

Feedbacks between the carbon cycle and other biogeochemical cycles

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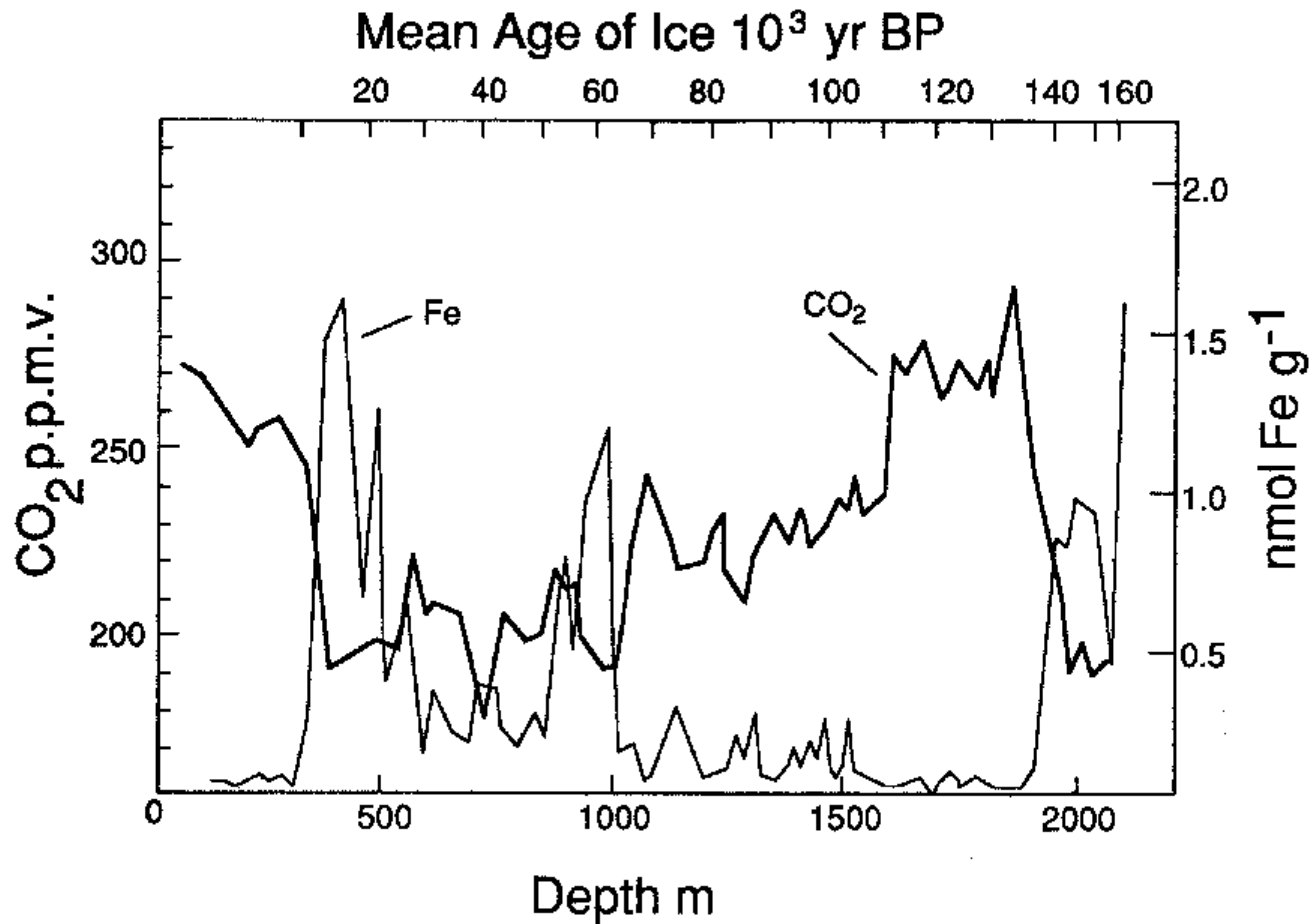
Carbon Pools in the Major Reservoirs on Earth

Table 5.1 Carbon pools in the major reservoirs on Earth

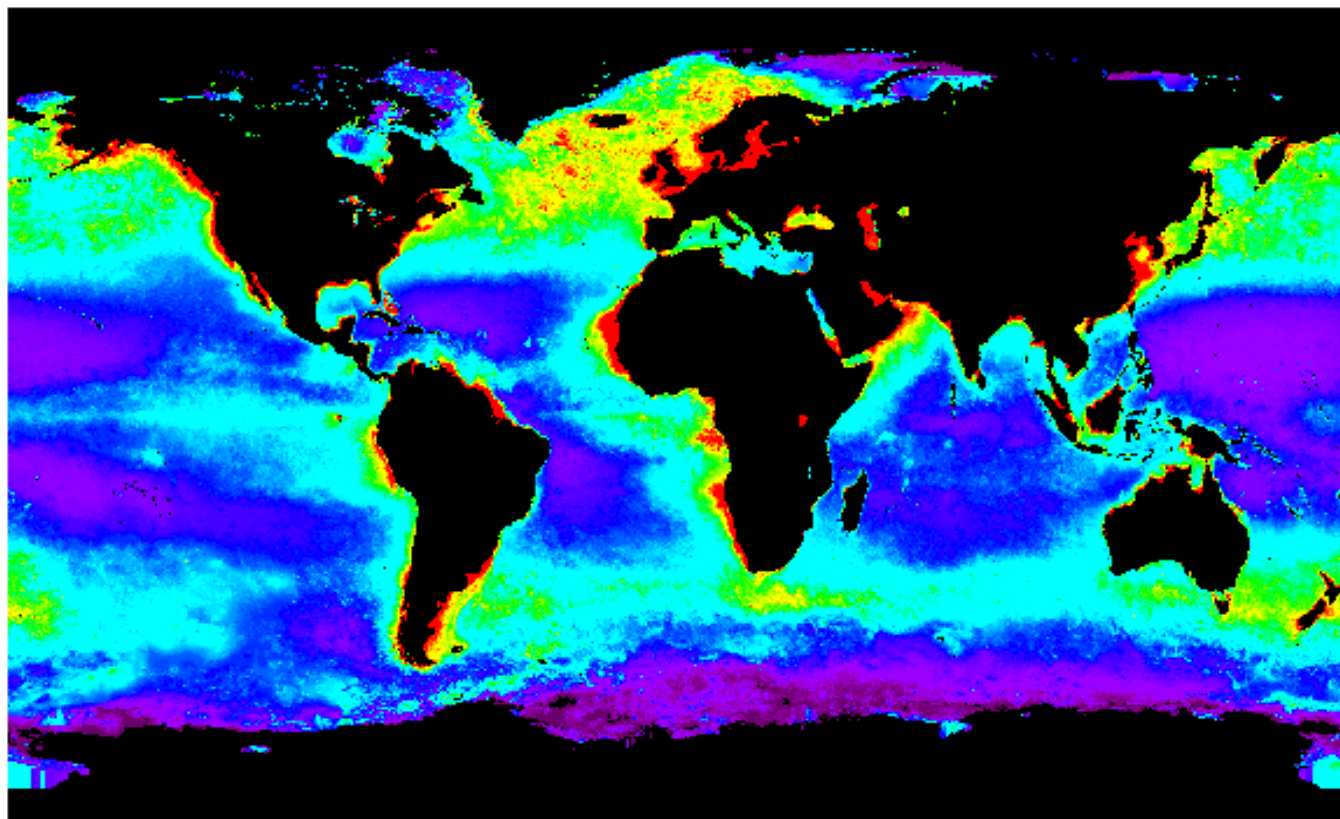
Pools	Quantity ($\times 10^{15}$ g)
Atmosphere	720
Oceans	38,400
Total inorganic	37,400
Surface layer	670
Deep layer	36,730
Total organic	1,000
Lithosphere	
Sedimentary carbonates	>60,000,000
Kerogens	15,000,000
Terrestrial biosphere (total)	2,000
Living biomass	600–1,000
Dead biomass	1,200
Aquatic biosphere	1–2
Fossil fuels	4,130
Coal	3,510
Oil	230
Gas	140
Other (peat)	250

From: Falkowski & Raven. Aquatic Photosynthesis. p. 130 (1997)

IRON AND ATMOSPHERIC CO₂ FROM VOSTOCK

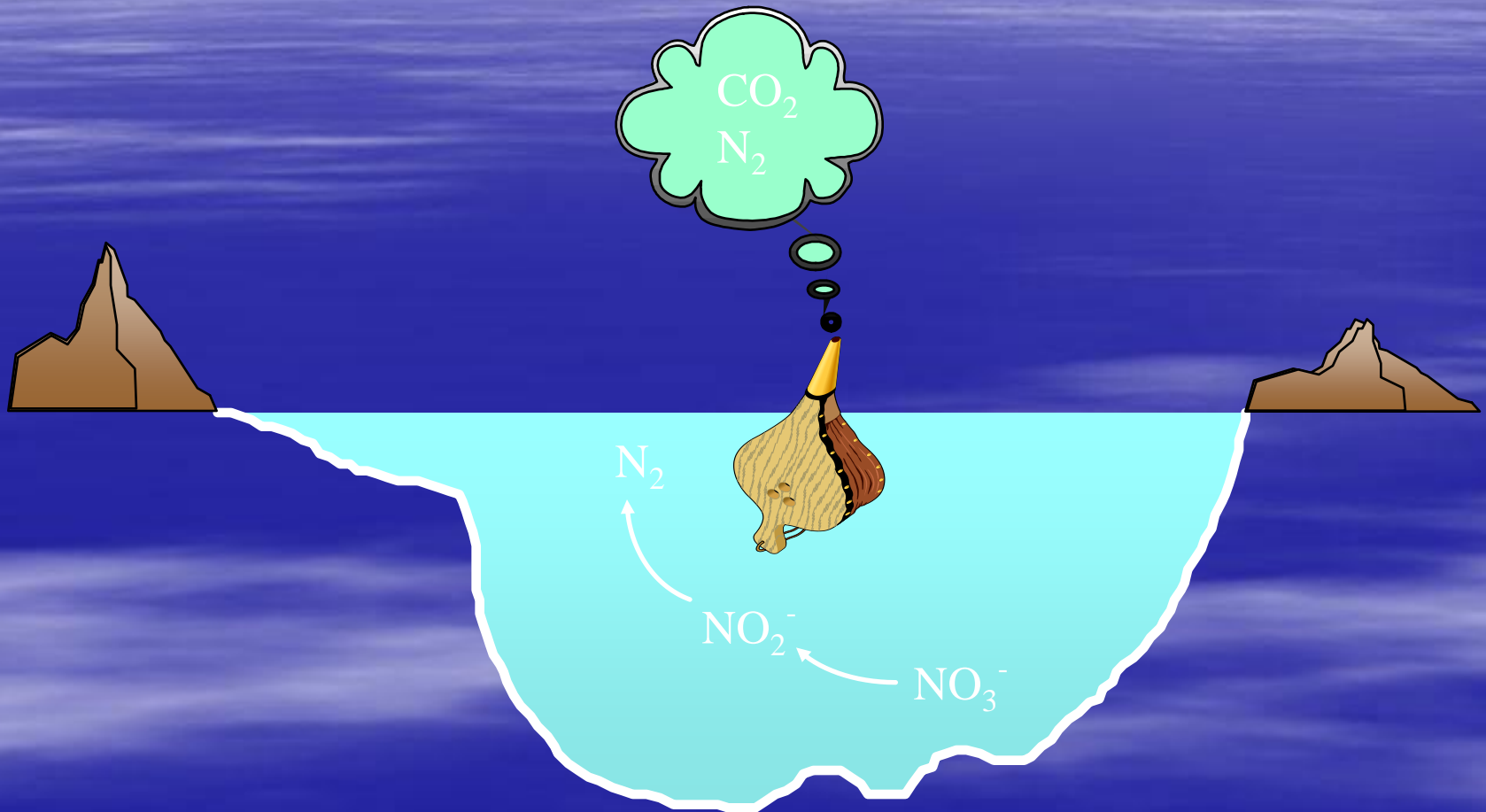


FROM MARTIN ET AL, PALEOCEAN. 5,1-13 (1990)

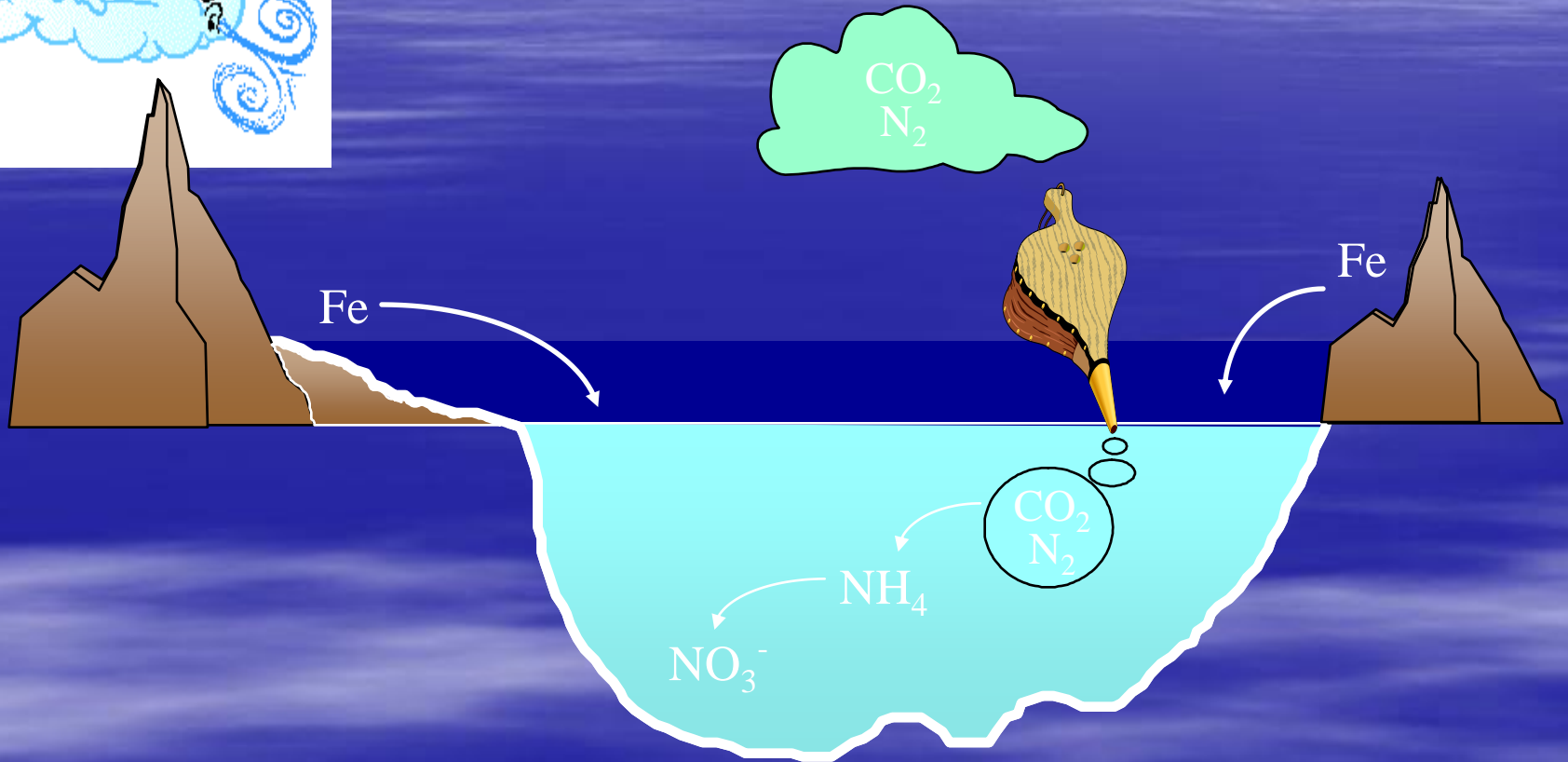


Export Photosynthetic Carbon (gC/m^2)

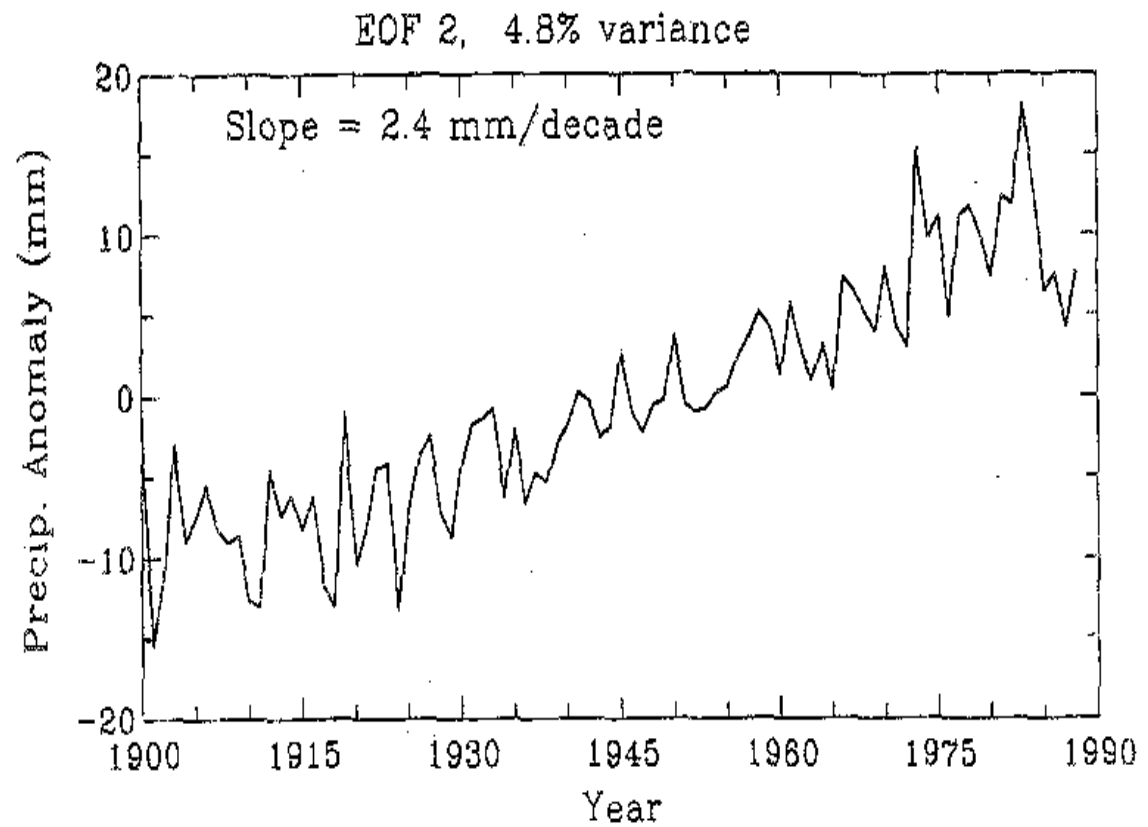
Interglacial Ocean



Glacial Ocean

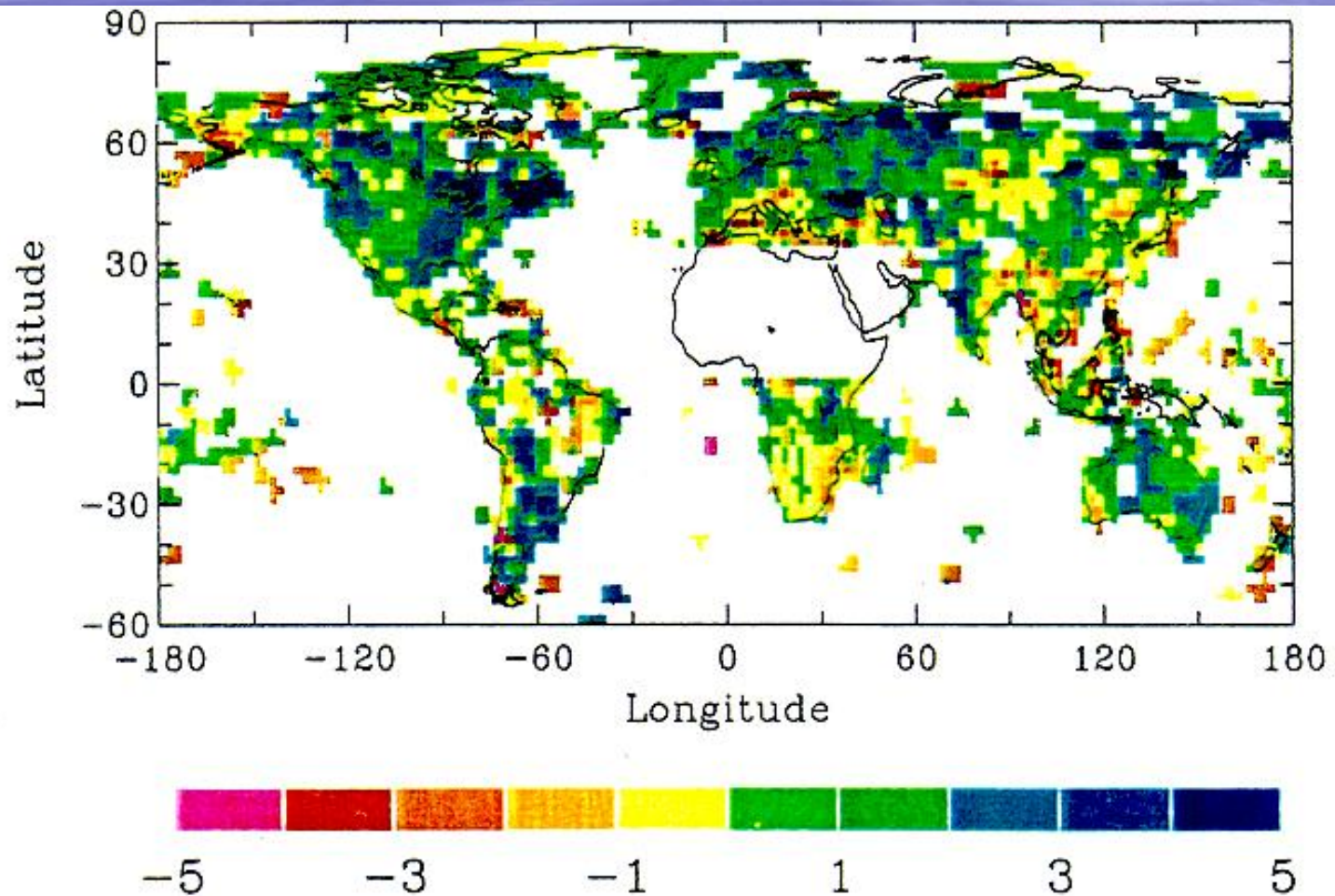


RAINFALL ANAMOLY FROM 1900 TO 1990



FROM DAI ET AL. J CLIMATE 10, 2943 (1997)

GLOBAL RAIN ANOMALY (1900-1997)



What regulates the aeolian sources of (e.g.) Fe?

- There appears to be an inverse relationship between Fe and soil moisture (as inferred from CH_4) over the past four glacial/interglacial cycles.
- There appears to have been an increase in global precipitation over the past century.
- Will Fe source areas be wetter (more precip) or drier (more evap) in the coming century?

Take home messages

1. There is no natural sink for the anthropogenically emitted carbon on time scales of centuries
2. The largest effect of alternations in the carbon cycle will be indirect – and most importantly, will impact the hydrological cycle.
3. The sign of the change in the hydrological cycle are relatively well understood – but the precipitation patterns are very very difficult to constrain.
4. We will never have complete knowledge of the climate system.