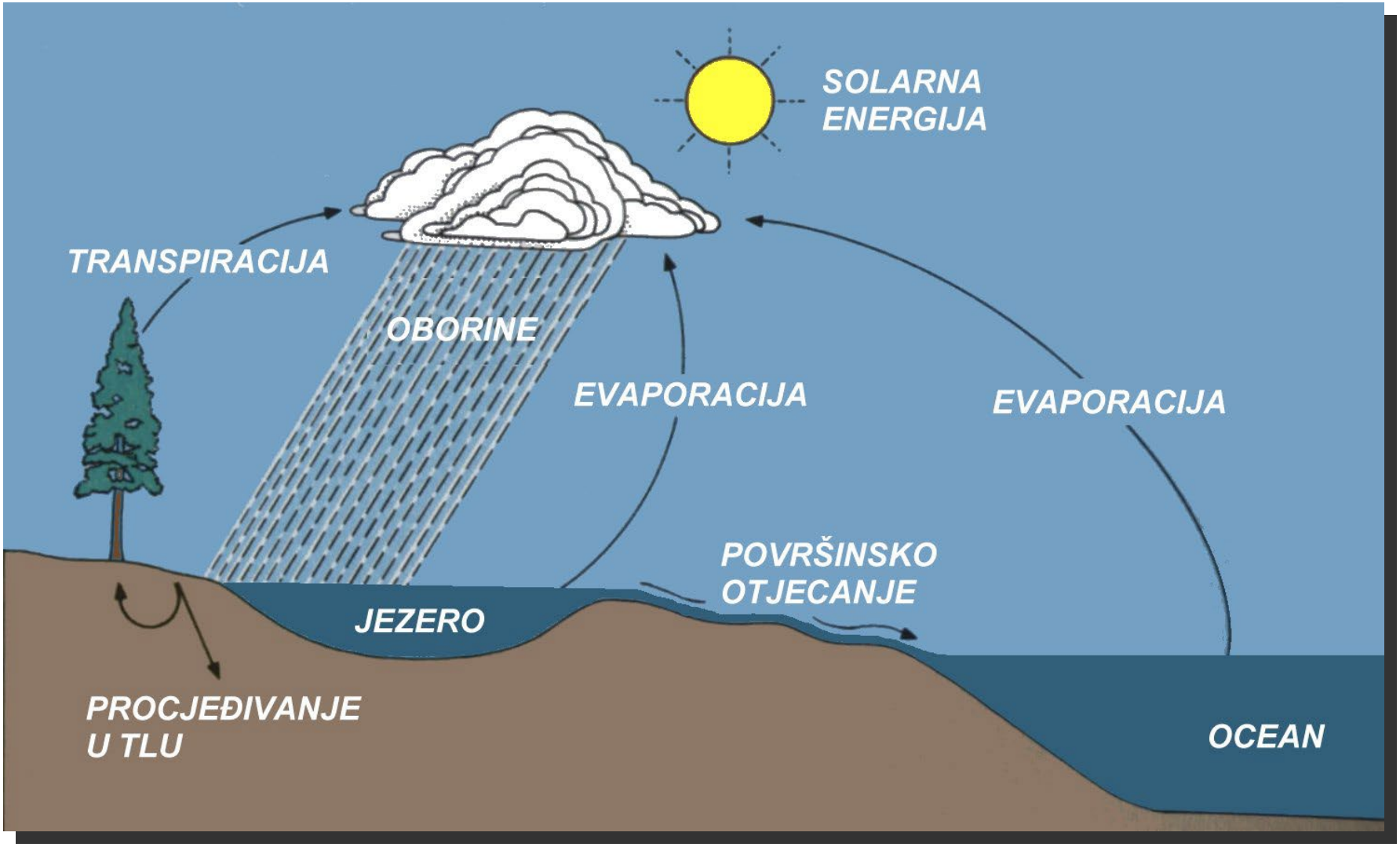
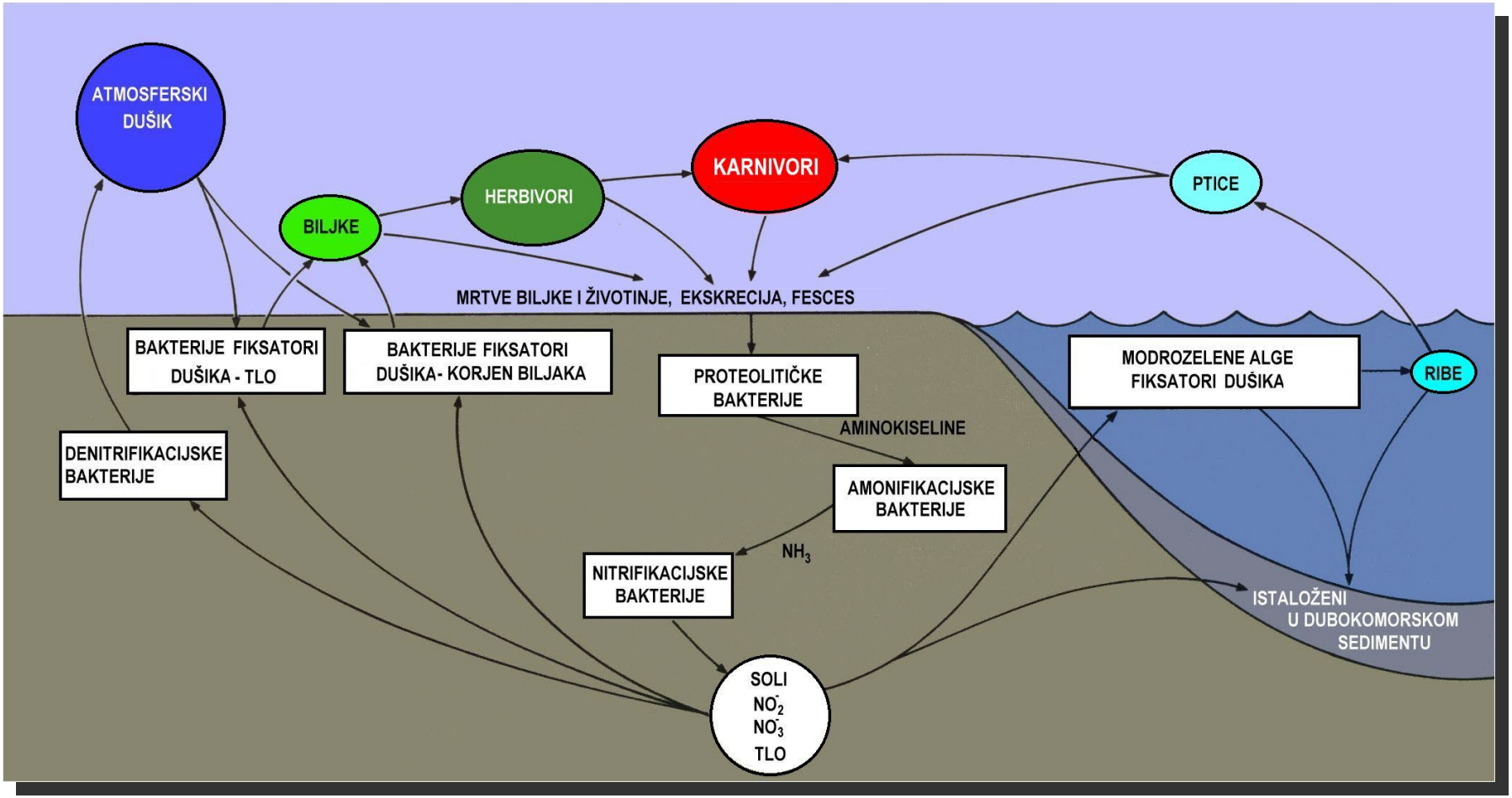
BIOGEOKEMIJSKI CIKLUSI I GLOBALNE PROMJENE

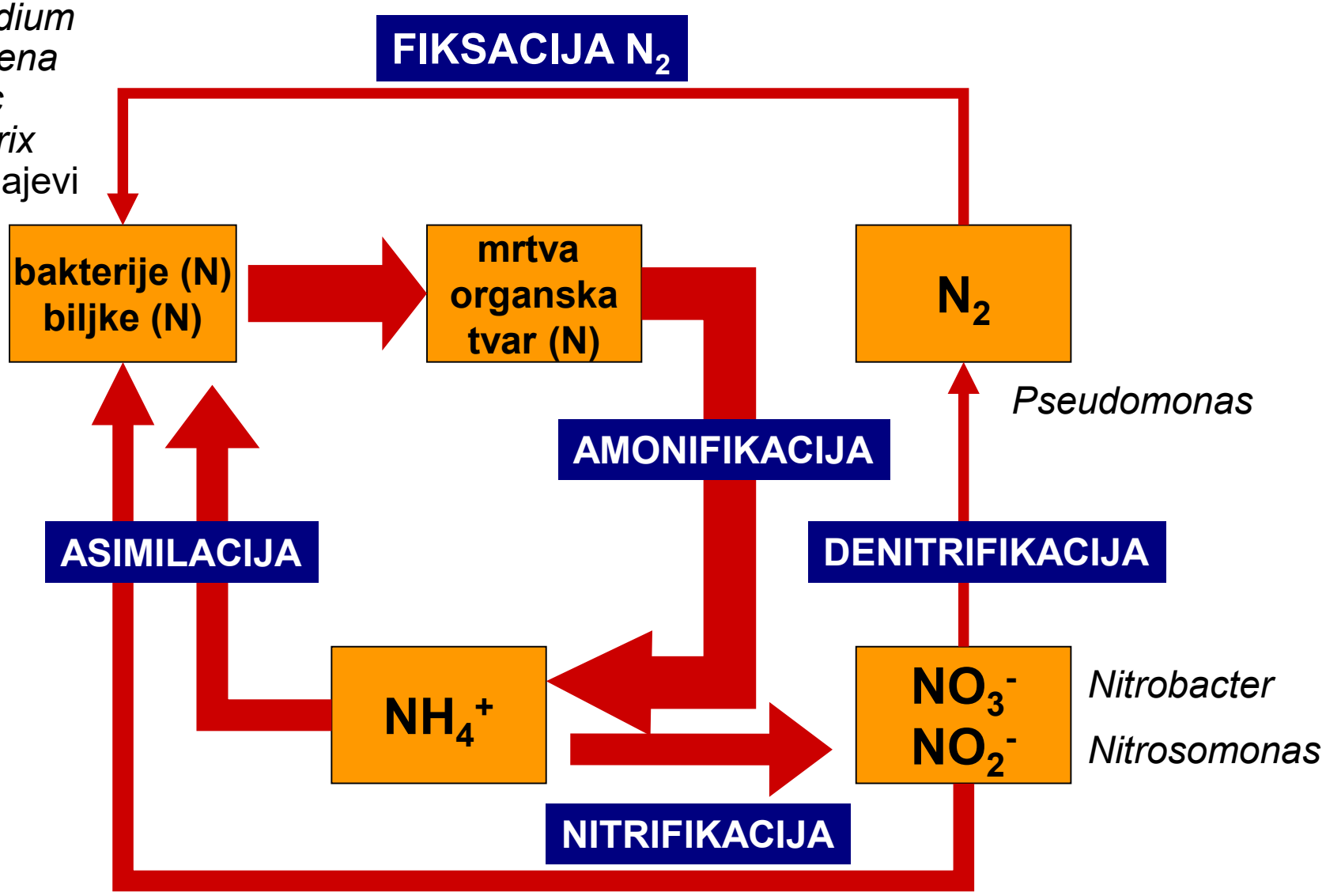
CIKLUS VODE


SOLARNA ENERGIJA
TRANSPIRACIJA
OBORINE
EVAPORACIJA
EVAPORACIJA
POVRŠINSKO OTJECANJE
JEZERO
PROCJEĐIVANJE U TLU
OCEAN

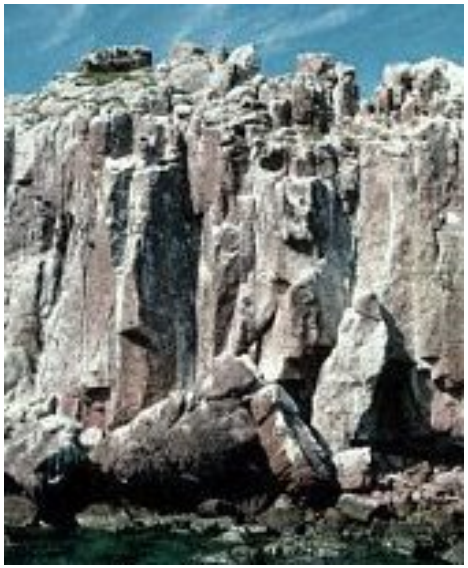
CIKLUS DUŠIKA



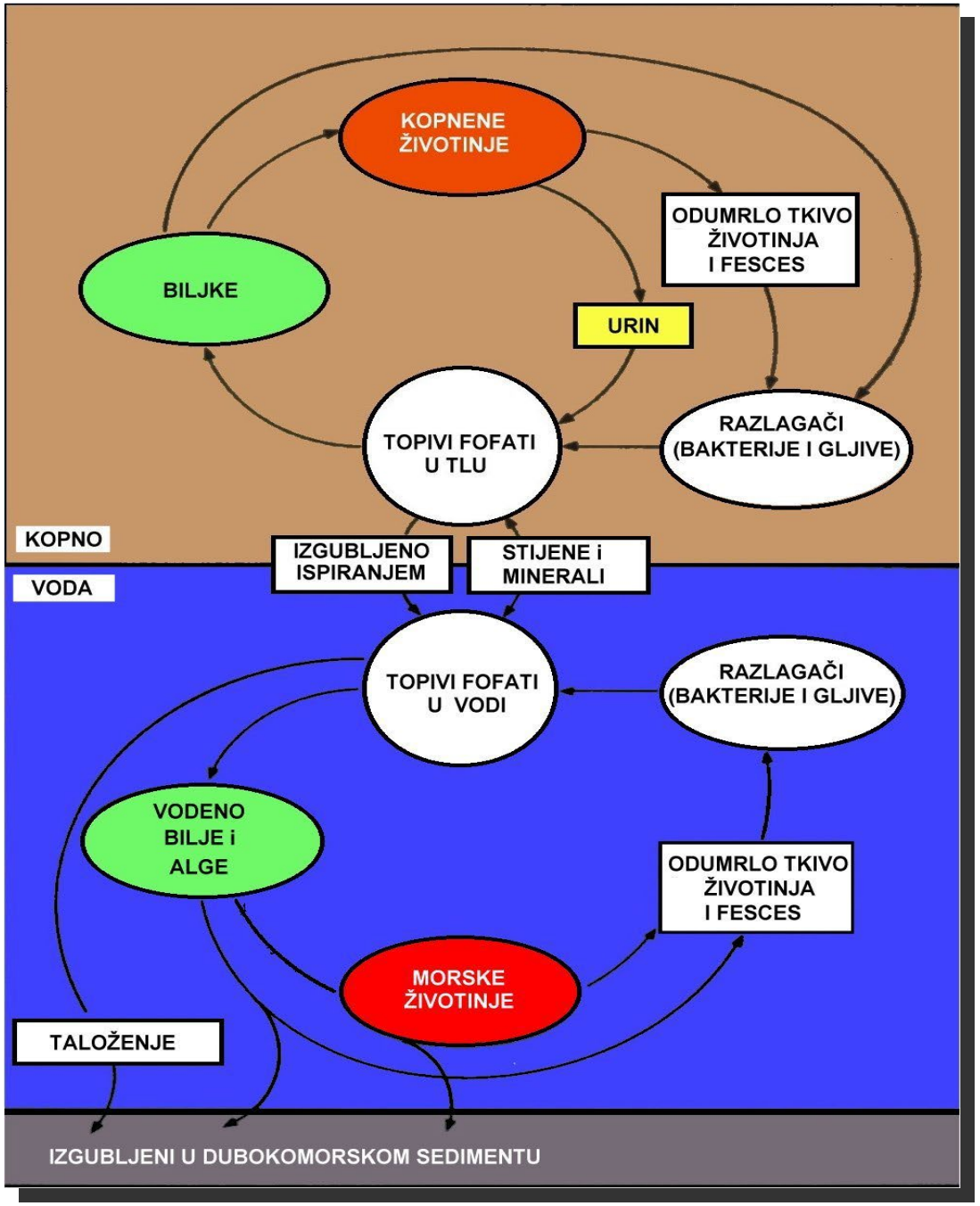
Rhizobium
Azotobacter
Clostridium
Anabaena
Nostoc
Calothrix
neki lišajevi



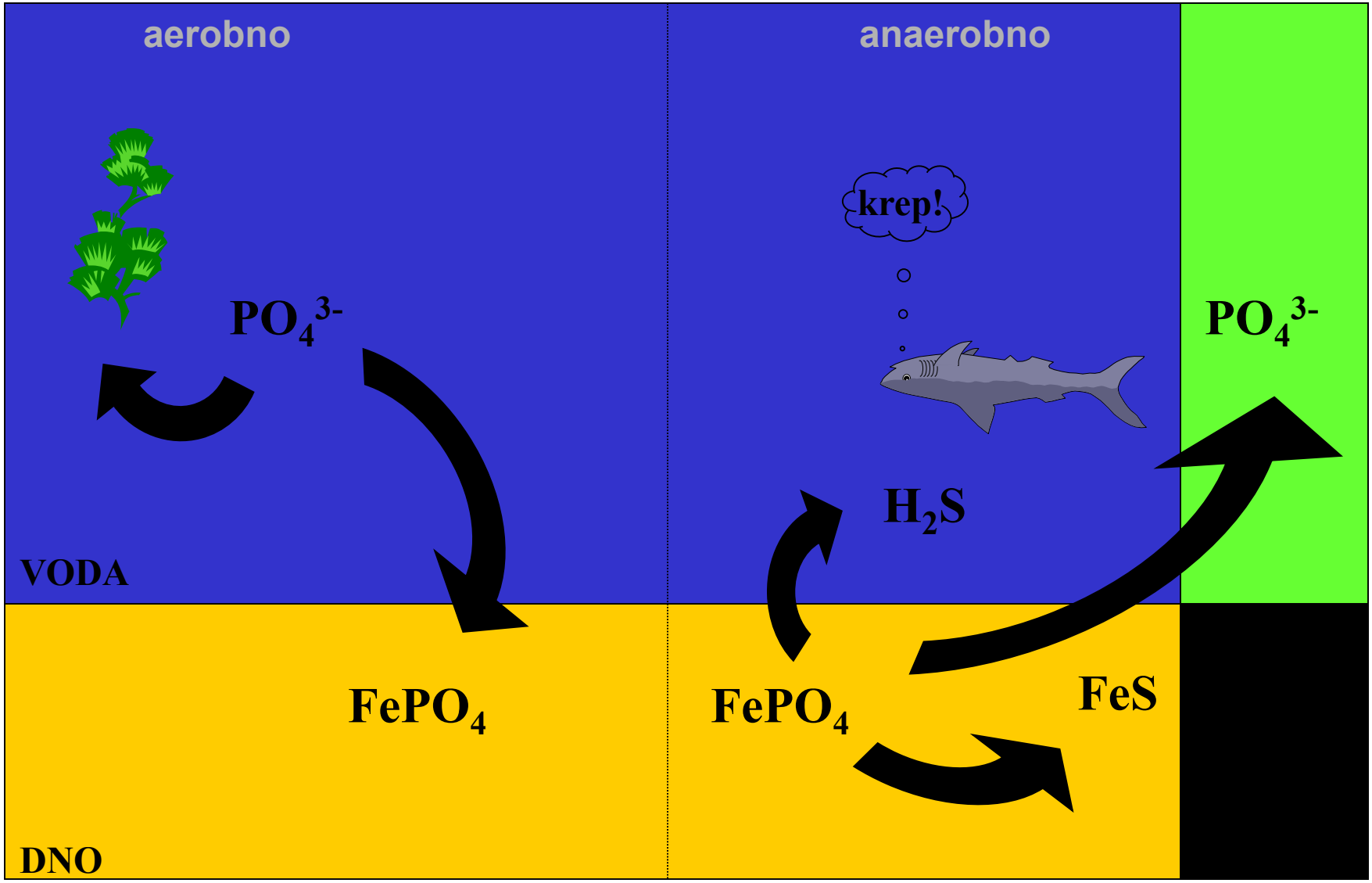
CIKLUS FOSFORA



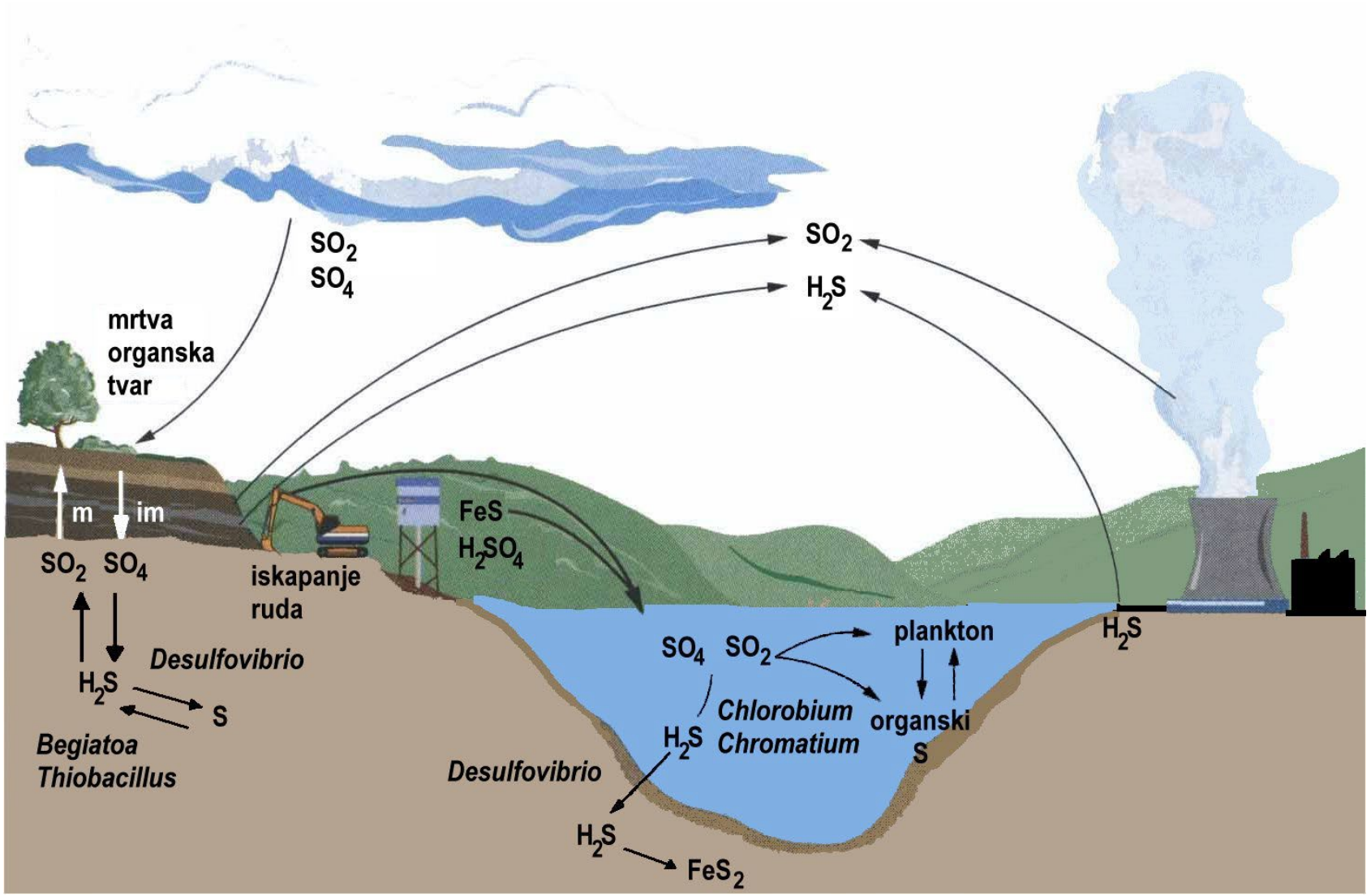
guano

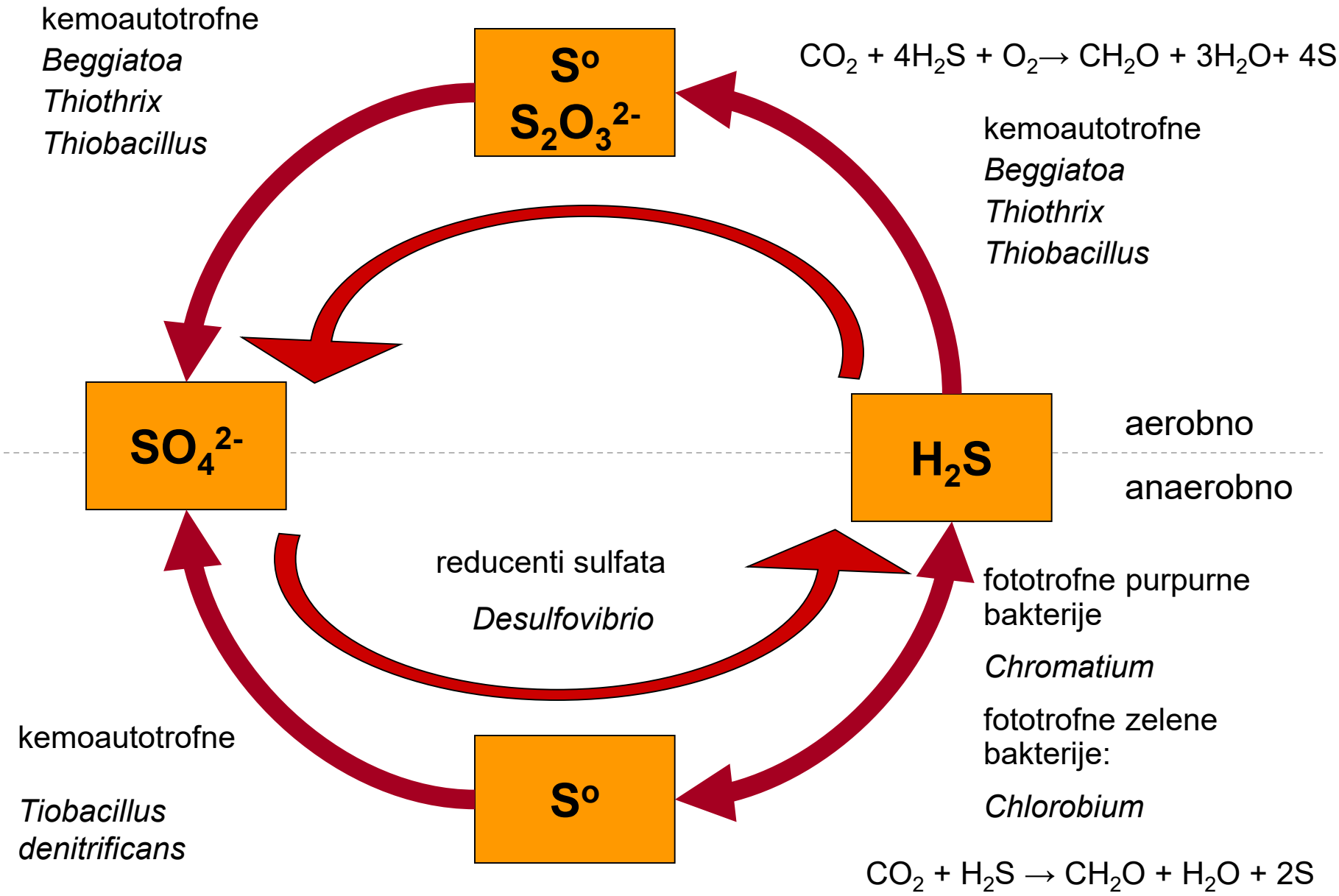


u vodi...

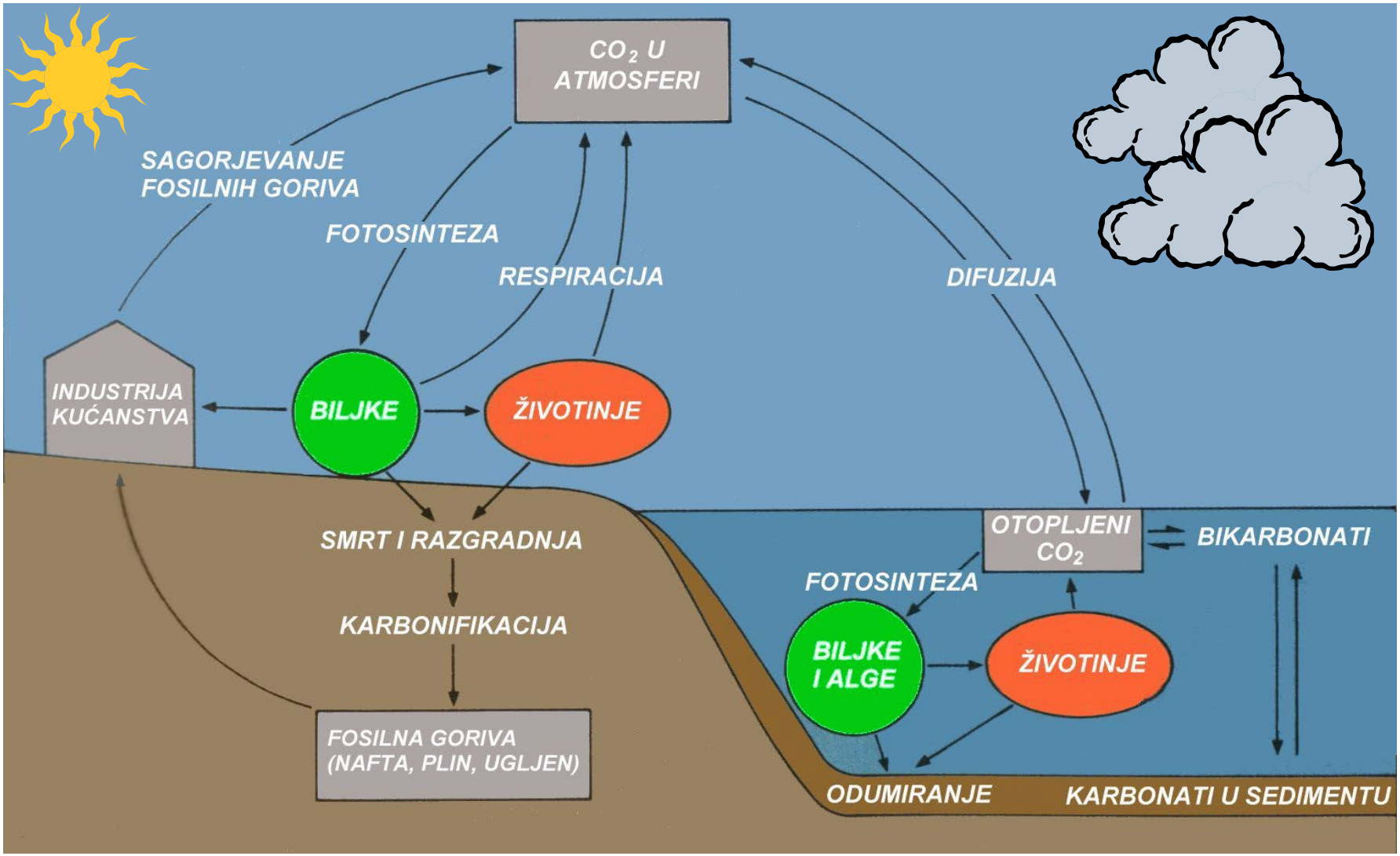

aerobno
anaerobno
krep!
PO_4^{3-}
PO_4^{3-}
H_2S
VODA
$FePO_4$
$FePO_4$
FeS
DNO

CIKLUS SUMPORA



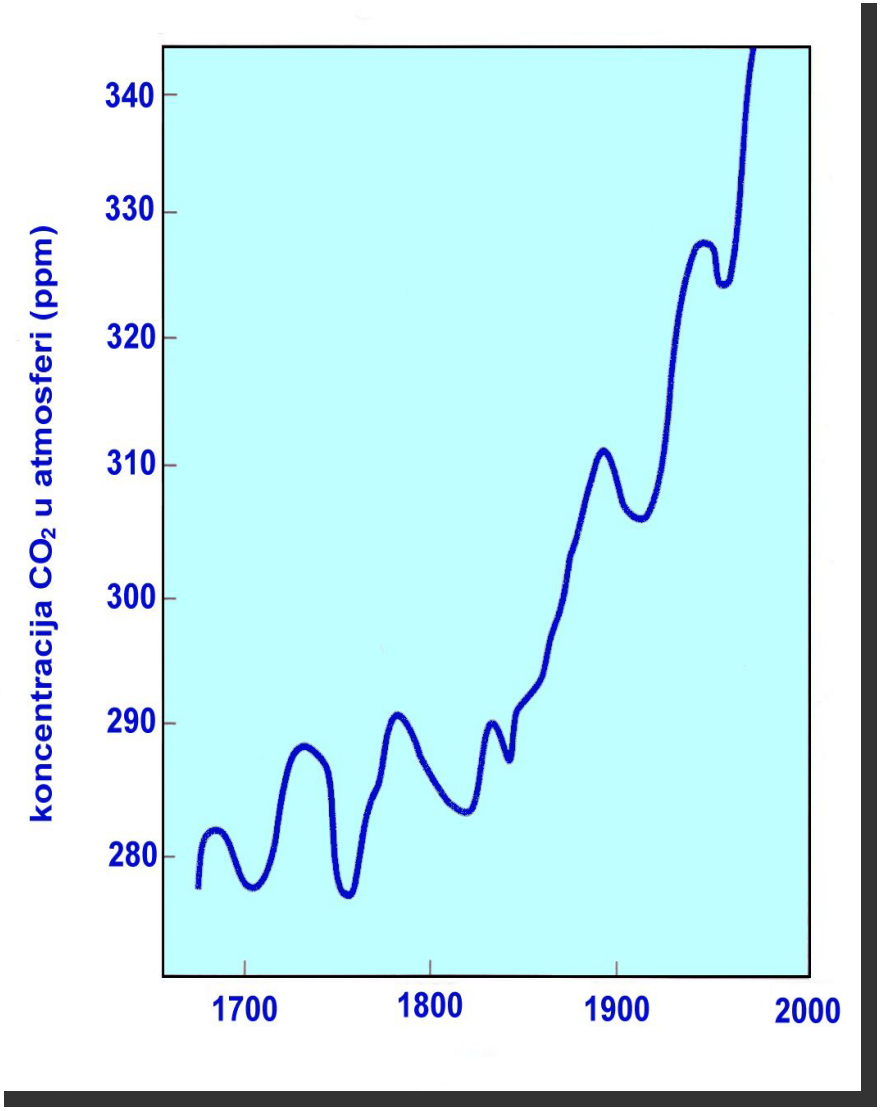

kemoautotrofne
Beggiatoa
Thiothrix
Thiobacillus
S°
S2O3 2-
CO2 + 4H2S + O2→ CH2O + 3H2O+ 4S
kemoautotrofne
Beggiatoa
Thiothrix
Thiobacillus
SO4 2-
H2S
aerobno
anaerobno
reducenti sulfata
Desulfovibrio
fototrofne purpurne bakterije
Chromatium
fototrofne zelene bakterije:
Chlorobium
kemoautotrofne
Tiobacillus denitrificans
S°
CO2 + H2S → CH2O + H2O + 2S

CIKLUS UGLJIKA

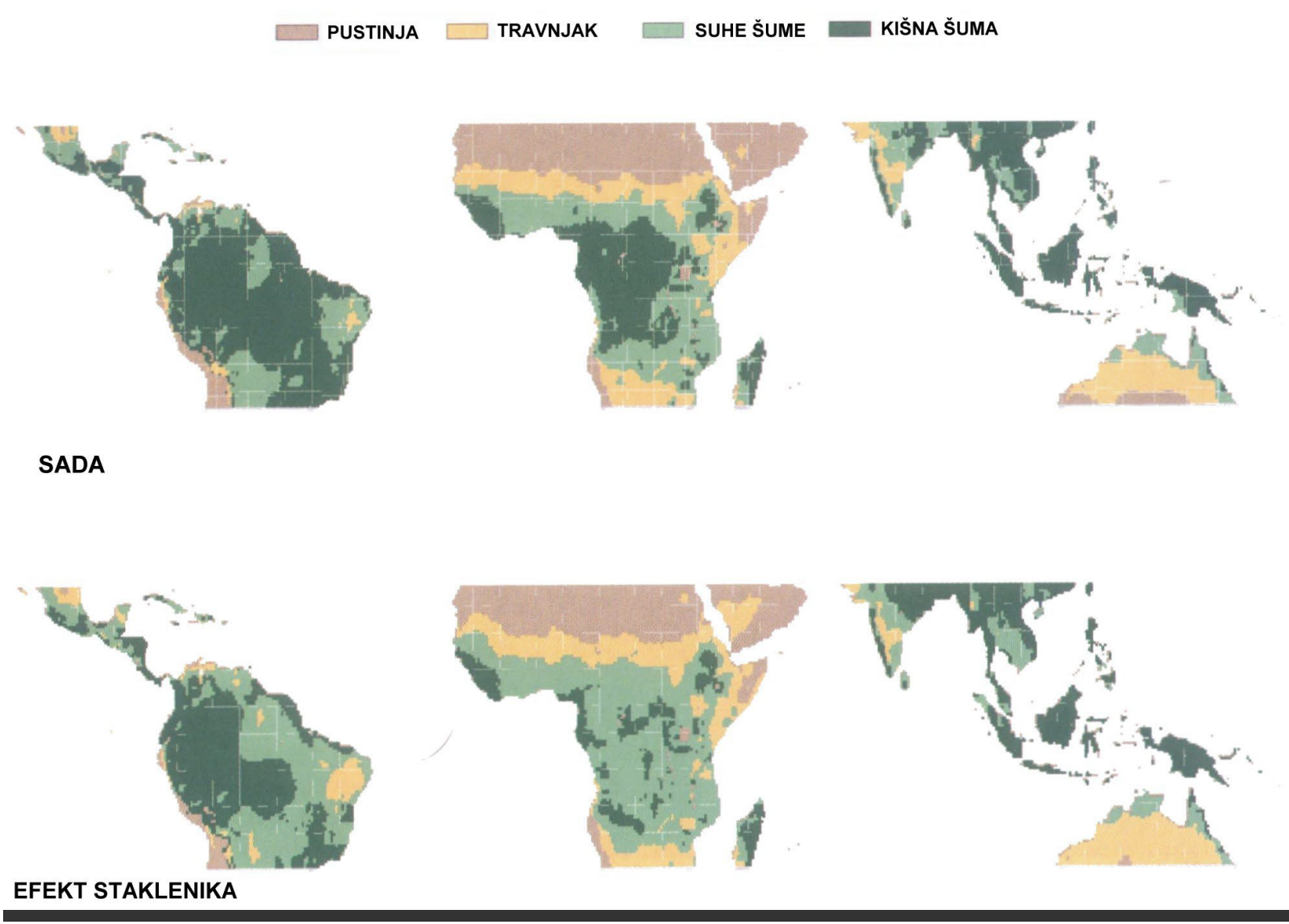


.... globalno zatopljenje

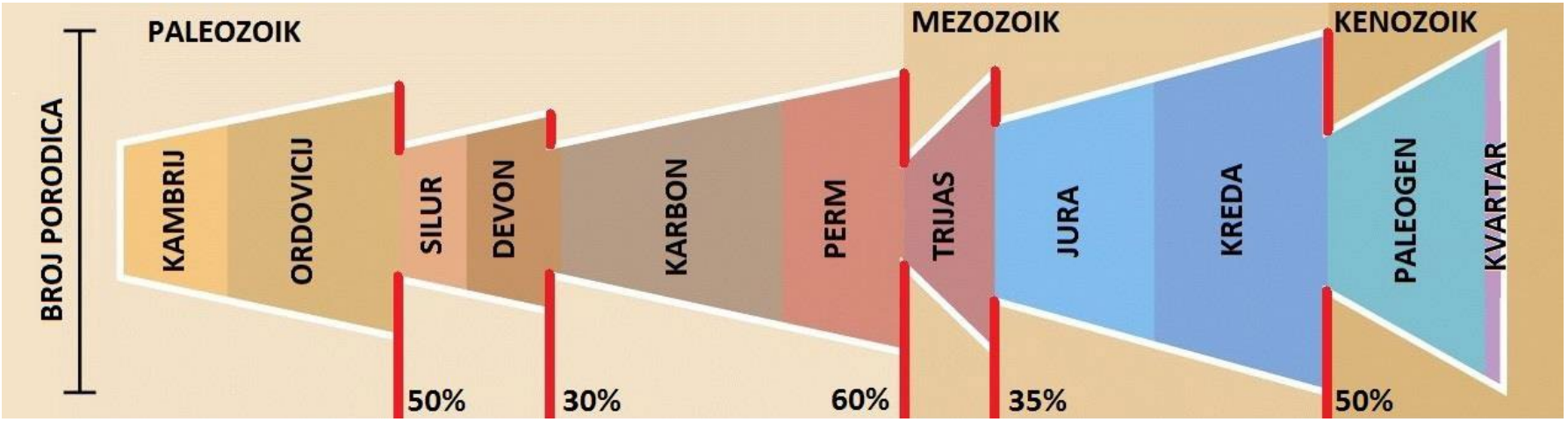
- Koncentracija CO_2 u atmosferi povećala se u zadnjih 100 godina oko 25%.
- Velika uporaba fosilnih goriva, uništavanje šuma
- “efekt staklenika”



.... globalno zatopljenje



.... globalno zatopljenje i masovno izumiranje

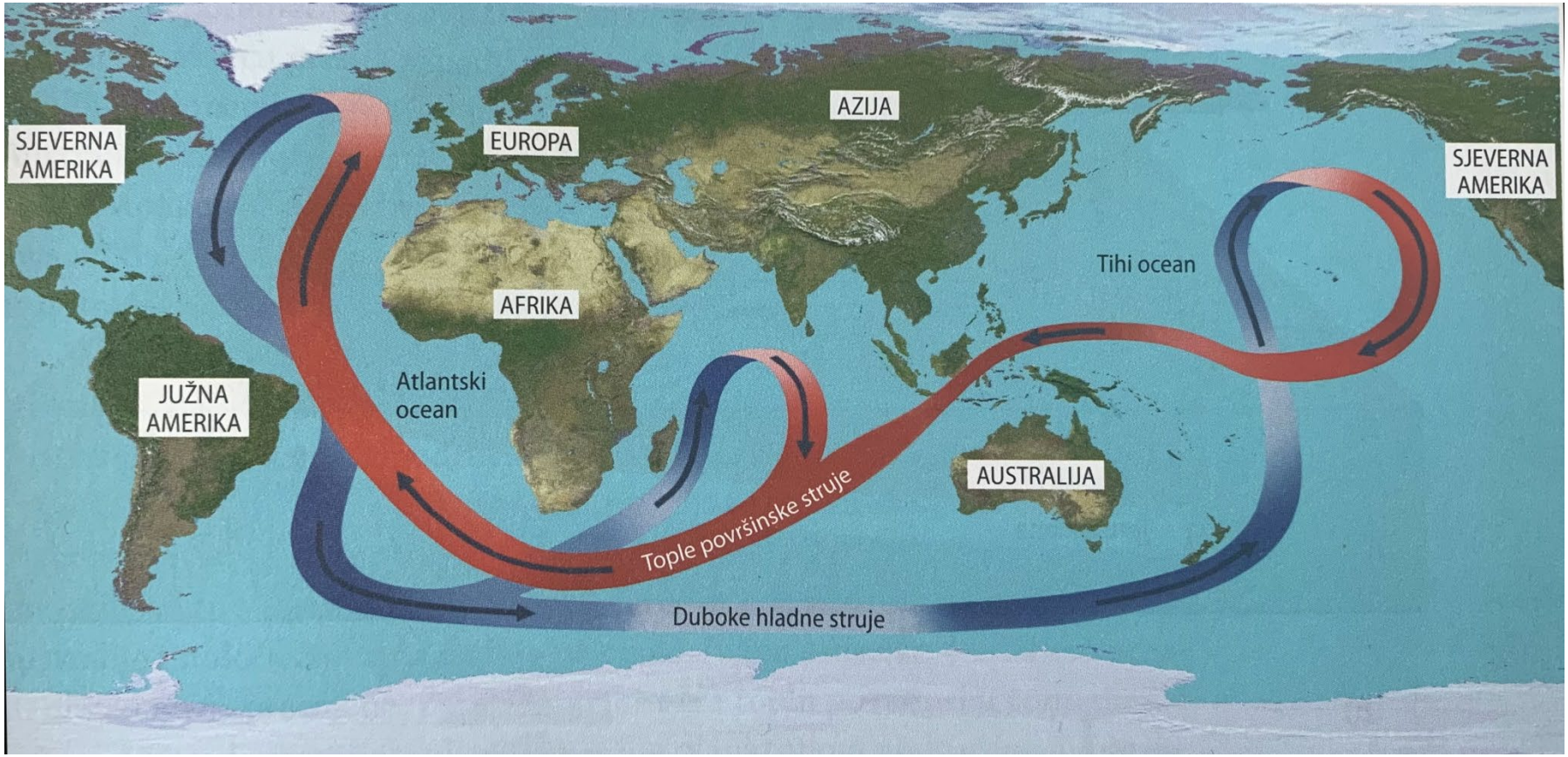


izumiranje životinjskih porodica tijekom masovnih izumiranja

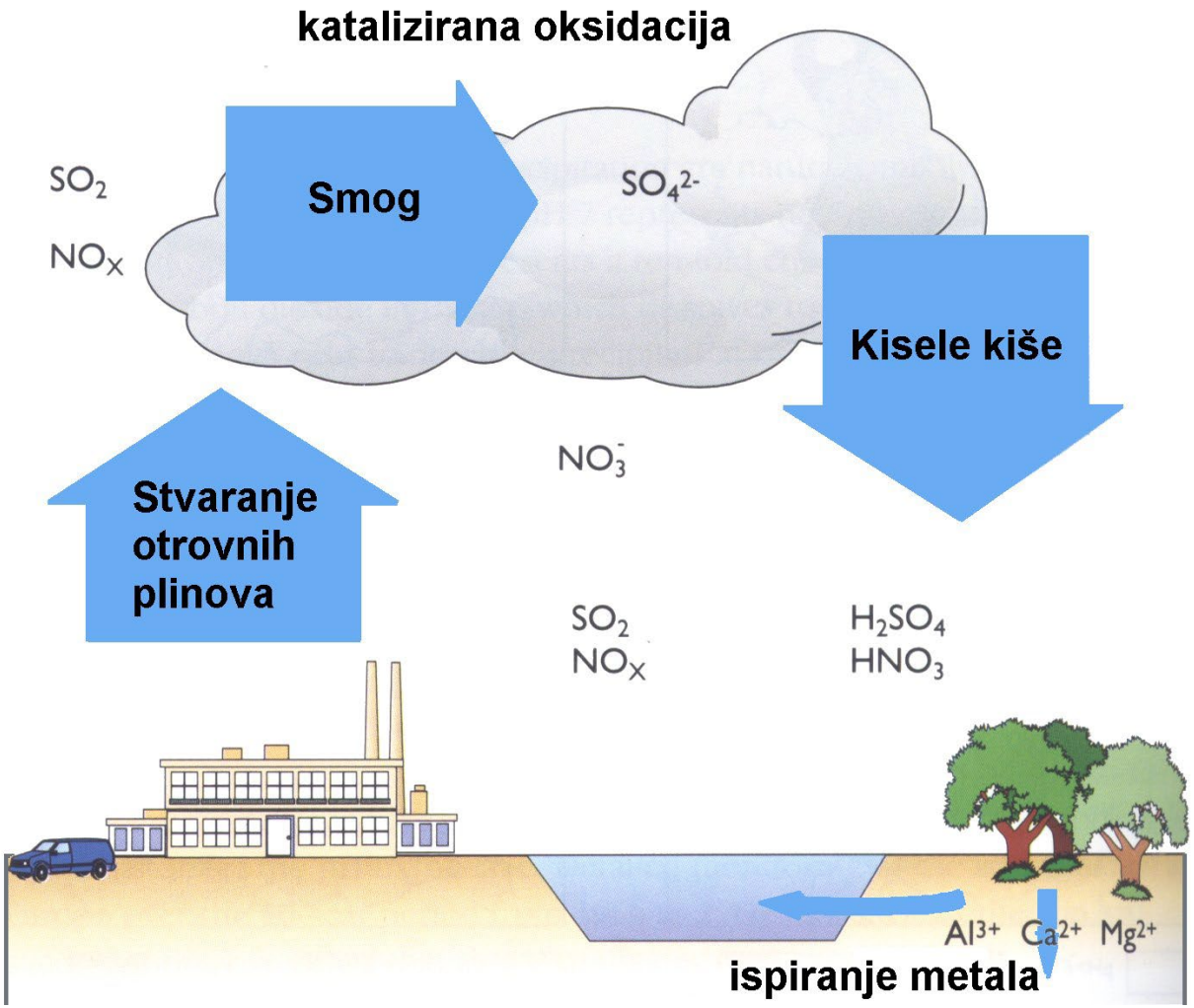
- izumiranje u Permu – posljedica globalnog zagrijavanja uslijed pojačane vulkanske aktivnosti

Penn, J. L., Deutsch, C., Payne, J. L., & Sperling, E. A. (2018). Temperature-dependent hypoxia explains biogeography and severity of end-Permian marine mass extinction. Science, 362 (6419).

… golfska struja



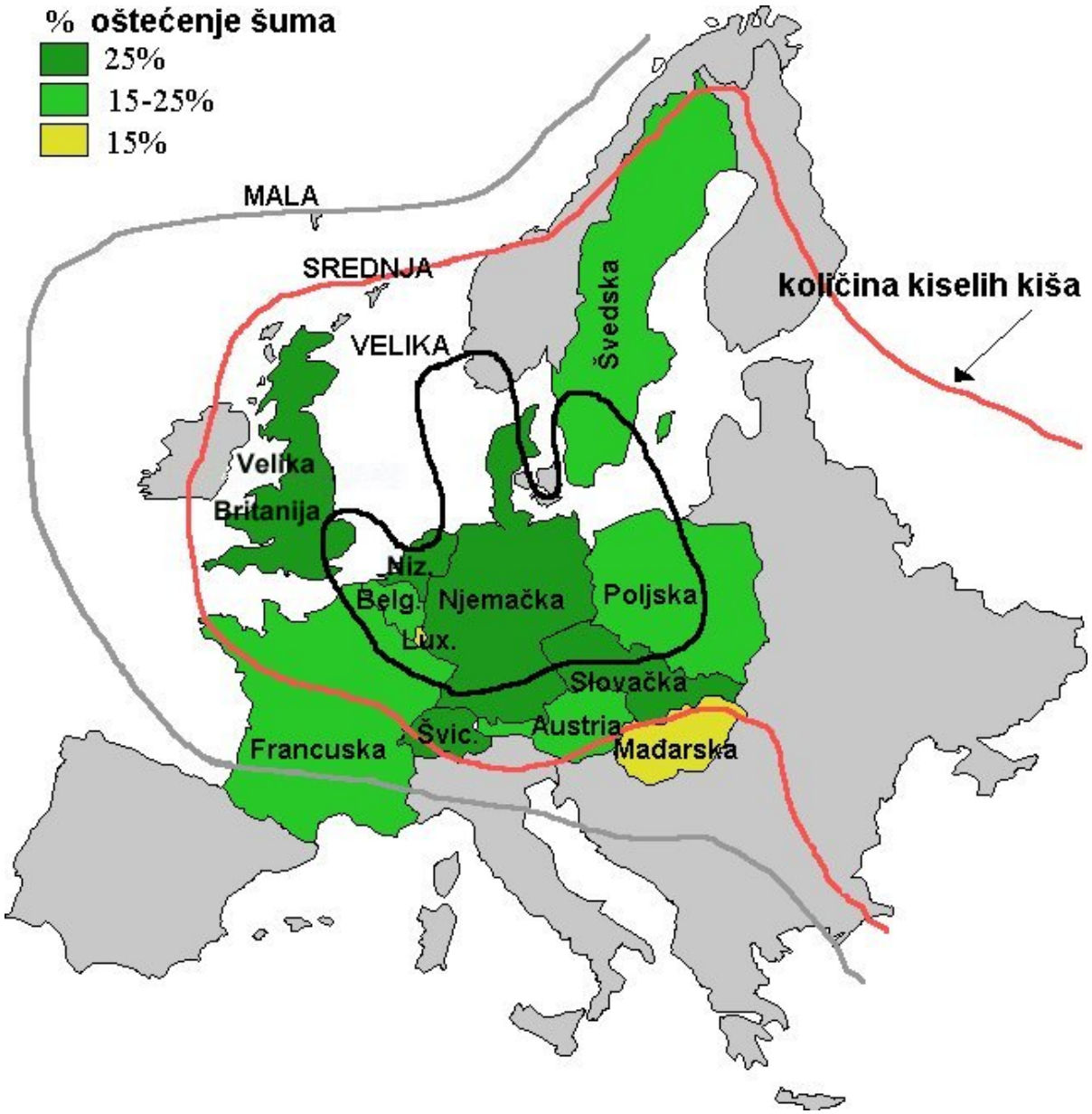
… kisele kiše


katalizirana oksidacija
SO_2
NO_X
Smog
SO_4^{2-}
Kisele kiše
NO_3^-
Stvaranje otrovnih plinova
SO_2
NO_X
H_2SO_4
HNO_3
Al^{3+} Ca^{2+} Mg^{2+}
ispiranje metala

... Emisija glavnih onečišćujućih tvari u Hrvatskoj 1999. g.

VRSTE ZAGAĐENJA	SO_2 (t/god.)	NO_x (t/god.)
Izgaranje u termoelektranama i u postrojenjima za pretvorbu energije	61.526	14.393
Izgaranje u neindustrijskim ložištima	6.158	3.820
Izgaranje u industriji	14.475	8.551
Proizvodni procesi	1.281	1.612
Cestovni transport	4.075	28.634
Ostali pokretni izvori i strojevi	2.984	15.018
Obrada i odlaganje otpada	169	43
Poljoprivreda	0	0
Ostali izvori	55	254
UKUPNO	**90.723**	**72.326**

… kisele kiše i oštećenje šuma



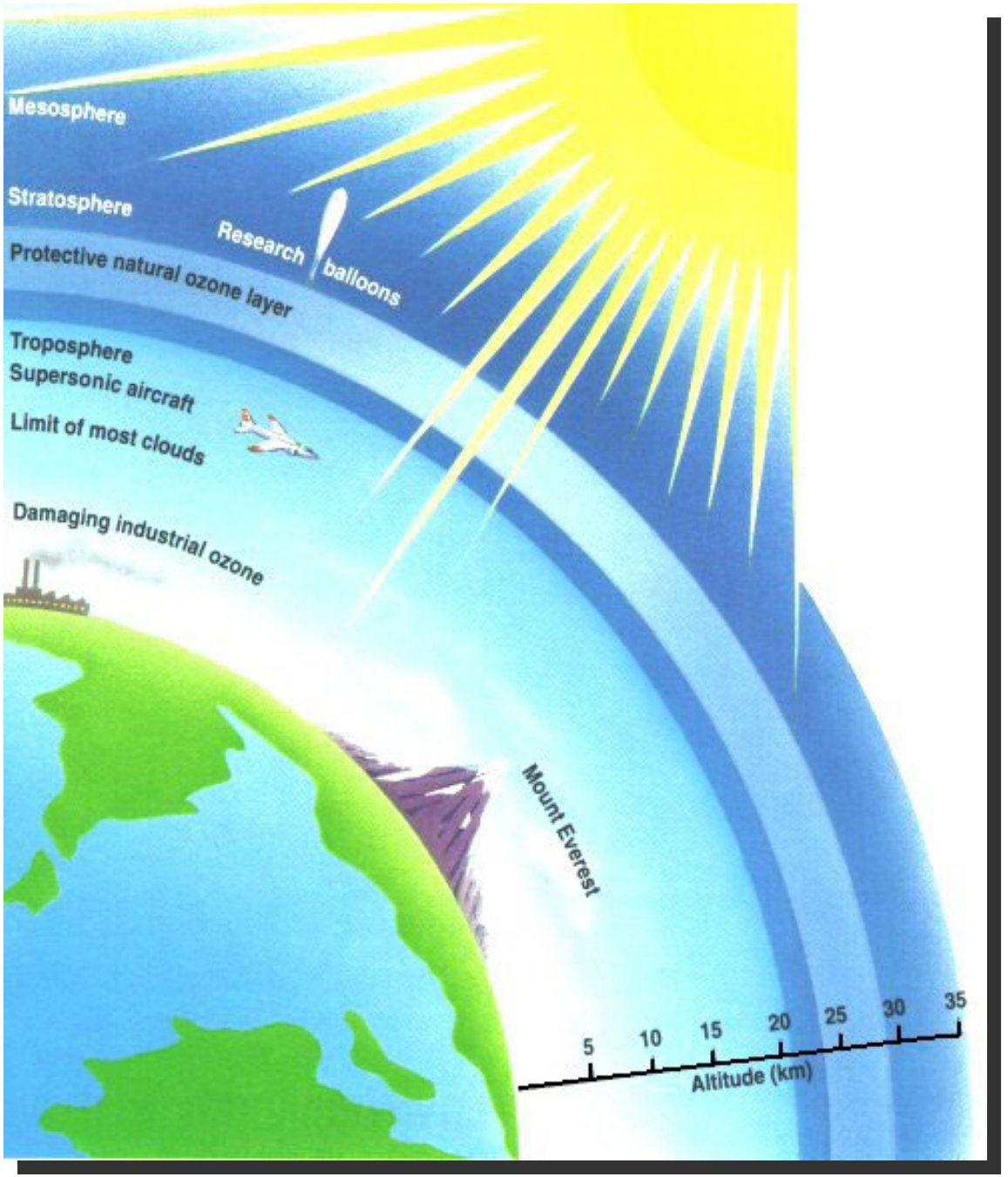
.... O_3 ozon

- u stratosferi
- apsorbira UV- zračenje

UV

$O_3 \rightarrow O + O_2$

$O_3 +$ IR



.... ozonske “rupe”

- **upotreba freona:**
  - klorfluorugljici - sprejevi, uređaji za hlađenje
  - 1 slobodni radikal klora može uništiti 100 000 molekula ozona!

$$CF_2Cl_3 \longrightarrow CF_2Cl + Cl$$
$$Cl + O_3 \longrightarrow ClO + O_2$$
$$ClO + O \longrightarrow Cl + O_2$$

- **let supersoničnih aviona (Concorde)**
- **detonacija nuklearnog oružja**
  - oslobađanje dušikovih oksida (NO)

$$NO + O_3 \longrightarrow NO_2 + O_2$$