Broecker Brief

Are meltwater events for real?

The meltwater events originally proposed by Fairbanks and Bard have become a subject of considerable controversy.

One aspect of this controversy concerns the difference between the coral record from Barbados and that from Tahiti. For Barbados there appear to be two such events. One occurred in the early stages of the Bølling Allerød and the other shortly after the end of the Younger Dryas. In contrast, only the older one has been found in the Tahiti record. So was there one such event or two?

Another aspect of the controversy has to do with the source of the water. As the records suggest sea level rose 8 to 15 meters, the amount of water required is more than is currently stored in Greenland and more than 10 percent that stored in Antarctica. Further, the records suggest that the release of this water took no more than 500 years. Yet, to my knowledge, there is no compelling physical evidence for such a release. As the six or so Heinrich events of the last glacial cycle left behind the globe encompassing evidence, why doesn't the impact of these floods show up anywhere on the planet?

Based on discussions with George Denton and Aaron Putnam, it became clear to me that a likely answer to these questions is that neither of these floods occurred. Rather, the corals are recording times when the rate of sea level rise outstripped the ability of coral growth to keep up.

In the scenario presented in Figure 1, coral reef crests began to fall behind rising sea level 18 kyrs ago when deglaciation began. Then, at the onset of the Bølling Allerød, the rate of melting of the northern ice sheets increased putting the reefs in jeopardy. After a few hundred years, coral growth on the pre-Bølling Allerød reefs in both Tahiti and Barbados ceased. Coral growth then initiated on shallower platforms previously protected by the pre-Bølling Allerød reefs. A similar thing happened a few hundred years after the end of the Younger Dryas causing a cessation of growth of Barbados reefs (but perhaps not on those surrounding Tahiti). If this

scenario is correct, then only a fraction of the apparent sea level jump need be attributed to sea level. Rather, most of it reflected a progressive deepening of the reef crests.

Of course, this scenario requires an increase in the rate of sea level rise at times when the conveyor circulation turned on. But if the coral record is influenced by reef crest deepening, this scenario will prove difficult to verify.

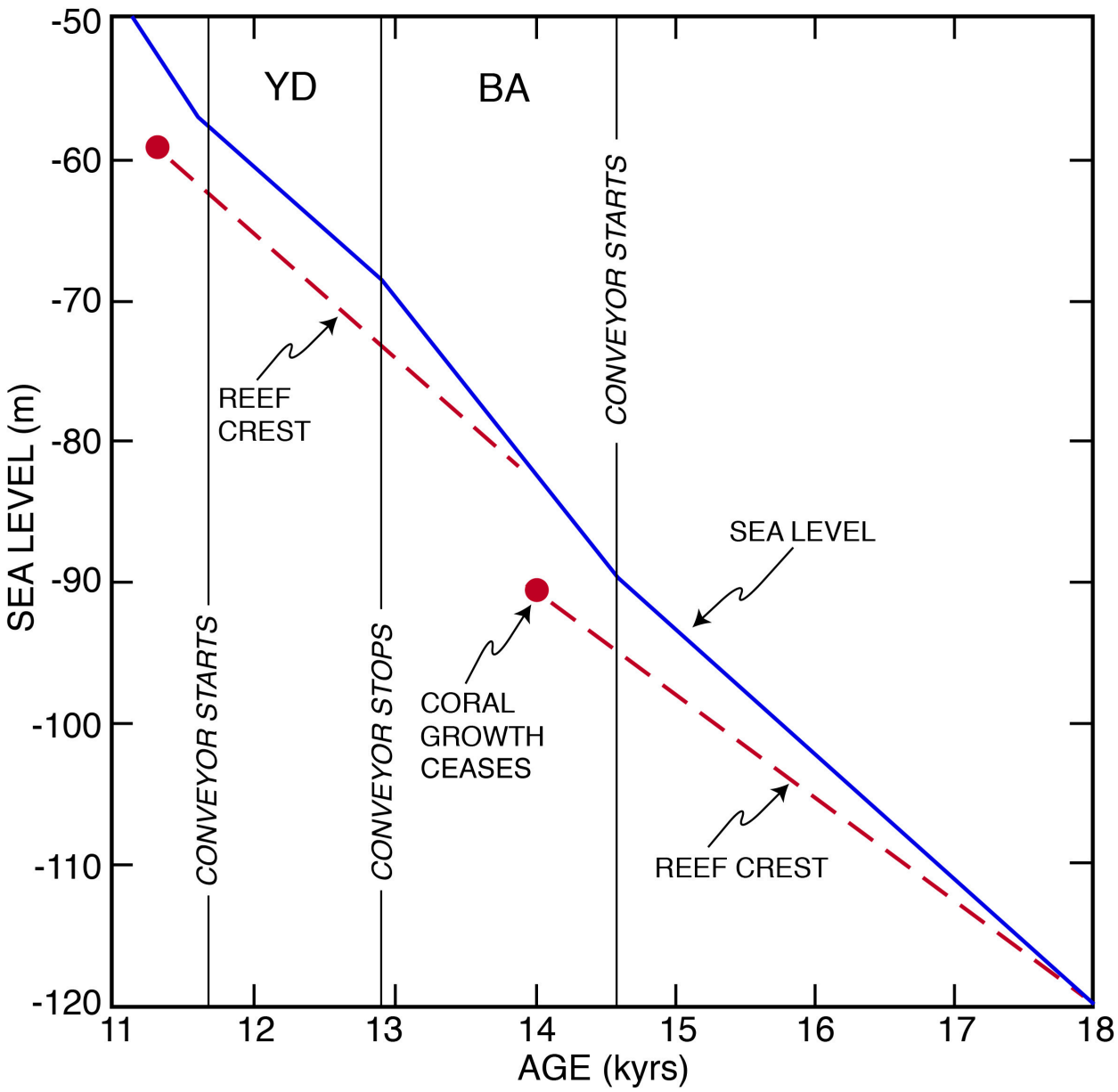

Figure 1. Scenario explaining the offsets in the coral record previously explained by meltwater floods. Instead, these offsets reflect a progressive deepening of the reef crest coupled with an increase in the rate of sea level rise at times conveyor circulation was reinitiated.