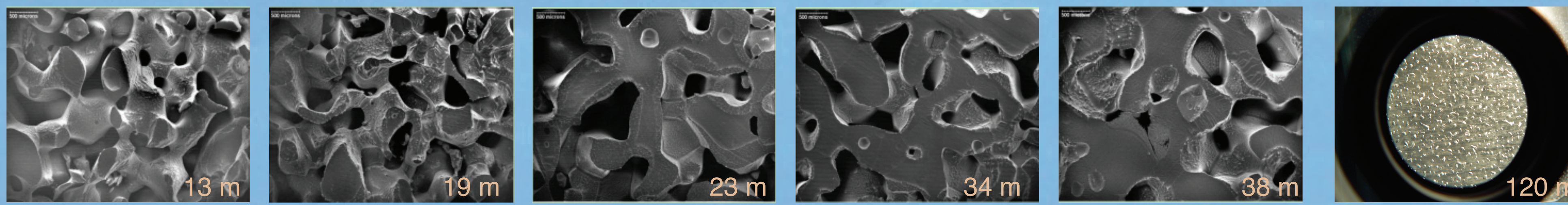




# In between snowflakes, there are holes...

These holes get sealed off as snow turns into ice and forms air bubbles, trapping ancient air.



Scanning Electron Microscopy images from Ian Baker (Dartmouth College, NH) showing firn (old snow) and bubbles of air slowly closing with depth. At about 80m, all the air is trapped and air bubbles are visible to the naked eye.

Carbon dioxide,  $\text{CO}_2$  is a greenhouse gas.

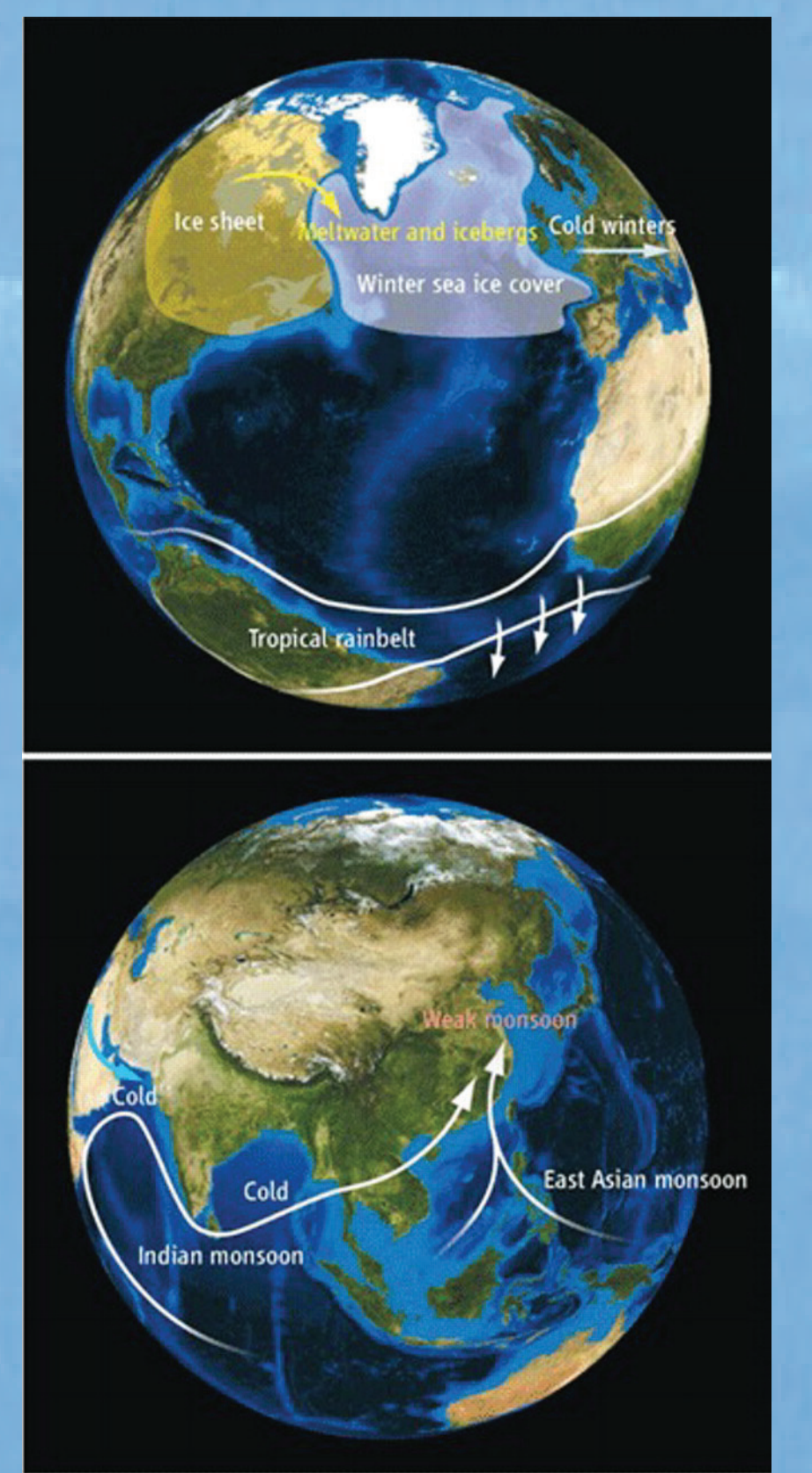
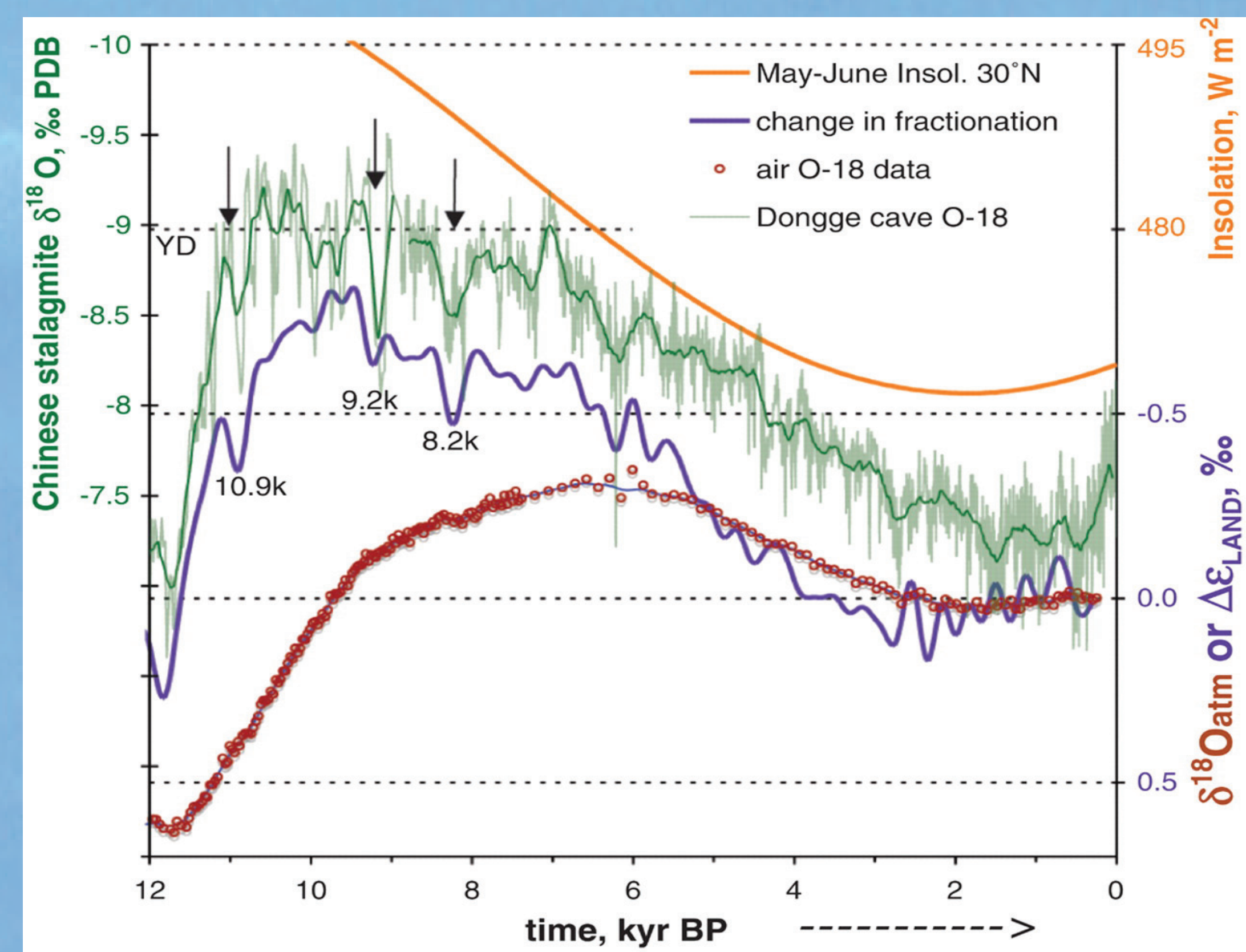
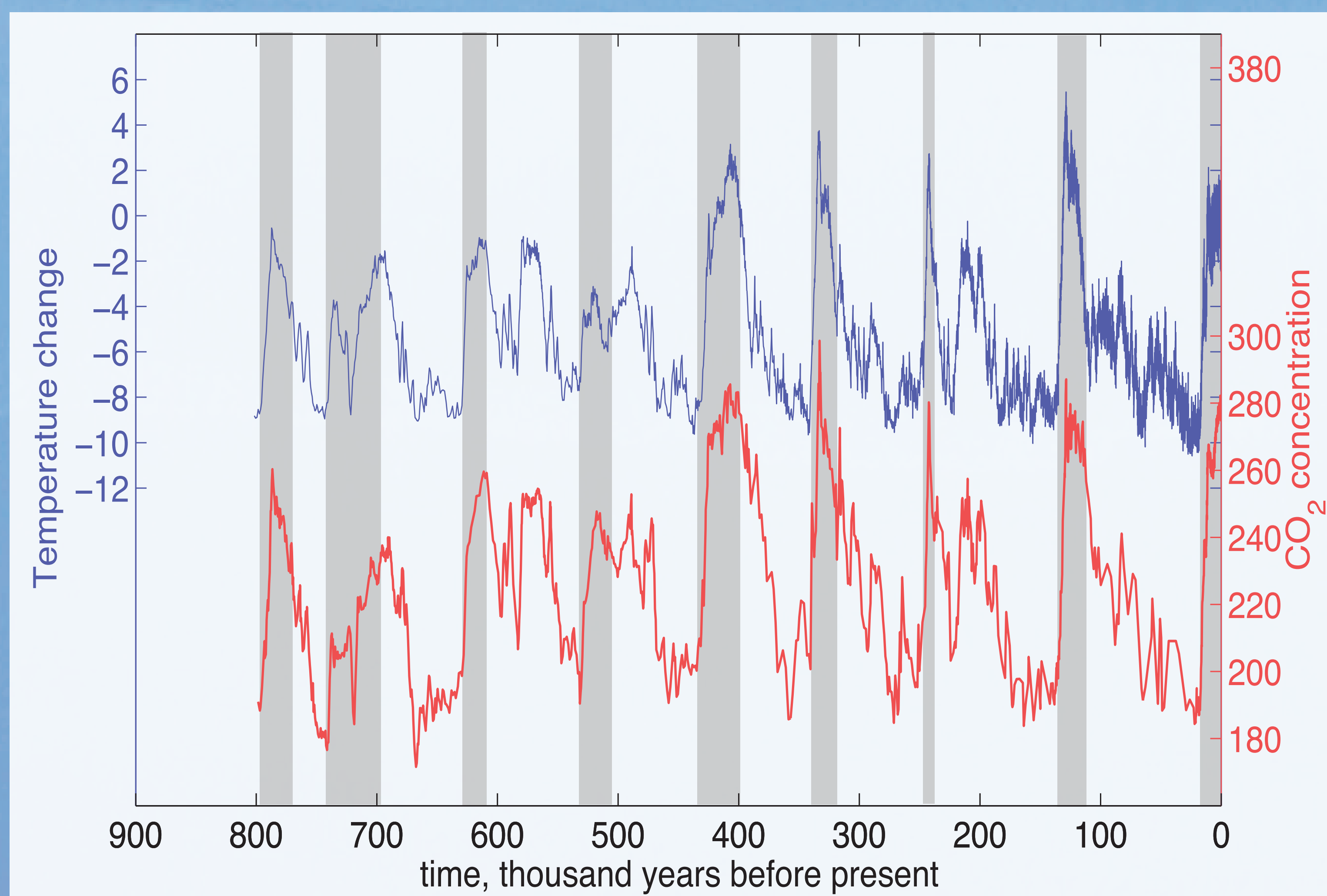


Ice melting under vacuum. Once released, the composition of the old air is measured with a mass spectrometer.

Antarctic Air tells us stories about the monsoon in far away China:

It traps heat from the Earth. This is a graph of the evolution of  $\text{CO}_2$  with temperature through time, from the EDC ice core in Antarctica. Today,  $\text{CO}_2$  concentration in the atmosphere is rising, due to the burning of oil and coal. The  $\text{CO}_2$  level is 380ppm. Can you spot it on the graph?

Source: Luthi, Nature, 2008.



When the rain stops during monsoon season in China, the vegetation responds quickly, and it affects the isotopes of Oxygen in the air, measured as  $\delta^{18}\text{O}_{\text{atm}}$ . Ice cores from Antarctica record it in their air bubbles. A recent study from Siple Dome shows that the land fraction of  $\delta^{18}\text{O}_{\text{atm}}$  from the ice core (purple) records the same signal as  $\delta^{18}\text{O}$  from stalagmites in Chinese caves (green). Ice cores give us clues about changes in the climate, not just in Antarctica, but all over the world.

Source: Severinghaus et al. Science 2009