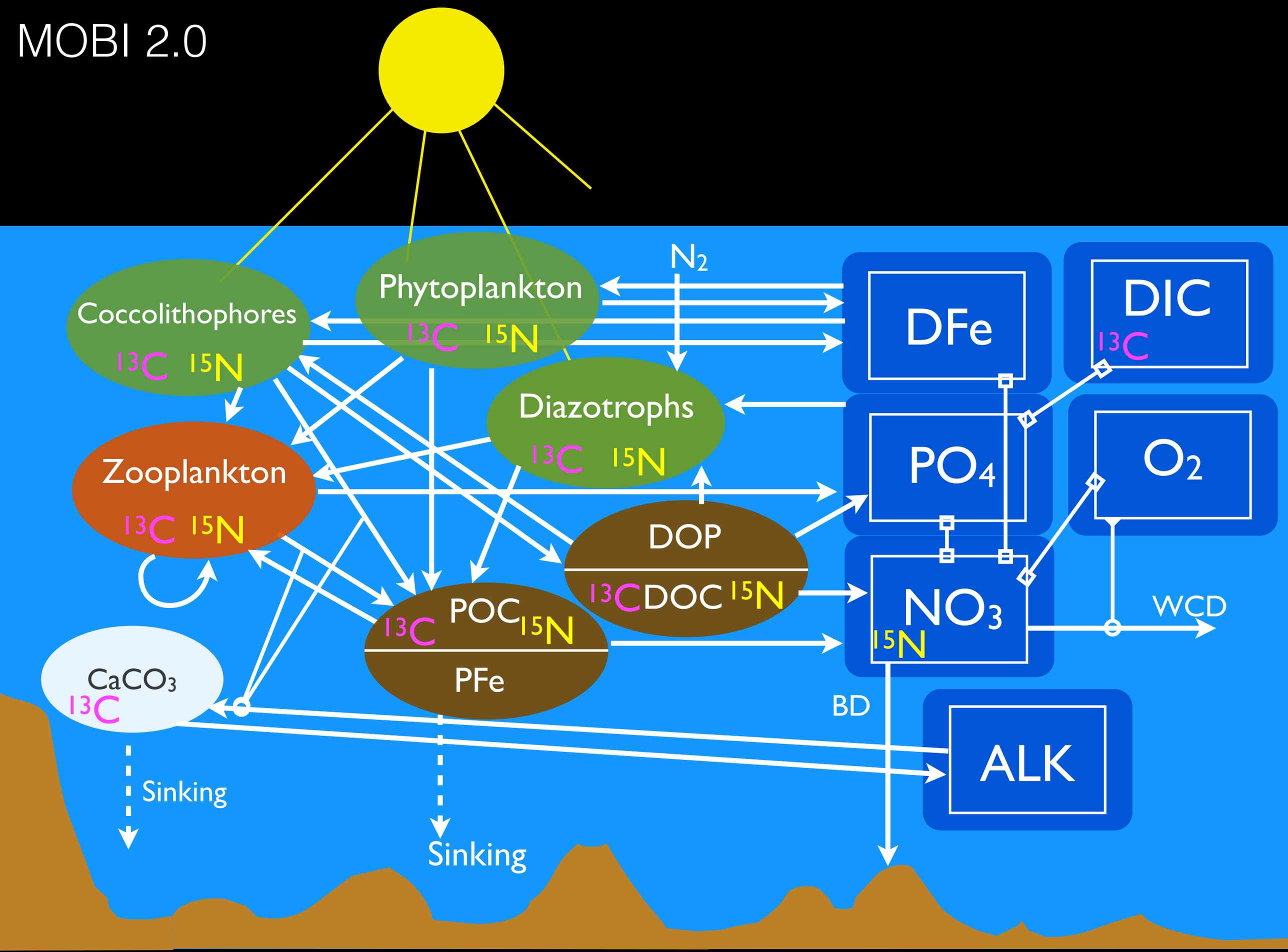
N=30

O_npzd
O_npzd_o2
O_npzd_nitrogen
O_npzd_nitrogen_15
O_npzd_iron

O_carbon
O_npzd_alk
O_npzd_caco3
O_carbon_13



MOBI 2.0


Coccolithophores
13C 15N
Phytoplankton
13C 15N
N2
Diazotrophs
13C 15N
Zooplankton
13C 15N
DOP
13CDOC 15N
POC 13C 15N
PFe
CaCO3
13C
Sinking
Sinking
DFe
DIC
13C
PO4
O2
NO3
15N
WCD
BD
ALK

MOBI 2.0

O_2

^{13}C CO_2

N_2

Coccolithophores

^{13}C ^{15}N

Phytoplankton

^{13}C ^{15}N

Diazotrophs

^{13}C ^{15}N

Zooplankton

^{13}C ^{15}N

DOP

^{13}C DOC ^{15}N

POC ^{13}C ^{15}N

PFe

$CaCO_3$

^{13}C

DFe

DIC

^{13}C ^{14}C

PO_4

O_2

NO_3

^{15}N

WCD

BD

ALK

Sinking

Sinking