Dust Simulations in the Last Deglaciation

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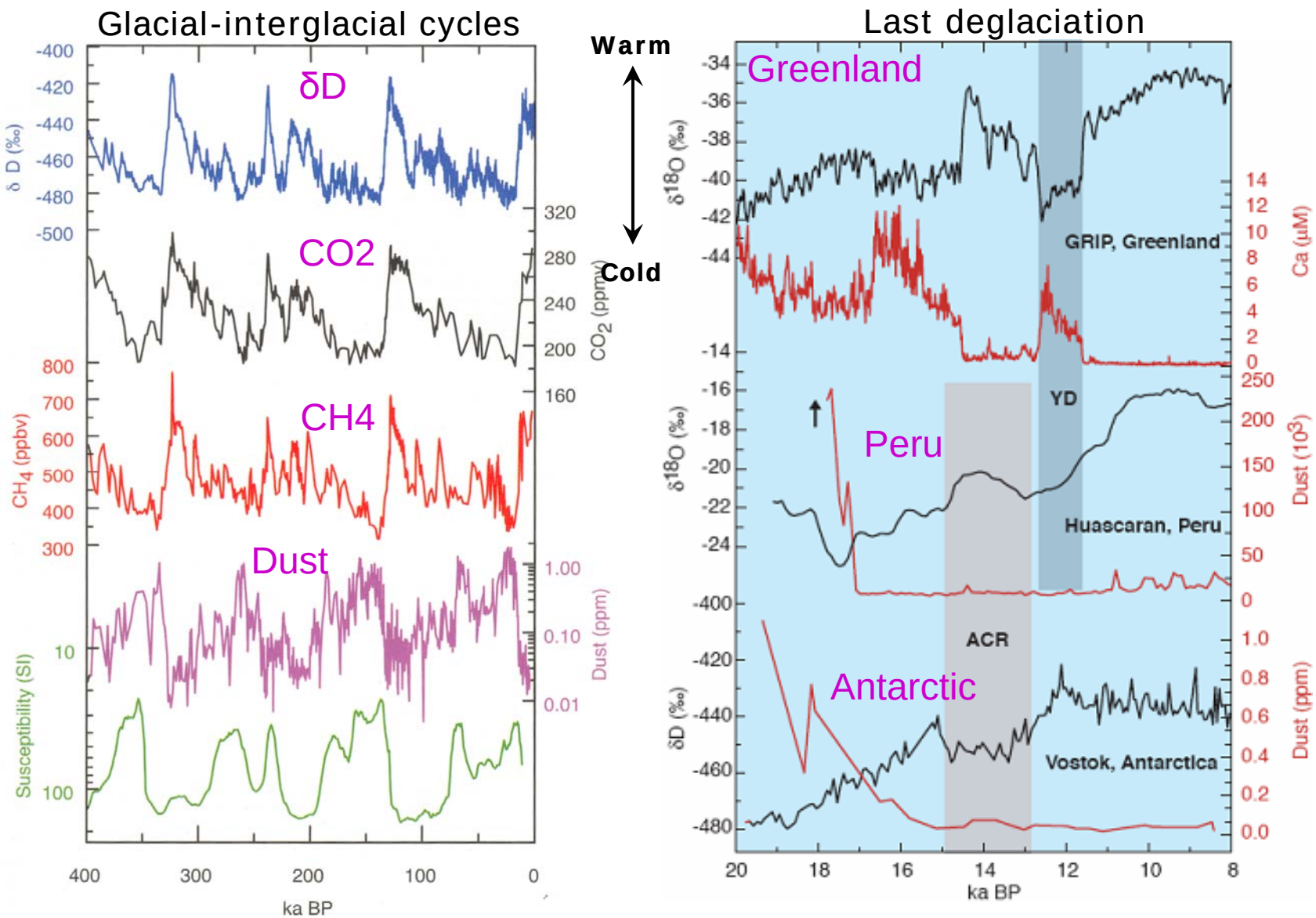
Background

- Mineral dust is one of the most important aerosols in terms of both atmospheric loading and radiative effects
- Dust is known to have direct and indirect radiative effects as well as biogeochemical effects in the Earth's climate system
- Records from ice cores and marine sediment cores show large variations of dust accumulation rates during the Quaternary
- High dust accumulation rates correspond to cold climate and vice versa

Dust and climate in the past



Both from Raynaud et al., 2003 in Paleoclimate, Global Change and the Future, Alverson Ed., Springer

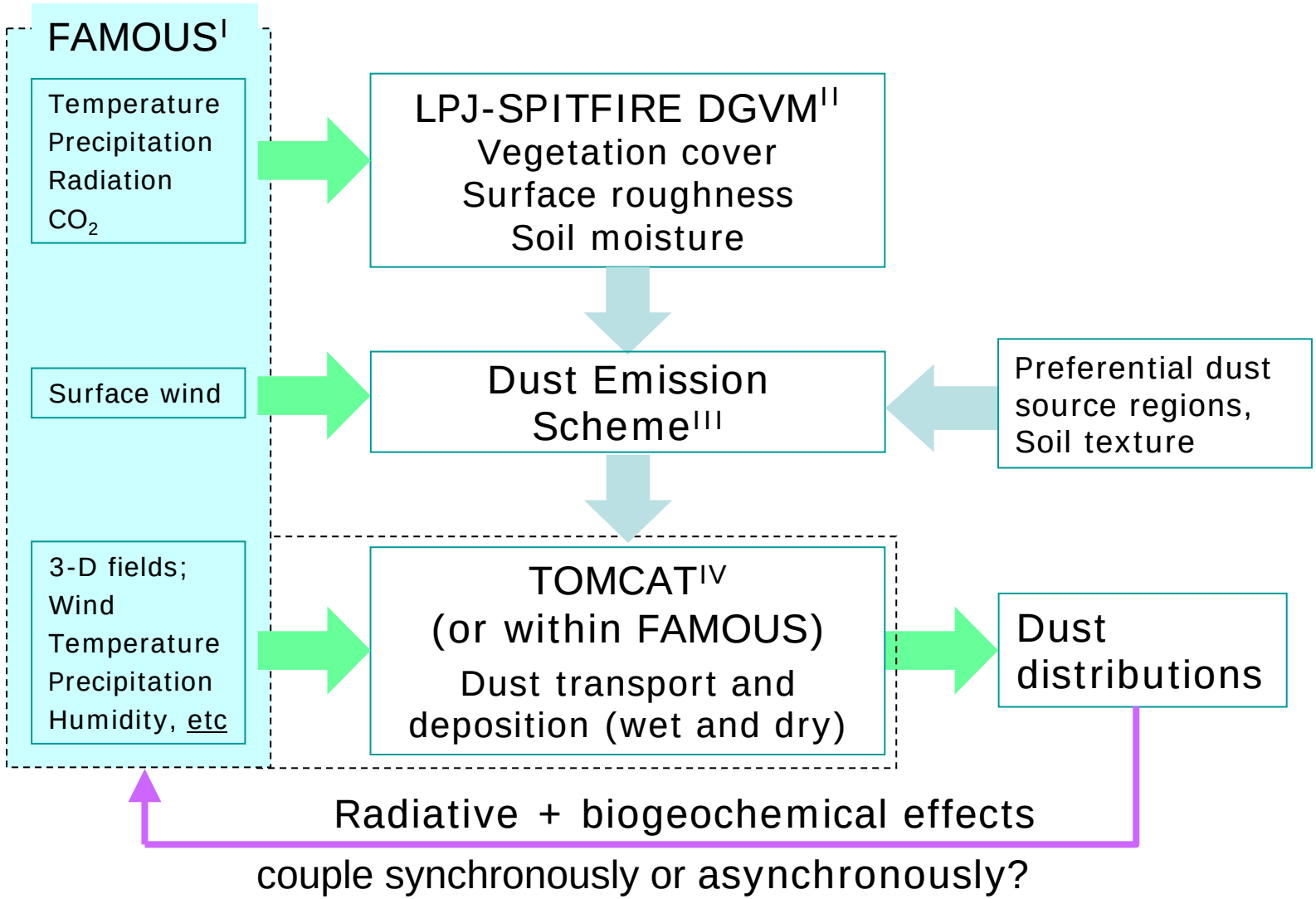
Background (continued)

- Greater source due to higher wind speed, lower soil moisture, less vegetation cover, exposed continental shelves, and glaciogenic production of fine sediments
- Longer lifetime and grater transport range due to less precipitation
- Dust may also have played active roles in the climate changes;
  - Radiative effects: net radiative effect of dust on climate is the cooling effect
  - Biogeochemical effects: dust supplies nutrients to terrestrial and marine ecosystems to enhance the carbon sink

Dust simulation in the QUEST Deglaciation Project

- QUEST Deglaciation Project aims to develop a fuller understanding of what has driven changes in climate, atmospheric composition and biogeochemical cycles during the period since the Last Glacial Maximum ~21K years
- First transient simulation of the last deglaciation using a full complexity Earth System model
- Development of new model components dealing with many important processes including dust and other aerosols
- Dynamical representation of key biogeochemical feedbacks
- Comprehensive evaluation of model against existing and newly developed datasets

Modeling framework



[I]Jones et al., 2005, [II]Thonicke in prep, [III]Tegen et al., 2002, [IV]Chipperfield and Simon 1996

FAMOUS

- FAst Met Office/UK Universities Simulator
- A low resolution version of HadCM3, which is a coupled general circulation model (AOGCM)
- Atmospheric resolution is 7.5^{o} x 5.0^{o} x 11 levels
- Ocean resolution is 3.75^{o} x 2.5^{o} x 20 levels (same as HadCM3L)
- Reported to do reasonable jobs compared with higher resolution models but known to have some biases such as underestimates of storm track intensity
- Computes radiative transfer and transport of spices
- Will be coupled with atmospheric and marine biogeochemical components
- See Jones et al. (2005) in Climate Dynamics 25 for details

More details and very preliminary results

Please come to the poster session and find out!
Feedbacks will be appreciated!!!